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SEPTEMBER 1982

CROP WEATHER MODELS OF CORN AND SOYBEANS FOR AGROPHYSICAL
UNITS (APU's) IN IOWA USING MONTHLY METEOROLOGICAL PREDICTORS

SHARON LEDUC

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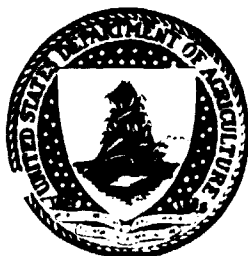
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16. Abstract Models based on multiple regression were developed to estimate corn and soybean yield from weather data for Agrophysical Units (APU) in Iowa. The predictor variables are derived from monthly average temperature and monthly total precipitation data at meteorological stations in the cooperative network. The models are similar in form to the previous models developed for Crop Reporting Districts (CRD). The trends and derived variables were the same and the approach to select the significant predictors was similar to that used in developing the CRD models. The APU's were selected to be more homogeneous with respect crop to production than the CRDs. The APU models are quite similar to the CRD models, similar explained variation and number of predictor variables. The APU models will be independently evaluated and compared to the previously evaluated CRD models. That comparison will indicate the preferred model area for this application, i.e., APU or CRD.					
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CROP YIELD MODELS OF CORN AND SOYBEANS FOR
AGROPHYSICAL UNITS (APU's) IN
IOWA USING MONTHLY METEOROLOGICAL PREDICTORS

Sharon LeDuc

Introduction

Models were developed to investigate the hypothesis that prediction of yield from monthly weather parameters would improve if the basic area for the model became more homogeneous with respect to agricultural environment, soils and climate. The homogeneous areas, or agrophysical units (APU's), are groupings of counties. Models developed for APU's are compared with similar models previously developed for the crop reporting districts (CRD's). Eight APU's for Iowa, shown in Figure 1, were defined in a memorandum of understanding from Strommen and Dragg (January 10, 1980).

Data

The basic meteorological data were monthly average maximum and average minimum temperatures and total precipitation for all of the available cooperative stations. These data were used to estimate the monthly average temperature and monthly total precipitation for each county in the state. This task was completed at the University of Missouri - Columbia, Atmospheric Science Department, under the supervision of Professor Wayne Decker. The methods (Thiessen and inverse distance) were briefly described by LeDuc (1982). Since no significant difference in the values produced by the two methods was detected, the computationally simpler method, the inverse distance method was used. These county data were then averaged over all counties within each

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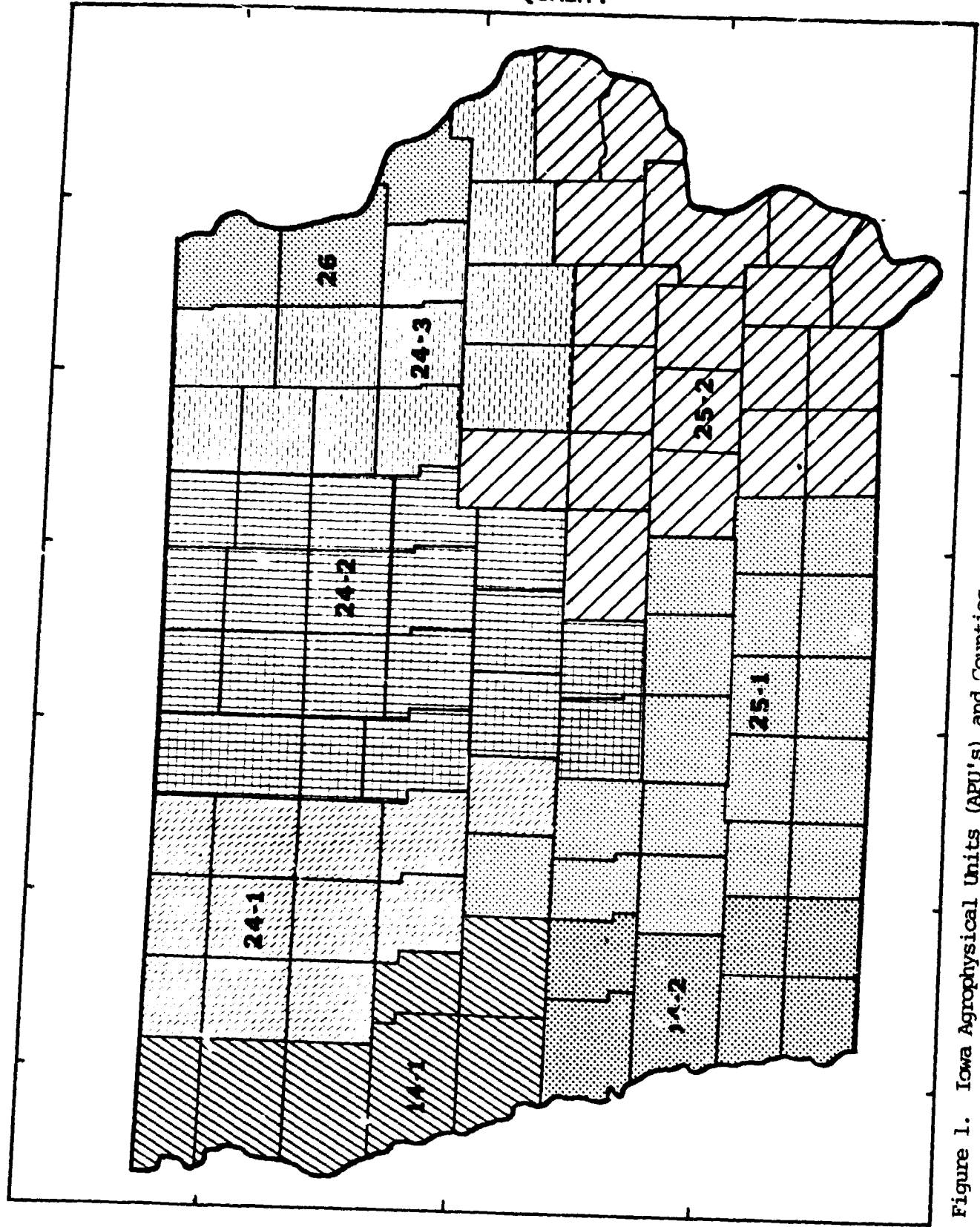


Figure 1. Iowa Agrophysical Units (APU's) and Counties

APU to obtain an average monthly temperature and total monthly precipitation for that APU.

Variables considered as predictor variables in the models are the same as those considered for the CRD's models (Motha, 1980; LeDuc, 1980). The trend variables are also the same. For the soybean models there are two linear trends; the change occurred in 1961. For the corn models there is a single linear trend.

Method

The method for selecting variables was similar to that used for the previously developed CRD models. A preliminary correlation analysis was done between the yield with trend removed and the predictor variables. This was used to determine which variables to consider. Stepwise regression with stepwise, backward and forward selection was used. The selected variables were examined with respect to the sign of the coefficient, the agreement of variables selected for adjacent APU's and the statistical significance and correlation among the predictor variables. In some cases variables not selected in stepwise were considered for subjective reasons and the results analyzed. These additional variables were considered because they were important in adjacent APU's. If no variable was included for a month, including a period when weather might have had a significant affect on yield, several additional variables for that month were tried. These variables were not included in the models unless the coefficients were statistically significant in the full season model. This full season model is developed separately from the truncated models, i.e. models which used variables only through a specified month for each of the APU's.

Discussion of the Models

The statistical details of each of the models are included in Appendix A. The truncated models, i.e., models using variables only through a specified month, for each of the APU's are included. There is also a separate model which incorporated observations from all of the separate APU's, cross sectional data. This increased the number of observations available to select the variables and to estimate the regression coefficients. In this model a dummy variable is considered for inclusion for each APU. This allows for a different level of yield for each APU, but assumes the same impact of the meteorological variables on yield in all APU's. The statistical summaries of the end of season models for soybeans and corn are included in Tables 1 and 2, respectively.

The production and harvested area data were available for counties (Cotter, 1981). For soybeans data were from 1950 through 1979. For corn, the data for "corn for grain" did not begin until 1956. Prior to that production and harvested area data were only available for "corn for grain." Kestle (1982) used a statistical adjustment to provide the yield of "corn for grain" from the yield of "corn for all purposes" for six years, 1950-1955. The statistical adjustment was based on 1956, the only year both sets of statistics were available. These data increased the sample size by 25 percent. The calculated yield was the sum of the production over all counties in each APU divided by the sum of the harvested area for those same counties. The observation for 1970 was not used to develop the corn models in some areas because of the devastating impact of the corn blight on yield.

Development of the Models

The derived meteorological variables developed as potential predictors in the crop yield models are the same as those considered for the CRD models (Motha, 1980; LeDuc, 1980).

The variable PET (potential evapotranspiration) is calculated using Thornthwaite's method (1948).

The ET (evapotranspiration) and ETHAT (climatically appropriate evapotranspiration) are determined using a hydrologic accounting procedure developed by Palmer (1956). Software for calculating these variables is available for the Statistical Analysis System (SAS). Documentation and code for the software are available from Dr. Thomas Phillips at the Center for Environmental Assessment Services (CEAS). Restricting the variables considered as predictors was deliberate to allow evaluation of the difference in models (i.e. comparison Crop Reporting District (CRD, versus Agrophysical (APU) resulting from a change in the basic geographic unit for which yield was estimated. Other variables, such as monthly average maximum and minimum temperature were available for consideration in the models but were ignored when selecting variables for the models.

Models

The models are described in Tables in Appendix A. Figures displaying the yield and estimated yield from the model for the end of the season are included in Appendix B. Appendix C includes the data used in estimating the models.

Soybean Models

The soybean models (Appendix A) for the CRD's include variables for the weather in September in six of the nine CRD models, the southern, western and the north central models. September variables were included in models for 5 of the 8 APU's and also for the model which included all of the APU's.

The cumulative precipitation, the sum from September of the previous fall through April just prior to planting, was a variable in four of the CRD models. The coefficient was negative, indicating decreased yield is associated with too

much precipitation during that period. None of the APU models included this variable nor had April truncations. One of the APU models and the model for all APU's included the squared deviation from normal of the cumulative precipitation through May. The coefficient estimate was negative in both models.

Other variables for the month of May included in the APU models were precipitation and evapotranspiration. The CRD models used temperature and the squared precipitation. For the June truncation the APU models included variables which were functions of potential and/or estimated evapotranspiration. The CRD models used temperature in the June models. For both types of models, the July and August variables were largely functions of the evapotranspiration. August and September are important months in relating final yield to the weather. The variables included in the models are significant and explain much of the variability in the yields.

The explained variance (R^2) for the final truncation of the soybean APU models ranged from 77-95 percent (77-98 percent for final CRD models). In the models which combined all APU's there were three APU's found to have a significantly lower level of yield (APU 141, 243 and 260) as indicated by the negative coefficients for variables D1, D4 and D5. The coefficients for the trend variables changed with the various models. The estimated increase due to trend is similar for both APU and CRD models. The estimated increase due to trend from 1950 to 1979 ranged from 7.4 q/ha in APU 251 in the south central to 13.4 q/ha in APU 260 in the northeast. Comparably, the range for the CRD models is from 7.4 q/ha for the southeast CRD to 13.5 q/ha for the northeast CRD.

Corn Models

The statistics for the truncated corn models for the APU's are included in Appendix A. The models for the full season model are summarized in Table 2.

There were only two APU models with a May truncation. One indicated that high temperatures in May were associated with decreased yields; the other that decreased yield is observed when May precipitation is high. July is the most important month in both the APU and the CRD models. The July variables for the APU models are functions of potential and/or estimated evapotranspiration.

June potential and/or estimated evapotranspiration also appears to be significant in many of the models. The end of the season model for APU 242 had a variable for April, the ratio of precipitation to potential evapotranspiration for April, and three models had variables for August.

The CRD models also had emphasis on the July variables. Cumulative precipitation for September through June was included as a squared deviation from the mean in three CRD models and in one APU model. One CRD model contains cumulative precipitation, September through June. An April truncation is not included for any of the CRD models and for only one APU model.

The explained variance (R^2) is somewhat higher with the APU models (88-95 percent) than with CRD models (67-91 percent). The estimates of the trend coefficients appear to be higher with the CRD models although the differences are small. The increase in estimated yield due to trend ranges from 34.8 q/ha to 48.9 q/ha for the APU models for the period 1950 to 1980.

Three APU's (141, 142, 251) were found to have a significantly different level of yield as indicated by the significance of the coefficient of variable D1 in the model for all APU's.

Summary

The variables of the APU models found to be significant for the APU models are closely related to those found to be significant for the CRD models, temperature or evapotranspiration was determined to be significant for the same month in the same geographic area. The functional form varied slightly as did the amount of variation explained. Structurally the models are similar by construction with differences being in the predictor variables selected. The estimated contribution due to trend is similar for the two types of models. The amount of variation explained by the APU models for corn was somewhat higher than for the CRD models. Selection between these two types of models will be made after the APU models have been independently tested. Differences between the statistics of the models (APU vs CRD) developed from historic data are not significant and do not determine a preference toward one type of selection of one geographical unit as the basis for models. Models for both types can be improved. The initial attempts can possibly be improved by evaluation of the trend through use of different linear trends or through incorporation of estimates of the components of technology, such as crop type and fertilizer application. The extent of this improvement will need to be determined in future model development. The evaluation of the current APU models and the comparison of the two types of models will be determined on the predictive capability since this is the intended use. The comparison of the regressions for the two types will be based on a bootstrap test procedure. Results will be presented in a later report.

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Table 1. Summary of Variables and Coefficient Estimates for APU Soybean Models (Final Truncation)

APU	R ²	Trend		May		June		July		August		September		Dummy	
		1	2	Var.	Coef.	Var.	Coef.	Var.	Coef.	Var.	Coef.	Var.	Coef.	Var.	Coef.
141	.89	.18	.52			ET	.09	ET	.08						
142	.78	.29	.17	E	85.20	ETP	-32.34					E	3.35		
242	.92	.39	.28	DSQ	-.00005	ET	.04	ET	.06	XDD	.58	PDSQ	-.00007		
243	.95	.33	.47			ET	.09	ET	.03	ETP	5.27	XDD	47.93		
251	.77	.33	.19	PDD	-.02	PET	.05	ET	.09	ETHPT	-9.33				
252						ET	.06	E	4.84			P	-.00002		
260	.94	.34	.52			E	-30.46	ET	.06	E	5.63	ETHAT	-10.42		
All	.84	.33	.36	DSQ	-.00002	ET	.05	PD	.01	ET	.04	E	.03	DI	-.98
														D4	-1.16
														D5	-2.31

PDD, deviation from mean of monthly precipitation (mm);
 ET, evapotranspiration (mm);
 ETHAT, climatically appropriate evapotranspiration (mm);
 E, ratio of ET to ETHAT;
 PET, potential evapotranspiration (mm);
 ETP, ratio of ET to PET;
 DSQ, squared deviation from mean of cumulative precipitation since last September (mm²);
 PDSQ, squared deviation from mean of precipitation (mm²);
 XDD, deviation from mean of temperature (°C);
 TREND1, year minus 1930 prior to 1962, then 32;
 TREND2, .1 prior to 1962, then year minus 1961;
 DI (D4, D5), zero for all APU's except 141 (2 + 3, 260), when value is one, respectively.

Table 2. Summary of Variables and Coefficient Estimates for APU Corn Models (Final Truncation)

APU	R ²	Trend	April		May		June		July		August		Dummy	
			Var.	Coef.	Var.	Coef.	Var.	Coef.	Var.	Coef.	Var.	Coef.	Var.	Coef.
141	.88	1.41								E	62.20			
142	.90	1.18							DEF	.05				
241	.93	1.57			XDD	-1.39	ET	.36	ETP	89.19	PD	-0.05		
									DEF	.08	E	19.12		
											XDD	1.41		
242	.95	1.63	MR	-1.34			XDD	.95	ETP	103.96				
243	.94	1.38					ET	.20	ETP	78.69	PD	.03		
251	.89	1.16					ET	.41	DEF	.07				
252	.94	1.46					RSQ	-.00009	E	51.47				
							ETHAT	.21						
260	.95	1.42			PD	-.05	ET	.20	E	57.85				
									MR	5.13				
All	.86	1.41					ET	.20	ETP	56.70			DI	-2.95

DEF, precipitation minus potential evapotranspiration (mm);
 DSQ, squared deviation from mean of cumulative precipitation since last September (mm);
 E, ratio of ET to ETHAT;
 ET, evapotranspiration (mm);
 ETHAT, climatically appropriate evapotranspiration (mm);
 ETP, ratio of ET to PET;
 MR, precipitation divided by PET;
 PD, precipitation (mm);
 XDD, temperature deviation from mean (°C);
 DI, zero for all APU's except 141, 142, or 251 when it is one.

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Appendix A

VARIABLE LABELS

TREND1 - YEAR-1930 IF YEAR<1952 OR 32 IF YEAR>1951
TREND2 - 0.1 IF YEAR<1962 OR YEAR-1961 IF YEAR>1961
E5 - ET/ETHAT FOR MAY
DSQ5 - SQUARED CUM PRECIP DEVIATION FOR MAY
P005 - PRECIP DEVIATION FOR MAY
E6 - ET/ETHAT FOR JUNE
ETP5 - ET/PET FOR JUNE
PET6 - POTENTIAL EVAPOTRANSPIRATION FOR JUNE
ET7 - EVAPOTRANSPIRATION FOR JULY
P07 - PRECIP FOR JULY
ET8 - EVAPOTRANSPIRATION FOR AUGUST
E8 - ET/ETHAT FOR AUGUST
E9 - ET/ETHAT FOR SEPTEMBER
PDS09 - SQUARED PRECIP DEVIATION FOR SEPTEMBER
ETP9 - ET/PET FOR SEPTEMBER
ETHAT9 - CLIMATICALLY APPROPRIATE POTENTIAL
EVAPOTRANSPIRATION FOR SEPTEMBER
DSQ9 - SQUARED CUM PRECIP DEVIATION FOR SEPTEMBER
X009 - TEMPERATURE DEVIATION FOR SEPTEMBER
ET9 - EVAPOTRANSPIRATION FOR SEPTEMBER
D1 - 1 IF APU=141
D4 - 1 IF APU=243
D5 - 1 IF APU=260

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IONA SOYBEANS NORTHWESTERN APU 141

MODEL:	TREND		SSE	145.523915	F RATIO	29.07
DEP VAR:	YIELD		DFF	23	PROB>F	0.0001
			MSF	6.62633	R-SQUARE	0.6749
VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T RATIO	PROB>T	
INTERCEPT	1	8.365214	4.234571	2.0937	0.0435	
TREND1	1	0.229144	0.153774	1.4901	0.1474	
TREND2	1	0.451737	0.091159	4.9549	0.0001	

MODEL:	JULY		SSE	192.194459	F RATIO	41.26
DEP VAR:	YIELD		DFF	27	PROB>F	0.0001
			MSF	3.78498	R-SQUARE	0.6209
VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T RATIO	PROB>T	
INTERCEPT	1	-10.103189	5.155265	-1.9534	0.0505	
TREND1	1	0.205755	0.116317	1.7777	0.0867	
TREND2	1	0.431990	0.069205	6.2645	0.0001	
ET7	1	0.144093	0.030709	4.6922	0.0001	

MODEL:	AUGUST		SSE	64.651310	F RATIO	50.88
DEP VAR:	YIELD		DFF	29	PROB>F	0.0001
			MSF	2.486599	R-SQUARE	0.8367
VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T RATIO	PROB>T	
INTERCEPT	1	-11.240329	4.149552	-2.6829	0.0125	
TREND1	1	0.205390	0.094281	2.1838	0.0382	
TREND2	1	0.432965	0.056095	7.6098	0.0001	
ET7	1	0.092773	0.028178	3.2924	0.0029	
ET8	1	0.073542	0.018927	3.8855	0.0006	

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IOWA SOYBEANS NORTH-WESTERN CENTRAL APU 241

MODEL:	TREND		SSE	131.208905	F RATIO	36.36
DEP VAR:	YIELD		D.F.E	28	PROB>F	U.0001
			MSE	4.686032	R-SQUARE	U.7220
VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T RATIO	PROB> T	
INTERCEPT	1	8.901801	3.561193	2.4997	U.0186	
TREND1	1	0.281784	0.129318	2.1788	U.0379	
TREND2	1	0.393413	0.076570	5.1313	U.0001	

MODEL:	MAY		SSE	115.540591	F RATIO	27.76
DEP VAR:	YIELD		D.F.E	27	PROB>F	U.0001
			MSE	4.279281	R-SQUARE	U.7552
VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T RATIO	PROB> T	
INTERCEPT	1	8.008395	3.435007	2.3314	U.0274	
TREND1	1	0.344363	0.127936	2.6938	U.0120	
TREND2	1	0.358593	0.075493	4.7500	U.0001	
OSQ5	1	-0.000083928	.00004386125	-1.9135	U.0663	

MODEL:	JULY		SSE	82.698737	F RATIO	30.59
DEP VAR:	YIELD		D.F.E	25	PROB>F	U.0001
			MSE	3.180721	R-SQUARE	U.8248
VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T RATIO	PROB> T	
INTERCEPT	1	-4.154903	4.806111	-0.8645	U.3952	
TREND1	1	0.345721	0.110213	3.1368	U.0042	
TREND2	1	0.345467	0.065213	5.2980	U.0001	
OSQ5	1	-0.0000684292	.00003812087	-1.7951	U.0843	
ET7	1	0.090026	0.028017	3.2133	U.0035	

MODEL:	AUGUST		SSE	52.647863	F RATIO	39.82
DEP VAR:	YIELD		D.F.E	23	PROB>F	U.0001
			MSE	2.105915	R-SQUARE	U.8984
VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T RATIO	PROB> T	
INTERCEPT	1	-7.157513	3.990634	-1.7936	U.0850	
TREND1	1	0.350064	0.089586	3.9032	U.0006	
TREND2	1	0.341470	0.053074	6.4359	U.0001	
OSQ5	1	-0.0000675296	.00003101939	-2.1770	U.0391	
ET7	1	0.051198	0.025007	2.0474	U.0513	
ET8	1	0.073093	0.019349	3.7775	U.0009	

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IOWA SOYBEANS NORTHWESTERN CENTRAL APU 241

MODEL: SEPT
DEP VAR: YIELD

SSE 34.448269
DFE 23
MSE 1.497751

F RATIO 41.73
PROB>F U.0001
R-SQUARE U.9270

VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T RATIO	PROB> T
INTERCEPT		-8.151966	3.414368	-2.3875	U.0256
TREND1		0.373889	0.077547	4.8214	U.0001
TREND2		0.298544	0.046427	6.4305	U.0001
OSQ5		-0.000434136	0.0002740155	-1.5843	U.1268
ERT7		0.041727	0.021599	1.9230	U.0670
XD09		0.056087	0.018949	2.9755	U.0068
9		0.598013	0.179157	3.3379	U.0029
		3.504807	1.734866	2.0202	U.0552

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IOWA SOYBEANS NORTHERN CENTRAL APU 242

MODEL:	TREND		SSE	70.954573	F RATIO	63.21
DEP VAR:	YIELD		DFF	28	PROB>F	0.0001
			MSE	2.534095	R-SQUARE	0.8187
VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T RATIO	PROB> T	
INTERCEPT	1	7.224666	2.618912	2.7588	0.0101	
TREND1	1	0.356923	0.095097	3.7533	0.0008	
TREND2	1	0.338749	0.056381	6.0082	0.0001	

MODEL:	JUNE		SSE	57.756527	F RATIO	51.98
DEP VAR:	YIELD		DFF	27	PROB>F	0.0001
			MSE	2.139134	R-SQUARE	0.8524
VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T RATIO	PROB> T	
INTERCEPT	1	-0.454469	3.917520	-0.1160	0.9085	
TREND1	1	0.354560	0.087377	4.0578	0.0004	
TREND2	1	0.342606	0.051825	6.6109	0.0001	
ET6	1	0.062361	0.025106	2.4839	0.0195	

MODEL:	AUGUST		SSE	37.715752	F RATIO	60.94
DEP VAR:	YIELD		DFF	25	PROB>F	0.0001
			MSE	1.450506	R-SQUARE	0.9036
VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T RATIO	PROB> T	
INTERCEPT	1	-8.699990	3.915147	-2.2221	0.0352	
TREND1	1	0.323202	0.072447	4.4612	0.0001	
TREND2	1	0.365831	0.043132	8.4817	0.0001	
ET6	1	0.071913	0.020934	3.4521	0.0019	
ET8	1	0.068417	0.018407	3.7169	0.0010	

MODEL:	SEPT		SSE	27.246535	F RATIO	53.45
DEP VAR:	YIELD		DFF	24	PROB>F	0.0001
			MSE	1.135272	R-SQUARE	0.9304
VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T RATIO	PROB> T	
INTERCEPT	1	-11.670862	3.608922	-3.2340	0.0035	
TREND1	1	0.324175	0.066006	4.9113	0.0001	
TREND2	1	0.367668	0.038335	9.5409	0.0001	
ET6	1	0.086894	0.019120	4.5446	0.0001	
ET8	1	0.036364	0.019946	1.8323	0.0793	
POS09	1	-0.000603855	0.0002969343	-2.0336	0.0532	
ET09	1	5.450705	2.075977	2.6256	0.0148	

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IOWA SOYBEANS NORTH-EASTERN CENTRAL APU 243

MODEL: TREND		SSE	64.630002	F RATIO	97.94
DEP VAR: YIELD		DFE	23	PROB>F	0.0001
		MSE	2.308214	R-SQUARE	0.9749
VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T RATIO	PROB> T
INTERCEPT	1	5.421748	2.499372	2.1692	0.0387
TREND1	1	0.351425	0.090750	3.8720	0.0006
TREND2	1	0.439387	0.053510	8.1749	0.0001

MODEL: JUNE		SSE	55.648447	F RATIO	74.52
DEP VAR: YIELD		DFE	27	PROB>F	0.0001
		MSE	2.061139	R-SQUARE	0.8923
VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T RATIO	PROB> T
INTERCEPT	1	-1.648753	4.129379	-0.3993	0.6928
TREND1	1	0.353388	0.085327	4.1757	0.0003
TREND2	1	0.430524	0.051144	8.4343	0.0001
PET6	1	0.055324	0.026741	2.0875	0.0464

MODEL: AUGUST		SSE	35.808785	F RATIO	87.30
DEP VAR: YIELD		DFE	25	PROB>F	0.0001
		MSE	1.377255	R-SQUARE	0.9307
VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T RATIO	PROB> T
INTERCEPT	1	-11.614533	4.277362	-2.7165	0.0116
TREND1	1	0.328467	0.070563	4.6201	0.0001
TREND2	1	0.456312	0.042275	10.7935	0.0001
PET6	1	0.063230	0.021347	2.9811	0.0078
ETR	1	0.035597	0.022353	1.5954	0.0004

MODEL: SEPT		SSE	23.454332	F RATIO	94.13
DEP VAR: YIELD		DFE	24	PROB>F	0.0001
		MSE	0.977264	R-SQUARE	0.9545
VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T RATIO	PROB> T
INTERCEPT	1	680.474564	250.078344	2.7211	0.0114
TREND1	1	0.327391	0.060555	5.4058	0.0001
TREND2	1	0.473077	0.038199	12.3845	0.0001
PET6	1	0.048580	0.019250	2.5243	0.0164
ETR	1	0.048424	0.019255	2.5253	0.0001
XDD9	1	44.941264	17.452329	2.5819	0.0104
ETHAT9	1	-9.729354	3.522349	-2.7621	0.0107

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IOWA SOYBEANS SOUTHERN CENTRAL APU 251

MODEL: TREND SSE 108.048518 F RATIO 22.76
 DEP VAR: YIELD DFE 28 PROB>F 0.0001
 MSE 3.858979 R-SQUARE 0.6192

VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T RATIO	PROB> T
INTERCEPT	1	8.580604	3.231643	2.6552	0.0129
TREND1	1	0.288593	0.117351	2.4592	0.0204
TREND2	1	0.237713	0.069575	3.4167	0.0020

MODEL: MAY SSE 106.045039 F RATIO 15.08
 DEP VAR: YIELD DFE 27 PROB>F 0.0001
 MSE 3.927594 R-SQUARE 0.6262

VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T RATIO	PROB> T
INTERCEPT	1	8.395031	3.270526	2.5668	0.0161
TREND1	1	0.296820	0.118950	2.4953	0.0190
TREND2	1	0.229958	0.071027	3.2376	0.0032
PD05	1	-0.00673008	0.009422912	-0.7142	0.4812

MODEL: JUNE SSE 92.122438 F RATIO 13.52
 DEP VAR: YIELD DFE 25 PROB>F 0.0001
 MSE 3.543171 R-SQUARE 0.6753

VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T RATIO	PROB> T
INTERCEPT	1	0.932164	4.880952	0.1910	0.8500
TREND1	1	0.308481	0.113132	2.7267	0.0113
TREND2	1	0.223226	0.067546	3.3048	0.0028
PD05	1	-0.00824873	0.008982529	-0.9183	0.3569
ET6	1	0.057518	0.029016	1.9823	0.0581

MODEL: AUGUST SSE 60.693266 F RATIO 18.37
 DEP VAR: YIELD DFE 23 PROB>F 0.0001
 MSE 2.427731 R-SQUARE 0.7861

VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T RATIO	PROB> T
INTERCEPT	1	-13.070348	5.609725	-2.3299	0.0282
TREND1	1	0.322396	0.093726	3.4398	0.0021
TREND2	1	0.204107	0.056164	3.6341	0.0013
PD05	1	-0.019557	0.008072323	-2.4227	0.0230
ET6	1	0.086143	0.025302	3.4046	0.0023
EB	1	10.118020	2.812091	3.5980	0.0014

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IOWA SOYBEANS SOUTHEASTERN APU 252

MODEL: TREND		SSE	89.427939	F RATIO	47.33
DEP VAR: YIELD		DFE	28	PROB>F	U.0001
		MSE	3.193555	R-SQUARE	U.7717
VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T RATIO	PROB> T
INTERCEPT	1	11.113158	2.940021	3.7800	U.0008
TREND1	1	0.236766	0.106761	2.2177	U.0349
TREND2	1	0.384410	0.063296	5.0732	U.0001

MODEL: JUNE		SSE	79.821775	F RATIO	35.17
DEP VAR: YIELD		DFE	27	PROB>F	U.0001
		MSE	2.956362	R-SQUARE	U.7963
VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T RATIO	PROB> T
INTERCEPT	1	4.109556	4.805891	0.8551	U.4000
TREND1	1	0.253519	0.103135	2.4581	U.0207
TREND2	1	0.372398	0.061261	5.0789	U.0001
ET6	1	0.051996	0.028945	1.8026	U.0826

MODEL: AUGUST		SSE	69.651056	F RATIO	30.06
DEP VAR: YIELD		DFE	26	PROB>F	U.0001
		MSE	2.678987	R-SQUARE	U.8222
VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T RATIO	PROB> T
INTERCEPT	1	-2.734247	5.767523	-0.4741	U.6394
TREND1	1	0.259036	0.098216	2.6374	U.0139
TREND2	1	0.344679	0.060026	5.7422	U.0001
ET6	1	0.068373	0.028716	2.3810	U.0249
E8	1	4.784751	2.455519	1.9485	U.0522

MODEL: SEPT		SSE	26.036296	F RATIO	46.15
DEP VAR: YIELD		DFE	23	PROB>F	U.0001
		MSE	1.132013	R-SQUARE	U.9335
VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T RATIO	PROB> T
INTERCEPT	1	810.252357	186.026321	4.3556	U.0002
TREND1	1	0.244408	0.064569	3.7793	U.0010
TREND2	1	0.384775	0.040728	9.4475	U.0001
ET6	1	0.054720	0.019452	2.8074	U.0100
E8	1	4.944258	1.606127	3.0784	U.0053
DS09	1	-0.000021304	0.0000611358	-3.4836	U.0020
X009	1	57.792325	13.173379	4.3870	U.0002
ETHAT9	1	-10.602992	2.432430	-4.3590	U.0002

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VARIABLE LABELS

TREND - 1 IF YEAR \leq 1949 OR YEAR=1949 IF YEAR $>$ 1949
MR4 - PRECIPITATION/PET FOR APRIL
POS - PRECIPITATION FOR MAY
XDD5 - TEMPERATURE DEVIATION FOR MAY
ETHAT6 - CLIMATICALLY APPROPRIATE POTENTIAL
EVAPOTRANSPIRATION FOR JUNE
XDD6 - TEMPERATURE DEVIATION FOR JUNE
DSQ6 - SQUARED PRECIPITATION DEVIATION FOR JUNE
ET6 - EVAPOTRANSPIRATION FOR JUNE
MR7 - PRECIPITATION/PET FOR JULY
E7 - ET/ETHAT FOR JULY
DEF7 - TEMPERATURE DEVIATION-PET FOR JULY
ETP7 - ET/PET FOR JULY
PDR - PRECIPITATION FOR AUGUST
E8 - ET/ETHAT FOR AUGUST
XDD8 - TEMPERATURE DEVIATION FOR AUGUST
PDR - PRECIPITATION FOR AUGUST
D1 - DUMMY VARIABLE. 1 IF APJ=141 OR APJ=142 OR APJ=251

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IONA CORP NORTHWESTERN APR 141

MODEL:	TREND		SSR	2954.393	F-RATIO	48.58
			DFE	25	PROB>F	0.0001
DEP VAR:	YIELD		MSR	73.728307	R-SQUARE	0.6242
VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T-RATIO	PROB> T	
INTERCEPT	1	25.157471	5.151537	4.8744	0.0001	
TREND	1	1.141249	0.173327	6.58142	0.0001	

MODEL:	JULY		SSR	645.759132	F-RATIO	60.75
			DFE	25	PROB>F	0.0001
DEP VAR:	YIELD		MSR	25.830347	R-SQUARE	0.6752
VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T-RATIO	PROB> T	
INTERCEPT	1	-35.017255	13.433181	-2.5314	0.0177	
TREND	1	1.405412	0.195505	12.4902	0.0001	
E7	1	02.197195	12.785409	4.8647	0.0001	
DEF7	1	0.050301	0.025700	1.9550	0.0502	

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1974 CORN NORTHWEST CENTRAL APRU 2+1

MODEL:	TREND		SSE	1312.391	F RATIO	123.30
			DFE	25	PROB>F	0.0001
DEP VAR:	YIELD		MSR	46.571107	R-SQUARE	0.8149
VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T RATIO	PROB> T	
INTERCEPT	1	25.538472	2.519475	10.15711	0.0001	
TREND	1	1.234523	0.135193	11.1033	0.0001	

MODEL:	MAY		SSE	1214.742	F RATIO	55.04
			DFE	27	PROB>F	0.0001
DEP VAR:	YIELD		MSR	45.140954	R-SQUARE	0.7221
VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T RATIO	PROB> T	
INTERCEPT	1	25.395202	2.478759	10.2477	0.0001	
TREND	1	1.545797	0.135399	11.3829	0.0001	
XDD5	1	-1.026331	0.713350	-1.4347	0.1517	

MODEL:	JULY		SSE	655.004509	F RATIO	45.02
			DFE	25	PROB>F	0.0001
DEP VAR:	YIELD		MSR	25.230947	R-SQUARE	0.9075
VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T RATIO	PROB> T	
INTERCEPT	1	30.319186	2.030597	14.9290	0.0001	
TREND	1	1.591723	0.102140	15.5905	0.0001	
XDD5	1	-1.257412	0.535740	-2.3567	0.0257	
DEF7	1	0.091478	0.019357	4.7235	0.0001	

MODEL:	AUGUST		SSE	445.448202	F RATIO	55.32
			DFE	24	PROB>F	0.0001
DEP VAR:	YIELD		MSR	20.227505	R-SQUARE	0.9315
VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T RATIO	PROB> T	
INTERCEPT	1	11.187912	7.153424	1.5630	0.1311	
TREND	1	1.558775	1.092347	1.5512	0.0001	
XDD5	1	-1.391542	0.449500	-2.8452	0.0089	
DEF7	1	0.020445	0.015581	1.3276	0.0002	
ER	1	19.121327	5.335487	3.5775	0.0105	
XDD8	1	1.411204	0.754500	1.8693	0.0740	

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YIELD CORN SOUTHERN CENTRAL APR 251

MODEL: TREND SSE 2154.033 F-RATIO 42.71
DEP VAR: YIELD DF 25 PROB>F 0.0001
 MSE 77.429755 R-SQUARE 0.5040

VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T-RATIO	PROB> T
INTERCEPT	1	25.023435	3.235292	7.7345	0.0001
TREND	1	1.151353	0.177324	6.5354	0.0001

MODEL: JUNE SSE 1697.915 F-RATIO 25.45
DEP VAR: YIELD DF 27 PROB>F 0.0001
 MSE 70.293147 R-SQUARE 0.5534

VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T-RATIO	PROB> T
INTERCEPT	1	-5.235593	15.244444	-0.3223	0.7497
TREND	1	1.156319	0.154633	7.3413	0.0001
ET6	1	0.251556	0.125323	1.9503	0.0504

MODEL: JULY SSE 595.209555 F-RATIO 51.15
DEP VAR: YIELD DF 25 PROB>F 0.0001
 MSE 23.848365 R-SQUARE 0.8911

VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T-RATIO	PROB> T
INTERCEPT	1	-72.621151	17.236295	-4.2143	0.0003
TREND	1	1.151243	0.095755	11.7544	0.0001
ET6	1	0.405395	0.079027	5.1350	0.0001
OFF7	1	0.066706	0.014309	4.6630	0.0012
E7	1	51.468359	13.915591	3.6947	0.0011

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1976 CORN SOUTH AFRICA 489 232

MODEL:	TREND		SSE	419.443333	F RATIO	145.37
			DFE	20	PR > F	0.0001
DEP VAR:	YIELD		MSR	32.882702	MS ERROR	0.00413
VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T RATIO	PROB > T	
INTERCEPT	1	10.213274	2.113700	4.83015	0.0001	
TREND	1	1.407354	0.115701	12.1511	0.0001	

MODEL:	JUNE		SSE	707.457331	F RATIO	62.32
			DFE	20	PR > F	0.0001
DEP VAR:	YIELD		MSR	27.219902	MS ERROR	0.00774
VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T RATIO	PROB > T	
INTERCEPT	1	20.852557	11.356725	1.8351	0.0774	
TREND	1	1.443492	0.110572	13.0345	0.0001	
DSDB	1	-0.000945327	0.0002657342	-3.5551	0.0017	
ETHAT6	1	0.000153	0.001250	0.1222	0.9331	

MODEL:	JULY		SSE	345.113117	F RATIO	95.64
			DFE	20	PR > F	0.0001
DEP VAR:	YIELD		MSR	13.804725	MS ERROR	0.00404
VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T RATIO	PROB > T	
INTERCEPT	1	-57.151214	17.243497	-3.3164	0.0024	
TREND	1	1.454417	0.115131	12.6319	0.0001	
DSDB	1	-0.000904117	0.0002605779	-3.4557	0.0017	
ETHAT6	1	0.212753	0.055394	3.8435	0.0034	
E7	1	61.074154	11.221325	5.4232	0.0001	

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1074 COR1 NORTHEASTERN APU 260

MODEL: TREND SSE 571.536700 F-RATIO 232.09
DEP VAR: YIELD DFE 27 P>F 0.0001
 SSE 20.397225 R-SQUARE 0.8889

VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T-RATIO	PROB> T
INTERCEPT	1	30.136304	1.552401	19.3834	0.0001
TREND	1	1.381543	0.040591	15.2545	0.0001

MODEL: MAY SSE 557.196715 F-RATIO 119.33
DEP VAR: YIELD DFE 26 P>F 0.0001
 SSE 19.971015 R-SQUARE 0.8950

VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T-RATIO	PROB> T
INTERCEPT	1	33.091743	2.845751	11.6254	0.0001
TREND	1	1.369245	0.090055	15.1501	0.0001
POS	1	-0.027477	0.021593	-1.2725	0.2137

MODEL: JUNE SSE 484.572750 F-RATIO 54.59
DEP VAR: YIELD DFE 27 P>F 0.0001
 SSE 17.950543 R-SQUARE 0.9090

VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T-RATIO	PROB> T
INTERCEPT	1	13.021533	9.835359	1.3352	0.1714
TREND	1	1.381057	0.085777	16.1912	0.0001
POS	1	-0.033477	0.020555	-1.6115	0.1172
ET6	1	0.161782	0.079401	2.0375	0.0515

MODEL: JULY SSE 274.695394 F-RATIO 119.32
DEP VAR: YIELD DFE 26 P>F 0.0001
 SSE 10.585267 R-SQUARE 0.8484

VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T-RATIO	PROB> T
INTERCEPT	1	-43.741455	15.433229	-2.8351	0.0051
TREND	1	1.424232	0.066511	21.4131	0.0001
POS	1	-0.024338	0.015291	-1.5849	0.0530
ET6	1	0.193410	0.051410	3.7605	0.0005
ET7	1	37.347557	12.975705	2.8741	0.0051

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1974 OHIO STATE MODEL FOR ALL APUR IN STATE

MODEL: TREND		SSR	14008.97	F RATIO	315.69
DEP VAR: YIELD		DF	249	PROB>F	0.0001
		MSE	56.370715	R-SQUARE	0.7248
VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T RATIO	PROB> T
INTERCEPT	1	23.931394	1.011543	23.6912	0.0001
TREND	1	1.352124	0.054415	24.7479	0.0001
DT	1	-3.487938	1.449582	-3.0740	0.0003

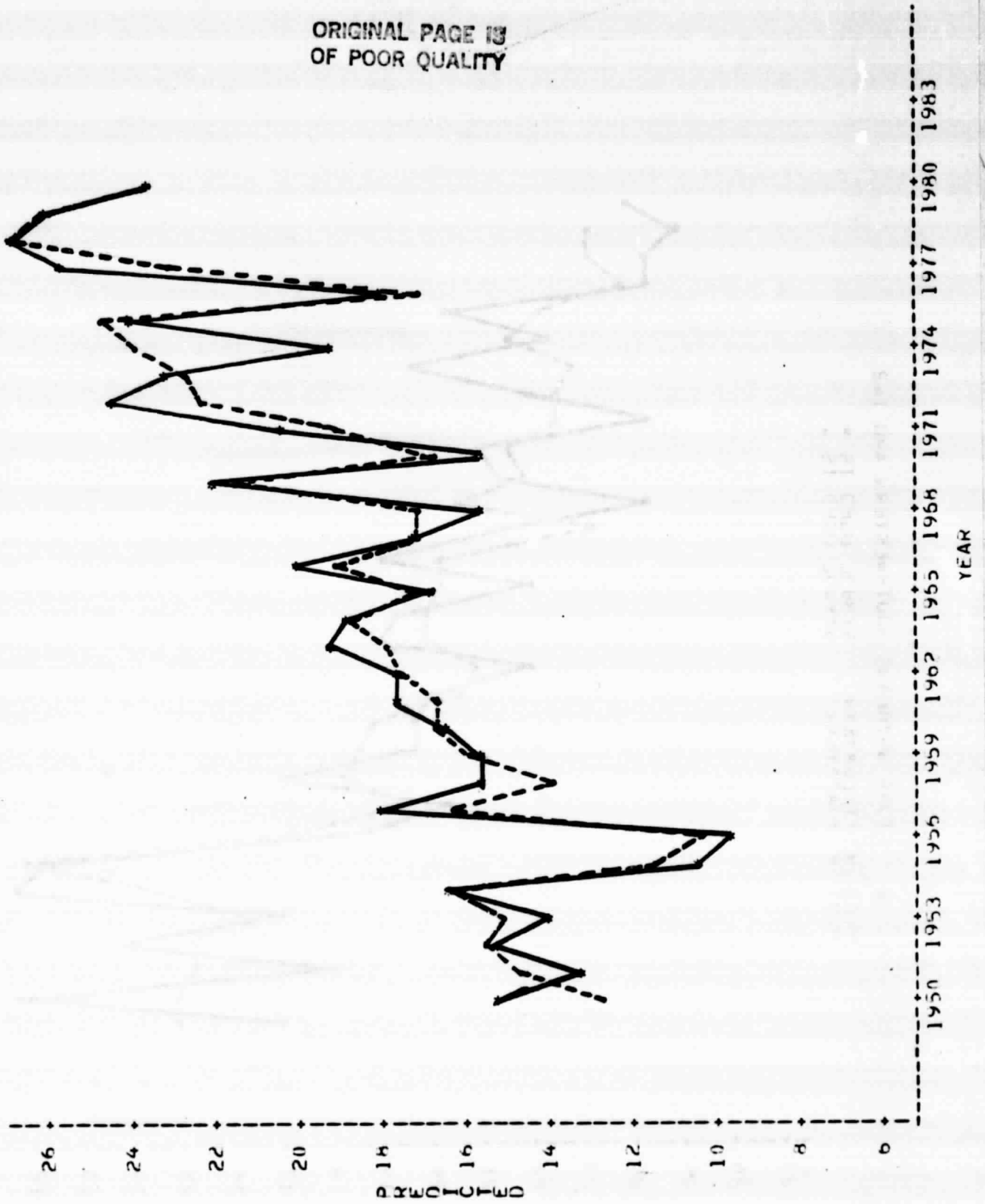
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DEP VAR: YIELD		DF	234	PROB>F	0.0001
		MSE	54.787399	R-SQUARE	0.7426
VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T RATIO	PROB> T
INTERCEPT	1	7.869372	5.246773	1.4998	0.1350
TREND	1	1.347987	0.052729	25.3643	0.0001
DT	1	-5.339389	1.443757	-3.6935	0.0003
ETS	1	0.170236	0.041551	4.0842	0.0001

MODEL: JULY		SSR	7079.343	F RATIO	293.14
DEP VAR: YIELD		DF	237	PROB>F	0.0001
		MSE	29.871910	R-SQUARE	0.8508
VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T RATIO	PROB> T
INTERCEPT	1	-54.456088	6.542157	-8.3240	0.0001
TREND	1	1.414570	0.039253	35.8343	0.0001
DT	1	-2.255205	1.079390	-2.1378	0.0057
ETS	1	0.201507	0.032415	6.2106	0.0001
DT	1	5.134723	1.279572	4.0125	0.0001
DT ²	1	55.703500	5.625545	9.9543	0.0001

Appendix B

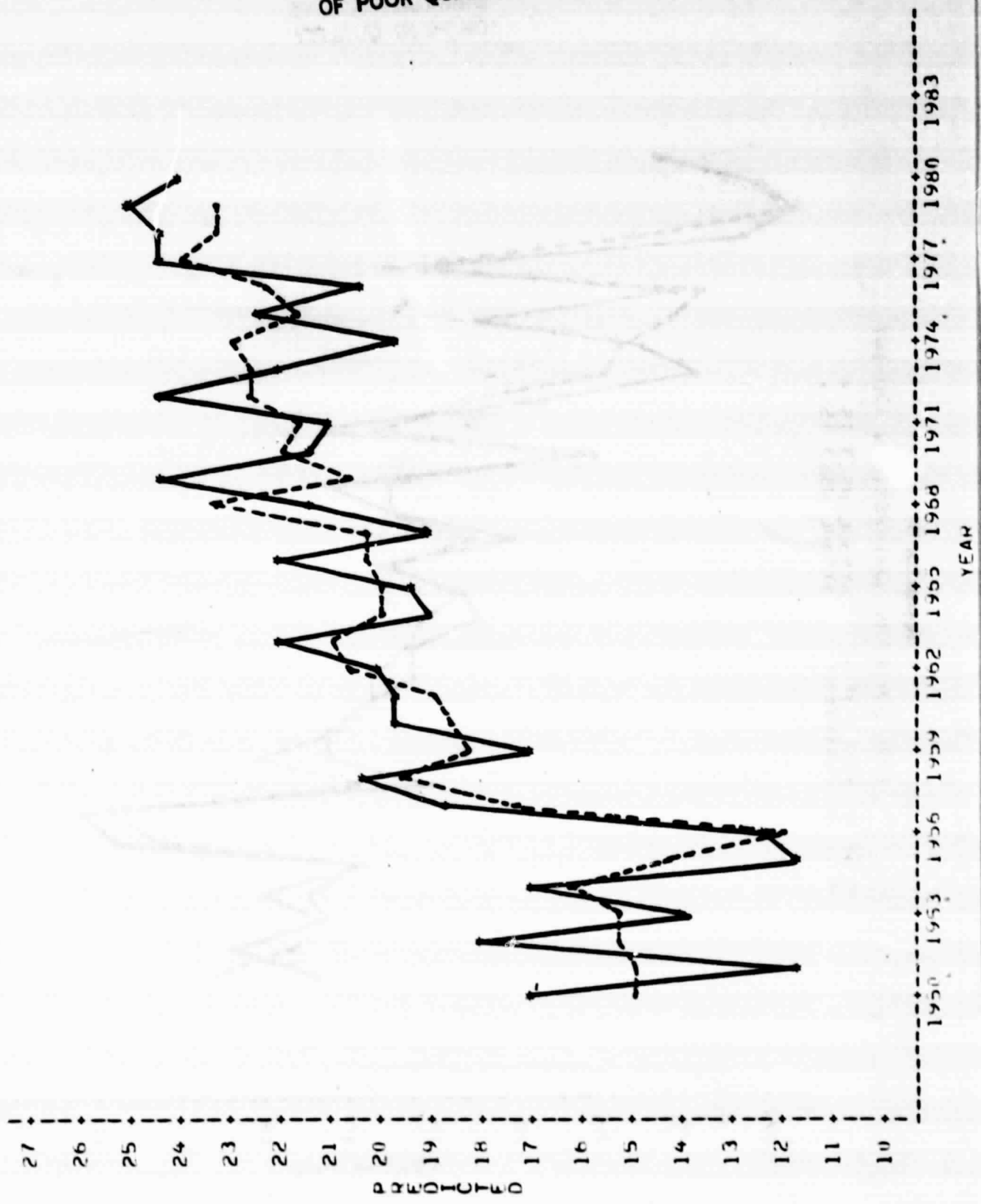
IDM SOYBEANS NORTHWESTERN ARIJ 141

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PLOT OF YHAT*YEAR SYMBOL USED IS :



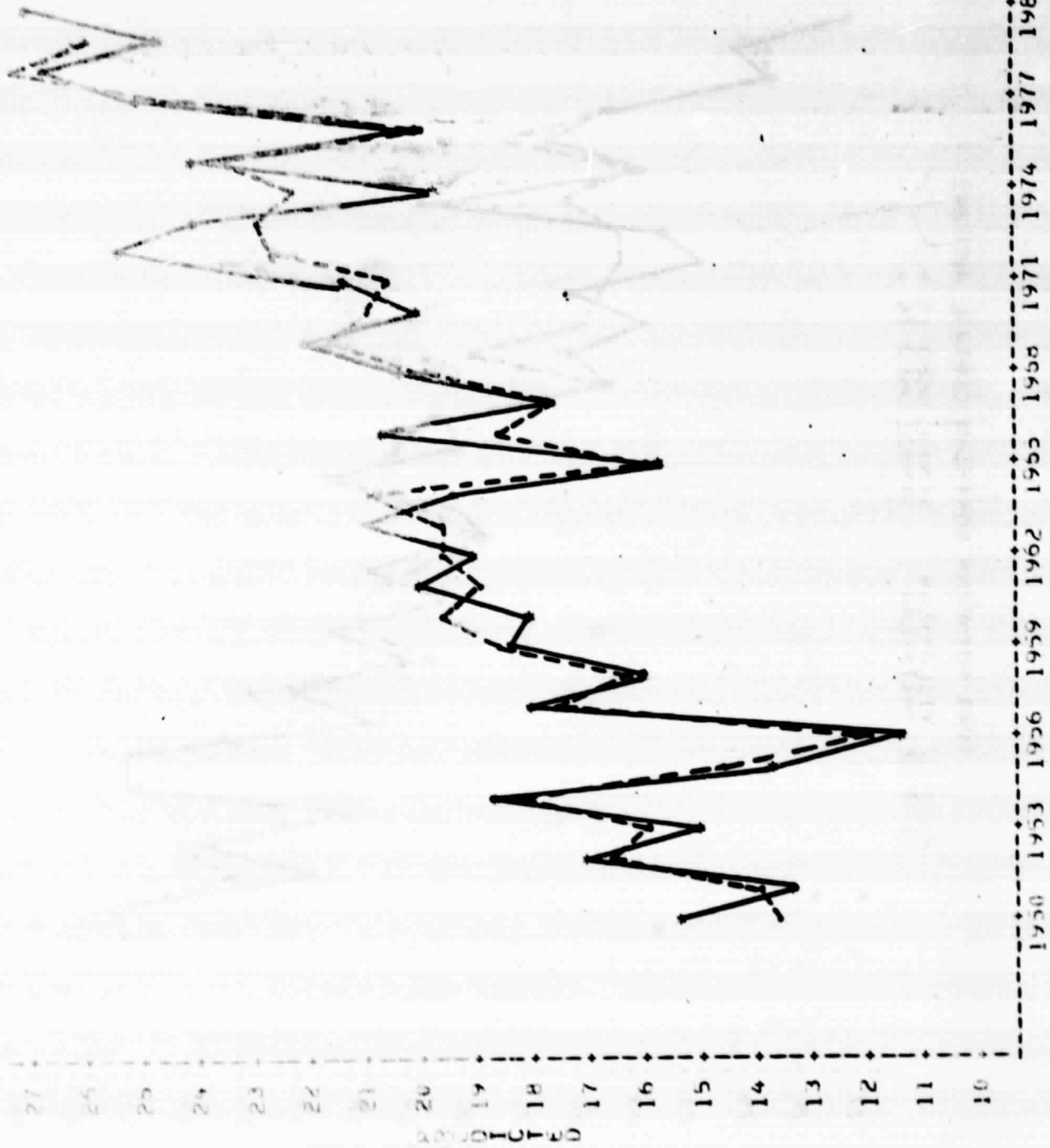
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LOWA SOYBEAN IS SOUTHWESTERN APR 142
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PLOT OF YIAT*YEAR SYMBOL USED IS .



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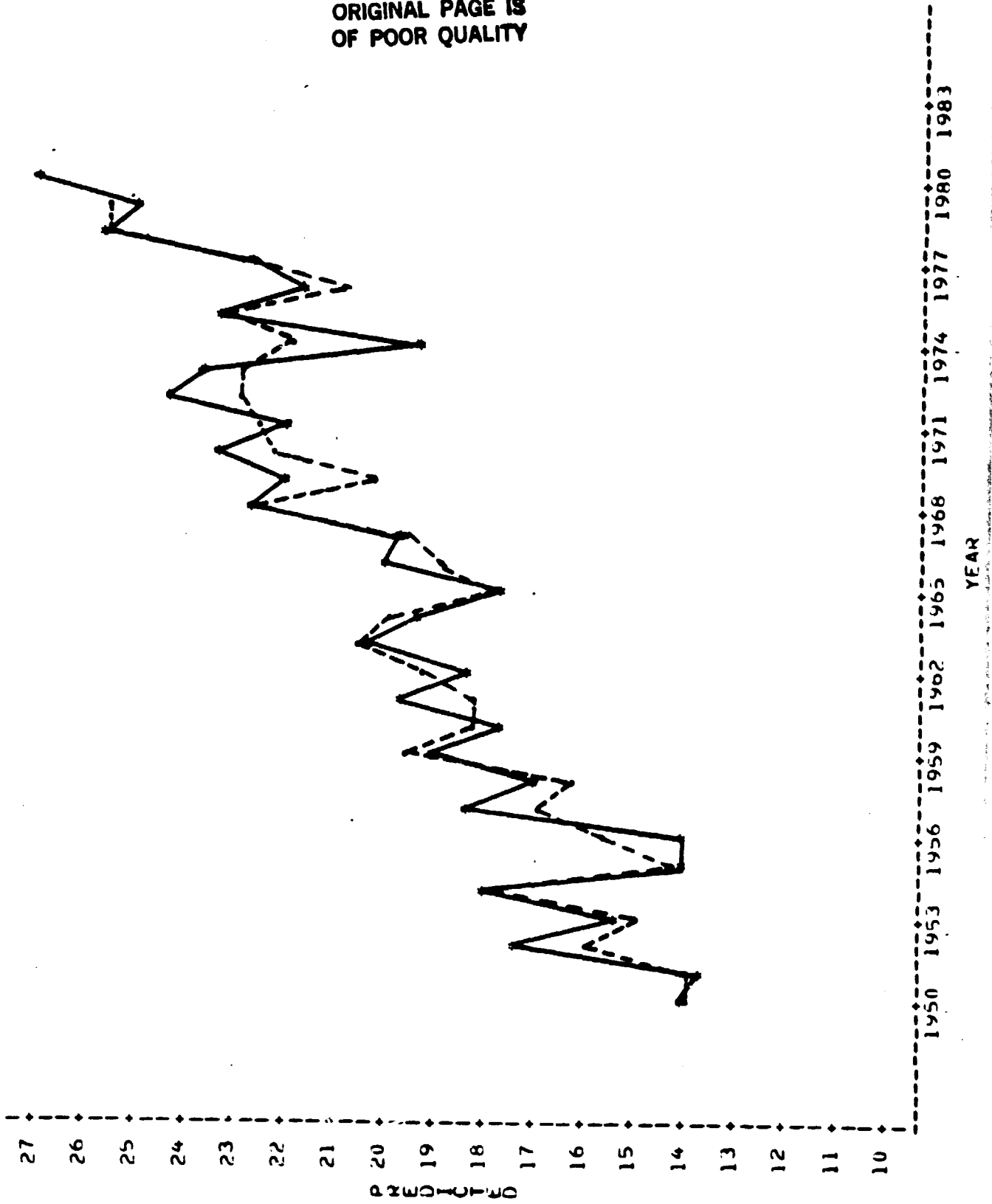
INDUSTRIAL PRODUCTION INDEX
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IOWA SOYBEANS NORTHERN CENTRAL APU 242

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PLOT OF YIELD*YEAR SYMBOL USED IS :

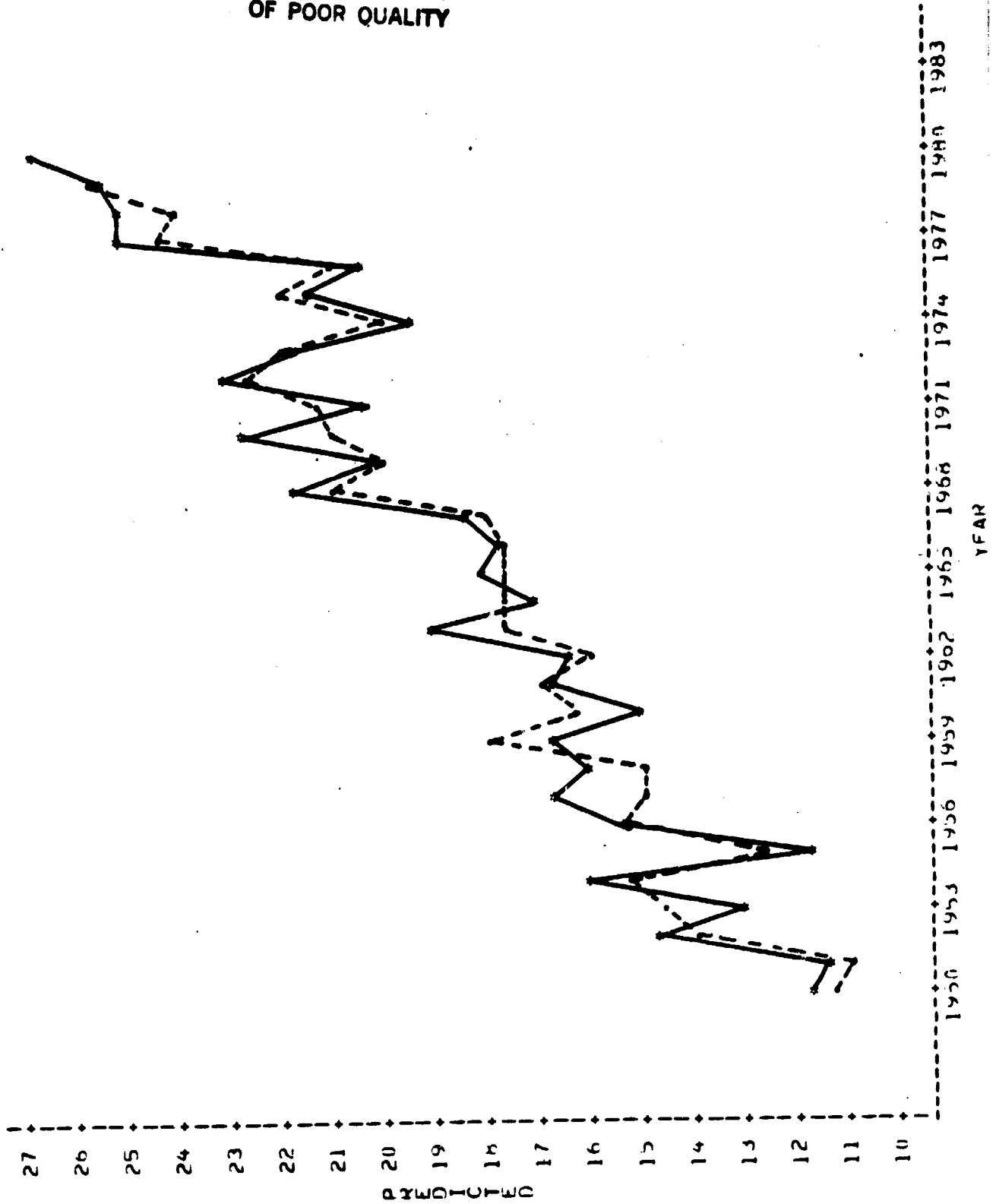
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IOWA SOYBEANS NORTHEASTERN CENTRAL APU 243

PLOT OF YIELD*YEAR SYMBOL USED IS *
PLOT OF Y-YAT*YEAR SYMBOL USED IS :

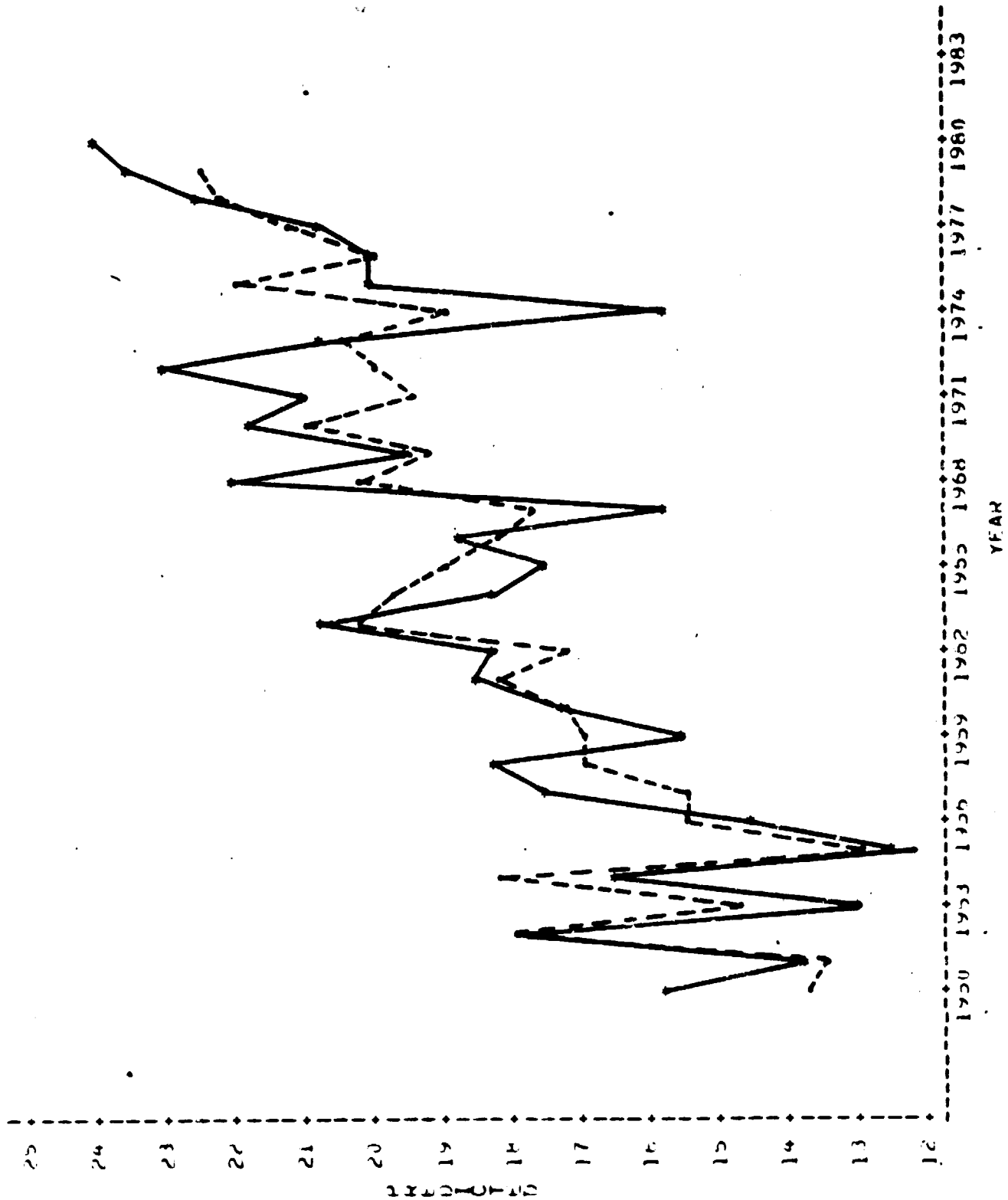
ORIGINAL PAGE IS
OF POOR QUALITY



ORIGINAL PAGE IS
OF POOR QUALITY

IOWA SOYBEANS SOUTHERN CENTRAL APU 251

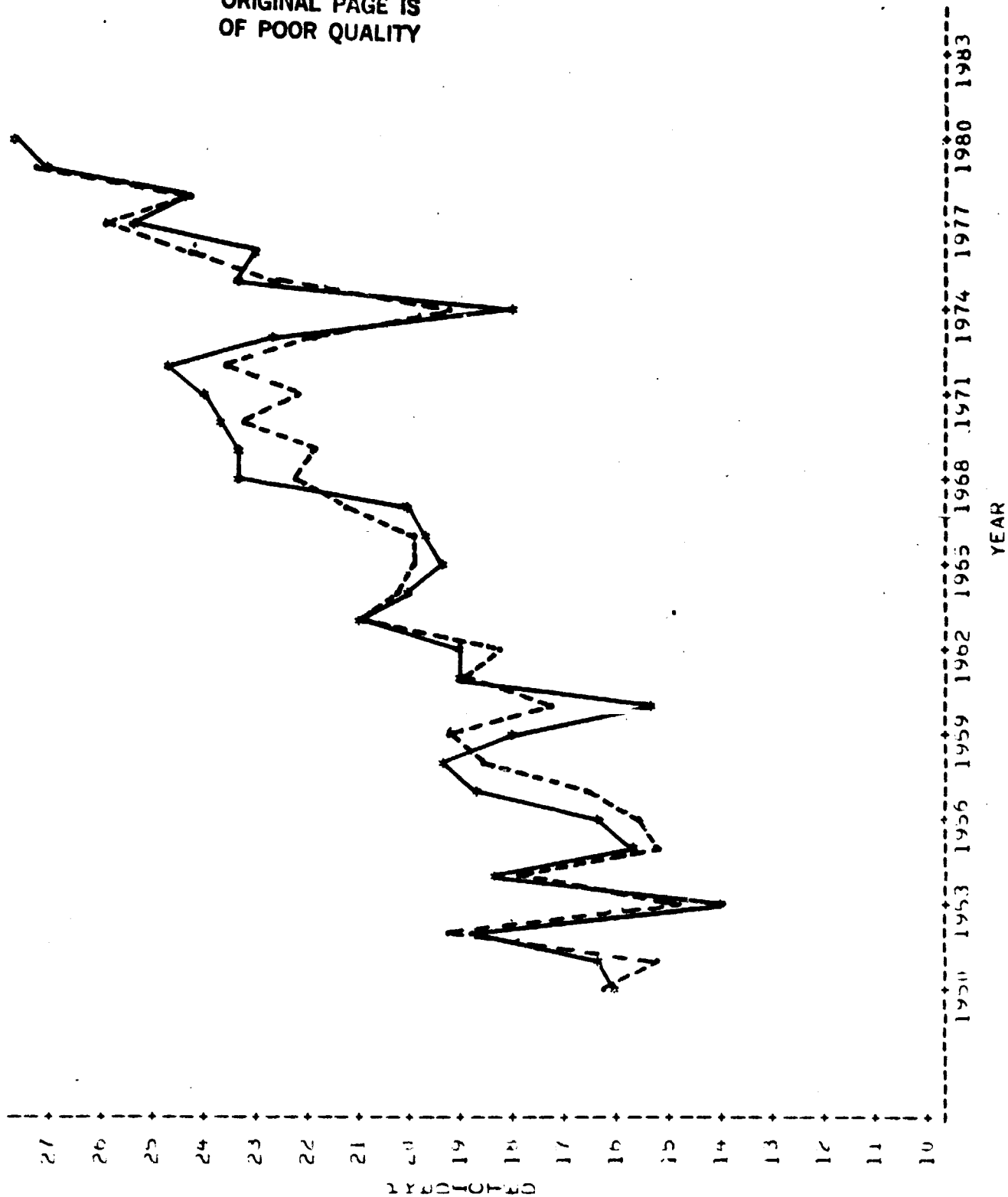
PLOT OF YIELD*YEAR SYMBOL USED IS *
PLOT OF MAT*YEAR SYMBOL USED IS :



IOWA SOYBEANS SOUTHEASTERN APU 252

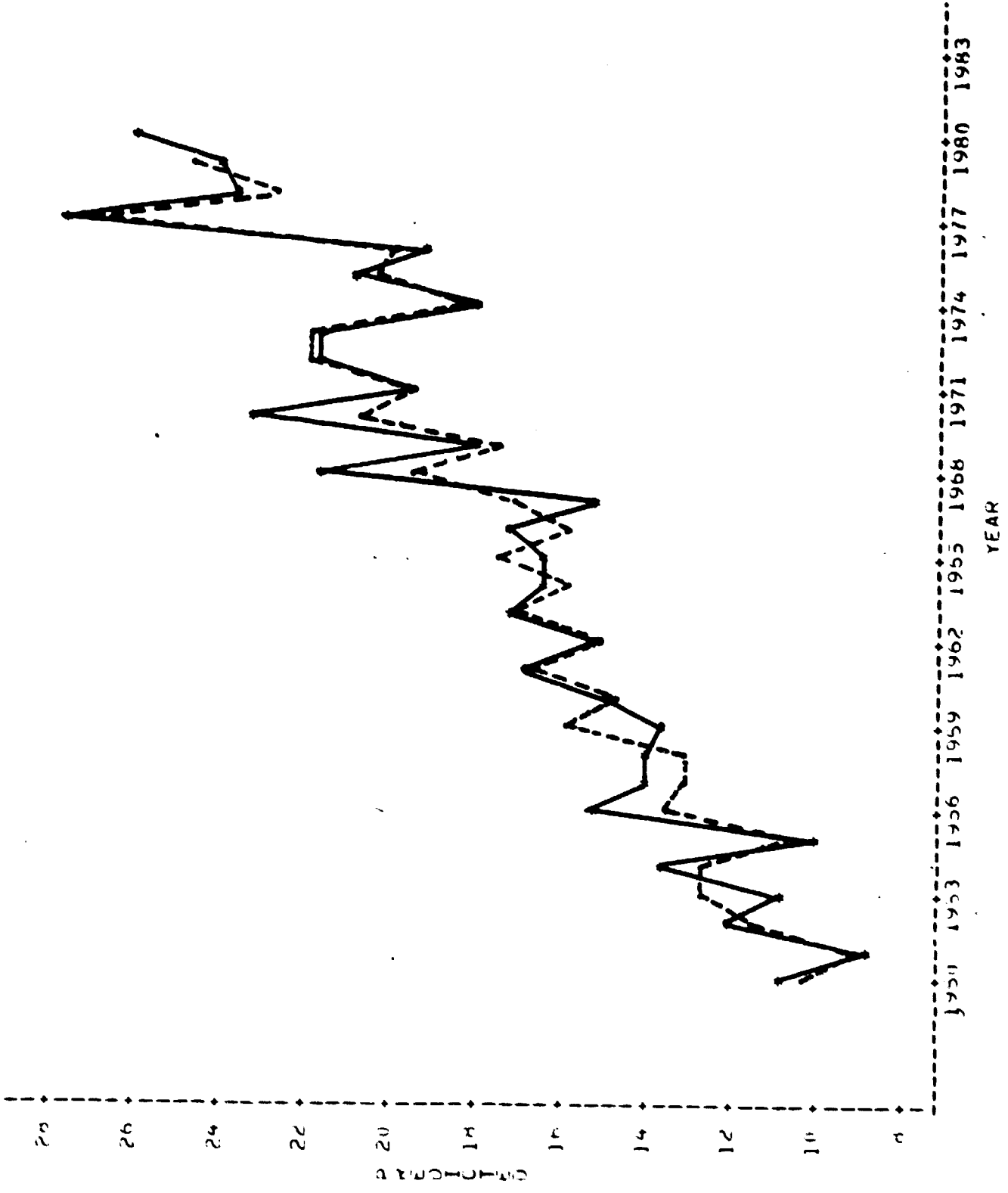
PLOT OF YIELD*YEAR SYMBOL USED IS *
 PLOT OF YHAT*YEAR SYMBOL USED IS :

ORIGINAL PAGE IS
 OF POOR QUALITY



ORIGINAL PAGE IS
OF POOR QUALITY

I 14A SOYBEANS NORTHEASTERN APU 260
PLOT OF YIELD & YEAR SYMBOL USED IS *
PLOT OF Y14T & YEAR SYMBOL USED IS :

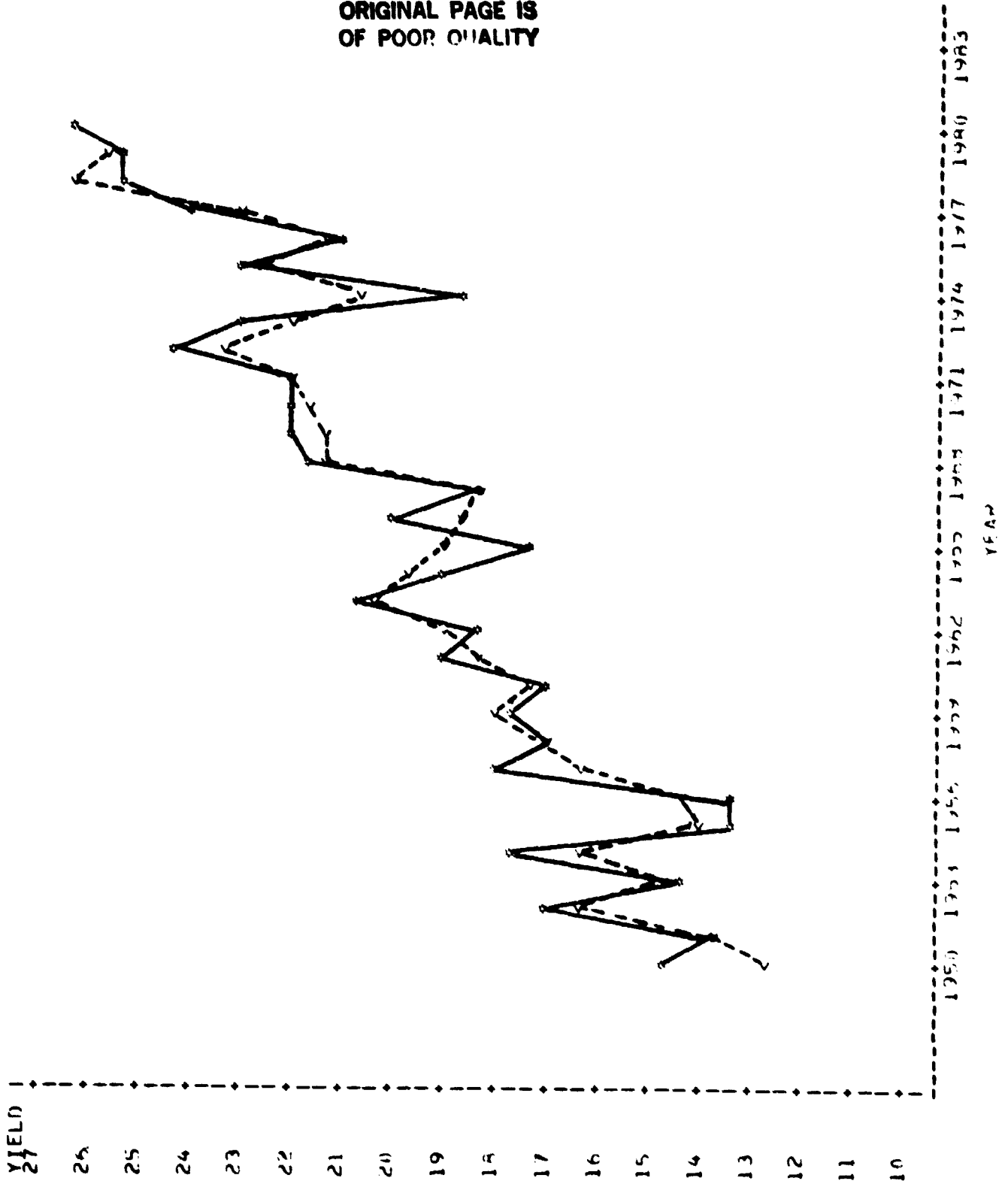


ORIGINAL PAGE IS
OF POOR QUALITY

1974 SOYBEAN STATE ADELS FOR ALL AGENS IN STATE

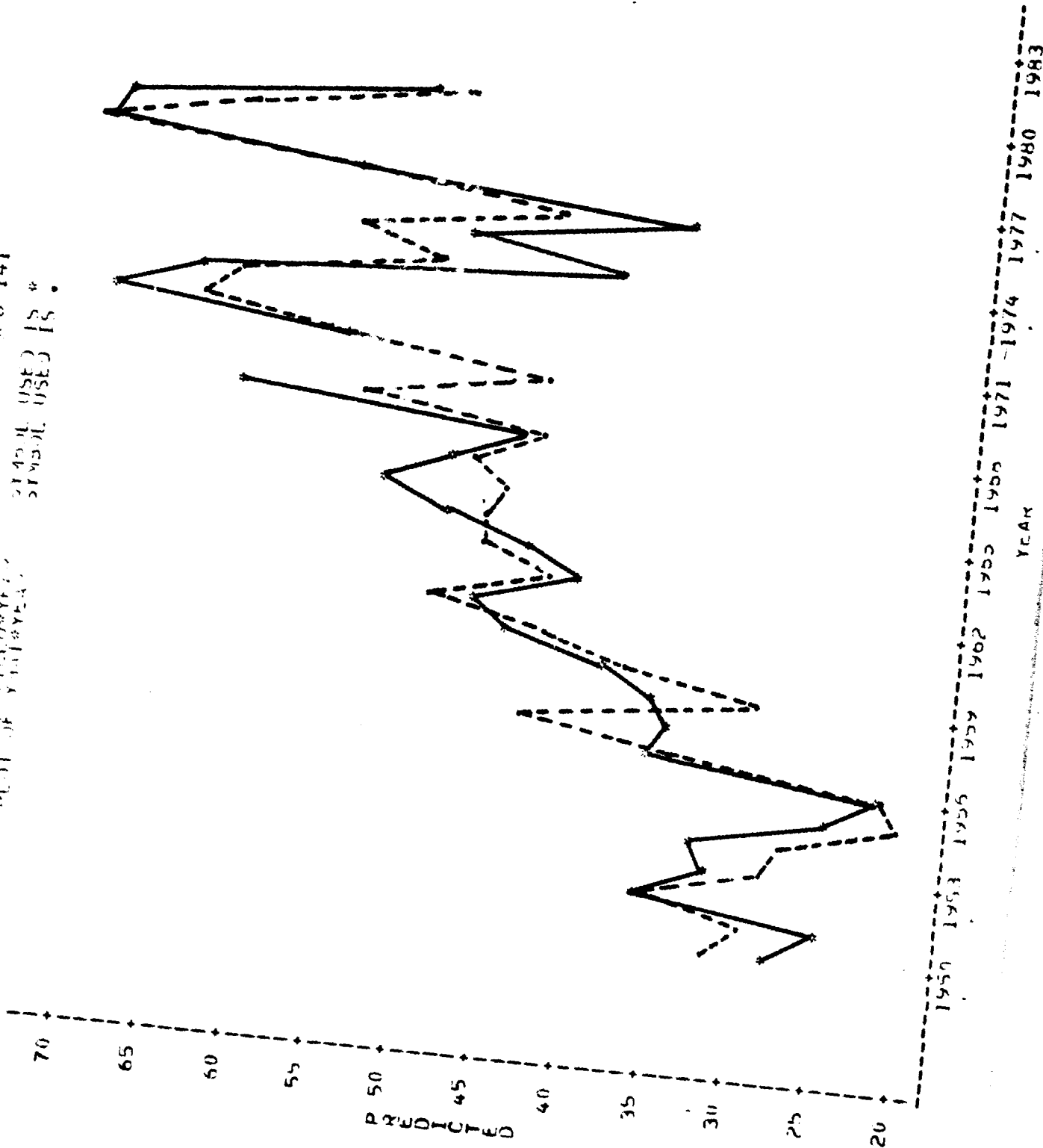
PLOT OF YIELD/ACRE SYMBOL USE) IS *

PLOT OF YIELD/ACRE SYMBOL USE) IS *



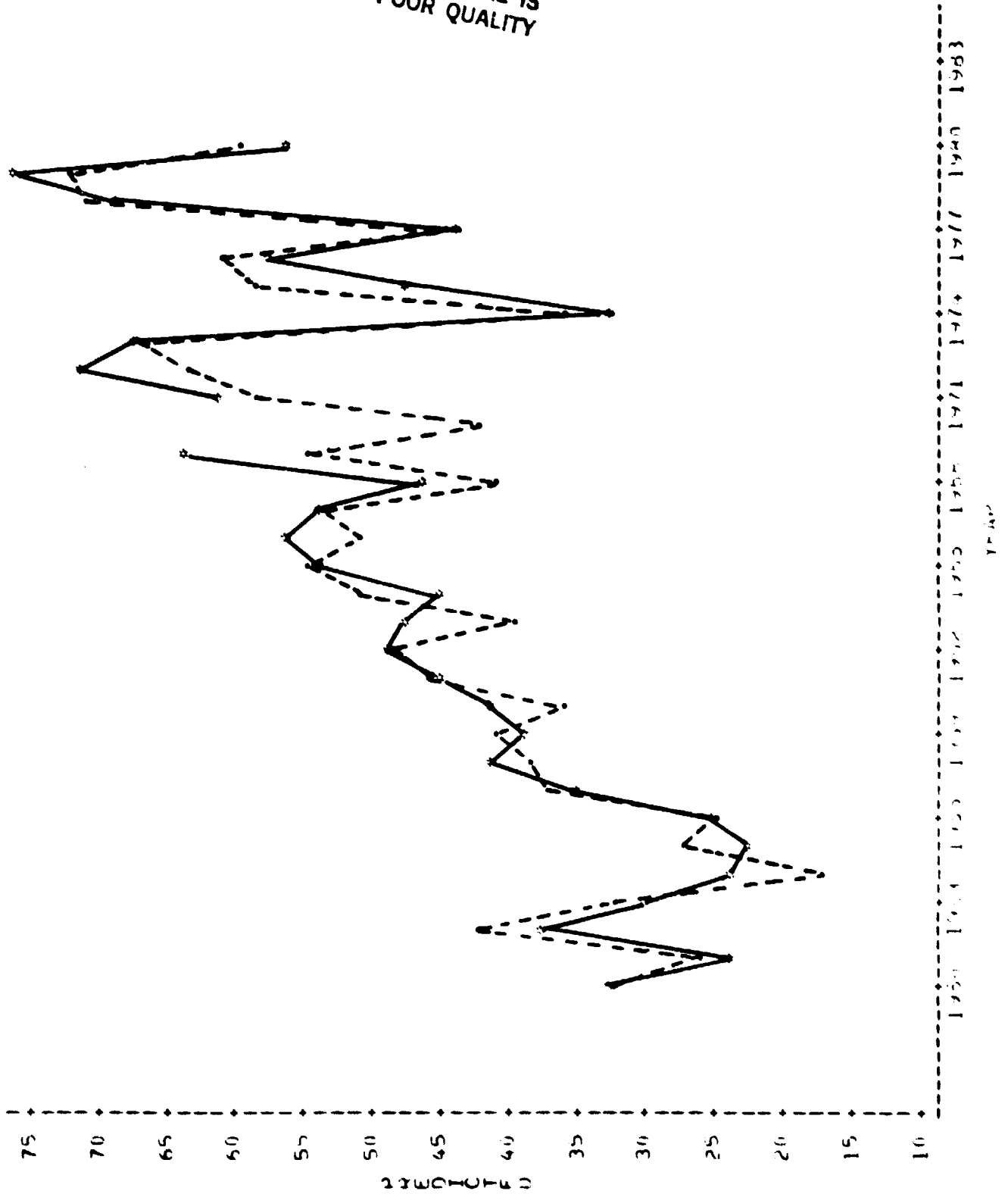
ORIGINAL PAGE IS
OF POOR QUALITY

UNITED STATES APO 141
SYMBOL USED IS %
SYMBOL USED IS %



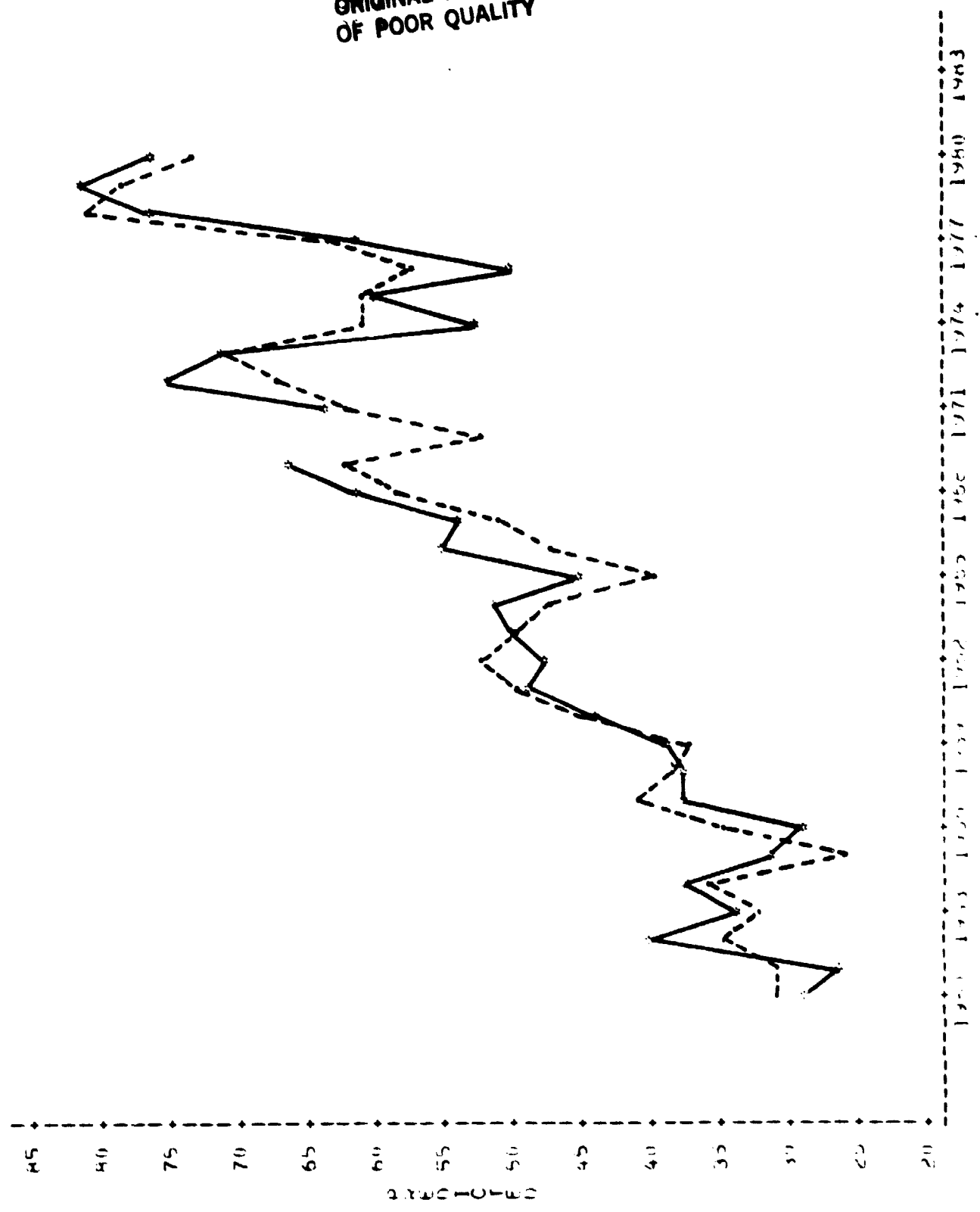
ORIGINAL PAGE IS
OF POOR QUALITY

PERCENTAGE OF THE TOTAL POPULATION
LIVING IN RURAL AREAS



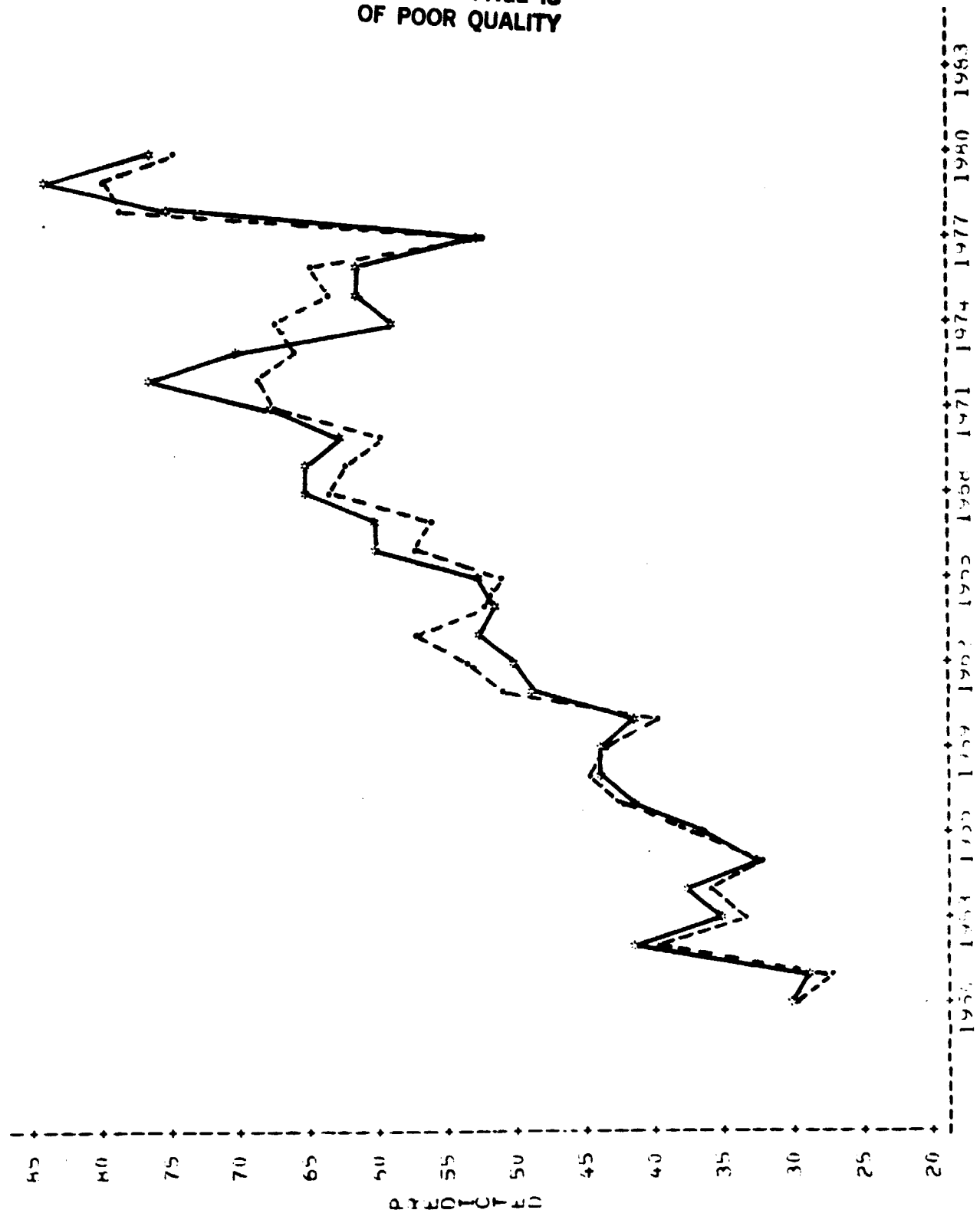
ORIGINAL PAGE IS
OF POOR QUALITY

UNITED STATES DEPARTMENT OF COMMERCE
BUREAU OF ECONOMIC ANALYSIS
STATE OF MICHIGAN



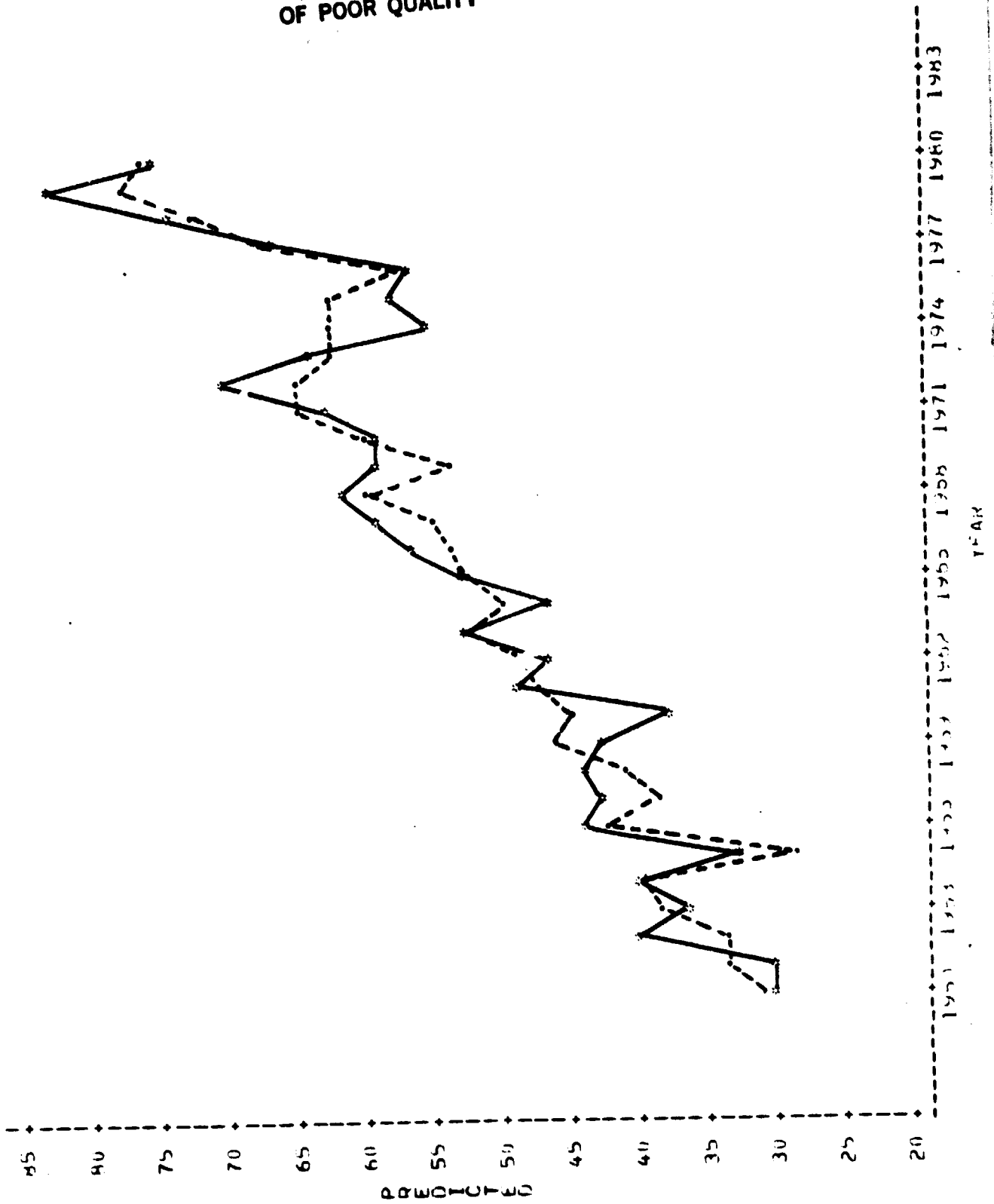
ORIGINAL PAGE IS
OF POOR QUALITY

UNITED STATES SUPPLY CENTER AND 242
DATE OF VISITATION SYMBOL USED IS #
DATE OF CONTACT SYMBOL USED IS •



ORIGINAL PAGE IS
OF POOR QUALITY

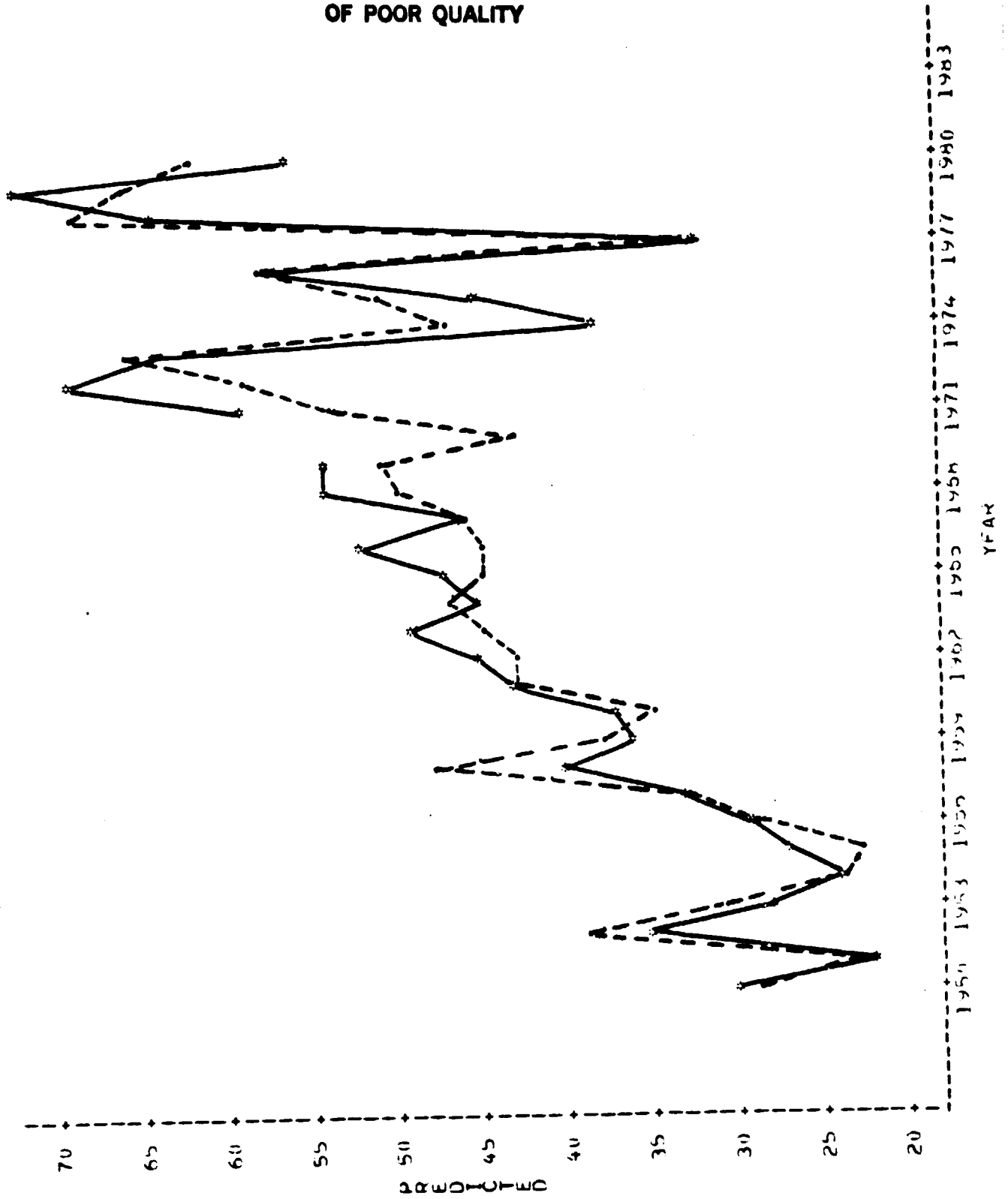
1960-1983
PERCENTAGE OF VETERAN
SYMBOL USED IS *



ORIGINAL PAGE IS
OF POOR QUALITY

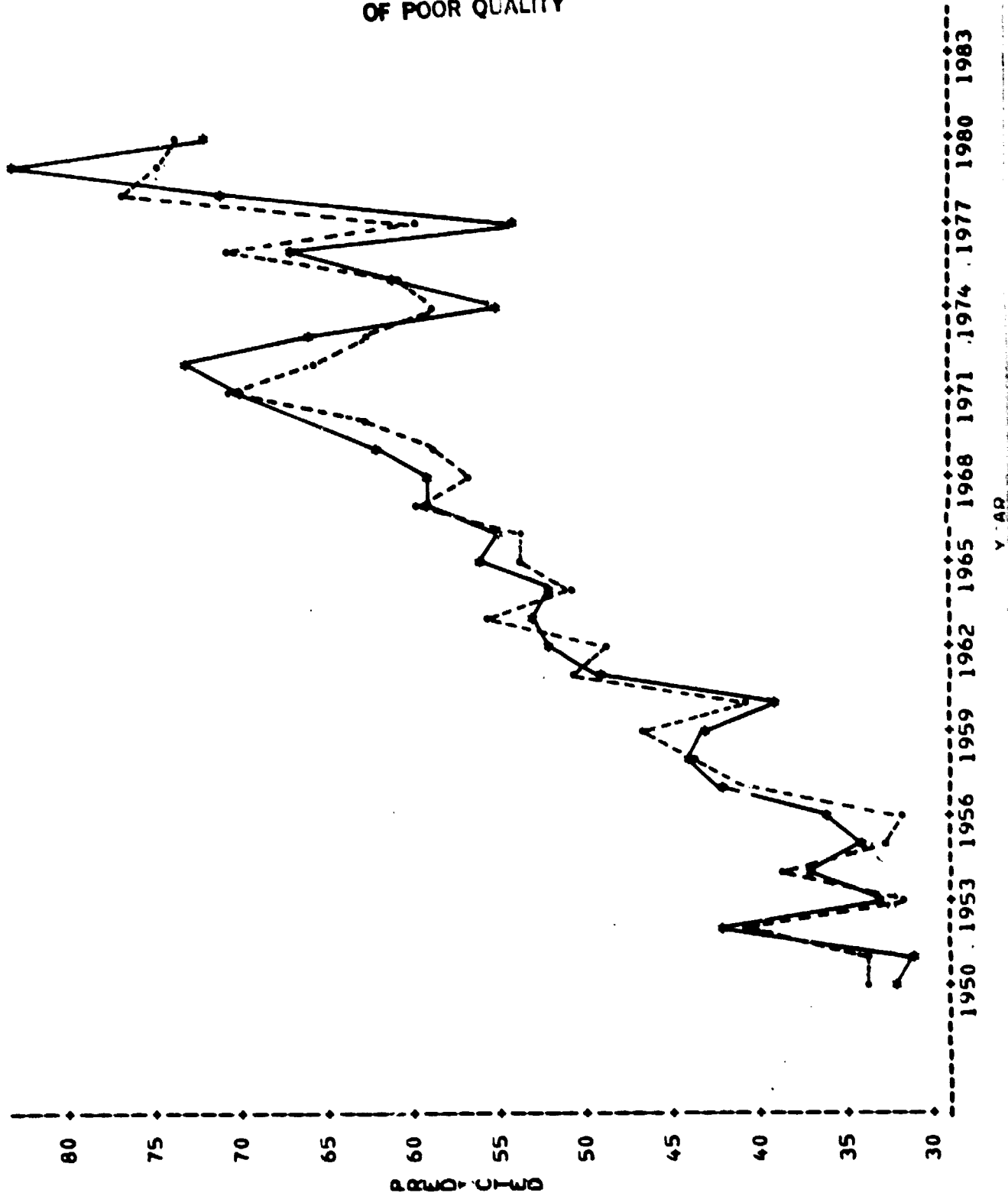
U. S. CORN SUPPLY - CENTRAL AND SOUTHERN

PLANT OF YEAR*YEAR SYMBOL USED IS #
PLANT OF YEAR*YEAR SYMBOL USED IS #



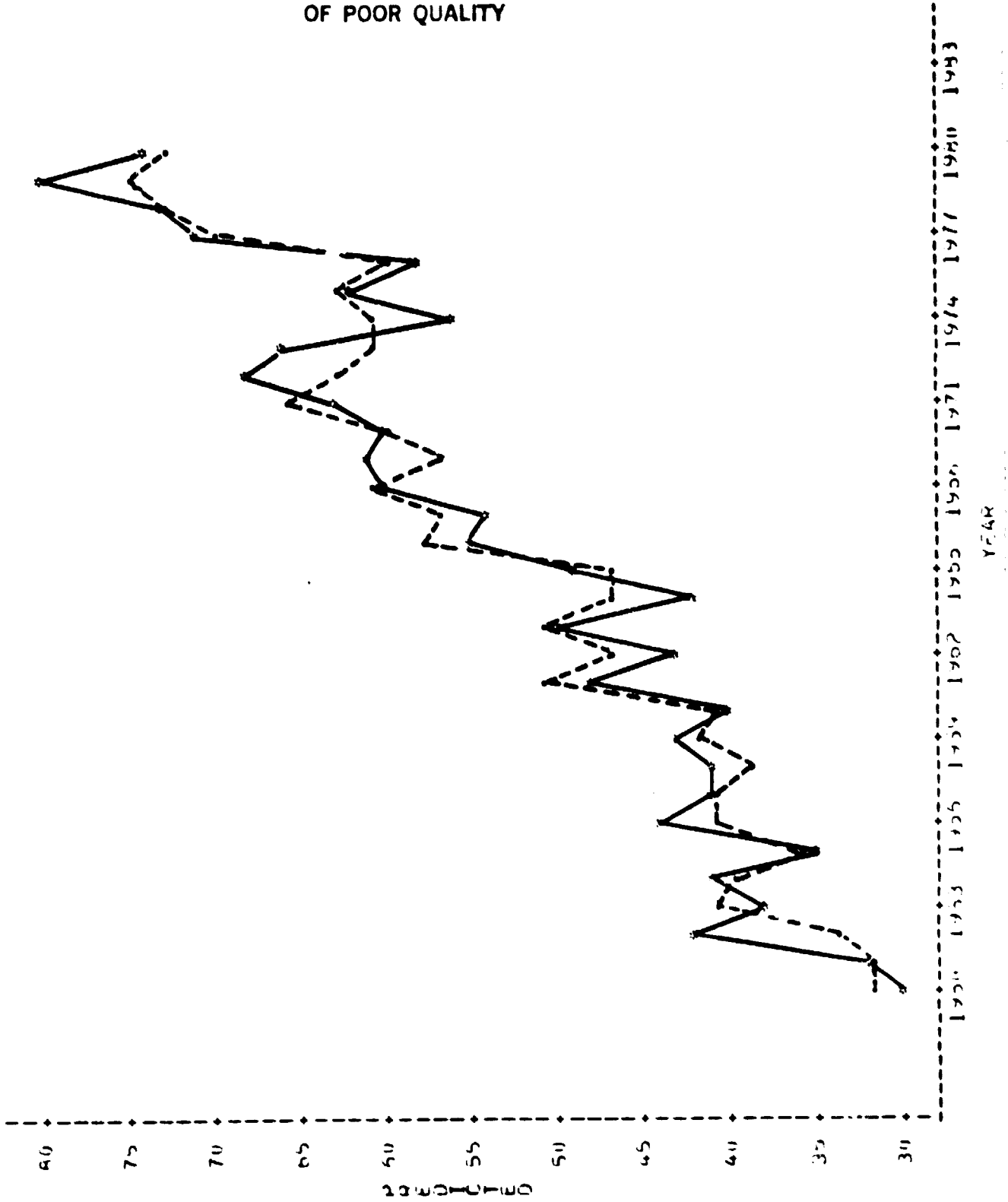
IOWA CORN SOUTHEASTERN APU 252
 PLOT OF YIELD*YEAR SYMBOL USED IS *
 PLOT OF YHAT*YEAR SYMBOL USED IS :

ORIGINAL PAGE IS
 OF POOR QUALITY



ORIGINAL PAGE IS
OF POOR QUALITY

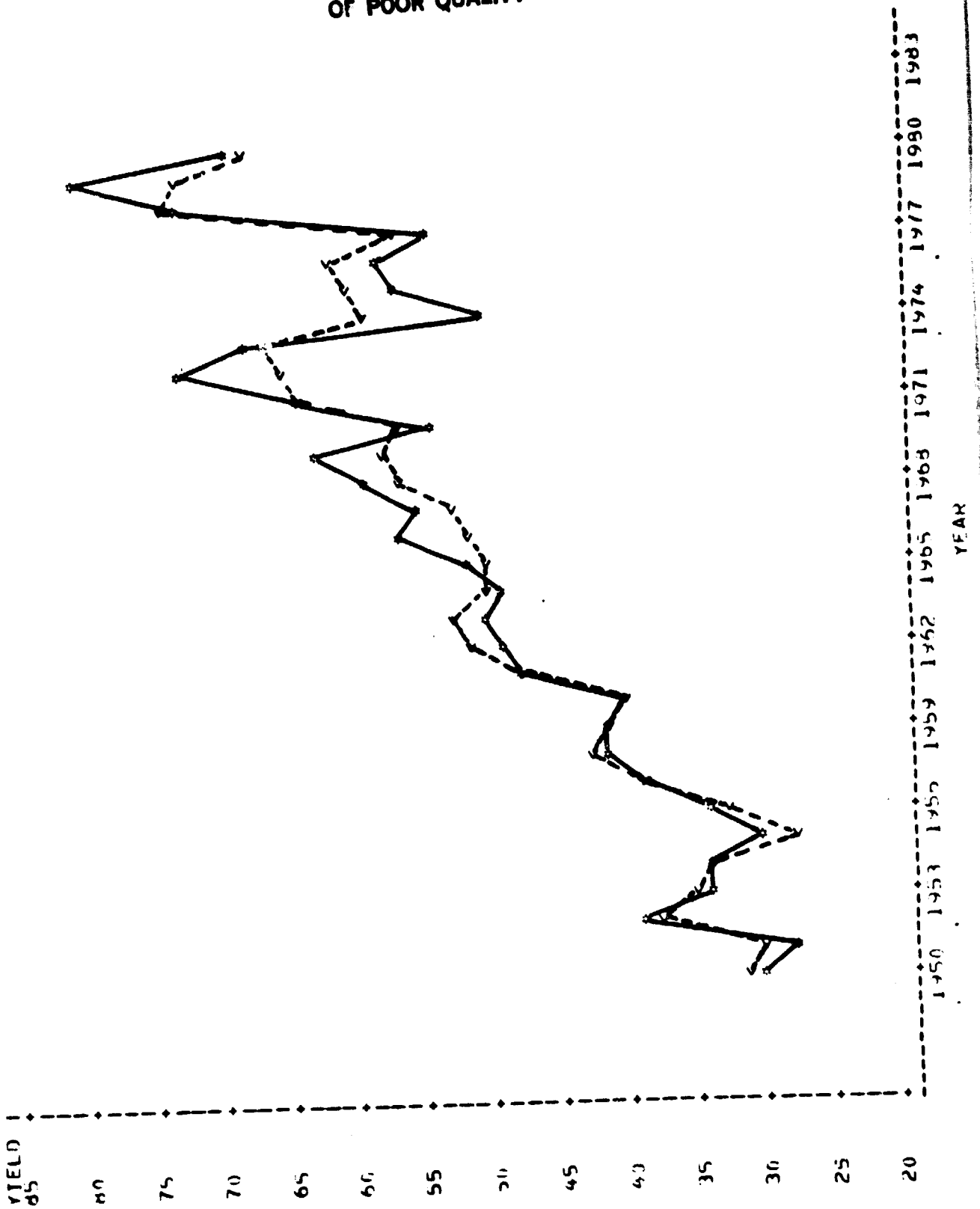
1950-1959: 100-100-100-100-100-100-100-100-100-100
1960-1969: 100-100-100-100-100-100-100-100-100-100
1970-1979: 100-100-100-100-100-100-100-100-100-100
1980-1989: 100-100-100-100-100-100-100-100-100-100
1990-1999: 100-100-100-100-100-100-100-100-100-100



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OF POOR QUALITY

IOWA CORN STATE MODEL FOR ALL APPLICABLE YEARS

PLOT OF YIELD VS YEAR
SYMBOL USED IS *
SYMBOL USED IS <



ORIGINAL PAGE 13
OF POOR QUALITY

Appendix C

IOWA SOYBEANS NORTHWESTERN APU 141

YR	YEAR	TREND	TREND	ET7	ET8	XDD9
1	1950	20	0.1	126.653	104.203	-0.0156
2	1951	21	0.1	134.127	121.286	-0.3156
3	1952	22	0.1	145.015	114.543	-1.7844
4	1953	23	0.1	141.444	113.735	1.3844
5	1954	24	0.1	152.460	114.821	1.3844
6	1955	25	0.1	133.902	117.294	1.9844
7	1956	26	0.1	105.370	90.100	0.4844
8	1957	27	0.1	152.184	111.186	-1.4156
9	1958	28	0.1	129.680	102.525	-0.3156
10	1959	29	0.1	119.355	133.548	-0.7844
11	1960	30	0.1	113.015	133.486	1.1156
12	1961	31	0.1	136.841	123.493	-1.5156
13	1962	32	0.1	136.541	125.516	1.6844
14	1963	33	2.0	147.016	116.105	-0.5156
15	1964	34	3.0	151.831	112.151	-3.7156
16	1965	35	4.0	136.224	110.430	-1.0156
17	1966	36	5.0	147.524	108.444	-0.8156
18	1967	37	6.0	127.916	103.700	-0.3844
19	1968	38	7.0	118.411	102.020	0.5844
20	1969	39	8.0	142.016	126.890	0.6844
21	1970	40	9.0	127.537	98.014	0.3156
22	1971	41	10.0	137.026	111.393	-0.3156
23	1972	42	11.0	143.026	111.270	-1.8156
24	1973	43	12.0	146.442	114.294	1.1844
25	1974	44	13.0	140.792	1126.890	1.8844
26	1975	45	14.0	112.125	103.044	0.8844
27	1976	46	15.0	129.062	103.101	2.3844
28	1977	47	16.0	145.790	125.231	1.3844
29	1978	48	17.0	129.868	125.231	1.3844
30	1979	49	18.0	129.868	125.231	1.3844
31	1980	50	19.0	129.868	125.231	1.3844

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DATE	TIME	TIME	TIME	TIME	TIME
1	1420	20	0.1	1.00688	0.99882
2	1421	21	0.1	1.00688	1.00000
3	1422	22	0.1	1.00688	1.00000
4	1423	23	0.1	0.98778	0.95870
5	1424	24	0.1	1.00688	1.00000
6	1425	25	0.1	0.97924	0.84680
7	1426	26	0.1	0.94462	1.00000
8	1427	27	0.1	0.94452	0.94412
9	1428	28	0.1	1.00688	1.00000
10	1429	29	0.1	1.00688	1.00000
11	1430	30	0.1	1.00688	1.00000
12	1431	31	0.1	1.00688	0.96985
13	1432	32	1.0	1.00586	0.95400
14	1433	32	3.0	1.00688	1.00000
15	1434	32	4.0	1.00688	1.00000
16	1435	32	5.0	1.00688	1.00000
17	1436	32	6.0	1.00688	1.00000
18	1437	32	7.0	1.00688	1.00000
19	1438	32	8.0	1.00688	0.91352
20	1439	32	9.0	1.00688	1.00000
21	1440	32	10.0	0.99051	0.92603
22	1441	32	11.0	1.00688	0.97770
23	1442	32	12.0	1.00688	0.95135
24	1443	32	13.0	1.00688	0.95962
25	1444	32	14.0	1.00688	0.95718
26	1445	32	15.0	1.00688	1.00000
27	1446	32	16.0	1.00688	0.94470
28	1447	32	17.0	0.93446	0.75476
29	1448	32	18.0	1.00688	0.96988
30	1449	32	19.0	1.00688	0.97327
31	1450	32	19.0	1.00688	0.97327

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IOWA SOYBEANS NORTHWESTERN CENTRAL APU 241

OBS	YEAR	TREND1	TREND2	DSQ5	ET7	ET8	XDD9	E9
1	1950	0	0	4075	125	99	0688	1
2	1951	0	0	1750	143	115	0789	1
3	1952	0	0	1016	143	118	1688	0
4	1953	0	0	8287	139	108	1688	0
5	1954	0	0	2483	152	100	1688	0
6	1955	0	0	1279	127	102	1688	0
7	1956	0	0	1393	123	106	1688	1
8	1957	0	0	2617	133	122	1688	1
9	1958	0	0	2161	151	127	1688	1
10	1959	0	0	2826	145	108	1688	1
11	1960	0	0	2291	124	99	1688	1
12	1961	0	0	2269	124	96	1688	1
13	1962	0	0	2281	124	96	1688	1
14	1963	0	0	2281	124	96	1688	1
15	1964	0	0	2281	124	96	1688	1
16	1965	0	0	2281	124	96	1688	1
17	1966	0	0	2281	124	96	1688	1
18	1967	0	0	2281	124	96	1688	1
19	1968	0	0	2281	124	96	1688	1
20	1969	0	0	2281	124	96	1688	1
21	1970	0	0	2281	124	96	1688	1
22	1971	0	0	2281	124	96	1688	1
23	1972	0	0	2281	124	96	1688	1
24	1973	0	0	2281	124	96	1688	1
25	1974	0	0	2281	124	96	1688	1
26	1975	0	0	2281	124	96	1688	1
27	1976	0	0	2281	124	96	1688	1
28	1977	0	0	2281	124	96	1688	1
29	1978	0	0	2281	124	96	1688	1
30	1979	0	0	2281	124	96	1688	1
31	1980	0	0	2281	124	96	1688	1
32	1981	0	0	2281	124	96	1688	1
33	1982	0	0	2281	124	96	1688	1
34	1983	0	0	2281	124	96	1688	1
35	1984	0	0	2281	124	96	1688	1
36	1985	0	0	2281	124	96	1688	1
37	1986	0	0	2281	124	96	1688	1
38	1987	0	0	2281	124	96	1688	1
39	1988	0	0	2281	124	96	1688	1
40	1989	0	0	2281	124	96	1688	1
41	1990	0	0	2281	124	96	1688	1
42	1991	0	0	2281	124	96	1688	1
43	1992	0	0	2281	124	96	1688	1
44	1993	0	0	2281	124	96	1688	1
45	1994	0	0	2281	124	96	1688	1
46	1995	0	0	2281	124	96	1688	1
47	1996	0	0	2281	124	96	1688	1
48	1997	0	0	2281	124	96	1688	1
49	1998	0	0	2281	124	96	1688	1
50	1999	0	0	2281	124	96	1688	1
51	2000	0	0	2281	124	96	1688	1
52	2001	0	0	2281	124	96	1688	1
53	2002	0	0	2281	124	96	1688	1
54	2003	0	0	2281	124	96	1688	1
55	2004	0	0	2281	124	96	1688	1
56	2005	0	0	2281	124	96	1688	1
57	2006	0	0	2281	124	96	1688	1
58	2007	0	0	2281	124	96	1688	1
59	2008	0	0	2281	124	96	1688	1
60	2009	0	0	2281	124	96	1688	1
61	2010	0	0	2281	124	96	1688	1
62	2011	0	0	2281	124	96	1688	1
63	2012	0	0	2281	124	96	1688	1
64	2013	0	0	2281	124	96	1688	1
65	2014	0	0	2281	124	96	1688	1
66	2015	0	0	2281	124	96	1688	1
67	2016	0	0	2281	124	96	1688	1
68	2017	0	0	2281	124	96	1688	1
69	2018	0	0	2281	124	96	1688	1
70	2019	0	0	2281	124	96	1688	1
71	2020	0	0	2281	124	96	1688	1
72	2021	0	0	2281	124	96	1688	1
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77	2026	0	0	2281	124	96	1688	1
78	2027	0	0	2281	124	96	1688	1
79	2028	0	0	2281	124	96	1688	1
80	2029	0	0	2281	124	96	1688	1
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82	2031	0	0	2281	124	96	1688	1
83	2032	0	0	2281	124	96	1688	1
84	2033	0	0	2281	124	96	1688	1
85	2034	0	0	2281	124	96	1688	1
86	2035	0	0	2281	124	96	1688	1
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88	2037	0	0	2281	124	96	1688	1
89	2038	0	0	2281	124	96	1688	1
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91	2040	0	0	2281	124	96	1688	1
92	2041	0	0	2281	124	96	1688	1
93	2042	0	0	2281	124	96	1688	1
94	2043	0	0	2281	124	96	1688	1
95	2044	0	0	2281	124	96	1688	1
96	2045	0	0	2281	124	96	1688	1
97	2046	0	0	2281	124	96	1688	1
98	2047	0	0	2281	124	96	1688	1
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100	2049	0	0	2281	124	96	1688	1
101	2050	0	0	2281	124	96	1688	1
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106	2055	0	0	2281	124	96	1688	1
107	2056	0	0	2281	124	96	1688	1
108	2057	0	0	2281	124	96	1688	1
109	2058	0	0	2281	124	96	1688	1
110	2059	0	0	2281	124	96	1688	1
111	2060	0	0	2281	124	96	1688	1
112	2061	0	0	2281	124	96	1688	1
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114	2063	0	0	2281	124	96	1688	1
115	2064	0	0	2281	124	96	1688	1
116	2065	0	0	2281	124	96	1688	1
117	2066	0	0	2281	124	96	1688	1
118	2067	0	0	2281	124	96	1688	1
119	2068	0	0	2281	124	96	1688	1
120	2069	0	0	2281	124	96	1688	1
121	2070	0	0	2281	124	96	1688	1
122	2071	0	0	2281	124	96	1688	1
123	2072	0	0	2281	124	96	1688	1
124	2073	0	0	2281	124	96	1688	1
125	2074	0	0	2281	124	96	1688	1
126	2075	0	0	2281	124	96	1688	1
127	2076	0	0	2281	124	96	1688	1
128	2077	0	0	2281	124	96	1688	1
129	2078	0	0	2281	124	96	1688	1
130	2079	0	0	2281	124	96	1688	1
131	2080	0	0	2281	124	96	1688	1
132	2081	0	0	2281	124	96	1688	1
133	2082	0	0	2281	124	96	1688	1
134	2083	0	0	2281	124	96	1688	1
135	2084	0	0	2281	124	96	1688	1
136	2085	0	0	2281	124	96	1688	1
137	2086	0	0	2281	124	96	1688	1
138	2087	0	0	2281	124	96	1688	1
139	2088	0	0	2281	124	96	1688	1
140	2089	0	0	2281	124	96	1688	1
141	2090	0	0	2281	124	96	1688	1
142	2091	0	0	2281	124	96	1688	1
143	2092	0	0	2281	124	96	1688	1
144	2093	0	0	2281	124	96	1688	1
145	2094	0	0	2281	124	96	1688	1
146	2095	0	0	2281	124	96	1688	1
147	2096	0	0	2281	124	96	1688	1
148	2097	0	0	2281	124	96	1688	1
149	2098	0	0	2281	124	96	1688	1
150	2099	0	0	2281	124	96	1688	1
151	2100	0	0	2281	124	96	1688	1
152	2101	0	0	2281	124	96	1688	1
153	2102	0	0	2281	124	96	1688	1
154	2103	0	0	2281	124	96	1688	1
155	2104	0	0	2281	124	96	1688	1
156	2105	0	0	2281	124	96	1688	1
157	2106	0	0	2281	124	96	1688	1
158	2107	0	0	2281	124	96	1688	1
159	2108	0	0	2281	124	96	1688	1
160	2109	0	0	2281	124	96	1688	1
161	2110	0	0	2281	124	96	1688	1
162	2111	0	0	2281	124	96	1688	1
163	2112	0	0	2281	124	96	1688	1
164	2113	0	0	2281	124	96	1688	1
165	2114	0	0	2281	124	96	1688	1
166	2115	0	0	2281	124	96	1688	1
167	2116	0	0	2281	124	96	1688	1
168	2117	0	0	2281	124	96	1688	1
169	2118	0	0	2281	124	96	1688	1
170	2119	0	0	2281	124	96	1688	1
171	2120	0	0	2281				

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IOWA SOYBEANS NORTHERN CENTRAL APU 242

OBS	YEAR	TREND1	TREND2	ETS	ETB	OSD9	ETP9
1	1950	0	1	19	100	176	934
2	1951	2	1	6	114	79	000
3	1952	5	1	2	113	94	150
4	1953	9	1	0	123	04	615
5	1954	7	1	1	107	18	649
6	1955	8	1	4	119	6	790
7	1956	0	1	5	124	4	965
8	1957	0	1	2	139	7	206
9	1958	0	1	4	128	6	986
10	1959	0	1	2	123	1	000
11	1960	3	0	9	123	2	000
12	1961	3	0	1	128	3	000
13	1962	3	0	2	110	5	000
14	1963	3	0	0	102	8	000
15	1964	3	0	4	104	8	000
16	1965	3	0	2	110	7	000
17	1966	3	0	0	102	5	000
18	1967	3	0	2	100	4	000
19	1968	3	0	0	123	2	000
20	1969	3	0	4	123	1	000
21	1970	3	0	1	104	0	000
22	1971	3	0	7	107	6	000
23	1972	3	0	4	123	0	000
24	1973	3	0	1	109	9	000
25	1974	3	0	5	120	6	000
26	1975	3	0	2	104	3	000
27	1976	3	0	0	100	0	000
28	1977	3	0	4	120	6	000
29	1978	3	0	2	101	5	000
30	1979	3	0	0	122	3	000
31	1980	3	0	2	101	0	000
32	1981	3	0	0	122	5	000
33	1982	3	0	3	101	0	000
34	1983	3	0	1	122	8	000
35	1984	3	0	2	101	4	000
36	1985	3	0	0	122	0	000
37	1986	3	0	2	101	5	000
38	1987	3	0	0	122	0	000
39	1988	3	0	2	101	8	000
40	1989	3	0	0	122	4	000
41	1990	3	0	2	101	0	000
42	1991	3	0	0	122	5	000
43	1992	3	0	2	101	0	000
44	1993	3	0	0	122	8	000
45	1994	3	0	2	101	4	000
46	1995	3	0	0	122	0	000
47	1996	3	0	2	101	5	000
48	1997	3	0	0	122	0	000
49	1998	3	0	2	101	8	000
50	1999	3	0	0	122	4	000
51	2000	3	0	2	101	0	000
52	2001	3	0	0	122	5	000
53	2002	3	0	2	101	0	000
54	2003	3	0	0	122	8	000
55	2004	3	0	2	101	4	000
56	2005	3	0	0	122	0	000
57	2006	3	0	2	101	5	000
58	2007	3	0	0	122	0	000
59	2008	3	0	2	101	8	000
60	2009	3	0	0	122	4	000
61	2010	3	0	2	101	0	000
62	2011	3	0	0	122	5	000
63	2012	3	0	2	101	0	000
64	2013	3	0	0	122	8	000
65	2014	3	0	2	101	4	000
66	2015	3	0	0	122	0	000
67	2016	3	0	2	101	5	000
68	2017	3	0	0	122	0	000
69	2018	3	0	2	101	8	000
70	2019	3	0	0	122	4	000
71	2020	3	0	2	101	0	000
72	2021	3	0	0	122	5	000
73	2022	3	0	2	101	0	000
74	2023	3	0	0	122	8	000
75	2024	3	0	2	101	4	000
76	2025	3	0	0	122	0	000
77	2026	3	0	2	101	5	000
78	2027	3	0	0	122	0	000
79	2028	3	0	2	101	8	000
80	2029	3	0	0	122	4	000
81	2030	3	0	2	101	0	000
82	2031	3	0	0	122	5	000
83	2032	3	0	2	101	0	000
84	2033	3	0	0	122	8	000
85	2034	3	0	2	101	4	000
86	2035	3	0	0	122	0	000
87	2036	3	0	2	101	5	000
88	2037	3	0	0	122	0	000
89	2038	3	0	2	101	8	000
90	2039	3	0	0	122	4	000
91	2040	3	0	2	101	0	000
92	2041	3	0	0	122	5	000
93	2042	3	0	2	101	0	000
94	2043	3	0	0	122	8	000
95	2044	3	0	2	101	4	000
96	2045	3	0	0	122	0	000
97	2046	3	0	2	101	5	000
98	2047	3	0	0	122	0	000
99	2048	3	0	2	101	8	000
100	2049	3	0	0	122	4	000

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IOWA SOYBEANS SOUTHERN CENTRAL APU 251

OBS	YEAR	TREND1	TREND2	PDD5	ET6	EB
1	1950	0	0	40	127	1
2	1951	2	0	34	109	1
3	1952	2	0	2	143	0
4	1953	2	0	156	143	0
5	1954	2	0	156	125	0
6	1955	2	0	156	195	0
7	1956	2	0	844	4	0
8	1957	2	0	156	120	0
9	1958	2	0	156	132	0
0	1959	2	0	844	18	0
1	1960	3	0	844	22	0
2	1961	3	0	156	22	0
3	1962	3	0	844	25	0
4	1963	3	0	156	25	0
5	1964	3	0	156	25	0
6	1965	3	0	156	25	0
7	1966	3	0	156	25	0
8	1967	3	0	156	25	0
9	1968	3	0	156	25	0
0	1969	3	0	156	25	0
1	1970	3	0	156	25	0
2	1971	3	0	156	25	0
3	1972	3	0	156	25	0
4	1973	3	0	156	25	0
5	1974	3	0	156	25	0
6	1975	3	0	156	25	0
7	1976	3	0	156	25	0
8	1977	3	0	156	25	0
9	1978	3	0	156	25	0
0	1979	3	0	156	25	0
1	1980	3	0	156	25	0
2	1981	3	0	156	25	0
3	1982	3	0	156	25	0
4	1983	3	0	156	25	0

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IOWA SOYBEANS SOUTHEASTERN APU 252

OBS	YEAR	TREND1	TREND2	ET6	E8	DS07	XDD9	ETHAT9
1	1951	20	0	123	0	20932	0	75
2	1951	22	0	150	1	245	1	56
3	1951	22	0	140	1	359	0	84
4	1951	23	0	146	1	223	1	58
5	1951	25	0	199	1	249	1	82
6	1951	26	0	264	1	249	1	02
7	1951	27	0	337	1	516	1	73
8	1951	28	0	415	1	763	1	35
9	1951	29	0	444	1	853	1	57
10	1951	30	0	473	1	441	1	90
11	1951	31	0	502	1	304	1	45
12	1951	32	0	531	1	442	1	81
13	1951	33	0	560	1	343	1	58
14	1951	34	0	589	1	300	1	97
15	1951	35	0	618	1	235	1	20
16	1951	36	0	647	1	377	1	41
17	1951	37	0	676	1	308	1	81
18	1951	38	0	705	1	335	1	50
19	1951	39	0	734	1	345	1	29
20	1951	40	0	763	1	405	1	59
21	1951	41	0	792	1	289	1	29
22	1951	42	0	821	1	120	1	87
23	1951	43	0	850	1	150	1	35
24	1951	44	0	879	1	171	1	52
25	1951	45	0	908	1	161	1	09
26	1951	46	0	937	1	186	1	87
27	1951	47	0	966	1	125	1	52
28	1951	48	0	995	1	184	1	21
29	1951	49	0	1024	1	174	1	98
30	1951	50	0	1053	1	164	1	35
31	1951	51	0	1082	1	184	1	52
32	1951	52	0	1111	1	174	1	09
33	1951	53	0	1140	1	164	1	87
34	1951	54	0	1169	1	184	1	35
35	1951	55	0	1198	1	174	1	52
36	1951	56	0	1227	1	164	1	09
37	1951	57	0	1256	1	184	1	87
38	1951	58	0	1285	1	174	1	35
39	1951	59	0	1314	1	164	1	52
40	1951	60	0	1343	1	154	1	09
41	1951	61	0	1372	1	144	1	87
42	1951	62	0	1401	1	134	1	35
43	1951	63	0	1430	1	124	1	52
44	1951	64	0	1459	1	114	1	09
45	1951	65	0	1488	1	104	1	87
46	1951	66	0	1517	1	94	1	35
47	1951	67	0	1546	1	84	1	52
48	1951	68	0	1575	1	74	1	09
49	1951	69	0	1604	1	64	1	87
50	1951	70	0	1633	1	54	1	35
51	1951	71	0	1662	1	44	1	52
52	1951	72	0	1691	1	34	1	09
53	1951	73	0	1720	1	24	1	87
54	1951	74	0	1749	1	14	1	35
55	1951	75	0	1778	1	4	1	52
56	1951	76	0	1807	1	0	1	09
57	1951	77	0	1836	1	0	1	87
58	1951	78	0	1865	1	0	1	35
59	1951	79	0	1894	1	0	1	52
60	1951	80	0	1923	1	0	1	09
61	1951	81	0	1952	1	0	1	87
62	1951	82	0	1981	1	0	1	35
63	1951	83	0	2010	1	0	1	52
64	1951	84	0	2039	1	0	1	09
65	1951	85	0	2068	1	0	1	87
66	1951	86	0	2097	1	0	1	35
67	1951	87	0	2126	1	0	1	52
68	1951	88	0	2155	1	0	1	09
69	1951	89	0	2184	1	0	1	87
70	1951	90	0	2213	1	0	1	35
71	1951	91	0	2242	1	0	1	52
72	1951	92	0	2271	1	0	1	09
73	1951	93	0	2300	1	0	1	87
74	1951	94	0	2329	1	0	1	35
75	1951	95	0	2358	1	0	1	52
76	1951	96	0	2387	1	0	1	09
77	1951	97	0	2416	1	0	1	87
78	1951	98	0	2445	1	0	1	35
79	1951	99	0	2474	1	0	1	52
80	1951	100	0	2503	1	0	1	09

IOWA SOYBEANS NORTH EASTERN APU 260

Year	Area	Yield	Moisture	Weight	Price	FTM	W009	E9	ETHAT9
1957	1	1.02000	17.107	103.512	-0.225	1.0897	70.0465		
1958	2	1.02085	17.234	112.474	-0.225	1.10423	61.9813		
1959	3	1.02055	17.225	116.451	-0.225	1.04223	72.5986		
1960	4	1.02053	17.345	124.366	0.175	0.97942	72.0870		
1961	5	1.01993	17.447	112.254	1.175	1.04232	74.2640		
1962	6	1.01940	17.487	105.171	1.625	0.89103	79.8208		
1963	7	1.02085	17.788	112.546	-0.925	1.03813	66.4985		
1964	8	1.02015	17.161	112.647	0.875	1.04157	66.4369		
1965	9	1.02065	17.326	134.647	0.875	1.10787	75.1369		
1966	10	1.02055	17.116	124.154	1.125	1.10787	75.6804		
1967	11	1.02084	17.596	117.166	1.125	1.10787	78.2640		
1968	12	1.02070	17.049	120.643	-0.625	1.10787	70.5557		
1969	13	1.02073	17.705	127.942	-0.425	1.09689	62.9307		
1970	14	1.02065	17.303	105.975	-0.225	1.10397	73.6236		
1971	15	1.02065	17.071	120.643	-0.425	1.10397	70.0465		
1972	16	1.02085	17.594	105.426	-0.125	1.04527	65.4907		
1973	17	1.02085	17.526	124.067	-0.725	1.10787	69.0292		
1974	18	1.02085	17.527	123.193	0.375	1.10787	67.5092		
1975	19	1.02085	17.092	119.757	0.375	1.04213	71.5760		
1976	20	1.02099	17.348	127.293	0.275	1.10787	73.1086		
1977	21	1.02099	17.186	127.520	0.575	1.10297	80.8615		
1978	22	1.02065	17.097	112.749	0.275	1.10787	74.1369		
1979	23	1.02085	17.581	113.829	-2.125	1.10787	72.5986		
1980	24	1.02065	17.502	129.595	-2.125	1.09721	60.4871		
1981	25	1.02065	17.274	126.595	-2.125	0.93610	60.4871		
1982	26	1.02085	17.763	117.122	0.375	0.61653	68.5223		
1983	27	1.02085	17.701	117.814	0.375	1.10787	73.1086		
1984	28	1.02085	17.315	114.592	0.875	1.10787	75.6804		
1985	29	1.02085	17.315	114.592	0.875	1.10438	75.6804		

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IOWA SOYBEANS STATE MODEL FOR ALL APUS IN STATE

OBS	YEAR	TREND1	TREND2	D1	D4	D5	DS05	ET6	P07	ETA	ET9
1	1951	0	0	1	0	0	1407	122	127	108	73
2	1952	2	0	1	0	0	1752	104	187	121	66
3	1953	2	0	1	0	0	753	145	143	118	79
4	1954	4	0	1	0	0	182	35	163	113	57
5	1955	5	0	1	0	0	225	94	43	114	72
6	1956	7	0	1	0	0	18	19	107	90	55
7	1957	9	0	1	0	0	86	109	103	72	27
8	1958	9	0	1	0	0	132	145	125	53	63
9	1959	9	0	1	0	0	167	13	58	120	84
10	1960	2	0	1	0	0	487	113	139	123	73
11	1961	2	0	1	0	0	139	12	135	125	81
12	1962	2	0	1	0	0	140	105	108	116	71
13	1963	2	0	1	0	0	139	113	102	112	87
14	1964	2	0	1	0	0	137	12	102	110	79
15	1965	2	0	1	0	0	409	24	187	110	59
16	1966	2	0	1	0	0	55	23	182	108	54
17	1967	2	0	1	0	0	46	3	135	122	68
18	1968	2	0	1	0	0	35	3	105	120	66
19	1969	2	0	1	0	0	73	4	157	176	83
20	1970	2	0	1	0	0	173	6	155	166	65
21	1971	2	0	1	0	0	33	2	171	176	83
22	1972	2	0	1	0	0	110	2	164	164	69
23	1973	2	0	1	0	0	33	2	130	130	78
24	1974	2	0	1	0	0	33	2	130	130	78
25	1975	2	0	1	0	0	81	2	164	164	69
26	1976	2	0	1	0	0	501	2	130	130	78
27	1977	2	0	1	0	0	194	2	130	130	78
28	1978	2	0	1	0	0	28	2	130	130	78
29	1979	2	0	1	0	0	489	2	130	130	78
30	1980	2	0	1	0	0	183	2	130	130	78
31	1981	2	0	1	0	0	19	2	130	130	78
32	1982	2	0	1	0	0	19	2	130	130	78
33	1983	2	0	1	0	0	19	2	130	130	78
34	1984	2	0	1	0	0	19	2	130	130	78
35	1985	2	0	1	0	0	19	2	130	130	78
36	1986	2	0	1	0	0	19	2	130	130	78
37	1987	2	0	1	0	0	19	2	130	130	78
38	1988	2	0	1	0	0	19	2	130	130	78
39	1989	2	0	1	0	0	19	2	130	130	78
40	1990	2	0	1	0	0	19	2	130	130	78
41	1991	2	0	1	0	0	19	2	130	130	78
42	1992	2	0	1	0	0	19	2	130	130	78
43	1993	2	0	1	0	0	19	2	130	130	78
44	1994	2	0	1	0	0	19	2	130	130	78
45	1995	2	0	1	0	0	19	2	130	130	78
46	1996	2	0	1	0	0	19	2	130	130	78
47	1997	2	0	1	0	0	19	2	130	130	78
48	1998	2	0	1	0	0	19	2	130	130	78
49	1999	2	0	1	0	0	19	2	130	130	78
50	2000	2	0	1	0	0	19	2	130	130	78

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OB5	YEAR	TREND1	TREND2	D1	D4	D5	D505	FT6	PD7	ETA	ETA9
63	1977	32	0	0	0	0	21999.6	106.187	106	124.283	89.729
64	1978	32	0	0	0	0	28452.1	131.028	180	124.612	100.980
65	1979	32	0	0	0	0	7687.3	127.632	142	114.079	85.513
66	1980	32	0	0	0	0	3561.4	127.632	142	114.079	85.513
67	1981	32	0	0	0	0	48.5	37	127	99.979	74.696
68	1982	32	0	0	0	0	150.5	583	130	115.810	65.822
69	1983	32	0	0	0	0	168.4	614	130	115.810	65.822
70	1984	32	0	0	0	0	173.4	721	130	115.810	65.822
71	1985	32	0	0	0	0	225.5	227	130	115.810	65.822
72	1986	32	0	0	0	0	245.7	227	130	115.810	65.822
73	1987	32	0	0	0	0	285.1	227	130	115.810	65.822
74	1988	32	0	0	0	0	357.1	227	130	115.810	65.822
75	1989	32	0	0	0	0	404.8	227	130	115.810	65.822
76	1990	32	0	0	0	0	427.9	227	130	115.810	65.822
77	1991	32	0	0	0	0	483.3	227	130	115.810	65.822
78	1992	32	0	0	0	0	557.1	227	130	115.810	65.822
79	1993	32	0	0	0	0	616.7	227	130	115.810	65.822
80	1994	32	0	0	0	0	647.9	227	130	115.810	65.822
81	1995	32	0	0	0	0	647.9	227	130	115.810	65.822
82	1996	32	0	0	0	0	647.9	227	130	115.810	65.822
83	1997	32	0	0	0	0	647.9	227	130	115.810	65.822
84	1998	32	0	0	0	0	647.9	227	130	115.810	65.822
85	1999	32	0	0	0	0	647.9	227	130	115.810	65.822
86	2000	32	0	0	0	0	647.9	227	130	115.810	65.822
87	2001	32	0	0	0	0	647.9	227	130	115.810	65.822
88	2002	32	0	0	0	0	647.9	227	130	115.810	65.822
89	2003	32	0	0	0	0	647.9	227	130	115.810	65.822
90	2004	32	0	0	0	0	647.9	227	130	115.810	65.822
91	2005	32	0	0	0	0	647.9	227	130	115.810	65.822
92	2006	32	0	0	0	0	647.9	227	130	115.810	65.822
93	2007	32	0	0	0	0	647.9	227	130	115.810	65.822
94	2008	32	0	0	0	0	647.9	227	130	115.810	65.822
95	2009	32	0	0	0	0	647.9	227	130	115.810	65.822
96	2010	32	0	0	0	0	647.9	227	130	115.810	65.822
97	2011	32	0	0	0	0	647.9	227	130	115.810	65.822
98	2012	32	0	0	0	0	647.9	227	130	115.810	65.822
99	2013	32	0	0	0	0	647.9	227	130	115.810	65.822
00	2014	32	0	0	0	0	647.9	227	130	115.810	65.822
01	2015	32	0	0	0	0	647.9	227	130	115.810	65.822
02	2016	32	0	0	0	0	647.9	227	130	115.810	65.822
03	2017	32	0	0	0	0	647.9	227	130	115.810	65.822
04	2018	32	0	0	0	0	647.9	227	130	115.810	65.822
05	2019	32	0	0	0	0	647.9	227	130	115.810	65.822
06	2020	32	0	0	0	0	647.9	227	130	115.810	65.822

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IOWA SOYBEANS STATE MODEL FOR ALL APUS IN STATE

OBS	YEAR	TREND1	TREND2	D1	D4	D5	DS05	ET6	PD7	ET8	ET9
1	1970	32	9	0	0	0	419.6	127.361	96	106.345	79.8657
2	1971	32	10	0	0	0	319.2	147.458	98	190.426	79.1780
3	1972	32	11	0	0	0	651.1	121.435	130	124.903	80.1364
4	1973	32	12	0	0	0	59788.6	131.510	106	108.434	78.1578
5	1974	32	13	0	0	0	38618.6	116.324	151	130.588	75.1780
6	1975	32	14	0	0	0	703.6	126.522	259	130.016	51.7619
7	1976	32	15	0	0	0	4801.2	102.422	82	181.650	43.6066
8	1977	32	16	0	0	0	342.3	123.834	144	122.082	43.3086
9	1978	32	17	0	0	0	342.2	123.834	144	122.082	43.3086
10	1979	32	18	0	0	0	342.2	123.834	144	122.082	43.3086
11	1980	32	19	0	0	0	342.2	123.834	144	122.082	43.3086
12	1981	32	20	0	0	0	342.2	123.834	144	122.082	43.3086
13	1982	32	21	0	0	0	342.2	123.834	144	122.082	43.3086
14	1983	32	22	0	0	0	342.2	123.834	144	122.082	43.3086
15	1984	32	23	0	0	0	342.2	123.834	144	122.082	43.3086
16	1985	32	24	0	0	0	342.2	123.834	144	122.082	43.3086
17	1986	32	25	0	0	0	342.2	123.834	144	122.082	43.3086
18	1987	32	26	0	0	0	342.2	123.834	144	122.082	43.3086
19	1988	32	27	0	0	0	342.2	123.834	144	122.082	43.3086
20	1989	32	28	0	0	0	342.2	123.834	144	122.082	43.3086
21	1990	32	29	0	0	0	342.2	123.834	144	122.082	43.3086
22	1991	32	30	0	0	0	342.2	123.834	144	122.082	43.3086
23	1992	32	31	0	0	0	342.2	123.834	144	122.082	43.3086
24	1993	32	32	0	0	0	342.2	123.834	144	122.082	43.3086
25	1994	32	33	0	0	0	342.2	123.834	144	122.082	43.3086
26	1995	32	34	0	0	0	342.2	123.834	144	122.082	43.3086
27	1996	32	35	0	0	0	342.2	123.834	144	122.082	43.3086
28	1997	32	36	0	0	0	342.2	123.834	144	122.082	43.3086
29	1998	32	37	0	0	0	342.2	123.834	144	122.082	43.3086
30	1999	32	38	0	0	0	342.2	123.834	144	122.082	43.3086
31	2000	32	39	0	0	0	342.2	123.834	144	122.082	43.3086
32	2001	32	40	0	0	0	342.2	123.834	144	122.082	43.3086
33	2002	32	41	0	0	0	342.2	123.834	144	122.082	43.3086
34	2003	32	42	0	0	0	342.2	123.834	144	122.082	43.3086
35	2004	32	43	0	0	0	342.2	123.834	144	122.082	43.3086
36	2005	32	44	0	0	0	342.2	123.834	144	122.082	43.3086
37	2006	32	45	0	0	0	342.2	123.834	144	122.082	43.3086
38	2007	32	46	0	0	0	342.2	123.834	144	122.082	43.3086
39	2008	32	47	0	0	0	342.2	123.834	144	122.082	43.3086
40	2009	32	48	0	0	0	342.2	123.834	144	122.082	43.3086
41	2010	32	49	0	0	0	342.2	123.834	144	122.082	43.3086
42	2011	32	50	0	0	0	342.2	123.834	144	122.082	43.3086
43	2012	32	51	0	0	0	342.2	123.834	144	122.082	43.3086
44	2013	32	52	0	0	0	342.2	123.834	144	122.082	43.3086
45	2014	32	53	0	0	0	342.2	123.834	144	122.082	43.3086
46	2015	32	54	0	0	0	342.2	123.834	144	122.082	43.3086
47	2016	32	55	0	0	0	342.2	123.834	144	122.082	43.3086
48	2017	32	56	0	0	0	342.2	123.834	144	122.082	43.3086
49	2018	32	57	0	0	0	342.2	123.834	144	122.082	43.3086
50	2019	32	58	0	0	0	342.2	123.834	144	122.082	43.3086
51	2020	32	59	0	0	0	342.2	123.834	144	122.082	43.3086
52	2021	32	60	0	0	0	342.2	123.834	144	122.082	43.3086
53	2022	32	61	0	0	0	342.2	123.834	144	122.082	43.3086
54	2023	32	62	0	0	0	342.2	123.834	144	122.082	43.3086
55	2024	32	63	0	0	0	342.2	123.834	144	122.082	43.3086
56	2025	32	64	0	0	0	342.2	123.834	144	122.082	43.3086
57	2026	32	65	0	0	0	342.2	123.834	144	122.082	43.3086
58	2027	32	66	0	0	0	342.2	123.834	144	122.082	43.3086
59	2028	32	67	0	0	0	342.2	123.834	144	122.082	43.3086
60	2029	32	68	0	0	0	342.2	123.834	144	122.082	43.3086
61	2030	32	69	0	0	0	342.2	123.834	144	122.082	43.3086
62	2031	32	70	0	0	0	342.2	123.834	144	122.082	43.3086
63	2032	32	71	0	0	0	342.2	123.834	144	122.082	43.3086
64	2033	32	72	0	0	0	342.2	123.834	144	122.082	43.3086
65	2034	32	73	0	0	0	342.2	123.834	144	122.082	43.3086
66	2035	32	74	0	0	0	342.2	123.834	144	122.082	43.3086
67	2036	32	75	0	0	0	342.2	123.834	144	122.082	43.3086
68	2037	32	76	0	0	0	342.2	123.834	144	122.082	43.3086
69	2038	32	77	0	0	0	342.2	123.834	144	122.082	43.3086
70	2039	32	78	0	0	0	342.2	123.834	144	122.082	43.3086
71	2040	32	79	0	0	0	342.2	123.834	144	122.082	43.3086
72	2041	32	80	0	0	0	342.2	123.834	144	122.082	43.3086
73	2042	32	81	0	0	0	342.2	123.834	144	122.082	43.3086
74	2043	32	82	0	0	0	342.2	123.834	144	122.082	43.3086
75	2044	32	83	0	0	0	342.2	123.834	144	122.082	43.3086
76	2045	32	84	0	0	0	342.2	123.834	144	122.082	43.3086
77	2046	32	85	0	0	0	342.2	123.834	144	122.082	43.3086
78	2047	32	86	0	0	0	342.2	123.834	144	122.082	43.3086
79	2048	32	87	0	0	0	342.2	123.834	144	122.082	43.3086
80	2049	32	88	0	0	0	342.2	123.834	144	122.082	43.3086
81	2050	32	89	0	0	0	342.2	123.834	144	122.082	43.3086
82	2051	32	90	0	0	0	342.2	123.834	144	122.082	43.3086
83	2052	32	91	0	0	0	342.2	123.834	144	122.082	43.3086
84	2053	32	92	0	0	0	342.2	123.834	144	122.082	43.3086
85	2054	32	93	0	0	0	342.2	123.834	144	122.082	43.3086
86	2055	32	94	0	0	0	342.2	123.834	144	122.082	43.3086
87	2056	32	95	0	0	0	342.2	123.834	144	122.082	43.3086
88	2057	32	96	0	0	0	342.2	123.834	144	122.082	43.3086
89	2058	32	97	0	0	0	342.2	123.834	144	122.082	43.3086
90	2059	32	98	0	0	0	342.2	123.834	144	122.082	43.3086
91	2060	32	99	0	0	0	342.2	123.834	144	122.082	43.3086
92	2061	32	100	0	0	0	342.2	123.834	144	122.082	43.3086

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IOWA SOYBEANS STATE MODEL FOR ALL APUS IN STATE

OBS	YEAR	TREND1	TREND2	D1	D4	D5	NSQ5	ET6	PD7	ET8	ET9
1	1963	3	3	0	0	0	345	35	107	118	82
2	1964	3	4	0	0	0	1338	122	116	116	74
3	1965	3	5	0	0	0	919	122	110	110	58
4	1966	3	6	0	0	0	1202	125	119	119	71
5	1967	3	7	0	0	0	336	111	129	129	15
6	1968	3	8	0	0	0	786	126	133	133	78
7	1969	3	9	0	0	0	401	144	182	182	85
8	1970	3	0	0	0	0	146	124	123	123	78
9	1971	3	1	0	0	0	232	130	136	136	85
10	1972	3	2	0	0	0	448	130	136	136	85
11	1973	3	3	0	0	0	156	117	105	105	71
12	1974	3	4	0	0	0	173	127	101	101	68
13	1975	3	5	0	0	0	63	104	102	102	68
14	1976	3	6	0	0	0	358	126	119	119	68
15	1977	3	7	0	0	0	259	104	122	122	68
16	1978	3	8	0	0	0	137	104	119	119	68
17	1979	3	9	0	0	0	1	104	119	119	68
18	1980	3	0	0	0	0	156	126	119	119	68
19	1981	3	1	0	0	0	173	126	119	119	68
20	1982	3	2	0	0	0	156	126	119	119	68
21	1983	3	3	0	0	0	173	126	119	119	68
22	1984	3	4	0	0	0	156	126	119	119	68
23	1985	3	5	0	0	0	173	126	119	119	68
24	1986	3	6	0	0	0	156	126	119	119	68
25	1987	3	7	0	0	0	173	126	119	119	68
26	1988	3	8	0	0	0	156	126	119	119	68
27	1989	3	9	0	0	0	173	126	119	119	68
28	1990	3	0	0	0	0	156	126	119	119	68
29	1991	3	1	0	0	0	173	126	119	119	68
30	1992	3	2	0	0	0	156	126	119	119	68
31	1993	3	3	0	0	0	173	126	119	119	68
32	1994	3	4	0	0	0	156	126	119	119	68
33	1995	3	5	0	0	0	173	126	119	119	68
34	1996	3	6	0	0	0	156	126	119	119	68
35	1997	3	7	0	0	0	173	126	119	119	68
36	1998	3	8	0	0	0	156	126	119	119	68
37	1999	3	9	0	0	0	173	126	119	119	68
38	2000	3	0	0	0	0	156	126	119	119	68
39	2001	3	1	0	0	0	173	126	119	119	68
40	2002	3	2	0	0	0	156	126	119	119	68
41	2003	3	3	0	0	0	173	126	119	119	68
42	2004	3	4	0	0	0	156	126	119	119	68
43	2005	3	5	0	0	0	173	126	119	119	68
44	2006	3	6	0	0	0	156	126	119	119	68
45	2007	3	7	0	0	0	173	126	119	119	68
46	2008	3	8	0	0	0	156	126	119	119	68
47	2009	3	9	0	0	0	173	126	119	119	68
48	2010	3	0	0	0	0	156	126	119	119	68
49	2011	3	1	0	0	0	173	126	119	119	68
50	2012	3	2	0	0	0	156	126	119	119	68
51	2013	3	3	0	0	0	173	126	119	119	68
52	2014	3	4	0	0	0	156	126	119	119	68
53	2015	3	5	0	0	0	173	126	119	119	68
54	2016	3	6	0	0	0	156	126	119	119	68
55	2017	3	7	0	0	0	173	126	119	119	68
56	2018	3	8	0	0	0	156	126	119	119	68
57	2019	3	9	0	0	0	173	126	119	119	68
58	2020	3	0	0	0	0	156	126	119	119	68
59	2021	3	1	0	0	0	173	126	119	119	68
60	2022	3	2	0	0	0	156	126	119	119	68
61	2023	3	3	0	0	0	173	126	119	119	68
62	2024	3	4	0	0	0	156	126	119	119	68
63	2025	3	5	0	0	0	173	126	119	119	68
64	2026	3	6	0	0	0	156	126	119	119	68
65	2027	3	7	0	0	0	173	126	119	119	68
66	2028	3	8	0	0	0	156	126	119	119	68
67	2029	3	9	0	0	0	173	126	119	119	68
68	2030	3	0	0	0	0	156	126	119	119	68
69	2031	3	1	0	0	0	173	126	119	119	68
70	2032	3	2	0	0	0	156	126	119	119	68
71	2033	3	3	0	0	0	173	126	119	119	68
72	2034	3	4	0	0	0	156	126	119	119	68
73	2035	3	5	0	0	0	173	126	119	119	68
74	2036	3	6	0	0	0	156	126	119	119	68
75	2037	3	7	0	0	0	173	126	119	119	68
76	2038	3	8	0	0	0	156	126	119	119	68
77	2039	3	9	0	0	0	173	126	119	119	68
78	2040	3	0	0	0	0	156	126	119	119	68
79	2041	3	1	0	0	0	173	126	119	119	68
80	2042	3	2	0	0	0	156	126	119	119	68
81	2043	3	3	0	0	0	173	126	119	119	68
82	2044	3	4	0	0	0	156	126	119	119	68
83	2045	3	5	0	0	0	173	126	119	119	68
84	2046	3	6	0	0	0	156	126	119	119	68
85	2047	3	7	0	0	0	173	126	119	119	68
86	2048	3	8	0	0	0	156	126	119	119	68
87	2049	3	9	0	0	0	173	126	119	119	68
88	2050	3	0	0	0	0	156	126	119	119	68
89	2051	3	1	0	0	0	173	126	119	119	68
90	2052	3	2	0	0	0	156	126	119	119	68
91	2053	3	3	0	0	0	173	126	119	119	68
92	2054	3	4	0	0	0	156	126	119	119	68
93	2055	3	5	0	0	0	173	126	119	119	68
94	2056	3	6	0	0	0	156	126	119	119	68
95	2057	3	7	0	0	0	173	126	119	119	68
96	2058	3	8	0	0	0	156	126	119	119	68
97	2059	3	9	0	0	0	173	126	119	119	68
98	2060	3	0	0	0	0	156	126	119	119	68
99	2061	3	1	0	0	0	173	126	119	119	68
100	2062	3	2	0	0	0	156	126	119	119	68

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OBS	YEAR	TREND1	TREND2	D1	D4	D5	DS05	ET6	PD7	ET8	ET9
2	1956	2	0	0	0	1	597	33	1	123	63
3	1957	2	0	0	0	1	168	205	1	122	69
4	1958	2	0	0	0	1	183	22	1	124	69
5	1959	3	1	0	0	1	336	11	1	124	86
6	1960	3	1	0	0	1	33	11	1	127	78
7	1961	3	1	0	0	1	600	11	1	120	79
8	1962	3	1	0	0	1	953	11	1	120	72
9	1963	3	1	0	0	1	907	11	1	125	72
10	1964	3	1	0	0	1	933	11	1	125	74
11	1965	3	1	0	0	1	76	11	1	105	58
12	1966	3	1	0	0	1	276	11	1	105	74
13	1967	3	1	0	0	1	43	11	1	104	79
14	1968	3	1	0	0	1	47	11	1	105	79
15	1969	3	1	0	0	1	76	11	1	105	68
16	1970	3	1	0	0	1	147	11	1	105	80
17	1971	3	1	0	0	1	43	11	1	105	80
18	1972	3	1	0	0	1	73	11	1	105	80
19	1973	3	1	0	0	1	48	11	1	105	80
20	1974	3	1	0	0	1	33	11	1	105	80
21	1975	3	1	0	0	1	32	11	1	105	80
22	1976	3	1	0	0	1	127	11	1	105	80
23	1977	3	1	0	0	1	4	11	1	105	80
24	1978	3	1	0	0	1	27	11	1	105	80
25	1979	3	1	0	0	1	61	11	1	105	80
26	1980	3	1	0	0	1	17	11	1	105	80
27	1981	3	1	0	0	1	39	11	1	105	80
28	1982	3	1	0	0	1	4	11	1	105	80
29	1983	3	1	0	0	1	4	11	1	105	80

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Line	Code	Value	Unit	Value	Unit
1	100	1.00	100	1.00	100
2	101	1.01	101	1.01	101
3	102	1.02	102	1.02	102
4	103	1.03	103	1.03	103
5	104	1.04	104	1.04	104
6	105	1.05	105	1.05	105
7	106	1.06	106	1.06	106
8	107	1.07	107	1.07	107
9	108	1.08	108	1.08	108
10	109	1.09	109	1.09	109
11	110	1.10	110	1.10	110
12	111	1.11	111	1.11	111
13	112	1.12	112	1.12	112
14	113	1.13	113	1.13	113
15	114	1.14	114	1.14	114
16	115	1.15	115	1.15	115
17	116	1.16	116	1.16	116
18	117	1.17	117	1.17	117
19	118	1.18	118	1.18	118
20	119	1.19	119	1.19	119
21	120	1.20	120	1.20	120
22	121	1.21	121	1.21	121
23	122	1.22	122	1.22	122
24	123	1.23	123	1.23	123
25	124	1.24	124	1.24	124
26	125	1.25	125	1.25	125
27	126	1.26	126	1.26	126
28	127	1.27	127	1.27	127
29	128	1.28	128	1.28	128
30	129	1.29	129	1.29	129
31	130	1.30	130	1.30	130
32	131	1.31	131	1.31	131
33	132	1.32	132	1.32	132
34	133	1.33	133	1.33	133

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Line	Page	Text	Page	Text	Page	Text
1	1	1.00000	1	133.501	1	1
2	1	0.99999	2	133.000	2	2
3	1	0.99997	3	132.500	3	3
4	1	0.99994	4	132.000	4	4
5	1	0.99989	5	131.500	5	5
6	1	0.99982	6	131.000	6	6
7	1	0.99973	7	130.500	7	7
8	1	0.99961	8	130.000	8	8
9	1	0.99946	9	129.500	9	9
10	1	0.99928	10	129.000	10	10
11	1	0.99907	11	128.500	11	11
12	1	0.99882	12	128.000	12	12
13	1	0.99853	13	127.500	13	13
14	1	0.99820	14	127.000	14	14
15	1	0.99782	15	126.500	15	15
16	1	0.99740	16	126.000	16	16
17	1	0.99693	17	125.500	17	17
18	1	0.99641	18	125.000	18	18
19	1	0.99584	19	124.500	19	19
20	1	0.99522	20	124.000	20	20
21	1	0.99455	21	123.500	21	21
22	1	0.99383	22	123.000	22	22
23	1	0.99306	23	122.500	23	23
24	1	0.99224	24	122.000	24	24
25	1	0.99137	25	121.500	25	25
26	1	0.99045	26	121.000	26	26
27	1	0.98948	27	120.500	27	27
28	1	0.98846	28	120.000	28	28
29	1	0.98739	29	119.500	29	29
30	1	0.98627	30	119.000	30	30
31	1	0.98510	31	118.500	31	31
32	1	0.98388	32	118.000	32	32
33	1	0.98261	33	117.500	33	33
34	1	0.98129	34	117.000	34	34

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DATE	TIME	TYPE	CLASS	REMARKS	REMARKS	REMARKS	REMARKS	REMARKS
1	1000	1	1	1	1	1	1	1
2	1000	1	1	1	1	1	1	1
3	1000	1	1	1	1	1	1	1
4	1000	1	1	1	1	1	1	1
5	1000	1	1	1	1	1	1	1
6	1000	1	1	1	1	1	1	1
7	1000	1	1	1	1	1	1	1
8	1000	1	1	1	1	1	1	1
9	1000	1	1	1	1	1	1	1
10	1000	1	1	1	1	1	1	1
11	1000	1	1	1	1	1	1	1
12	1000	1	1	1	1	1	1	1
13	1000	1	1	1	1	1	1	1
14	1000	1	1	1	1	1	1	1
15	1000	1	1	1	1	1	1	1
16	1000	1	1	1	1	1	1	1
17	1000	1	1	1	1	1	1	1
18	1000	1	1	1	1	1	1	1
19	1000	1	1	1	1	1	1	1
20	1000	1	1	1	1	1	1	1
21	1000	1	1	1	1	1	1	1
22	1000	1	1	1	1	1	1	1
23	1000	1	1	1	1	1	1	1
24	1000	1	1	1	1	1	1	1
25	1000	1	1	1	1	1	1	1
26	1000	1	1	1	1	1	1	1
27	1000	1	1	1	1	1	1	1
28	1000	1	1	1	1	1	1	1
29	1000	1	1	1	1	1	1	1
30	1000	1	1	1	1	1	1	1
31	1000	1	1	1	1	1	1	1
32	1000	1	1	1	1	1	1	1
33	1000	1	1	1	1	1	1	1
34	1000	1	1	1	1	1	1	1
35	1000	1	1	1	1	1	1	1
36	1000	1	1	1	1	1	1	1

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Year	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
1	1971	1	2,352,200	-1,774,300	0.93907											
2	1972	2	2,552,200	-2,479,300	0.94930											
3	1973	3	2,193,377	2,100,000	0.94070											
4	1974	4	2,974,412	1,400,000	0.95253											
5	1975	5	2,275,425	1,400,000	0.95422											
6	1976	6	1,272,477	-1,393,000	0.90378											
7	1977	7	1,452,483	-1,400,000	0.95970											
8	1978	8	1,914,004	-1,473,300	0.95970											
9	1979	9	1,441,622	-1,473,300	1.00000											
10	1980	10	1,192,160	-1,473,300	0.95534											
11	1981	11	1,712,322	-1,393,000	0.90570											
12	1982	12	2,227,122	-1,393,000	1.00000											
13	1983	13	1,474,499	-1,393,000	1.00000											
14	1984	14	1,737,480	-1,393,000	1.00000											
15	1985	15	3,552,210	0.10000	0.97073											
16	1986	16	3,175,100	-1,393,000	0.94570											
17	1987	17	1,451,290	-1,393,000	0.94975											
18	1988	18	2,322,431	-1,393,000	1.00000											
19	1989	19	1,524,310	-1,393,000	1.00000											
20	1990	20	1,943,100	-1,393,000	0.92245											
21	1991	21	2,500,322	-1,393,000	0.94359											
22	1992	22	2,024,693	-1,393,000	1.00000											
23	1993	23	2,351,260	-1,393,000	0.94253											
24	1994	24	1,316,322	-1,393,000	0.95384											
25	1995	25	4,581,830	0.10000	0.93367											
26	1996	26	2,334,500	-1,393,000	0.95704											
27	1997	27	1,224,150	-1,393,000	0.74144											
28	1998	28	2,531,040	-1,393,000	1.00000											
29	1999	29	2,713,000	-1,393,000	1.00000											
30	2000	30	1,716,000	0.00000	0.90953											
31	2001	31											
32	2002	32											
33	2003	33											
34	2004	34											

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ONS	YR	YR	YR	YR	YR	YR	YR
1	1951	29.0941	1	1.7	117.135	1.00477	17
2	1951	31.0375	2	1.5	123.774	1.00477	
3	1952	41.0257	3	1.15	132.223	0.997777	
4	1953	33.0337	4	1.70	134.205	1.00477	
5	1954	41.0707	5	1.72	135.009	1.003044	
6	1955	35.0243	6	1.72	135.009	1.00707	
7	1956	43.0235	7	1.13	133.130	1.00520	
8	1957	41.0342	8	1.16	127.737	1.00375	
9	1958	41.0205	9	1.25	129.116	0.99730	
10	1959	42.0330	10	1.27	129.732	1.003412	
11	1960	39.0390	11	1.57	112.008	1.00370	
12	1961	40.1152	12	1.15	112.008	1.00477	
13	1962	43.0775	13	1.14	117.003	1.00477	
14	1963	50.2222	14	1.14	120.001	0.99357	
15	1964	42.2317	15	1.16	120.201	0.99757	
16	1965	40.0423	16	1.13	121.027	0.99872	
17	1966	34.0757	17	1.13	120.547	1.005025	
18	1967	54.0425	18	1.13	120.577	1.00740	
19	1968	59.0091	19	1.10	120.000	1.00477	
20	1969	60.7062	20	1.1	111.002	1.00512	
21	1970	53.0749	21	1.15	123.177	1.00042	
22	1971	53.2193	22	1.16	113.137	1.00303	
23	1972	50.1117	23	1.16	132.009	1.00477	
24	1973	60.4115	24	1.13	132.009	0.99077	
25	1974	50.7371	25	1.15	119.022	1.00330	
26	1975	62.2534	26	1.13	122.057	0.99337	
27	1976	50.0494	27	1.10	117.244	0.995313	
28	1977	70.0017	28	1.16	107.792	1.00477	
29	1978	73.1324	29	1.16	123.002	1.00477	
30	1979	79.0347	30	1.10	121.005	1.00705	
31	1980	73.0044	31	1.14	121.737	1.001024	
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TOTAL COST STATE MODEL FOR ALL STATES IN STATE

YR	YEAR	TRADD	DI	ETG	WT	ETP
1	1950	1	1	122.450	0.57173	1.00000
2	1951	2	1	104.816	0.033746	0.98236
3	1952	3	1	145.133	1.02743	1.00000
4	1953	4	1	135.906	0.26551	0.95140
5	1954	5	1	144.208	0.00257	0.77631
6	1955	6	1	100.230	0.69125	0.75107
7	1956	7	1	119.483	0.05929	0.92936
8	1957	8	1	113.488	1.01845	1.00000
9	1958	9	1	135.233	0.17816	0.85041
10	1959	10	1	114.880	0.40883	0.93744
11	1960	11	1	123.226	0.56390	0.96428
12	1961	12	1	120.226	1.01114	1.00000
13	1962	13	1	142.444	0.62147	0.92979
14	1963	14	1	126.400	0.66974	0.95984
15	1964	15	1	124.646	0.58869	0.94457
16	1965	16	1	124.401	0.44417	0.92330
17	1966	17	1	120.226	0.27637	0.94619
18	1967	18	1	135.264	0.59915	0.83551
19	1968	19	1	106.556	0.97179	0.97419
20	1969	20	1	129.593	0.37620	0.82467
21	1970	21	1	145.986	0.53523	0.96117
22	1971	22	1	127.027	1.19493	1.00000
23	1972	23	1	131.477	0.91943	0.90000
24	1973	24	1	121.054	0.19955	0.87110
25	1974	25	1	123.954	0.19438	0.91236
26	1975	26	1	125.497	0.22337	0.71623
27	1976	27	1	110.102	0.69850	0.81979
28	1977	28	1	125.071	1.04294	1.00000
29	1978	29	1	126.627	0.45528	0.85572
30	1979	30	1	122.150	0.24013	0.71256
31	1980	31	1			
32	1981	32	1			
33	1982	33	1			
34	1983	34	1			
35	1984	35	1			
36	1985	36	1			
37	1986	37	1			
38	1987	38	1			
39	1988	39	1			
40	1989	40	1			
41	1990	41	1			
42	1991	42	1			
43	1992	43	1			
44	1993	44	1			
45	1994	45	1			
46	1995	46	1			
47	1996	47	1			
48	1997	48	1			
49	1998	49	1			
50	1999	50	1			
51	2000	51	1			
52	2001	52	1			
53	2002	53	1			
54	2003	54	1			
55	2004	55	1			
56	2005	56	1			
57	2006	57	1			
58	2007	58	1			
59	2008	59	1			
60	2009	60	1			
61	2010	61	1			

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LOW COST STATE MODEL FOR ALL APUS IN STATE

YRS	YEAR	MEMO	DI	E16	**R7	EIP7
62	1977	29	1	196.240	0.63438	0.77122
63	1978	30	1	190.970	1.21150	1.00000
64	1979	31	1	127.580	0.99409	0.99464
65	1980	32	1	137.427	0.36052	0.87756
66	1981	33	1	.	.	.
67	1982	34	1	.	.	.
68	1983	1	0	120.250	1.01145	1.00000
69	1980	2	0	193.481	0.87471	1.00000
70	1981	3	0	141.549	0.90041	1.00000
71	1982	4	0	138.551	0.54857	0.97227
72	1983	5	0	134.075	0.41935	0.95832
73	1984	6	0	102.689	0.47949	0.78910
74	1985	7	0	104.339	0.63231	0.73407
75	1986	8	0	119.340	0.67603	0.95547
76	1987	9	0	107.806	0.01350	0.95150
77	1988	10	0	133.248	0.12878	0.84137
78	1989	11	0	113.419	0.44119	0.91324
79	1990	12	0	123.357	0.75218	0.96550
80	1991	13	0	119.340	1.31541	1.00000
81	1992	14	0	137.775	0.87759	0.97141
82	1993	15	0	125.458	0.86450	0.97709
83	1994	16	0	123.081	0.27588	0.84512
84	1995	17	0	124.269	0.37142	0.94514
85	1996	18	0	131.105	0.26502	0.84647
86	1997	19	0	194.907	0.97549	1.00000
87	1998	20	0	127.938	0.52114	0.86061
88	1970	21	0	144.557	0.72712	0.97438
89	1971	22	0	121.946	0.09152	1.00000
90	1972	23	0	129.638	0.92931	0.98358
91	1973	24	0	120.069	0.26060	0.92751
92	1974	25	0	120.069	0.11149	0.92791
93	1975	26	0	123.959	0.23389	0.80973
94	1976	27	0	123.959	0.63457	0.82545
95	1977	28	0	114.291	1.26724	1.00000
96	1978	29	0	124.011	0.26468	0.97752
97	1979	30	0	123.145	0.41728	0.79790
98	1980	31	0	120.230	.	.
99	1981	32	0	.	.	.
100	1982	33	0	.	.	.
101	1983	34	0	.	.	.
102	1984	1	0	119.894	0.70483	0.99067
103	1985	2	0	196.851	0.74331	0.99302
104	1986	3	0	142.195	0.78911	0.99072
105	1987	4	0	136.295	0.70030	0.98233
106	1988	5	0	136.295	0.34534	0.95485
107	1989	6	0	110.057	0.69315	0.90697
108	1990	7	0	124.913	0.81117	0.90378
109	1991	8	0	122.099	0.54958	0.96970
110	1992	9	0	108.288	1.00000	1.00000
111	1993	10	0	133.178	0.35471	0.93534
112	1994	11	0	114.654	0.41531	0.90870
113	1995	12	0	120.390	1.09908	1.00000
114	1996	13	0	119.429	1.29427	1.00000
115	1997	14	0	118.160	1.15109	1.00000
116	1998	15	0	115.832	1.61324	1.00000
117	1999	16	0	122.932	0.56263	0.94670
118	1984	17	0	125.750	0.54462	0.97126
119	1985	18	0	122.932	0.30448	0.94978
120	1986	19	0	130.960	1.04583	1.00000
121	1987	20	0	.	.	.

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10-4 CDM STATE MODEL FOR ALL APUS IN STATE

055	YEAR	1 (0-1)	01	ET6	RT	ELPT
123	1970	21	0	127.309	0.05220	0.92245
124	1971	22	0	147.446	0.00757	0.94959
125	1972	23	0	121.365	0.95745	1.00000
126	1973	24	0	131.462	0.73196	0.94253
127	1974	25	0	116.249	0.38042	0.95388
128	1975	26	0	126.519	0.15802	0.93387
129	1976	27	0	125.372	0.38309	0.89709
130	1977	28	0	103.258	0.50321	0.74144
131	1978	29	0	127.258	1.01679	1.00000
132	1979	30	0	123.765	1.04240	1.00000
133	1980	31	0	125.075	0.40017	0.90933
134	1981	32	0	.	.	.
135	1982	33	0	.	.	.
136	1983	34	0	.	.	.
137	1984	1	0	116.879	0.93133	1.00000
138	1985	2	0	107.527	0.87994	1.00000
139	1986	3	0	135.985	0.49844	0.92509
140	1987	4	0	132.928	0.94654	1.00000
141	1988	5	0	137.361	0.37845	0.95471
142	1989	6	0	110.033	0.55461	0.90423
143	1990	7	0	134.868	0.90733	0.97524
144	1991	8	0	120.087	0.54601	0.94778
145	1992	9	0	106.158	0.96290	0.99290
146	1993	10	0	127.736	0.55928	0.97487
147	1994	11	0	112.581	0.67114	0.97818
148	1995	12	0	118.589	1.33476	1.00000
149	1996	13	0	116.735	1.51539	1.00000
150	1997	14	0	128.154	1.11373	1.00000
151	1998	15	0	125.572	0.41207	0.95482
152	1999	16	0	118.324	0.86377	0.96791
153	2000	17	0	123.404	0.70067	0.98702
154	2001	18	0	127.786	0.55539	0.95539
155	2002	19	0	124.582	0.99586	1.00000
156	2003	20	0	103.322	1.21620	1.00000
157	2004	21	0	126.322	0.88069	0.98812
158	2005	22	0	144.054	0.84945	0.95554
159	2006	23	0	118.132	1.32726	1.00000
160	2007	24	0	131.455	0.50052	0.95211
161	2008	25	0	111.128	0.45745	0.96240
162	2009	26	0	126.571	0.24336	0.90196
163	2010	27	0	122.054	0.43512	0.85884
164	2011	28	0	119.356	0.86992	0.93496
165	2012	29	0	127.054	0.93596	1.00000
166	2013	30	0	124.133	0.94322	1.00000
167	2014	31	0	124.133	0.45131	0.95543
168	2015	32	0	.	.	.
169	2016	33	0	.	.	.
170	2017	34	0	.	.	.
171	2018	1	1	121.533	0.81965	0.94214
172	2019	2	1	107.272	0.81786	0.94003
173	2020	3	1	149.682	0.48138	0.96512
174	2021	4	1	143.683	0.34032	0.86595
175	2022	5	1	141.757	0.12175	0.78599
176	2023	6	1	112.249	0.47313	0.90031
177	2024	7	1	95.846	1.02238	1.00000
178	2025	8	1	124.610	0.38206	0.95241
179	2026	9	1	110.404	2.21037	1.00000
180	2027	10	1	132.435	0.43353	0.92231
181	2028	11	1	118.513	0.41200	0.95924
182	2029	12	1	121.354	0.82844	0.97012
183	2030	13	1	121.354	0.71179	0.95179

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MS	YEAR	TYPE	DI	EFB	W7	EIP7
144	1963	14	1	135.434	0.74450	0.89774
145	1964	15	1	126.914	0.67464	0.94397
146	1965	16	1	123.050	0.53785	0.96340
147	1966	17	1	122.316	0.46209	0.97207
148	1967	18	1	122.316	0.45104	0.96348
149	1968	19	1	130.763	0.71449	0.91619
150	1969	20	1	111.734	1.05765	1.00000
151	1970	21	1	126.172	0.40792	0.84421
152	1971	22	1	146.255	0.43136	0.85839
153	1972	23	1	123.903	1.00445	1.00000
154	1973	24	1	130.334	1.34915	1.00000
155	1974	25	1	117.000	0.27237	0.93291
156	1975	26	1	117.684	0.54584	0.92395
157	1976	27	1	126.145	0.44335	0.96006
158	1977	28	1	134.652	0.49491	0.95939
159	1978	29	1	130.738	0.61690	0.95020
160	1979	30	1	125.377	0.40395	0.95548
201	1980	31	1	130.001	.	.
202	1981	32	1	.	.	.
203	1982	33	1	.	.	.
204	1983	34	1	.	.	.
205	1984	1	0	123.238	0.61973	0.94141
206	1985	2	0	113.333	0.80140	0.99415
207	1986	3	0	150.809	0.44177	0.95250
208	1987	4	0	145.933	0.34714	0.82654
209	1988	5	0	114.432	0.20149	0.92345
210	1989	6	0	110.422	0.32225	0.88592
211	1990	7	0	126.825	0.77757	0.84412
212	1991	8	0	114.084	0.63787	0.95035
213	1992	9	0	114.455	1.42050	1.00000
214	1993	10	0	132.455	0.77303	0.92134
215	1994	11	0	119.406	0.64474	0.98279
216	1995	12	0	119.406	1.24420	1.00000
217	1996	13	0	124.424	1.09567	1.00000
218	1997	14	0	132.764	1.12044	1.00000
219	1998	15	0	121.764	0.54356	0.91946
220	1999	16	0	121.425	0.79941	0.95895
221	2000	17	0	125.550	0.48356	0.96410
222	2001	18	0	128.649	0.85358	0.94422
223	2002	19	0	135.649	0.49105	0.88873
224	2003	20	0	111.075	1.24094	1.00000
225	2004	21	0	129.420	0.82714	0.96336
226	2005	22	0	146.509	0.94695	0.98054
227	2006	23	0	123.238	0.79052	0.99303
228	2007	24	0	134.055	0.99903	0.97462
229	2008	25	0	114.544	0.54275	0.97462
230	2009	26	0	129.389	0.16573	0.82303
231	2010	27	0	127.325	0.55113	0.95038
232	2011	28	0	120.657	0.33796	0.80240
233	2012	29	0	132.540	0.93210	1.00000
234	2013	30	0	126.624	0.75734	0.94494
235	2014	31	0	127.372	0.52926	0.94457
236	2015	32	0	.	.	.
237	2016	33	0	.	.	.
238	2017	34	0	.	.	.
239	2018	1	0	117.104	1.30313	1.00000
240	2019	2	0	108.474	1.14519	1.00000
241	2020	3	0	132.423	0.87267	0.93708
242	2021	4	0	133.205	1.32545	1.00000
243	2022	5	0	136.909	0.50451	0.96755

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QMS	YEAR	TYPE	DI	ETB	WT	ETP7
245	1956	7	0	133.436	0.88076	0.95426
246	1957	9	0	120.737	0.88779	1.00000
247	1958	9	0	135.116	0.85442	0.90881
248	1959	10	0	128.782	0.52104	0.97101
249	1960	11	0	112.028	0.58503	0.97246
250	1961	12	0	116.671	1.24249	1.00000
251	1962	13	0	117.003	1.48044	1.00000
252	1963	14	0	125.691	0.83019	0.93300
253	1964	15	0	126.251	0.24406	0.91634
254	1965	16	0	120.027	0.55382	0.89853
255	1966	17	0	125.047	0.69265	0.98618
256	1967	18	0	126.579	0.30107	0.94592
257	1968	19	0	126.579	0.94052	1.00000
258	1969	20	0	101.362	0.73949	0.99167
259	1970	21	0	128.047	0.94091	0.99571
260	1971	22	0	143.617	0.69332	0.97074
261	1972	23	0	115.137	1.27204	1.00000
262	1973	24	0	132.033	0.44184	0.93614
263	1974	25	0	110.622	0.53676	0.97051
264	1975	26	0	122.389	0.28202	0.87650
265	1976	27	0	119.244	0.47338	0.81045
266	1977	28	0	105.732	1.23993	1.00000
267	1978	29	0	123.652	0.82359	1.00000
268	1979	30	0	121.465	6.92529	1.00000
269	1980	31	0	120.737	0.45386	0.99304
270	1981	32	0	0.95610
271	1982	33	0
272	1983	34	0