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INSTABILITY OF GRAIN YIELDS AND SOIL
CONDITIONS IN WISCONSIN COUNTIES:
A FIRST IMPRESSION

By

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INSTABILITY OF GRAIN YIELDS AND SOIL CONDITIONS IN WISCONSIN
COUNTIES: A FIRST IMPRESSION.
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Instability is defined as the deviation of values from an estimated trend. For a time interval T, instability can be measured by the coefficient of variation, $CV(T)=STD(T)/AVG(T)$, or by detrended coefficient of variation, $DCV(T)$, in which STD is replaced by the deviation from the trend, rather than from average. Neither measure is perfect, but these are probably the best available.

The instability of grain yields in Russia is of concern not only for Soviet researchers but for anyone who is interested in world grain prices. Two sets of factors can lead to changes in the level of instability - natural factors (weather included) and human intervention. It is impossible to completely separate the effect of these factors, and the interaction of their influence on soil conditions is of great interest.

Our recent research of 64 oblast's in Russia (regions similar to the states of USA) using traditional statistical instruments of multiple regression, cluster analysis and covariation analysis extracted an area with homogenous climate and weather conditions in central Russia. The most interesting results here were: 1)the dynamics of grain yields are strongly influenced by the level of soil's fertility (Note: this refers to dynamics and not to the level of productivity); 2)since the middle of 1960s, instability has grown more in the regions of high soil fertility - chernozem - and this corresponds to the period of intensive use of chemicals; 3)it is unusual to think of instability of time series when making decisions.

Now the question arises whether the similar pattern exists for grain yields in the USA.

We are used to think about sets of real data in terms of it's average levels and trends, characterizing coming changes of this

average. If these sets represent values of some cumulative economical indicators, very often this quantitative parameters will be insufficient to give an adequate picture of real process. Especially when the instability of dynamics is an subject of investigation: the big amount of elements, contributing to the process make the distribution of values close to Gaussian and negative deviations in values of one part of elements are overlapped by positive deviations by other part. So, the picture of total process can be rather idyllic in spite of controversy and complicity of internal processes.

The dynamic pattern of corn yield in Wisconsin appears to be quite attractive (Pic.1). There was a decline in 1988, but the trend is seems to be fine. Yet we look at the same parameters for the 60 chat explains sharply different patterns? Because I have only seen these data for a few weeks, I do not have a definitive answer to this question. The possibilities are several, with the differences in local weather conditions being an important one. But something more than weather may be at work, as we have seen in case of Russia.

I have estimated the instability of corn yields for Wisconsin counties for two sequential 9-years periods. I have not been able to check the stability of weather conditions for these two periods, but it is reasonable to assume that on average they have been roughly similar. The unfavorable year of 1988 provides an important part of the explanation of increasing of instability in counties like Dunn, Polk, Outagamieand Marathon (Pics.3-6). But this is too simple explanation of the dynamics of corn yields in Dane, Grant, Green Lake, Waukesha (Pics.7-11).

Similar patterns are evident for soybean yields (Pics.12-13) though the trend growth is weaker, at 0.6 bu/acr average pro year compared with 1.7 for corn and 1.2 for wheat. The dynamics looks great for Junneau (pic.14), but what about Lafayette, Walworth, St.Croix, Rock etc. (pics..15-20)?

[^]One interesting feature of these preliminary results is that there is a spatial pattern to the changes of instability have been estimated. Maps 1 and 2 are constructed from the data in Tables 1

and 2. This suggests a question to my colleagues from soils, whether these maps show the same tendency as found for regions in Russia? (Growth of instability varies with the level of fertility). This pattern is consistent with the view that the growth in the use of chemicals in the last two decades has not stabilized stabilize the productivity of grains. This is one more illustration of dualism of human intervention into the natural processes.

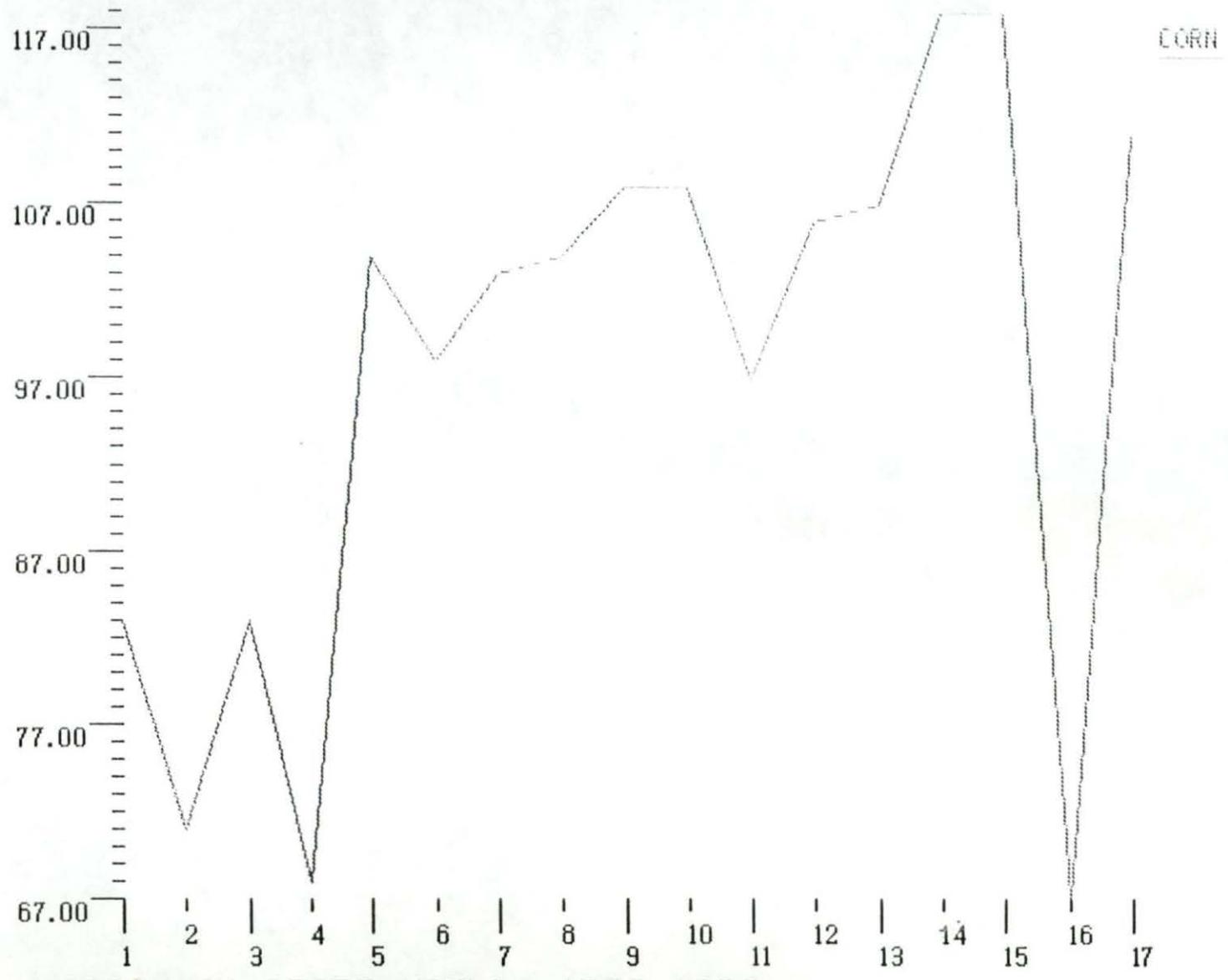
Up to now I have rased more questions then I have answered. What seems obvious however, is that the instability at various levels of aggregation of geography and products cab be a useful instrument in long term decision-making. The dynamics of instability can serve as a good indirect preliminary indicator of soil properties.

Very little is done and a lot remains to be done in this area.

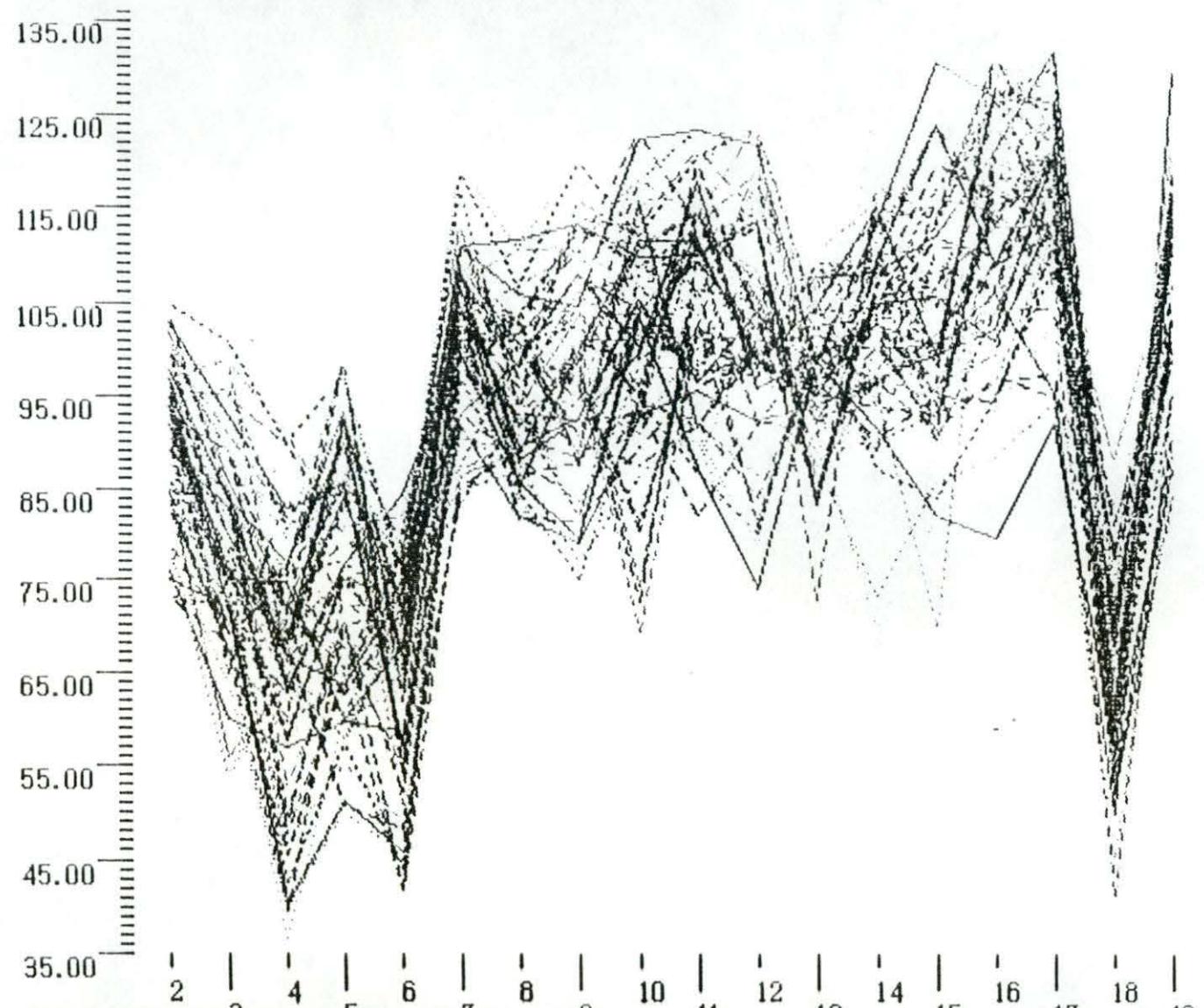
Our needs include:

1. The estimation and creation of indicators of instability, and of weather and soil conditions.
2. Software that combines a data base, data processing and the presentation of results (including the drawing of maps as an option).
3. Comparative analysis of processes of special interest regarding soil use (now, for counties with significant differences in levels of instability; for late 30-s and after, when chemicals took a greater role in soil fertility management; and finally for special analysis such as how the data for Amish farms compare to non-Amish.)
4. A good question - whether it makes sense to take into account all problems, connected with instability of yields or not - from point of view of economics - the trends are positive and average productivity goes up. And from point of view of soils? Econometric model need to be constructed for evaluation of results of following two possible ways of grain production development: a)keep the same way, used now, and oriented mostly on getting highest possible yields every year everywhere in most effective way (even through monoculturing); b)decreasing instability.

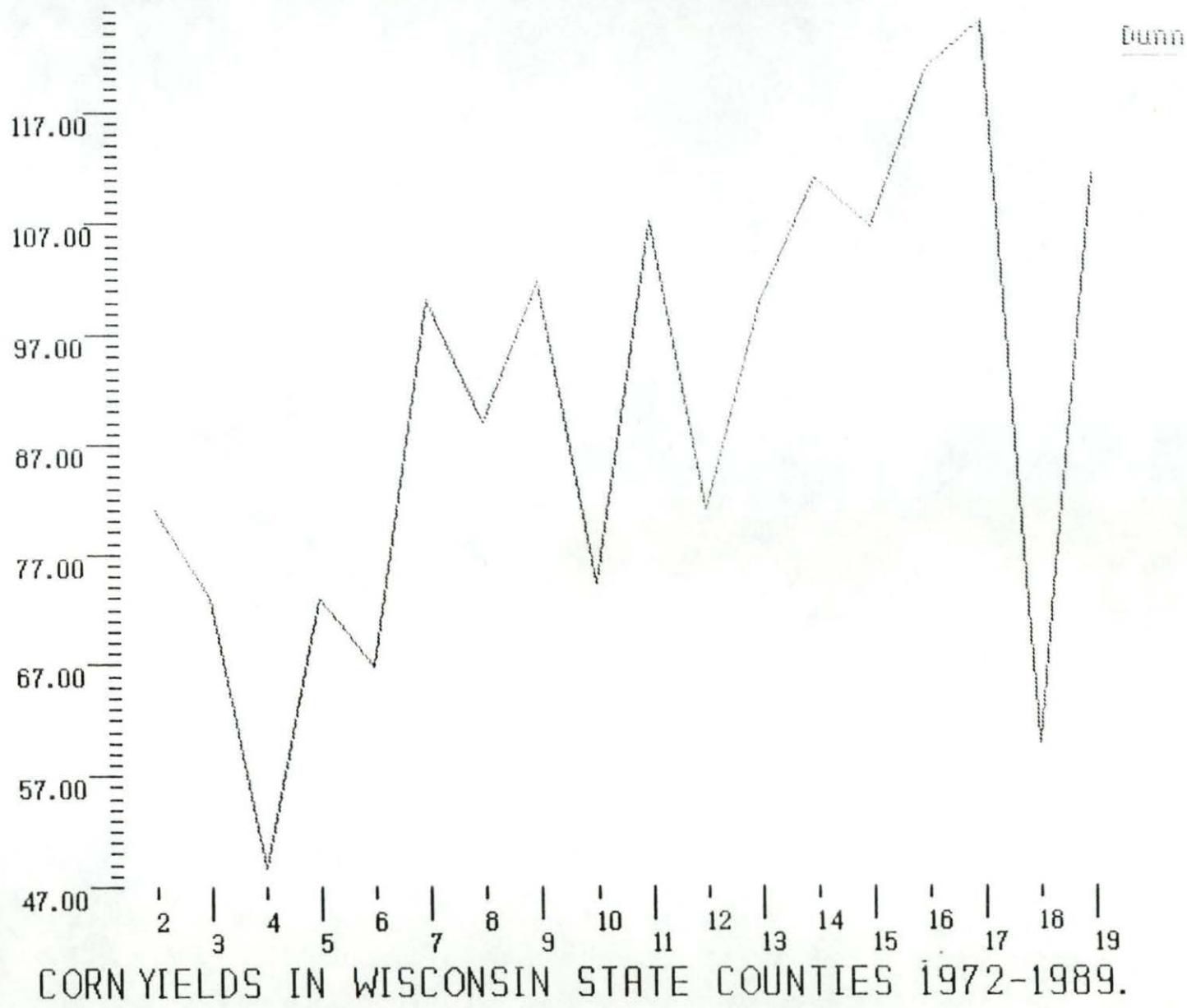
5. Casual or statistical explanations of the dynamics of grain yields in counties Wisconsin and in the differentials of county productivities. There are different soil and weather conditions in these counties. What role do they play in these dynamics? The technique, that was used to analyze the regions of Russia can be used to help answer/ this question.

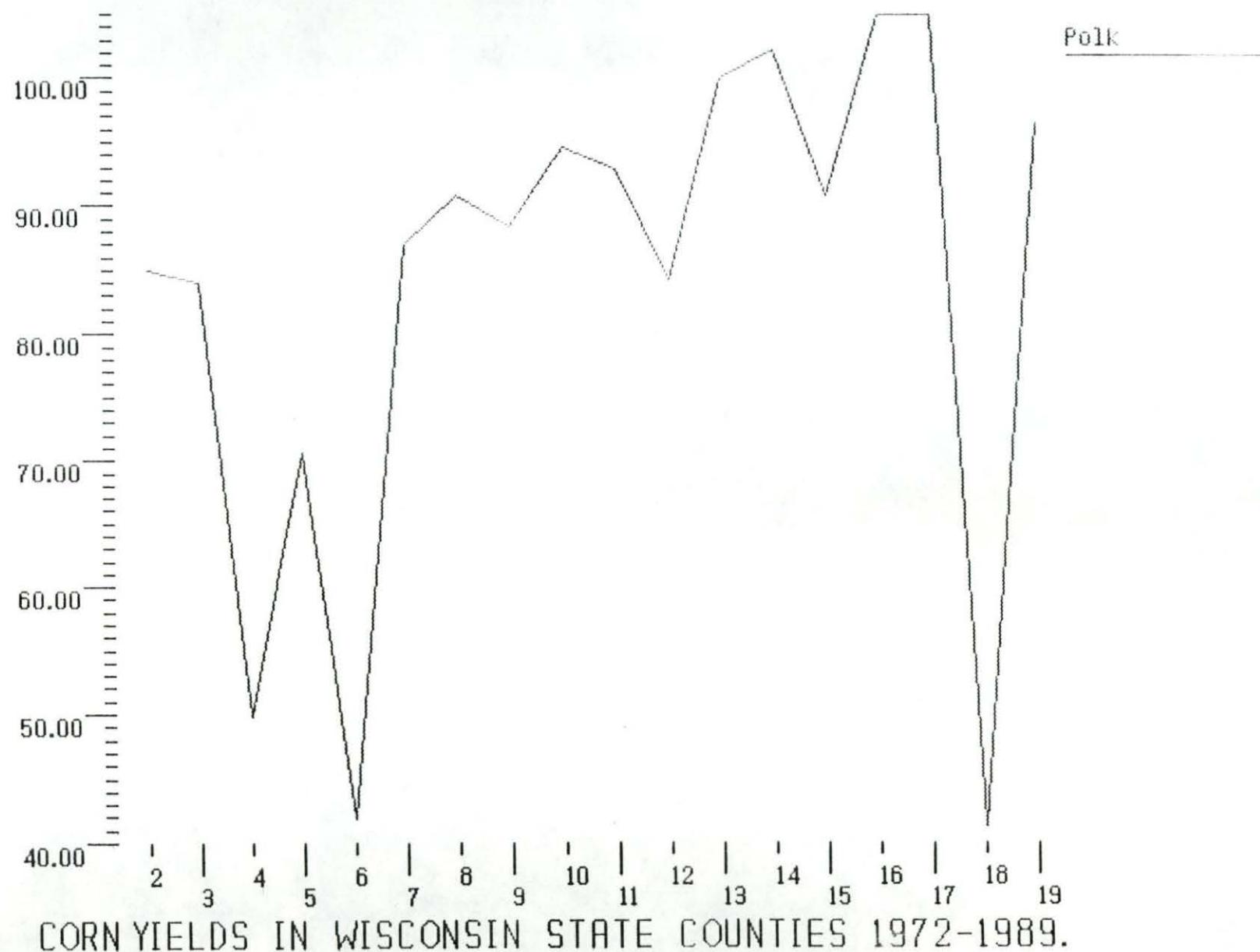


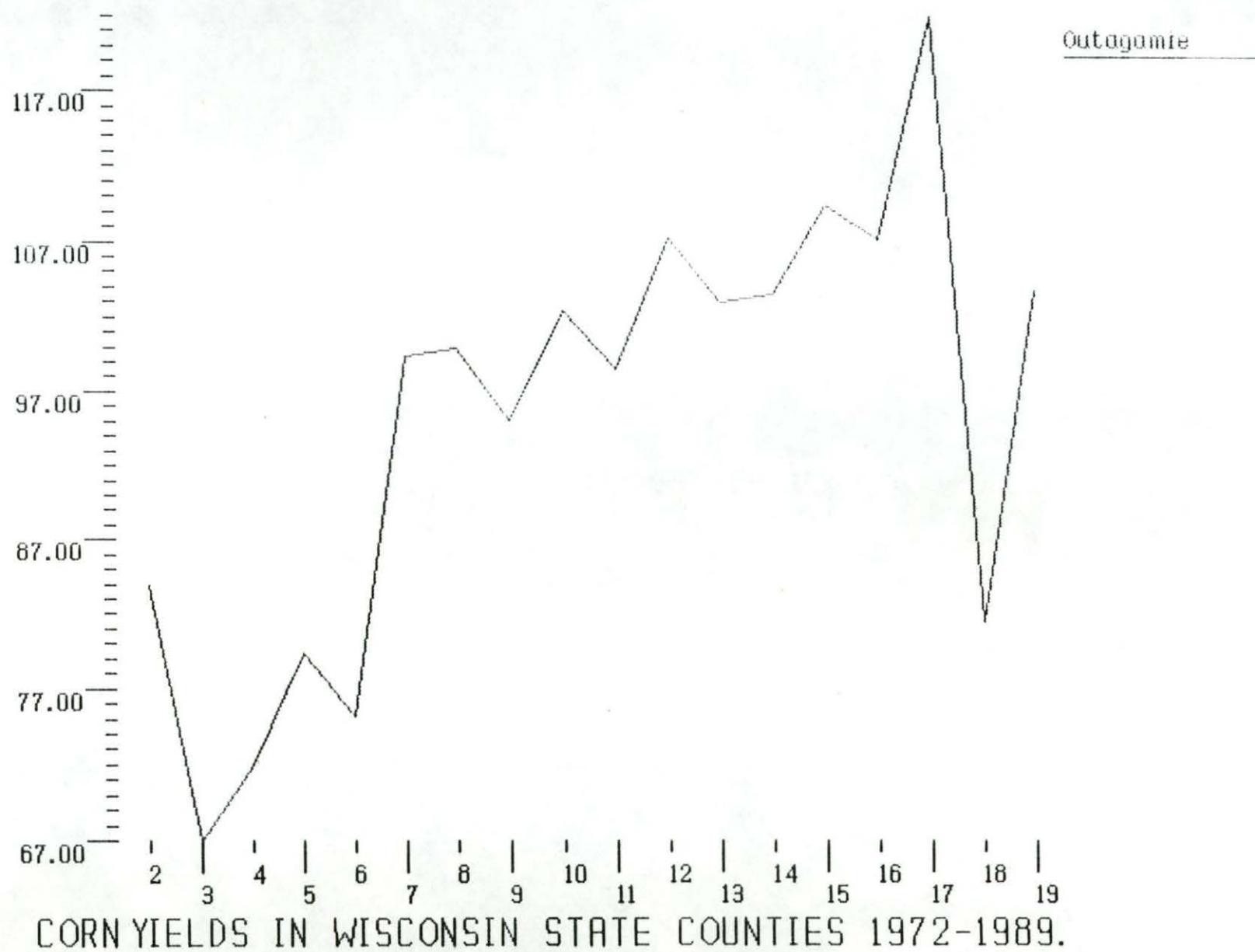
WISCONSIN STATE YIELDS 1973-1989.



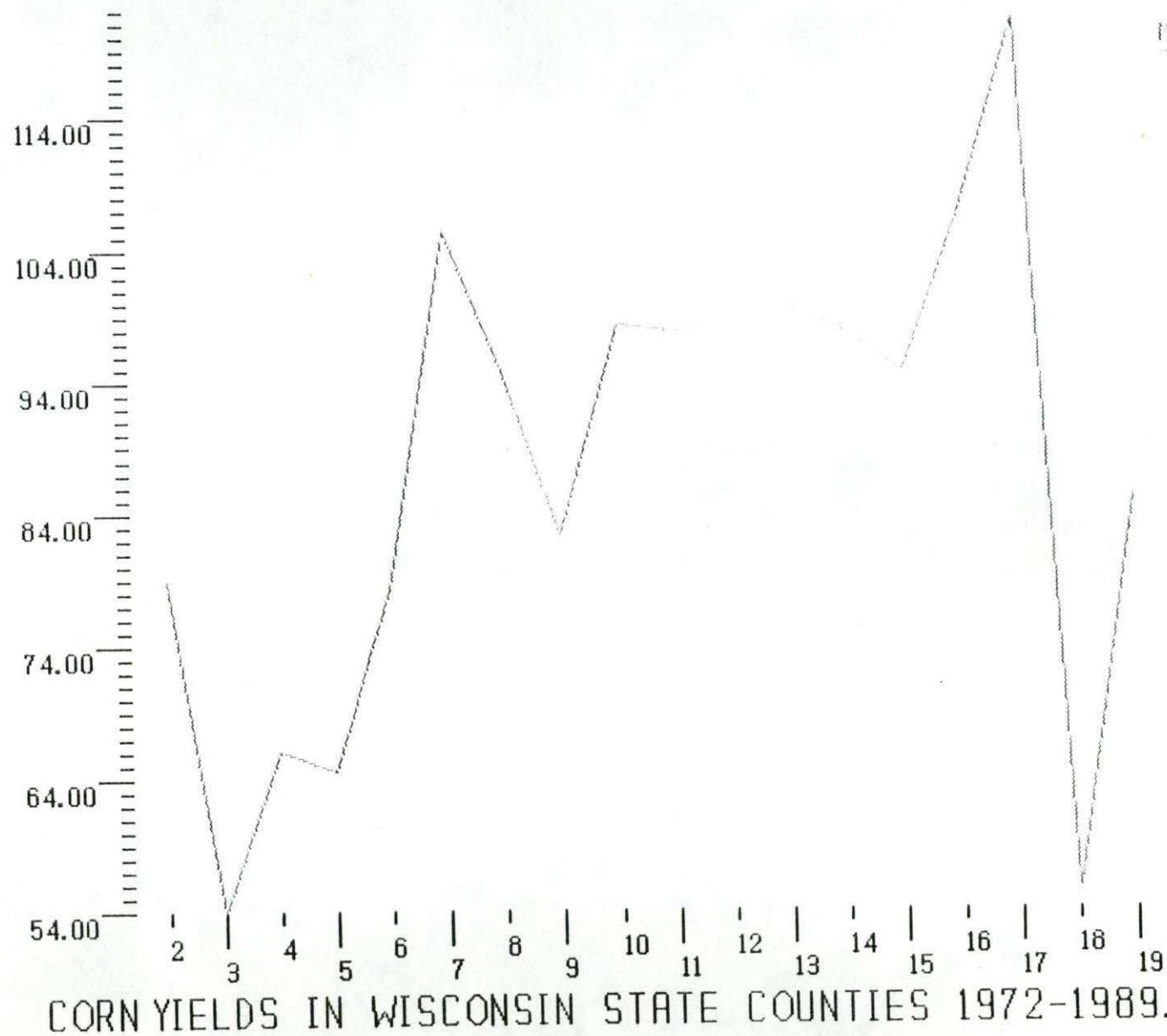
CORN YIELDS WISCONSIN STATE COUNTIES 1972-1989.



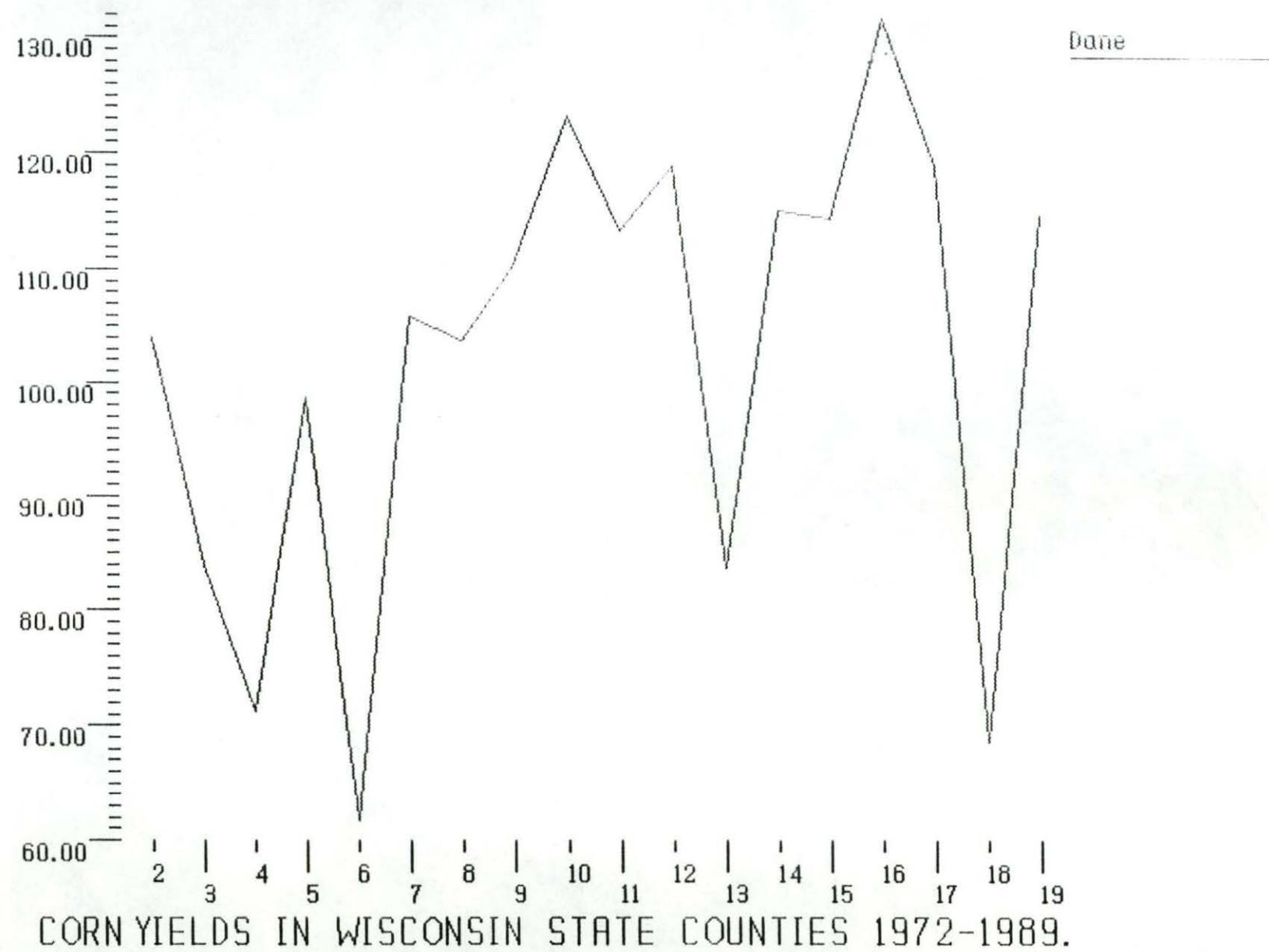




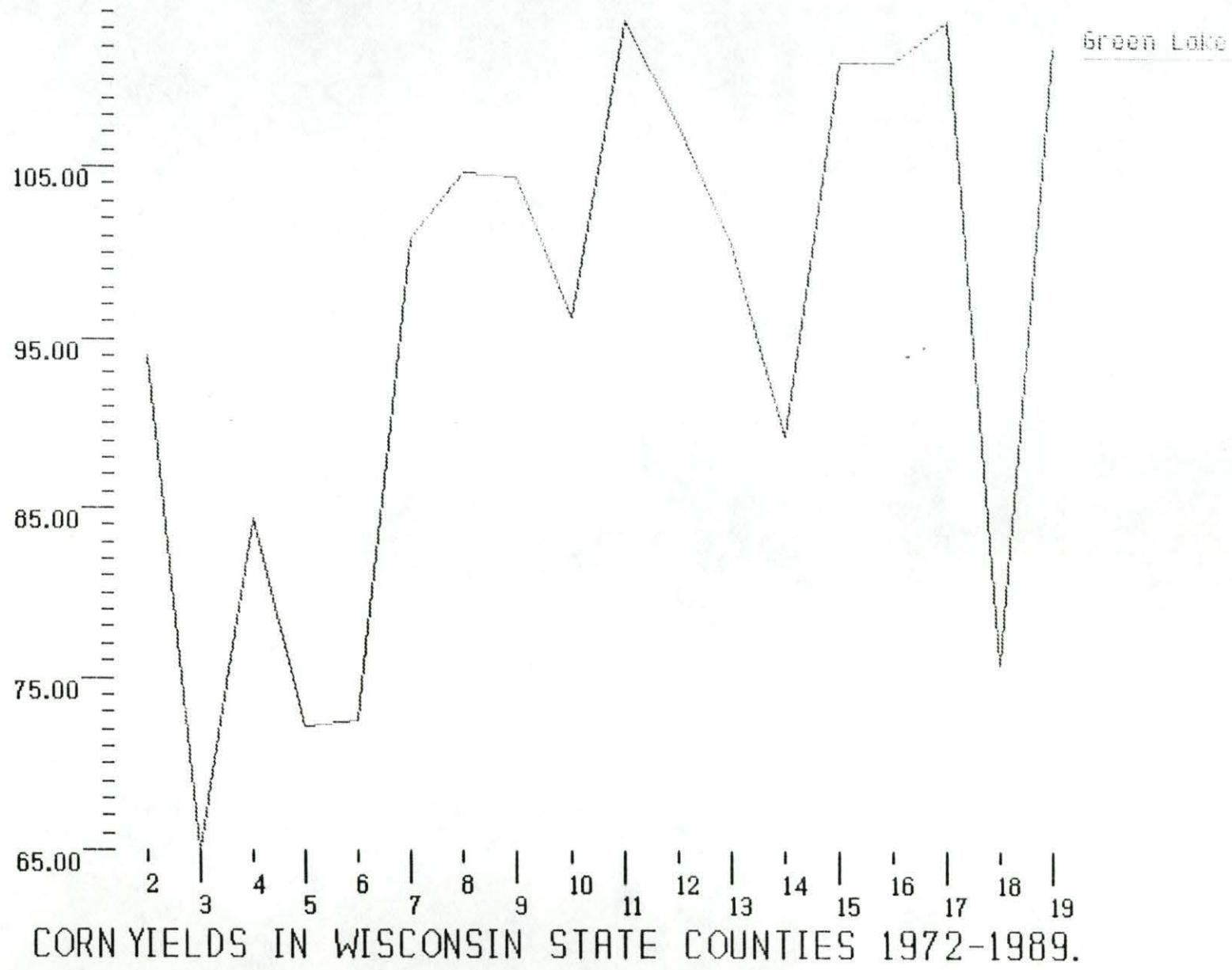
Horizon

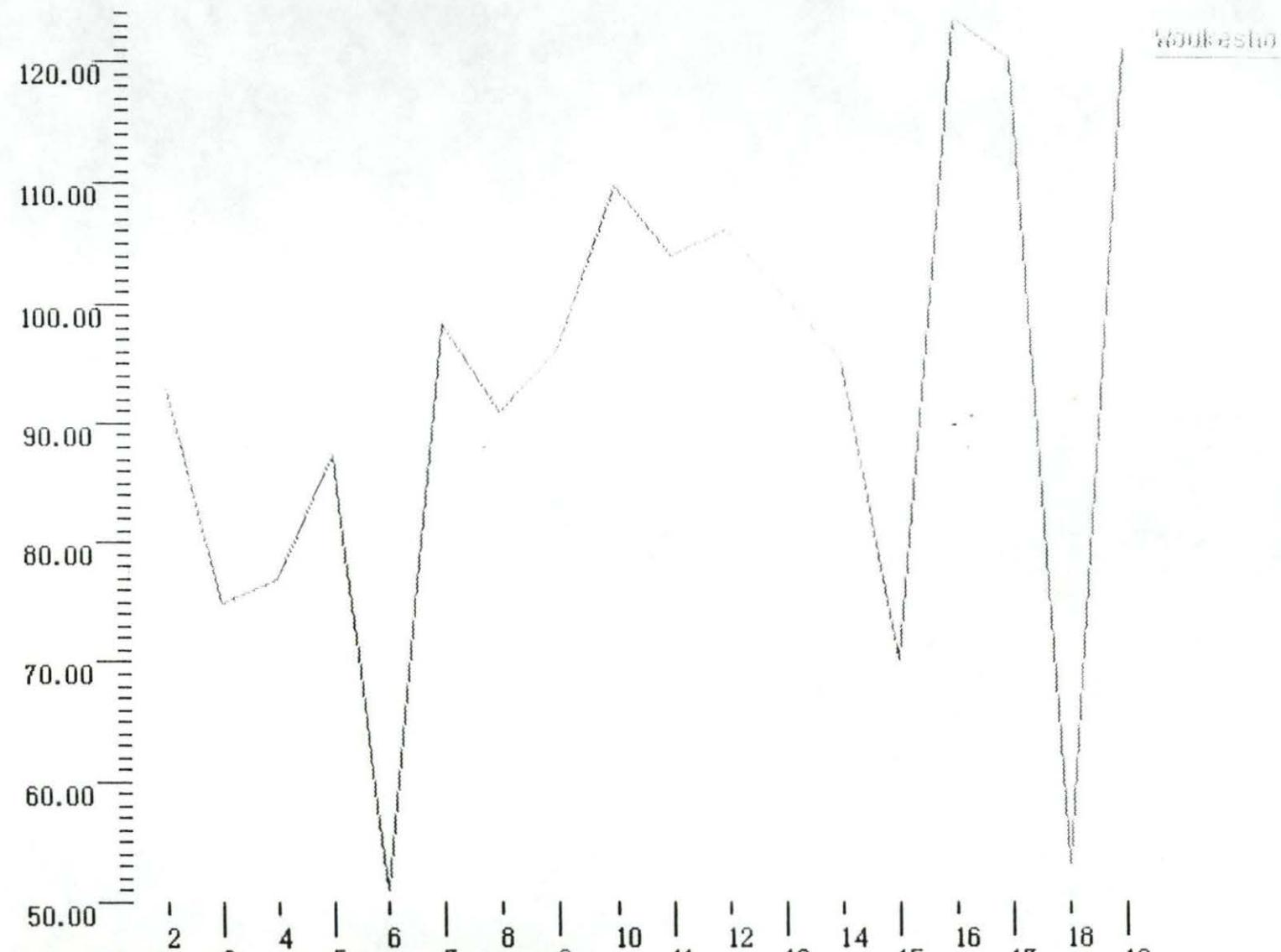


CORN YIELDS IN WISCONSIN STATE COUNTIES 1972-1989.









CORN YIELDS IN WISCONSIN STATE COUNTIES 1972-1989.

Oconto

102.00

92.00

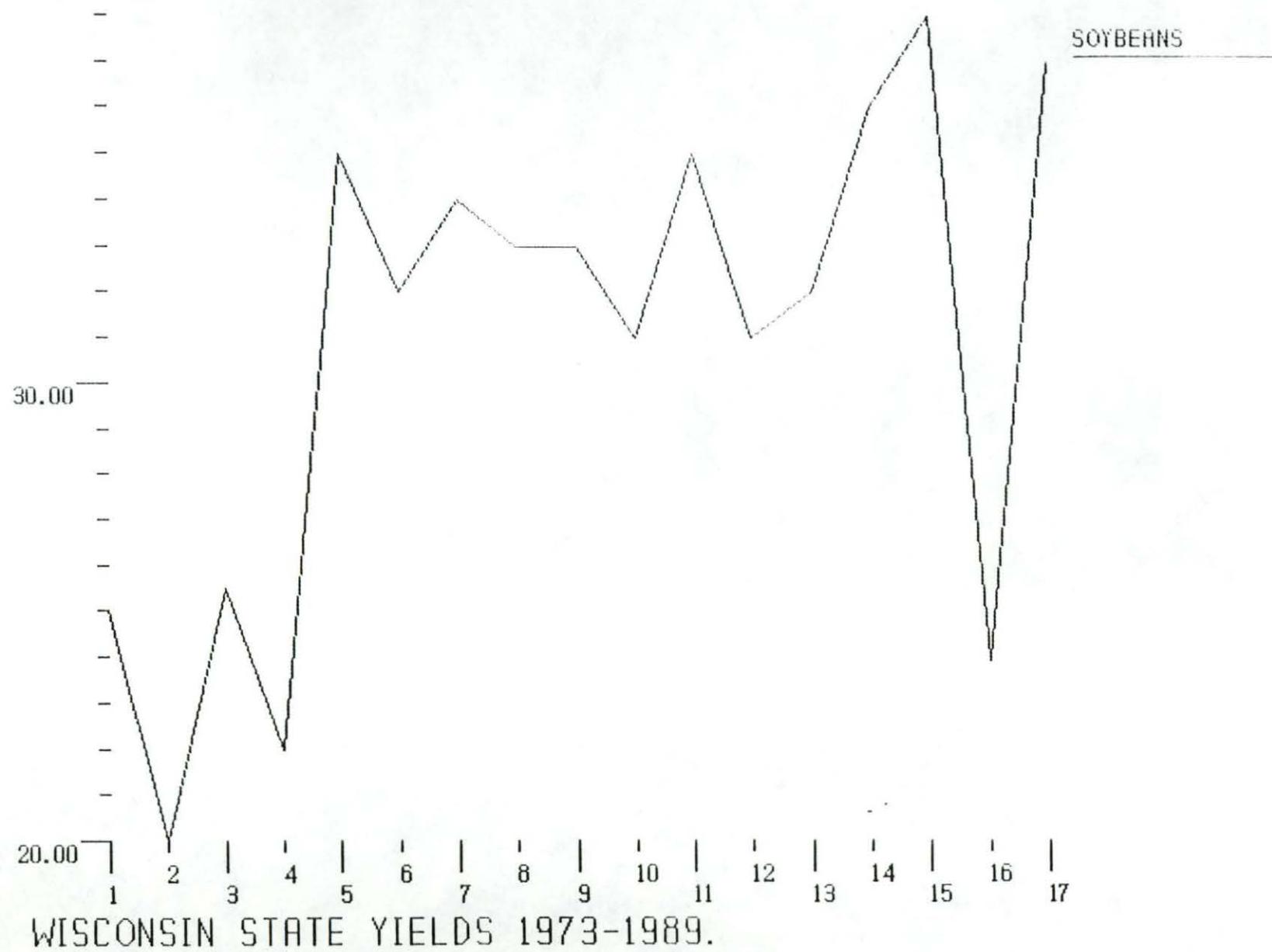
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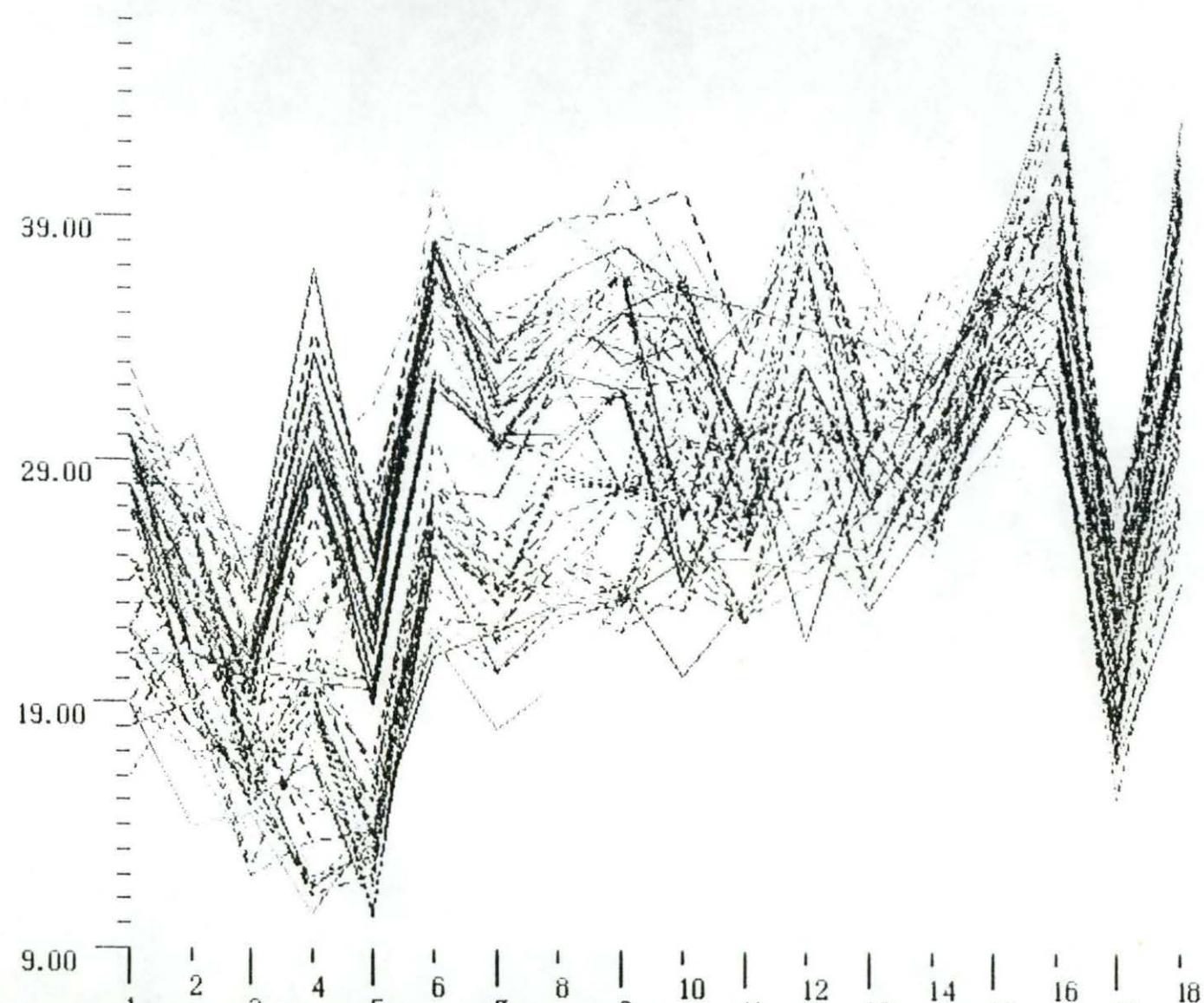
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62.00

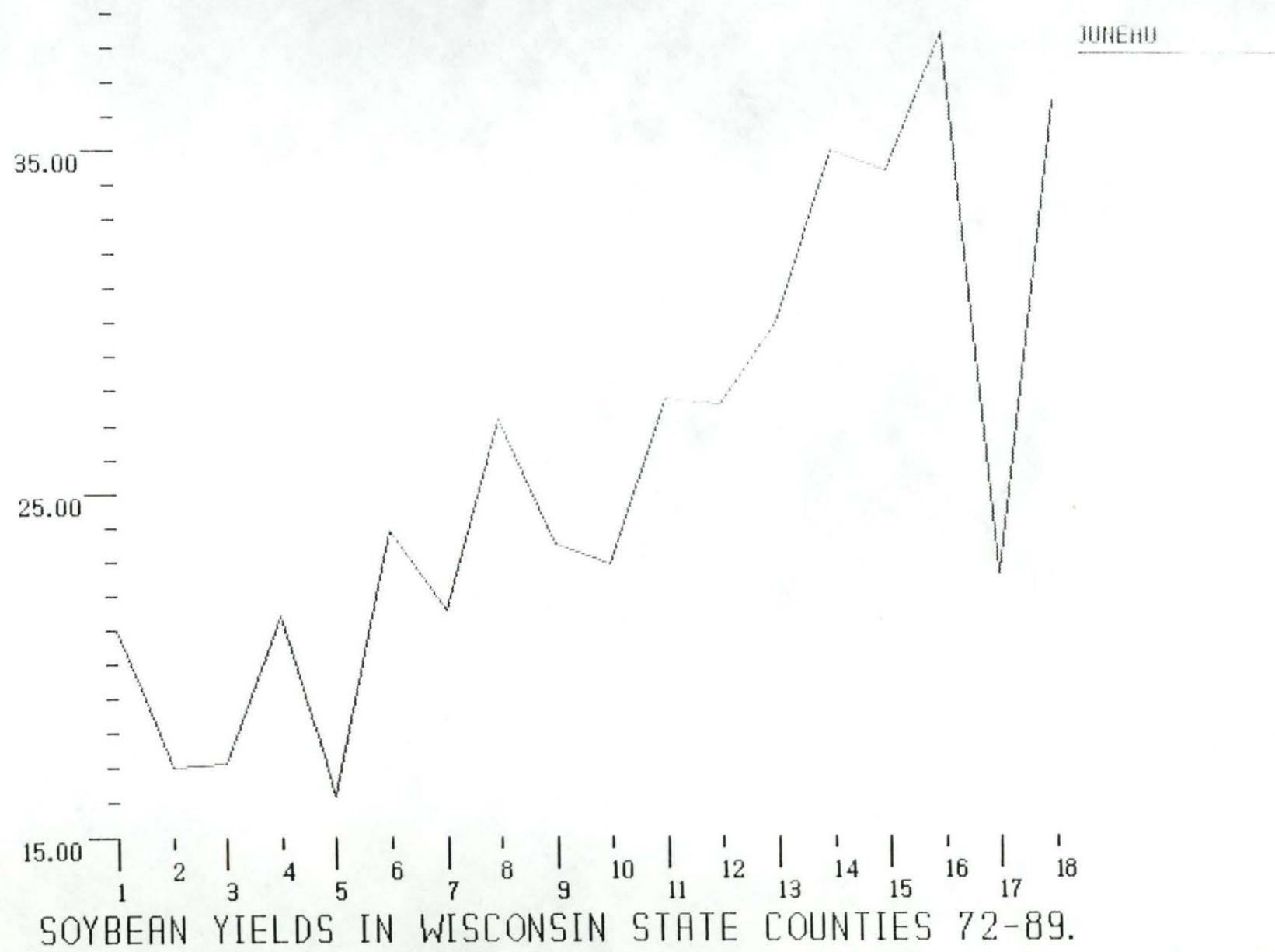


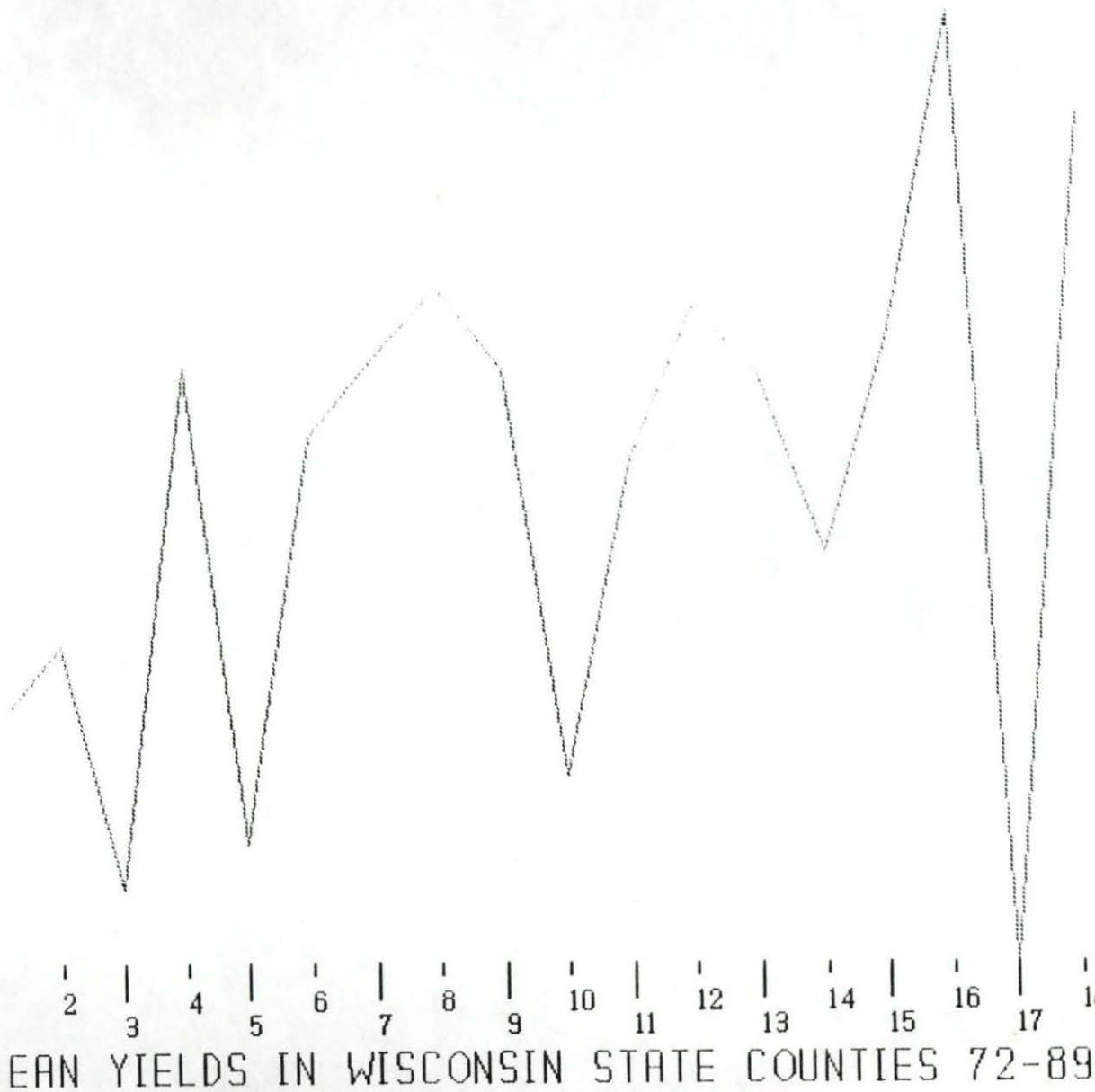
CORN YIELDS IN WISCONSIN STATE COUNTIES 1972-1989.





SOYBEAN YIELDS IN WISCONSIN STATE COUNTIES 72-89.



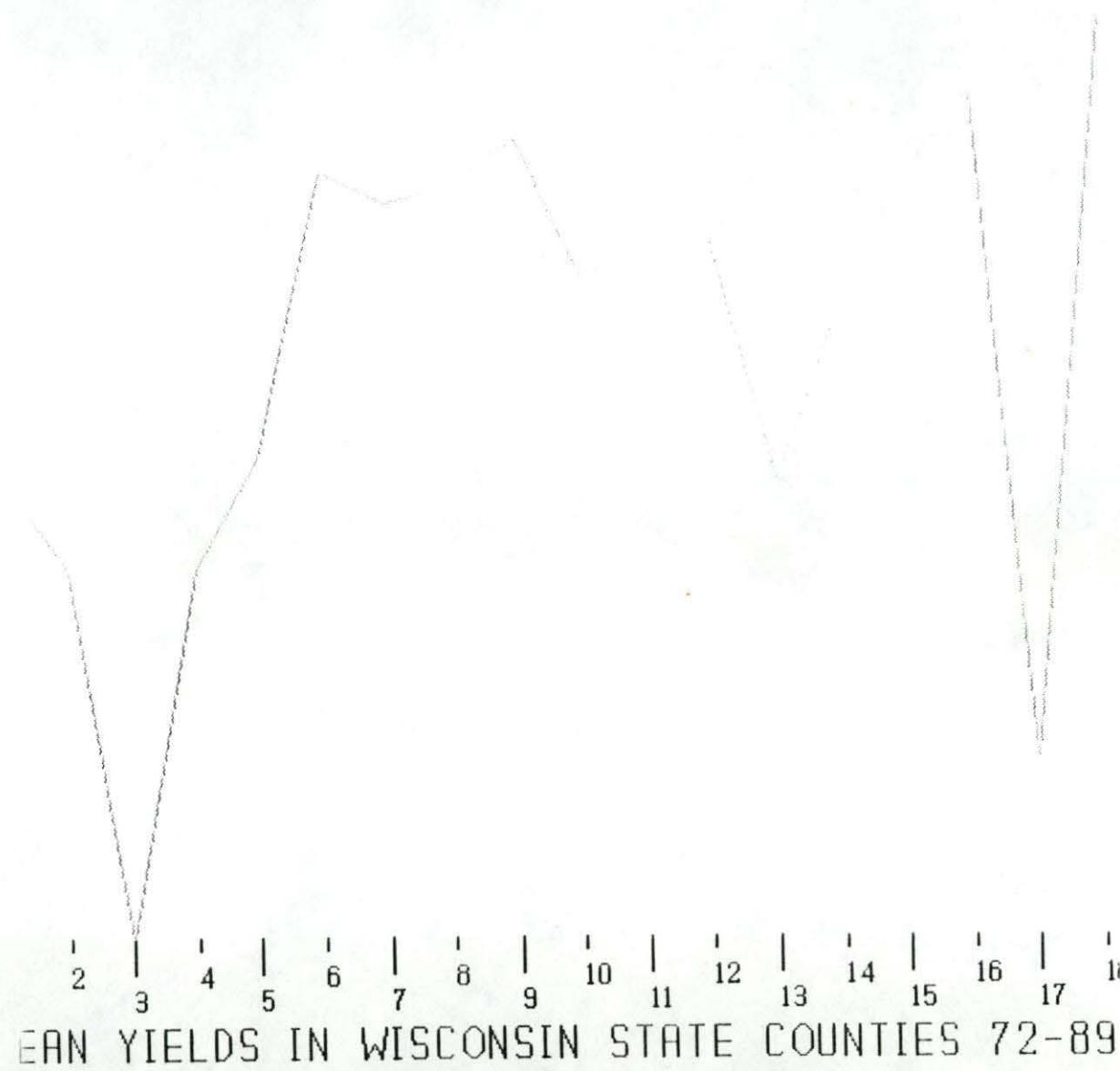


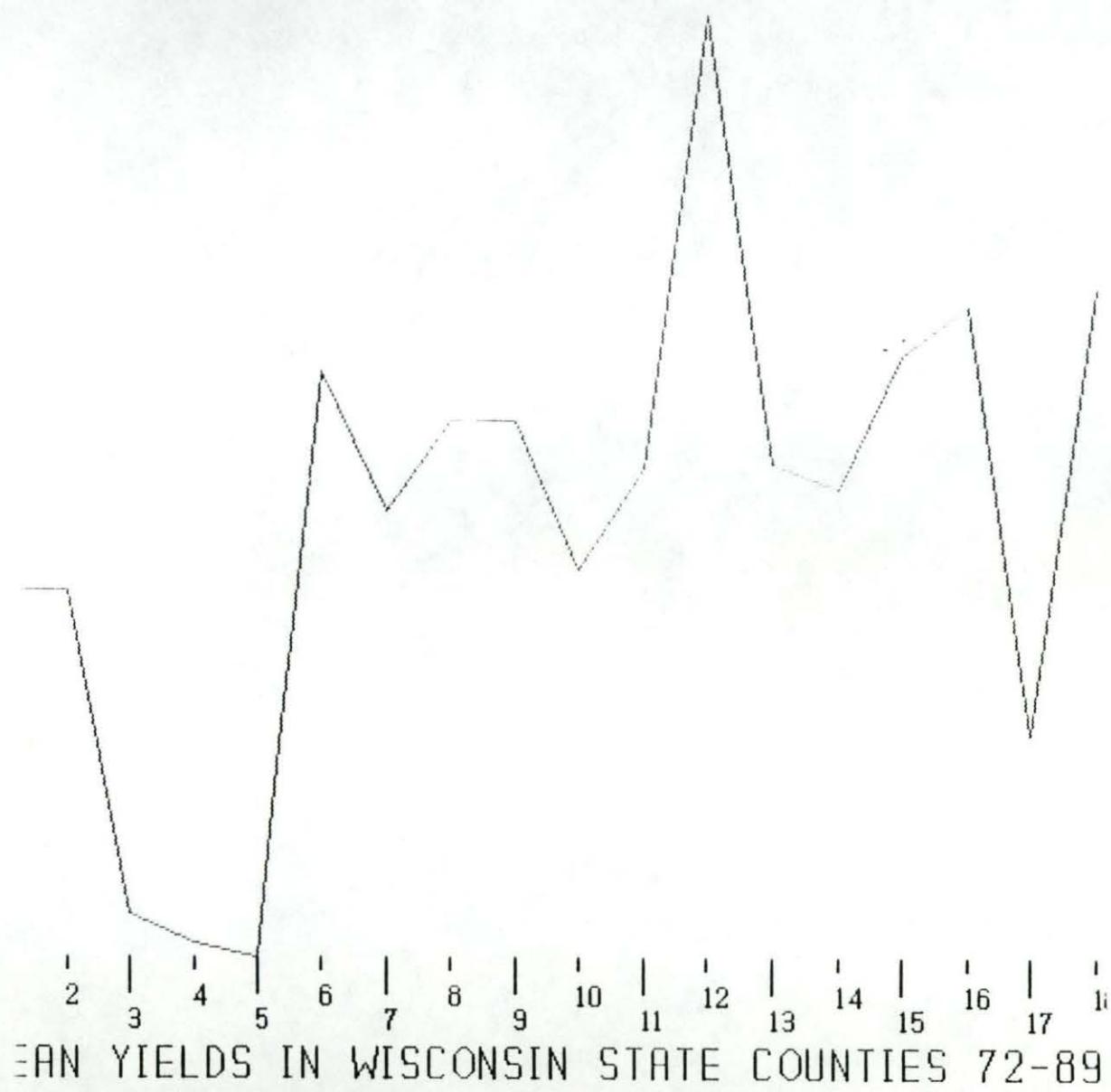


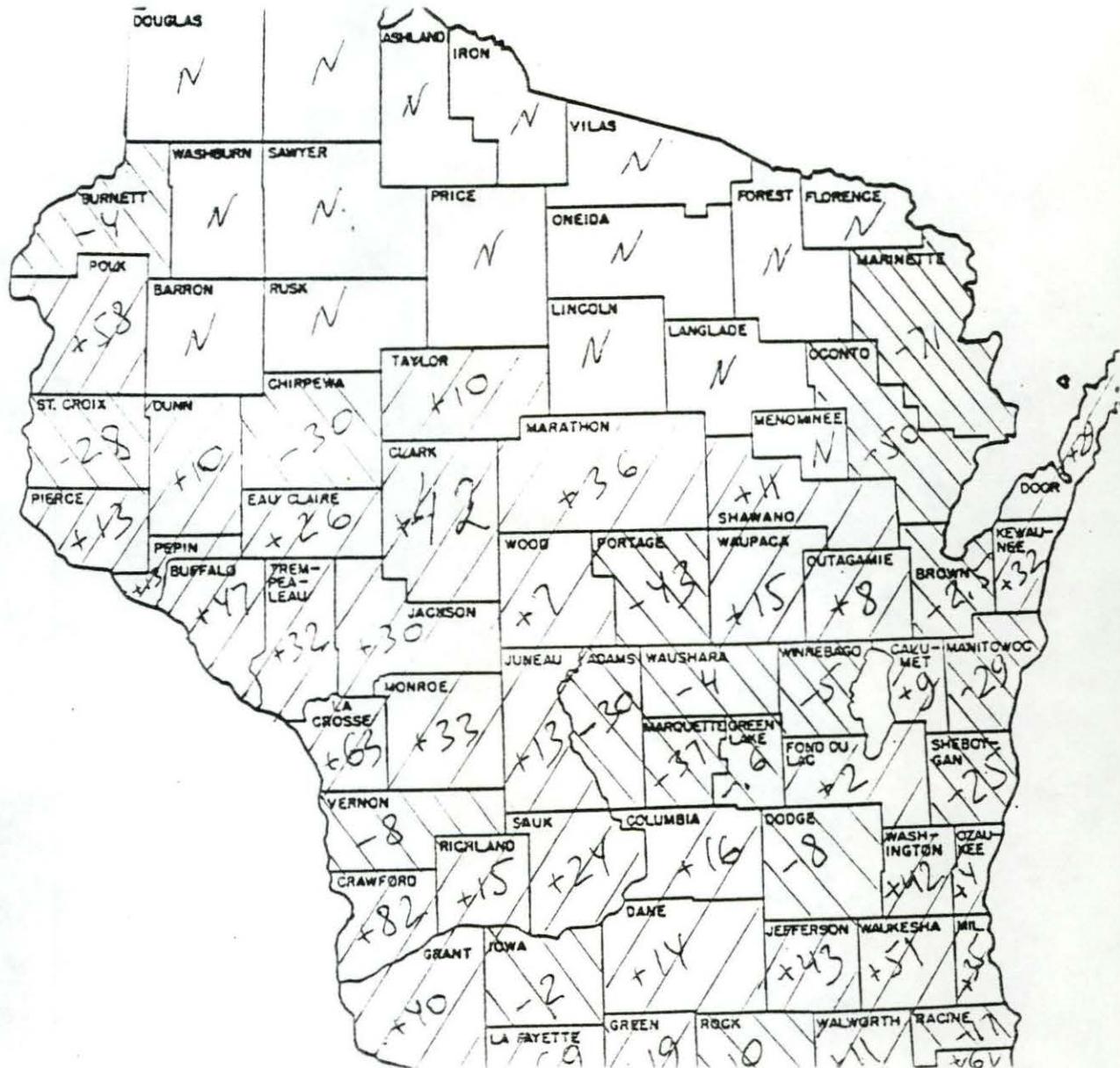
MEAN YIELDS IN WISCONSIN STATE COUNTIES 72-89.

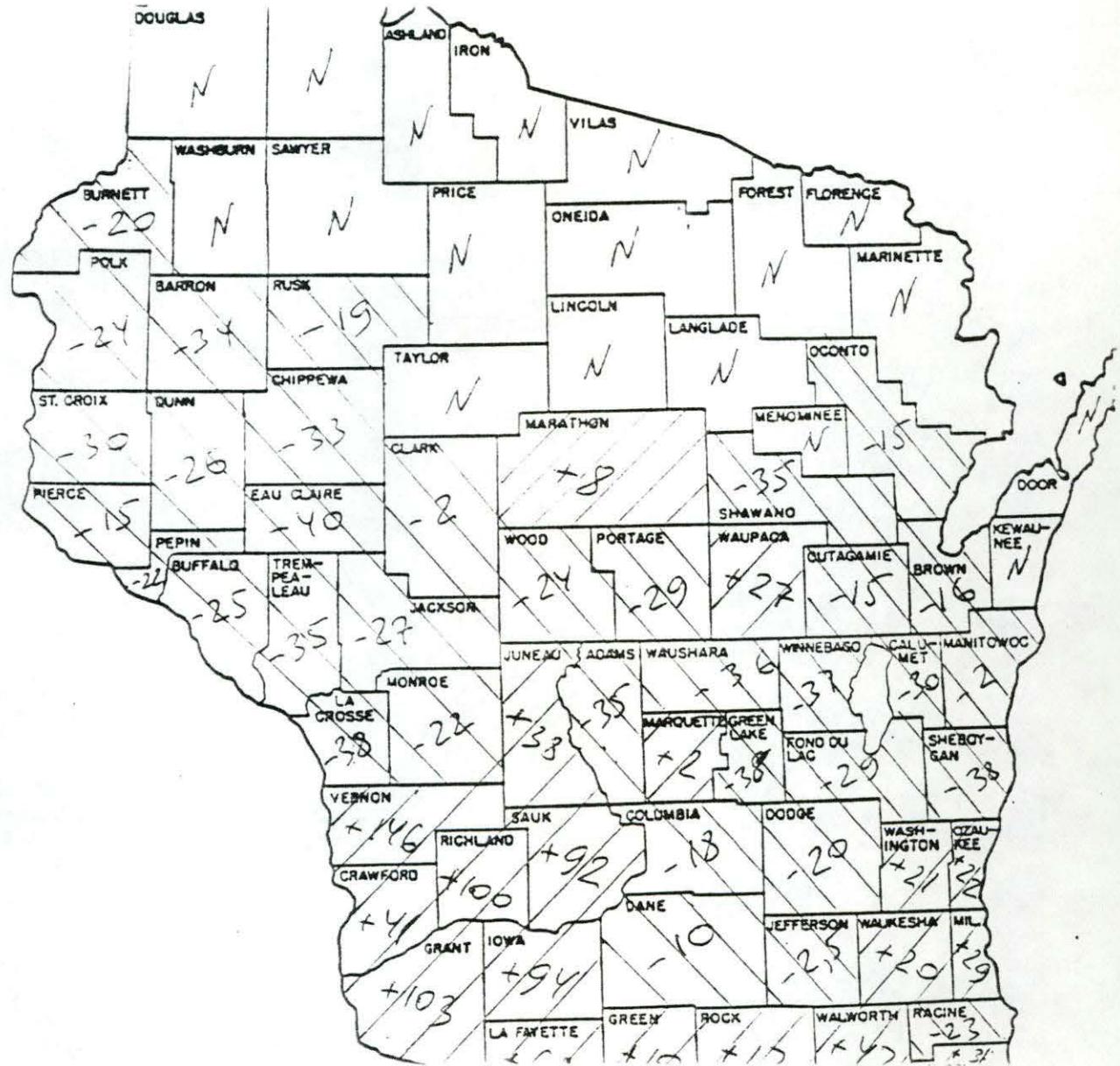


MEAN YIELDS IN WISCONSIN STATE COUNTIES 72-89

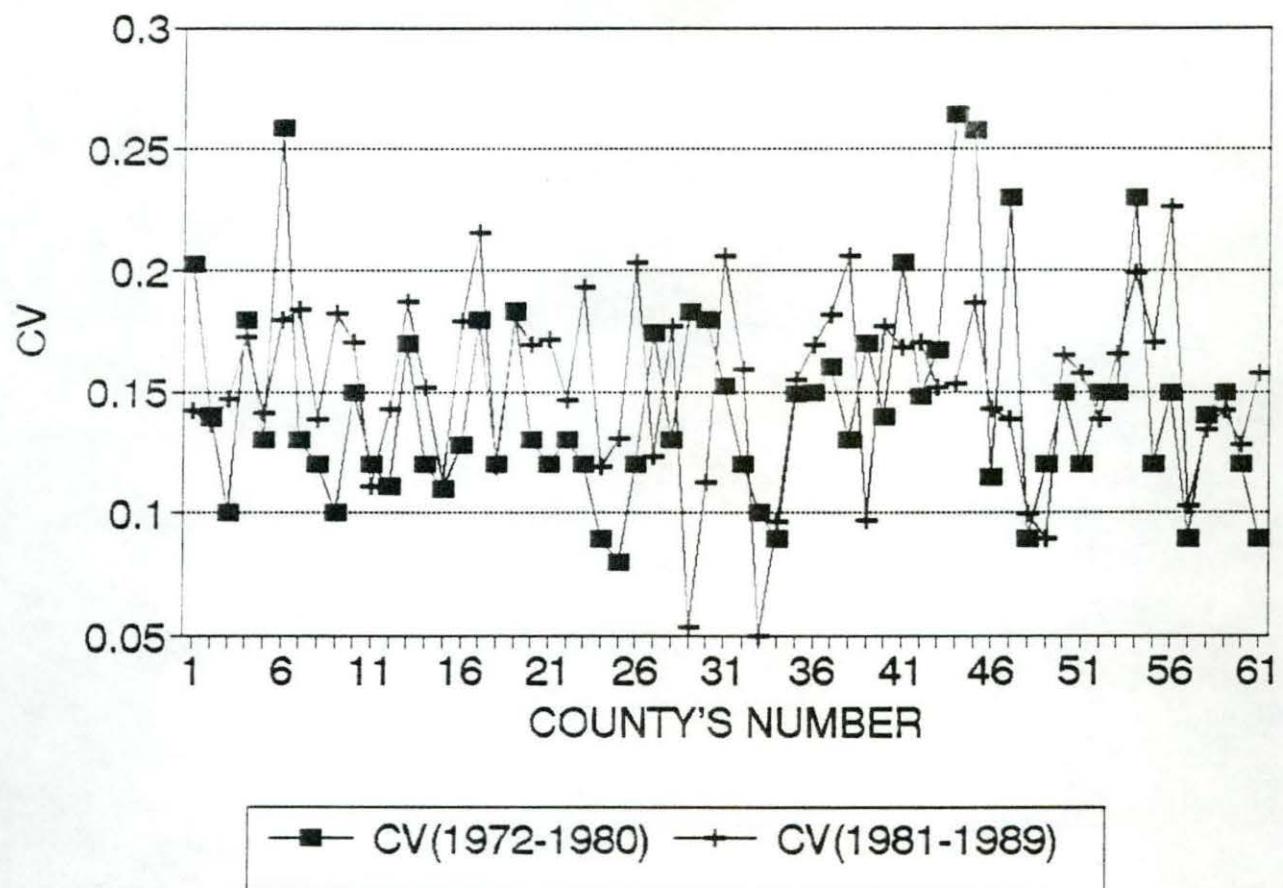




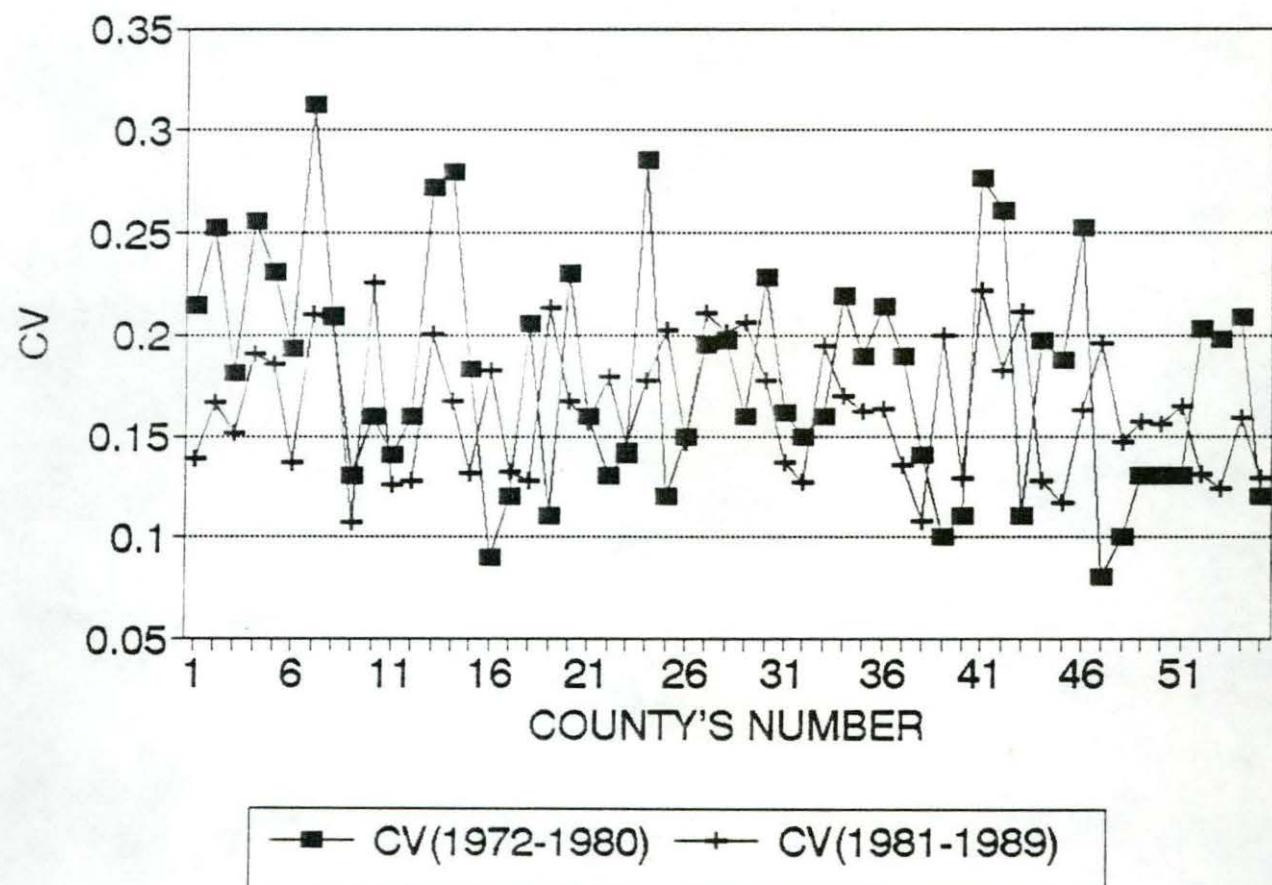




CORN YIELDS VARIATIONS COEFFICIENTS FOR COUNTIES OF WISCONSIN STATE.

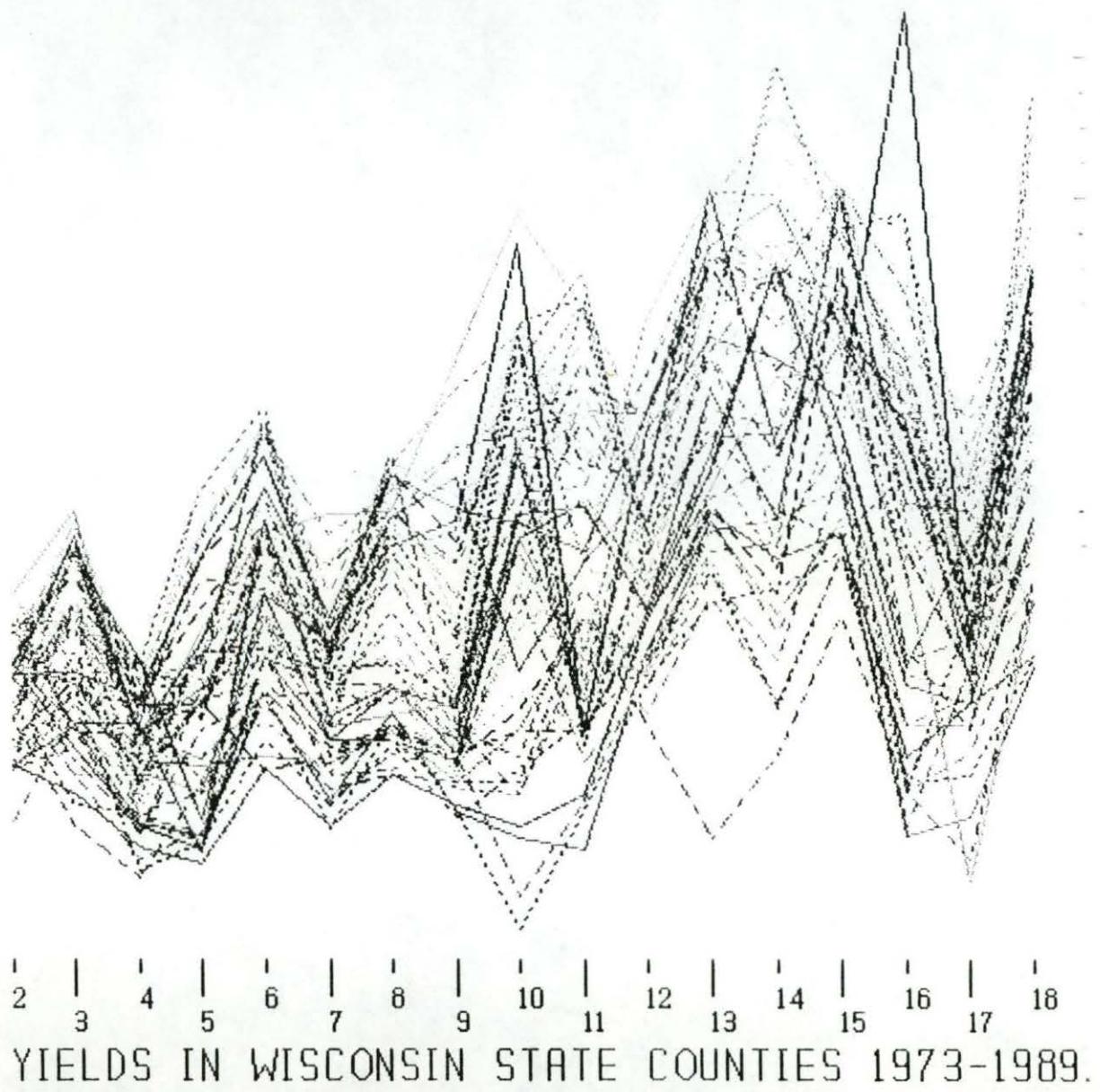


SOYBEANS VARIATIONS COEFFICIENTS IN COUNTIES OF WISCONSIN STATE.

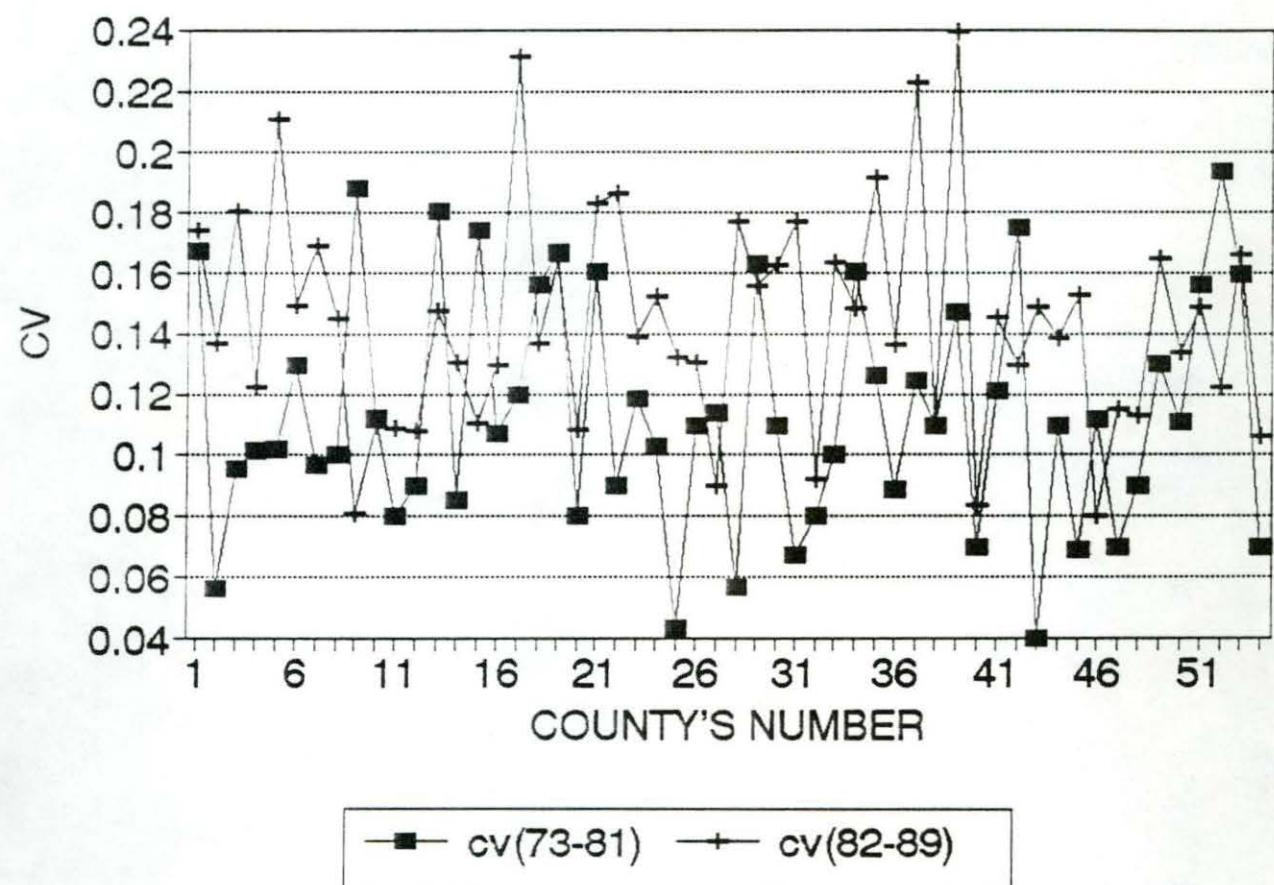




NSIN STATE YIELDS 1974-1989.



WHEAT YIELDS COEFFICIENTS OF VARIATION IN COUNTIES OF WISCONSIN STATE.



ID INSTABILITY ESTIMATED PARAMETERS FOR
TIES OF WISCONSIN STATE 1972 - 1989.

| 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|------|---------|---------|---------|-----------|--------|----------|----------|--------|---------|--------|--------|
| town | Buffalo | Burnett | Calumet | Chequpewa | Clark | Columbia | Crawford | Dane | Dodge | Door | Dunn |
| 35.0 | 89.0 | 77.0 | 96.0 | 85.0 | 76.0 | 100.0 | 96.0 | 104.0 | 102.0 | 90.0 | 81.0 |
| 76.0 | 85.0 | 73.0 | 80.0 | 67.0 | 60.0 | 79.0 | 95.0 | 84.0 | 86.0 | 82.0 | 73.0 |
| 56.8 | 63.2 | 46.9 | 72.0 | 39.7 | 57.1 | 68.1 | 89.8 | 71.2 | 72.2 | 76.3 | 48.7 |
| 75.6 | 76.7 | 55.2 | 65.4 | 70.2 | 59.6 | 83.5 | 80.0 | 98.8 | 86.2 | 72.0 | 73.0 |
| 79.2 | 84.4 | 49.1 | 78.2 | 52.2 | 58.8 | 77.1 | 74.6 | 61.8 | 77.5 | 75.2 | 66.8 |
| 20.2 | 101.3 | 85.1 | 107.6 | 104.8 | 92.0 | 101.8 | 100.8 | 106.0 | 113.4 | 102.2 | 100.4 |
| 26.8 | 102.0 | 87.0 | 100.9 | 92.8 | 82.2 | 103.9 | 103.6 | 103.9 | 94.2 | 82.9 | 89.2 |
| 39.8 | 108.0 | 77.3 | 91.1 | 90.2 | 79.1 | 113.2 | 112.9 | 110.6 | 104.0 | 81.2 | 102.0 |
| 18.8 | 104.6 | 86.6 | 107.7 | 87.9 | 93.4 | 109.2 | 111.3 | 123.3 | 104.1 | 95.1 | 74.5 |
| 34.6 | 109.5 | 92.4 | 97.7 | 92.3 | 95.9 | 112.7 | 115.1 | 113.5 | 112.2 | 88.5 | 107.5 |
| 79.4 | 102.7 | 86.8 | 99.7 | 100.0 | 92.9 | 113.0 | 100.1 | 119.2 | 115.0 | 102.1 | 81.2 |
| 26.6 | 108.0 | 88.6 | 103.4 | 105.8 | 94.6 | 97.5 | 93.0 | 83.8 | 106.9 | 81.1 | 100.1 |
| 25.1 | 108.6 | 73.6 | 111.8 | 111.6 | 97.6 | 104.6 | 100.9 | 115.2 | 114.2 | 100.9 | 111.3 |
| 21.2 | 112.6 | 86.1 | 124.3 | 94.4 | 100.0 | 117.4 | 93.0 | 114.5 | 107.0 | 96.0 | 106.9 |
| 18.8 | 121.8 | 88.8 | 114.3 | 120.2 | 102.7 | 127.2 | 117.3 | 131.8 | 120.8 | 105.2 | 121.0 |
| 21.7 | 132.2 | 95.0 | 125.2 | 121.0 | 121.2 | 116.7 | 116.5 | 119.2 | 120.0 | 105.3 | 125.4 |
| 71.2 | 70.3 | 45.7 | 72.6 | 57.3 | 52.6 | 72.7 | 56.7 | 68.7 | 77.9 | 64.2 | 60.0 |
| 27.5 | 117.3 | 89.5 | 106.1 | 102.2 | 84.8 | 118.9 | 116.8 | 114.9 | 114.9 | 82.2 | 111.7 |
| 1402 | 0.1000 | 0.1800 | 0.1300 | 0.2584 | 0.1300 | 0.1200 | 0.1000 | 0.1500 | 0.1200 | 0.1110 | 0.1700 |
| 1368 | 0.1471 | 0.1725 | 0.1418 | 0.1796 | 0.1839 | 0.1388 | 0.1821 | 0.1706 | 0.1109 | 0.1430 | 0.1874 |
| 0034 | 0.0471 | -0.0075 | 0.0118 | -0.0789 | 0.0539 | 0.0188 | 0.0821 | 0.0206 | -0.0091 | 0.0320 | 0.0174 |
| 2.5 | 47.1 | -4.1 | 9.0 | -30.5 | 41.5 | 15.6 | 82.1 | 13.7 | -7.6 | 28.8 | 10.2 |

| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 |
|-------|--------|---------|----------|-----------|-----------|-----------|----------|-----------|-----------|-----------|--------|
| erson | Juneau | Kenosha | Kewaunee | La Crosse | Lafayette | Manitowoc | Marathon | Marinette | Marquette | Milwaukee | Monroe |
| 97.0 | 90.0 | 94.0 | 84.0 | 97.0 | 101.0 | 97.0 | 79.0 | 86.0 | 83.0 | 95.0 | 93.0 |
| 72.0 | 69.0 | 76.0 | 76.0 | 99.0 | 89.0 | 80.0 | 54.0 | 68.0 | 69.0 | 76.0 | 80.0 |
| 76.2 | 62.8 | 68.2 | 75.5 | 91.1 | 79.8 | 69.6 | 66.1 | 73.2 | 67.6 | 69.2 | 70.3 |
| 99.0 | 76.1 | 92.3 | 85.1 | 80.9 | 98.0 | 75.1 | 64.6 | 61.0 | 50.9 | 84.2 | 83.9 |
| 55.1 | 65.3 | 71.7 | 80.2 | 82.1 | 74.8 | 73.4 | 78.3 | 58.9 | 48.3 | 67.0 | 70.3 |
| 03.5 | 97.3 | 111.1 | 107.9 | 103.3 | 119.9 | 109.1 | 105.7 | 97.3 | 85.4 | 108.5 | 105.8 |
| 96.2 | 103.6 | 106.1 | 97.2 | 107.0 | 110.9 | 100.9 | 95.0 | 100.4 | 89.4 | 88.4 | 103.1 |
| 06.4 | 87.9 | 104.9 | 104.7 | 110.8 | 120.6 | 89.1 | 82.4 | 84.2 | 101.0 | 92.9 | 111.2 |
| 08.1 | 104.5 | 122.7 | 95.2 | 107.0 | 115.3 | 115.9 | 98.6 | 93.1 | 99.5 | 100.0 | 93.4 |
| 10.7 | 101.5 | 123.6 | 92.0 | 109.6 | 119.9 | 92.0 | 98.1 | 86.3 | 101.9 | 118.2 | 112.0 |
| 13.1 | 101.8 | 122.1 | 103.5 | 107.2 | 124.5 | 101.4 | 98.5 | 87.7 | 98.6 | 96.3 | 114.8 |
| 87.5 | 99.4 | 99.0 | 97.2 | 110.8 | 86.4 | 101.9 | 100.1 | 95.0 | 95.8 | 99.6 | 107.3 |
| 01.5 | 103.6 | 113.8 | 109.7 | 116.0 | 127.1 | 100.5 | 98.0 | 96.0 | 94.3 | 103.1 | 113.9 |
| 91.9 | 112.3 | 131.1 | 105.3 | 118.7 | 122.3 | 101.1 | 95.0 | 93.3 | 93.6 | 100.7 | 115.7 |
| 19.9 | 110.2 | 127.3 | 109.4 | 129.4 | 129.5 | 104.5 | 107.2 | 86.2 | 97.1 | 106.7 | 126.8 |
| 12.6 | 114.5 | 122.3 | 113.0 | 131.7 | 128.3 | 118.4 | 121.7 | 90.1 | 98.0 | 96.0 | 127.5 |
| 61.4 | 62.2 | 56.2 | 71.5 | 77.8 | 58.3 | 69.6 | 55.6 | 83.5 | 65.3 | 50.0 | 64.1 |
| 14.0 | 111.3 | 119.6 | 100.0 | 115.4 | 121.5 | 100.7 | 85.3 | 82.0 | 102.6 | 130.0 | 114.4 |
| 1200 | 0.1300 | 0.1200 | 0.0900 | 0.0800 | 0.1200 | 0.1744 | 0.1300 | 0.1828 | 0.1800 | 0.1525 | 0.1200 |
| 1719 | 0.1467 | 0.1934 | 0.1188 | 0.1305 | 0.2030 | 0.1235 | 0.1767 | 0.0531 | 0.1125 | 0.2058 | 0.1591 |
| 0519 | 0.0167 | 0.0734 | 0.0288 | 0.0505 | 0.0830 | -0.0509 | 0.0467 | -0.1297 | -0.0675 | 0.0533 | 0.0391 |
| 43.2 | 12.8 | 61.1 | 32.0 | 63.1 | 69.2 | -29.2 | 35.9 | -70.9 | -37.5 | 34.9 | 32.6 |

| 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 |
|--------|----------|--------|---------|---------|---------|--------|---------|---------|-----------|--------|-----------|
| Racine | Richland | Rock | Rusk | St. | Croix | Sauk | Sawyer | Shawano | Sheboygan | Taylor | Trempeale |
| 75.0 | 96.0 | 96.0 | 104.0 | 73.0 | 86.0 | 100.0 | 75.0 | 86.0 | 91.0 | 73.0 | 89.0 |
| 58.0 | 66.0 | 86.0 | 97.0 | 72.0 | 84.0 | 91.0 | 72.0 | 70.0 | 78.0 | 68.0 | 83.0 |
| 36.7 | 60.2 | 83.1 | 77.2 | 42.6 | 47.9 | 82.0 | 40.5 | 76.1 | 66.9 | 45.5 | 66.6 |
| 50.0 | 92.4 | 84.7 | 100.9 | 57.5 | 64.7 | 87.8 | 51.4 | 77.0 | 70.4 | 64.7 | 63.7 |
| 53.5 | 78.7 | 63.3 | 60.2 | 44.2 | 42.0 | 71.7 | 45.8 | 72.1 | 70.7 | 75.0 | 73.4 |
| 20.9 | 113.2 | 110.1 | 105.8 | 97.2 | 101.5 | 102.7 | 100.0 | 83.7 | 103.5 | 105.1 | 93.3 |
| 88.1 | 97.2 | 102.8 | 97.9 | 85.0 | 89.2 | 100.0 | 85.8 | 93.3 | 86.7 | 82.0 | 99.0 |
| 77.5 | 99.0 | 103.5 | 107.0 | 75.2 | 98.2 | 106.0 | 79.6 | 82.1 | 88.2 | 81.6 | 108.3 |
| 86.8 | 118.3 | 101.9 | 116.2 | 95.1 | 80.8 | 102.0 | 103.8 | 103.2 | 103.1 | 89.9 | 100.6 |
| 20.8 | 123.6 | 103.0 | 118.5 | 87.0 | 103.4 | 105.9 | 87.5 | 99.1 | 100.5 | 96.6 | 111.4 |
| 74.0 | 122.8 | 120.3 | 114.8 | 80.4 | 82.0 | 117.9 | 74.5 | 97.5 | 98.7 | 99.1 | 99.7 |
| 05.9 | 94.1 | 96.8 | 90.4 | 103.3 | 100.9 | 105.7 | 99.2 | 109.4 | 96.4 | 97.1 | 105.0 |
| 25.2 | 103.4 | 103.7 | 108.4 | 87.6 | 102.9 | 94.6 | 92.0 | 104.1 | 102.7 | 90.9 | 115.6 |
| 92.9 | 97.2 | 104.8 | 117.0 | 84.5 | 95.9 | 116.4 | 82.4 | 109.0 | 97.0 | 95.6 | 99.9 |
| 04.2 | 131.8 | 120.6 | 135.8 | 95.6 | 110.3 | 115.3 | 80.0 | 106.9 | 100.0 | 94.9 | 128.4 |
| 15.3 | 123.8 | 117.4 | 114.3 | 109.3 | 120.6 | 108.8 | 92.6 | 109.9 | 118.3 | 111.7 | 126.6 |
| 58.1 | 71.8 | 59.7 | 75.1 | 59.2 | 54.5 | 68.2 | 57.5 | 79.3 | 81.5 | 52.3 | 68.0 |
| 90.0 | 122.5 | 115.4 | 120.3 | 96.1 | 108.2 | 117.7 | 87.7 | 88.5 | 104.3 | 91.6 | 113.2 |
| 1400 | 0.2032 | 0.1480 | 0.1680 | 0.2641 | 0.2580 | 0.1149 | 0.2300 | 0.0900 | 0.1200 | 0.1500 | 0.1200 |
| 1769 | 0.1683 | 0.1705 | 0.1519 | 0.1540 | 0.1863 | 0.1425 | 0.1382 | 0.0995 | 0.0899 | 0.1650 | 0.1581 |
| 0369 | -0.0349 | 0.0225 | -0.0161 | -0.1101 | -0.0717 | 0.0276 | -0.0918 | 0.0095 | -0.0301 | 0.0150 | 0.0381 |
| 26.4 | -17.2 | 15.2 | -9.6 | -41.7 | -27.8 | 24.0 | -39.9 | 10.5 | -25.1 | 10.0 | 31.7 |

| 59 | 60 | 61 | (1)-(60)only |
|-------|--------|---------|-----------------|
| ebago | Wood | state | STD CV(X) |
| 92.0 | 88.0 | | 8.4275 9.3293 |
| 75.0 | 76.0 | 83.0 | 10.5459 13.5523 |
| 74.7 | 64.1 | 71.0 | 13.1662 19.6301 |
| 60.0 | 60.6 | 83.0 | 13.6674 18.2071 |
| 67.8 | 72.0 | 68.0 | 11.2552 16.8871 |
| 06.9 | 90.6 | 104.0 | 8.7958 8.6755 |
| 89.9 | 89.6 | 98.0 | 7.6336 7.9981 |
| 93.1 | 95.0 | 103.0 | 11.7606 12.0545 |
| 05.6 | 91.4 | 104.0 | 11.6768 11.5746 |
| 97.1 | 101.6 | 108.0 | 11.0509 10.5458 |
| 04.3 | 105.4 | 108.0 | 12.5012 12.1414 |
| 95.6 | 89.4 | 97.0 | 7.7458 7.9383 |
| 05.4 | 90.6 | 106.0 | 9.6742 9.4145 |
| 06.1 | 93.7 | 107.0 | 11.7940 11.4442 |
| 01.4 | 96.9 | 118.0 | 12.4994 11.1134 |
| 14.8 | 113.1 | 118.0 | 9.7142 8.4248 |
| 62.1 | 66.9 | 67.0 | 10.3985 16.0067 |
| 04.0 | 99.6 | 111.0 | 11.9291 11.1221 |
| 1500 | 0.1200 | 0.0900 | |
| 1420 | 0.1284 | 0.1580 | |
| 0080 | 0.0084 | 0.0680 | |
| -5.4 | 7.0 | 75.5721 | |

SOYBEANS YIELDS DYNAMICS AND INSTABILITY ESTIMATED PARAMETERS
FOR COUNTIES OF WISCONSIN STATE 1972-1989.

| 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|-------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| on | Brown | Buffalo | Burnett | Calumet | Cheppewa | Clark | Columbia | Crawford | Dane | Dodge | Dunn |
| 16 | 30 | 22 | 18 | 31 | 27 | 22 | 27 | 27 | 30 | 33 | 25 |
| 20 | 23 | 27 | 19 | 26 | 19 | 20 | 26 | 22 | 29 | 26 | 25 |
| 15 | 19 | 15.9 | 15 | 19.1 | 12 | 12.3 | 22 | 25.7 | 23.2 | 20 | 18 |
| 18.9 | 26.7 | 15.4 | 16.6 | 20.9 | 13.5 | 18.4 | 22.5 | 17 | 30.9 | 23.7 | 18.7 |
| 10.7 | 19.3 | 13.1 | 10.6 | 20 | 11.3 | 15 | 24.1 | 26.3 | 21.3 | 25 | 10.3 |
| 25.5 | 32 | 27 | 25.2 | 32.6 | 27.9 | 26 | 37 | 34.9 | 36.5 | 37.1 | 28.4 |
| 21.5 | 30 | 25.8 | 20.4 | 30.2 | 23.8 | 25 | 34.1 | 29.1 | 35.2 | 31.9 | 30 |
| 23 | 29.2 | 28.3 | 23 | 30.2 | 23.9 | 22.7 | 35.1 | 30.3 | 36.4 | 33 | 31.5 |
| 27.4 | 32 | 28 | 24 | 32.1 | 27.3 | 23.1 | 36.8 | 37 | 41 | 38.4 | 27.9 |
| 30.4 | 25 | 27.4 | 20.2 | 27.8 | 24.7 | 26 | 38.3 | 27.2 | 36.5 | 34.6 | 28.4 |
| 26.2 | 22.5 | 25.4 | 23.4 | 26 | 26.2 | 23.1 | 33.7 | 29.4 | 35.5 | 32.7 | 22.2 |
| 33.2 | 32.5 | 31.4 | 26.4 | 35.8 | 36.4 | 25.7 | 34.6 | 28.3 | 35.2 | 41.5 | 37.4 |
| 23.1 | 35 | 28.3 | 23 | 32 | 28.4 | 31.1 | 32 | 34.3 | 33.5 | 37.3 | 26.1 |
| 26.9 | 30 | 28 | 26.9 | 33 | 25.3 | 26.3 | 32.8 | 28.5 | 35.8 | 33 | 30.6 |
| 31.7 | 32 | 35.9 | 32 | 32.6 | 33.7 | 35.5 | 36.8 | 34.2 | 38.7 | 34.6 | 33 |
| 31.4 | 30 | 40.7 | 31.4 | 34.5 | 32.7 | 36.7 | 38.8 | 33.6 | 41.4 | 36.1 | 36.8 |
| 17.9 | 21.8 | 19.8 | 16.8 | 22.1 | 15.3 | 17.5 | 27.1 | 15.4 | 25.7 | 25 | 18.8 |
| 30.4 | 28.2 | 31.9 | 24.2 | 30.5 | 27.5 | 26.2 | 39.3 | 42.1 | 41.8 | 39.5 | 32.1 |
| 12537 | 0.181037 | 0.255683 | 0.230771 | 0.193316 | 0.312291 | 0.209813 | 0.13 | 0.16 | 0.14 | 0.16 | 0.272414 |
| 16432 | 0.151392 | 0.191223 | 0.185789 | 0.136206 | 0.210397 | 0.205754 | 0.10697 | 0.225476 | 0.125426 | 0.127545 | 0.201088 |
| 0861 | -0.02965 | -0.06446 | -0.04498 | -0.05711 | -0.10189 | -0.00406 | -0.02303 | 0.065476 | -0.01457 | -0.03245 | -0.07133 |
| 1.096 | -16.3751 | -25.2109 | -19.4919 | -29.5427 | -32.628 | -1.93438 | -17.7156 | 40.92228 | -10.4097 | -20.2844 | -26.1831 |

| 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
|---------|-----------|----------|----------|-----------|-----------|-----------|----------|-----------|-----------|----------|----------|
| Jackson | Jefferson | Juneau | Kenosha | La Crosse | Lafayette | Manitowoc | Marathon | Marquette | Milwaukee | Monroe | |
| 30 | 21 | 30 | 21 | 30 | 27 | 28 | 29 | 21 | 18 | 28 | 27 |
| 23 | 18 | 26 | 17 | 25 | 24 | 30 | 22 | 24 | 22 | 19 | 23 |
| 25.3 | 16.1 | 19.5 | 17.1 | 21.8 | 16.8 | 23.9 | 20 | 12.8 | 18.5 | 21.9 | 18.9 |
| 27.3 | 11.2 | 31.6 | 21.4 | 29.3 | 12.2 | 37 | 28.5 | 22 | 13.4 | 29.7 | 19.5 |
| 23.3 | 12.1 | 21.9 | 16.2 | 25.1 | 11.9 | 25 | 20 | 15.3 | 13.8 | 22.5 | 12.3 |
| 34.4 | 26.3 | 37.5 | 23.9 | 40.5 | 27.3 | 35.3 | 32.5 | 26 | 22.6 | 38.2 | 27 |
| 33.2 | 23.9 | 32.1 | 21.6 | 33.3 | 23.6 | 37.3 | 30.9 | 24.7 | 22.2 | 34 | 24.8 |
| 33.5 | 26.8 | 34.6 | 27.2 | 36.1 | 28.1 | 39.1 | 33.9 | 20.5 | 24.7 | 35.6 | 30.3 |
| 37 | 28 | 33.7 | 23.5 | 36.5 | 28 | 37 | 32.4 | 23 | 23.5 | 33.1 | 28 |
| 34 | 28.5 | 32.5 | 22.9 | 36 | 26.3 | 26.7 | 30 | 26 | 30 | 34 | 32.3 |
| 26.8 | 26.9 | 35.2 | 27.8 | 33.9 | 26.1 | 34.8 | 27.1 | 21.2 | 29.7 | 29.9 | 27.6 |
| 27.3 | 32.2 | 37.4 | 27.6 | 36.6 | 30.8 | 38.6 | 38.1 | 26 | 30.2 | 21.7 | 27.6 |
| 25 | 29.4 | 27.7 | 30 | 30.5 | 30.3 | 36.9 | 34 | 26 | 23.9 | 30 | 35.8 |
| 28 | 28.4 | 33.3 | 35 | 35 | 28.6 | 32.4 | 30 | 31.3 | 29.2 | 32.4 | 33.6 |
| 33.5 | 34.3 | 36.2 | 34.4 | 39 | 35 | 37.8 | 28.9 | 35.3 | 32.5 | 36.5 | 38.4 |
| 40.7 | 37.4 | 35.2 | 38.5 | 39.6 | 39.8 | 46 | 37.5 | 38.3 | 41.3 | 31.8 | 39.6 |
| 20.5 | 18.9 | 21.8 | 22.6 | 22.7 | 21.8 | 22 | 23.2 | 20.1 | 21.8 | 17.6 | 21 |
| 40.5 | 33.1 | 40.1 | 36.5 | 39 | 37 | 43.5 | 29.8 | 24 | 41.2 | 37.8 | 37.3 |
| 0.11 | 0.23 | 0.16 | 0.13 | 0.14 | 0.285327 | 0.12 | 0.15 | 0.195809 | 0.197215 | 0.16 | 0.227471 |
| 13144 | 0.167447 | 0.156171 | 0.179559 | 0.145259 | 0.177223 | 0.202073 | 0.146677 | 0.2112 | 0.201712 | 0.206696 | 0.177404 |
| 03144 | -0.06255 | -0.00383 | 0.049559 | 0.005259 | -0.1081 | 0.082073 | -0.00332 | 0.015391 | 0.004497 | 0.046696 | -0.05007 |
| 76753 | -27.197 | -2.39297 | 38.12227 | 3.756744 | -37.8877 | 68.39446 | -2.21545 | 7.860064 | 2.280257 | 29.18485 | -22.0102 |

| Year | 35 Pierce | 36 Polk | 37 Portage | 38 Racine | 39 Richland | 40 Rock | 41 Rusk | 42 St. | 43 Croix | 44 Sauk | 45 Shawano | 46 Sheboygan | 47 Trempealeau | 48 Vernon | 49 Walworth | 50 Washington | 51 Waukesha | 52 Waupaca |
|-----------|--------------|------------|---------------|--------------|----------------|------------|------------|-----------|-------------|------------|---------------|-----------------|-------------------|--------------|----------------|------------------|----------------|---------------|
| 1972 | 23 | 19 | 19 | 30 | 27 | 31 | 19 | 27 | 29 | 21 | 30 | 27 | 22 | 29 | 28 | 30 | 19 | |
| 1973 | 23 | 22 | 14 | 22 | 24 | 29 | 19 | 24 | 27 | 21 | 21 | 24 | 27 | 27 | 23 | 24 | 17 | |
| 1974 | 19.1 | 17.1 | 14.5 | 20.6 | 25.5 | 21 | 13.3 | 15.7 | 25.9 | 16 | 20 | 18 | 23.1 | 23.6 | 20.8 | 25.1 | 15.8 | |
| 1975 | 19.3 | 16.8 | 10.5 | 31.7 | 22.5 | 29 | 13.5 | 19.6 | 21.7 | 20 | 29 | 14.5 | 25.1 | 34.4 | 29.8 | 32.3 | 21 | |
| 1976 | 13.6 | 11.8 | 13.9 | 26.6 | 26.7 | 31.4 | 11.3 | 10.4 | 28.1 | 15 | 20 | 15.5 | 26.7 | 27.2 | 24.4 | 22.1 | 14 | |
| 1977 | 27.9 | 25.4 | 21.7 | 37.2 | 34.8 | 37.7 | 26 | 26.5 | 35.9 | 30 | 32 | 27.8 | 35.3 | 38.4 | 38 | 36.8 | 22.5 | |
| 1978 | 27.6 | 23.7 | 18 | 31.2 | 30 | 37 | 20 | 23.1 | 33.2 | 24 | 30 | 27.6 | 31.6 | 37.5 | 31.3 | 30.8 | 22.4 | |
| 1979 | 32.7 | 25.1 | 20 | 36 | 33.4 | 37.4 | 20 | 29 | 34.8 | 24 | 32.8 | 32.8 | 31.7 | 39.1 | 33 | 35.8 | 25.3 | |
| 1980 | 28 | 24.1 | 23.4 | 34.1 | 36.9 | 38.4 | 27.5 | 28 | 36.9 | 22 | 32 | 28 | 35 | 39.3 | 35.2 | 35.2 | 23.4 | |
| 1981 | 30.3 | 26.1 | 27 | 36.8 | 36.3 | 35.5 | 28 | 28 | 24.6 | 28 | 24 | 37 | 33 | 40.3 | 35 | 34.2 | 23 | |
| 1982 | 25.6 | 22.4 | 31 | 32.7 | 28 | 36 | 24 | 22.5 | 31.2 | 22.7 | 30 | 27.2 | 27.4 | 33.6 | 30.2 | 32.3 | 31.3 | |
| 1983 | 33.4 | 30.6 | 24.7 | 35.8 | 25.7 | 36.4 | 27 | 26.2 | 37.2 | 34.2 | 33.1 | 39.8 | 28.9 | 40.6 | 31.3 | 31.4 | 31.9 | |
| 1984 | 30.8 | 29.6 | 26.1 | 35.1 | 29.8 | 31 | 25 | 27.1 | 24.8 | 31.3 | 27.6 | 30.4 | 32.1 | 31.8 | 27.2 | 28.6 | 29.4 | |
| 1985 | 26.7 | 27.6 | 30 | 36.3 | 30.7 | 35 | 27 | 26.1 | 30.4 | 34 | 30.6 | 31.8 | 30 | 31.5 | 31.5 | 26.5 | 30.5 | |
| 1986 | 32.5 | 31.6 | 32.8 | 39.8 | 37.3 | 37.7 | 33 | 32.5 | 36.2 | 33 | 33.6 | 36.9 | 35.7 | 38.2 | 37.5 | 33.5 | 30 | |
| 1987 | 36.7 | 31.1 | 32.9 | 39.5 | 45 | 39.5 | 30 | 35.3 | 43.5 | 33.6 | 36.3 | 39.1 | 45 | 39.2 | 40.4 | 33.1 | 31.6 | |
| 1988 | 20.5 | 17.2 | 21.4 | 26.3 | 22.7 | 24.9 | 12 | 18.5 | 42.3 | 25.4 | 27.9 | 22.7 | 23 | 24.6 | 22.6 | 20.1 | 21.6 | |
| 1989 | 35.8 | 27.9 | 32.6 | 37.3 | 35.5 | 41.1 | 22 | 33.5 | 25.2 | 31.3 | 33.3 | 33.3 | 41.2 | 40.4 | 34.2 | 37.3 | 39.5 | |
| CV(72-80) | 0.19 | 0.213773 | 0.19 | 0.14 | 0.1 | 0.11 | 0.276907 | 0.260798 | 0.11 | 0.196755 | 0.187541 | 0.252577 | 0.08 | 0.1 | 0.13 | 0.13 | 0.13 | |
| CV(81-89) | 0.162288 | 0.163386 | 0.13513 | 0.108167 | 0.199782 | 0.128847 | 0.221741 | 0.182746 | 0.211321 | 0.127951 | 0.11646 | 0.163003 | 0.196447 | 0.146978 | 0.156815 | 0.155752 | 0.164831 | |
| (2)-(1) | -0.02771 | -0.05039 | -0.05487 | -0.03183 | 0.099782 | 0.018847 | -0.05517 | -0.07805 | 0.101321 | -0.0688 | -0.07108 | -0.08957 | 0.116447 | 0.046978 | 0.026815 | 0.025752 | 0.034831 | |
| (3)/(1)*1 | 14.5854 | -23.5701 | -28.879 | -22.7378 | 99.782 | 17.13343 | -19.9222 | -29.9279 | 92.10991 | -34.9694 | -37.9019 | -35.4642 | 145.5593 | 46.97782 | 20.62656 | 19.80908 | 26.79332 | |

| Year | 52 Waushara | 53 Winnebago | 54 Wood | 55 State | ALL FOR (1) - (56) | |
|-----------|----------------|-----------------|------------|-------------|--------------------|----------|
| | | | | | STD | CV(%) |
| 1972 | 23 | 28 | 19 | | 4.314616 | 17.05632 |
| 1973 | 19 | 23 | 17 | 25 | 3.593976 | 15.74004 |
| 1974 | 13.5 | 20.3 | 12.5 | 20 | 3.766075 | 20.02837 |
| 1975 | 16 | 19.9 | 18.4 | 25.5 | 6.978539 | 31.72063 |
| 1976 | 13.2 | 19.6 | 13.7 | 22 | 5.813904 | 31.59731 |
| 1977 | 22.7 | 32.8 | 22 | 35 | 5.557365 | 18.17893 |
| 1978 | 20.8 | 30.2 | 23.7 | 32 | 5.069663 | 18.19257 |
| 1979 | 23 | 30.2 | 23.6 | 34 | 5.297128 | 17.7944 |
| 1980 | 23.4 | 32.1 | 23.4 | 33 | 5.550395 | 18.23233 |
| 1981 | 30 | 35.6 | 31.9 | 33 | 4.632345 | 15.34359 |
| 1982 | 28.8 | 30.4 | 29.7 | 31 | 4.027303 | 14.15572 |
| 1983 | 38.7 | 34.9 | 30 | 35 | 5.171992 | 15.92471 |
| 1984 | 36.2 | 35.7 | 31.3 | 31 | 3.725521 | 12.35434 |
| 1985 | 35.8 | 31.8 | 29 | 32 | 2.942184 | 9.651193 |
| 1986 | 35.3 | 32.1 | 32.3 | 36 | 2.420489 | 7.006883 |
| 1987 | 40.8 | 32.5 | 41.7 | 38 | 4.182134 | 11.25574 |
| 1988 | 26.5 | 21.9 | 21.3 | 23.9 | 4.279642 | 19.38927 |
| 1989 | 35.1 | 33.5 | 31.4 | 37 | 5.231021 | 15.18684 |
| CV(72-80) | 0.203113 | 0.197626 | 0.208971 | 0.12 | 0.197575 | 0.277954 |
| CV(81-89) | 0.130451 | 0.124028 | 0.15899 | 0.129419 | 0.217539 | 0.262082 |
| (2)-(1) | -0.07266 | -0.0736 | -0.04998 | 0.009419 | 0.019964 | -0.01587 |
| (3)/(1)*1 | 35.7743 | -37.2412 | -23.9175 | 7.849007 | 10.10445 | -5.71022 |

WHEAT YIELDS DYNAMICS AND INSTABILITY ESTIMATED PARAMETERS
FOR COUNTIES OF WISCONSIN STATE 1973-1989.

| Year | Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|-------------------------|------|----------|----------|----------|---------|----------|----------|----------|----------|----------|----------|----------|---------|----------|-----------|----------|
| | | Adams | Barron | Bayfield | Brown | Buffalo | Calumet | Cheppewa | Clark | Columbia | Crawford | Dane | Dodge | Dunn | Fond du L | |
| 1973 | 1973 | 34 | 32 | 31 | 31.2 | 28.5 | 32 | 32 | 25.5 | 37.9 | 35 | 36.3 | 34.4 | 33.8 | 32 | 31 |
| 1974 | 1974 | 29.5 | 28 | 25.2 | 37.1 | 30.7 | 37.5 | 28 | 31.5 | 42.6 | 40 | 39 | 41.9 | 31.5 | 26.4 | 40.6 |
| 1975 | 1975 | 25.3 | 28 | 22.5 | 31.9 | 25.4 | 34 | 23.5 | 26 | 29.6 | 26 | 30.9 | 33 | 29.9 | 26 | 33.4 |
| 1976 | 1976 | 24 | 29.2 | 27.5 | 31.4 | 24.7 | 31.1 | 25 | 27 | 35.9 | 33 | 41 | 41.4 | 25.4 | 24.3 | 33.3 |
| 1977 | 1977 | 34.5 | 31 | 32 | 39.9 | 32.2 | 41.8 | 32.3 | 32.6 | 41.4 | 36 | 46.8 | 47.4 | 39.8 | 30 | 47.7 |
| 1978 | 1978 | 30 | 28 | 27.3 | 34.3 | 26.6 | 33.1 | 28 | 29.2 | 42.4 | 34 | 41.3 | 38 | 36.2 | 26.4 | 34.8 |
| 1979 | 1979 | 30 | 30 | 28 | 38.9 | 31.5 | 41.4 | 28.3 | 31 | 42.5 | 34 | 43.7 | 45.3 | 38.5 | 29.7 | 45.8 |
| 1980 | 1980 | 28.8 | 27.3 | 27.6 | 33.1 | 26 | 35.9 | 30.4 | 28.5 | 50.9 | 29.3 | 45.6 | 43.4 | 30.5 | 25.7 | 30.6 |
| 1981 | 1981 | 42.4 | 27 | 27.6 | 40.7 | 24.6 | 52.8 | 29 | 38.3 | 59 | 32.7 | 48.4 | 46.1 | 47.9 | 28.4 | 47 |
| 1982 | 1982 | 42.8 | 34.4 | 37 | 47.6 | 24 | 54.4 | 38.5 | 28.8 | 53.8 | 30.7 | 54.1 | 52.1 | 40.9 | 31 | 48.1 |
| 1983 | 1983 | 37.3 | 33.5 | 30.9 | 42 | 35 | 41.5 | 32.9 | 32.9 | 44 | 40 | 47 | 48 | 44.9 | 34.1 | 48 |
| 1984 | 1984 | 45.8 | 40 | 24.6 | 51.2 | 42 | 56.7 | 39.1 | 42.1 | 54.9 | 49.3 | 59.4 | 57.6 | 51.2 | 39.3 | 58.4 |
| 1985 | 1985 | 56 | 31.7 | 29.2 | 45.7 | 37 | 52.8 | 34.4 | 35.9 | 55.3 | 44 | 64.5 | 62.5 | 44.2 | 32 | 55 |
| 1986 | 1986 | 45.2 | 40.3 | 36.9 | 54.1 | 42.2 | 58.2 | 45 | 42.2 | 52.2 | 47.7 | 60.2 | 58.9 | 55.7 | 40.2 | 60.6 |
| 1987 | 1987 | 33 | 33.6 | 27.1 | 46.9 | 24.8 | 58.9 | 25.3 | 28 | 50.1 | 49 | 57.9 | 55.6 | 40.8 | 27.7 | 54.6 |
| 1988 | 1988 | 32 | 32.5 | 23.5 | 34.9 | 25.7 | 36.3 | 34 | 33.7 | 44.7 | 40 | 45.8 | 43.5 | 32.4 | 28 | 42.2 |
| 1989 | 1989 | 42.3 | 47.2 | 39 | 51.7 | 34 | 53.8 | 45.3 | 38.5 | 52.9 | 52 | 56.6 | 51.2 | 45.5 | 34.5 | 49.6 |
| CV(73-81)CV(73-81) | (1) | 0.167491 | 0.056303 | 0.095699 | 0.10139 | 0.101911 | 0.13 | 0.096688 | 0.1 | 0.188246 | 0.112152 | 0.08 | 0.09 | 0.180301 | 0.085298 | 0.174187 |
| CV(82-89)CV(82-89) | (2) | 0.174202 | 0.137059 | 0.180354 | 0.12265 | 0.210508 | 0.149101 | 0.168752 | 0.144706 | 0.080891 | 0.11 | 0.108729 | 0.10796 | 0.147657 | 0.130745 | 0.110268 |
| (2) - (1)(2) - (1) | | 0.006712 | 0.080755 | 0.084655 | 0.02126 | 0.108596 | 0.019101 | 0.072064 | 0.044706 | -0.10735 | -0.00215 | 0.028729 | 0.01796 | -0.03264 | 0.045447 | -0.06392 |
| ((2)-(1))((2)-(1))/100(| | 4.0 | 143.4 | 88.5 | 21.0 | 106.6 | 14.7 | 74.5 | 44.7 | -57.0 | -1.9 | 35.9 | 20.0 | -18.1 | 53.3 | -36.7 |

| Year | Grant | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 |
|-------------------|-------|----------|----------|----------|-----------|----------|----------|----------|-----------|----------|-----------|----------|-----------|-----------|-----------|----------|-----------|----------|
| | | Green | Green | Laklowa | Jefferson | Juneau | Kenosha | Kewaunee | Lafayette | Langlade | Manitowoc | Marathon | Marinette | Marquette | Milwaukee | Oconto | Outagamie | |
| 1973 | 35.5 | 33.5 | 32 | 37 | 35.8 | 34 | 34.2 | 28.8 | 35.5 | 28.3 | 33 | 23.8 | 30 | 34 | 29.3 | 29.5 | 28.3 | |
| 1974 | 40.7 | 33.7 | 37.3 | 30.5 | 39 | 40 | 36.2 | 37.4 | 37.3 | 31.8 | 37.6 | 35.3 | 33.3 | 30.8 | 34 | 34.7 | 32.6 | |
| 1975 | 29 | 32.2 | 34.3 | 24.7 | 32.1 | 34.4 | 34 | 30.6 | 27.6 | 28.8 | 31 | 30.3 | 28 | 30.8 | 26.7 | 27.5 | 31.8 | |
| 1976 | 34.7 | 40 | 31.7 | 32.7 | 37.2 | 25.6 | 43.7 | 31.8 | 34.7 | 28.5 | 34.3 | 27.6 | 32 | 23.8 | 35.3 | 32.1 | 31.9 | |
| 1977 | 35.4 | 45.6 | 36.9 | 34.4 | 41.9 | 38 | 48.2 | 41.6 | 36 | 29 | 41.9 | 34.2 | 28.3 | 42 | 41.4 | 33.1 | 40.9 | |
| 1978 | 32.7 | 36 | 32 | 33 | 39.6 | 30 | 35.9 | 34.5 | 32 | 28.7 | 39.6 | 28.2 | 29 | 31.2 | 30.8 | 29.6 | 35 | |
| 1979 | 36 | 40.6 | 37.1 | 33 | 42.5 | 32.7 | 45.1 | 39.6 | 33 | 30.5 | 44.3 | 31.5 | 30.4 | 33 | 40.1 | 30.6 | 40.2 | |
| 1980 | 30.5 | 42 | 32.2 | 30 | 39.8 | 31.7 | 49.3 | 32.7 | 28 | 27.7 | 36.4 | 28.3 | 28.9 | 29.2 | 41.5 | 29.2 | 35.5 | |
| 1981 | 40.5 | 57.3 | 50.6 | 46.5 | 51.4 | 45.7 | 52.3 | 38.4 | 37.1 | 30.6 | 53 | 33 | 31.6 | 41 | 49 | 30.5 | 42.6 | |
| 1982 | 32.4 | 30.6 | 55.8 | 33.1 | 45.2 | 30.6 | 39.7 | 49.1 | 34.4 | 36.5 | 46 | 32 | 36.7 | 43.1 | 34.8 | 30.4 | 50.9 | |
| 1983 | 43.8 | 47 | 40.3 | 46.2 | 44.5 | 37 | 53 | 42 | 49.2 | 34 | 44.9 | 32.3 | 34.6 | 37.1 | 48 | 36.5 | 42 | |
| 1984 | 51.3 | 52.2 | 52.4 | 51.4 | 56.8 | 45 | 60.1 | 56.8 | 53.5 | 41.5 | 57.8 | 41.5 | 43 | 49.4 | 55.6 | 44 | 46.7 | |
| 1985 | 40.6 | 51 | 67.1 | 56.3 | 54.8 | 56.3 | 59.9 | 55.7 | 56.4 | 42.1 | 53.9 | 37.1 | 38.1 | 42.1 | 55.5 | 50 | 46.8 | |
| 1986 | 60.7 | 48.9 | 57.6 | 54 | 52.4 | 47.4 | 55.4 | 60.4 | 52.2 | 44 | 57.4 | 40.9 | 56.4 | 60 | 51.6 | 47.4 | 54.9 | |
| 1987 | 47.6 | 69.9 | 51.4 | 48.7 | 48.7 | 34 | 51.5 | 48.7 | 44.2 | 30.8 | 50.9 | 39 | 40.6 | 43 | 40 | 35.1 | 47.1 | |
| 1988 | 48.4 | 35.5 | 47.8 | 36.9 | 39.8 | 41.3 | 35 | 38.6 | 40 | 30.8 | 38.1 | 34 | 33.7 | 42.7 | 44.3 | 30.6 | 40.1 | |
| 1989 | 56.6 | 55.3 | 51.1 | 52.7 | 49.5 | 45.5 | 65.6 | 54.3 | 54.7 | 41.5 | 56.3 | 45 | 49.5 | 37.5 | 59 | 42.3 | 47.7 | |
| CV(73-81)0.106811 | | 0.12 | 0.156181 | 0.166891 | 0.08 | 0.1604 | 0.09 | 0.11865 | 0.102855 | 0.042952 | 0.11 | 0.113932 | 0.056839 | 0.162854 | 0.11 | 0.067582 | 0.08 | |
| CV(82-89) | | 0.13 | 0.230845 | 0.137302 | 0.164177 | 0.108482 | 0.182712 | 0.186037 | 0.139106 | 0.152169 | 0.132223 | 0.130822 | 0.09 | 0.176767 | 0.155577 | 0.162183 | 0.176848 | 0.092343 |
| (2) - (1)0.023189 | | 0.110845 | -0.01888 | -0.00271 | 0.028482 | 0.022311 | 0.096037 | 0.020456 | 0.049314 | 0.089272 | 0.020822 | -0.02393 | 0.119928 | -0.00728 | 0.052183 | 0.109266 | 0.012343 | |
| ((2)-(1)) | | 21.7 | 92.4 | -12.1 | -1.6 | 35.6 | 13.9 | 106.7 | 17.2 | 47.9 | 207.8 | 18.9 | -21.0 | 211.0 | -4.5 | 47.4 | 161.7 | 15.4 |

| Year | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 |
|------|---------|-------|--------|------|---------|--------|----------|------|------|-----------|---------|-----------|-------------|--------|----------|------------|----------|
| | Ozaukee | Pepin | Pierce | Polk | Portage | Racine | Richland | Rock | St. | CroixSauk | Shawano | Sheboygan | Trempealeau | Vernon | Walworth | Washington | Waukesha |
| 1973 | 33.3 | 29 | 28.4 | 33.4 | 34.2 | 34.7 | 36 | 37.5 | 32.1 | 34.6 | 28.8 | 32 | 28.5 | 34 | 36.2 | 34 | 31 |
| 1974 | 41.2 | 32.7 | 29.4 | 28.8 | 33 | 36.2 | 30.7 | 35.9 | 26.8 | 33.3 | 30.3 | 36.1 | 27 | 36 | 36.5 | 40.9 | 40.2 |
| 1975 | 30.2 | 22.8 | 25.7 | 25 | 28.2 | 31.2 | 27.5 | 31.3 | 24.7 | 29.5 | 30.2 | 33.2 | 24.1 | 28.7 | 31.6 | 32.4 | 30.3 |
| 1976 | 35.3 | 24.4 | 24.9 | 30.4 | 27.1 | 43.8 | 34.5 | 38.9 | 21.3 | 34.8 | 28.9 | 34.2 | 23.2 | 32 | 38.8 | 39.9 | 32.7 |
| 1977 | 43.8 | 32.8 | 34.5 | 32.4 | 36.7 | 42.4 | 39.3 | 38.4 | 32.3 | 34.9 | 32.4 | 47.1 | 28.4 | 36 | 38.2 | 43.3 | 37.9 |
| 1978 | 36.7 | 25.1 | 28.2 | 26.6 | 30.7 | 33.9 | 33.3 | 35.4 | 28 | 33.6 | 32.5 | 34.1 | 25.2 | 34 | 35.3 | 34.5 | 35.3 |
| 1979 | 44.6 | 31 | 31.1 | 29.2 | 31.3 | 43.9 | 34.7 | 41.5 | 29.9 | 34.3 | 32 | 43.1 | 28 | 41.9 | 44.7 | 42.2 | |
| 1980 | 42.7 | 26 | 29 | 30.6 | 32 | 42.9 | 32 | 39.8 | 29.2 | 32.1 | 35 | 37.8 | 26.4 | 30 | 46.1 | 40.9 | 44.4 |
| 1981 | 41.9 | 19.6 | 21.4 | 27 | 41.2 | 52.3 | 46.5 | 45.1 | 25.8 | 52.5 | 36.9 | 43.5 | 25.2 | 42.7 | 46.8 | 47.6 | 33.8 |
| 1982 | 40.4 | 26.2 | 26.7 | 35.4 | 34.4 | 57 | 31.3 | 47.8 | 29.2 | 29.7 | 43.6 | 44 | 27 | 32 | 44.8 | 49.5 | 39.8 |
| 1983 | 48 | 33.3 | 34.4 | 31.5 | 33.8 | 50.7 | 40 | 48.7 | 33.2 | 41.2 | 38.5 | 50 | 36.7 | 38.2 | 50 | 48 | 44 |
| 1984 | 57.1 | 37.6 | 40.4 | 38 | 44 | 57 | 48.3 | 55 | 39.8 | 47.3 | 43.3 | 56.8 | 42.6 | 45.9 | 59 | 56.1 | 60.2 |
| 1985 | 59.6 | 38.4 | 40.9 | 32.1 | 50 | 53.6 | 47.2 | 53.2 | 38.4 | 42.7 | 45.3 | 57.2 | 40 | 39.5 | 55.9 | 50.4 | 46.1 |
| 1986 | 52.8 | 40.4 | 46.6 | 40.3 | 50.3 | 54.7 | 60.8 | 51.3 | 42 | 41.1 | 55.8 | 58.3 | 41.4 | 48.7 | 54.8 | 54.2 | 52 |
| 1987 | 45.1 | 27.3 | 27.2 | 30.9 | 39.3 | 49.9 | 42 | 46.2 | 26.6 | 44.7 | 34.4 | 50 | 29 | 44 | 50.9 | 46.7 | 47.6 |
| 1988 | 35.3 | 37 | 29.3 | 32.4 | 22.3 | 38.8 | 33.5 | 41 | 34.1 | 38.1 | 35.5 | 36.3 | 32 | 44 | 39.5 | 36.8 | 33.2 |
| 1989 | 56 | 40 | 37.7 | 45.7 | 37.8 | 57.8 | 63.7 | 51 | 39.5 | 55.7 | 44.4 | 51.8 | 34.7 | 53 | 52.5 | 52.8 | 52 |

CV(73-81) 0.1 0.160648 0.126494 0.088692 0.124241 0.11 0.147371 0.07 0.121151 0.175135 0.04 0.11 0.068991 0.111939 0.07 0.09 0.130188
 CV(82-89) 0.163357 0.148388 0.191362 0.136537 0.222556 0.111259 0.23932 0.083582 0.145322 0.13 0.148631 0.138385 0.152753 0.08 0.115414 0.11301 0.164694
 (2) - (1) 0.063357 -0.01226 0.064868 0.047845 0.098315 0.001259 0.091949 0.013582 0.024171 -0.04513 0.108631 0.028385 0.083762 -0.03194 0.045414 0.02301 0.034507
 ((2)-(1)) 63.4 -7.6 51.3 53.9 79.1 1.1 62.4 19.4 20.0 -25.8 271.6 25.8 121.4 -28.5 64.9 25.6 26.5

| Year | 50 | 51 | 52 | 53 | 54 | ALL FOR (1)-(53) | |
|------|---------|----------|-----------|------|-------|------------------|----------|
| | Waupaca | Waushara | Winnebago | Wood | state | STD | CV(%) |
| 1973 | 35 | 31 | 31 | 35 | 3 | 3.024902 | 9.327426 |
| 1974 | 34.7 | 37 | 40.2 | 38.4 | 36.6 | 4.523913 | 13.05212 |
| 1975 | 32 | 25.8 | 26.9 | 33.8 | 30.3 | 3.246375 | 11.14148 |
| 1976 | 27.7 | 24.4 | 34.6 | 25 | 34.8 | 5.646396 | 17.93473 |
| 1977 | 35.3 | 40.9 | 43.1 | 35.2 | 41 | 5.2955 | 14.03658 |
| 1978 | 30.7 | 31.3 | 36.4 | 31.5 | 34.7 | 3.998236 | 12.32229 |
| 1979 | 32.7 | 33 | 42.3 | 31.7 | 40 | 5.681404 | 15.7166 |
| 1980 | 32.3 | 29.4 | 33 | 23.6 | 39.3 | 6.592069 | 19.60934 |
| 1981 | 42 | 36.1 | 52.9 | 40.1 | 45.6 | 9.747581 | 24.09729 |
| 1982 | 54 | 39.3 | 48.7 | 42.2 | 45.9 | 8.928618 | 22.50734 |
| 1983 | 39 | 38.9 | 44.5 | 33.1 | 45.4 | 6.092263 | 14.94792 |
| 1984 | 44.7 | 49.5 | 52.2 | 43.5 | 54.5 | 7.57963 | 15.51703 |
| 1985 | 56.3 | 57.1 | 50.5 | 50.9 | 53.4 | 9.195046 | 19.11727 |
| 1986 | 53.1 | 53.7 | 57 | 50.8 | 54.3 | 6.702936 | 13.15128 |
| 1987 | 39 | 45.6 | 43.5 | 36 | 47.3 | 9.947138 | 23.63694 |
| 1988 | 43.4 | 38.3 | 36.7 | 32 | 38.7 | 5.626821 | 15.40162 |
| 1989 | 48.1 | 41.7 | 45.2 | 40 | 51.8 | 7.448532 | 15.42501 |

CV(73-81) 0.110872 0.15624 0.193568 0.159406 0.07 0.038118 33.27935
 CV(82-89) 0.133961 0.148634 0.122706 0.165869 0.106486 0.035932 24.77457
 (2) - (1) 0.02309 -0.00761 -0.07086 0.006463 0.036486 0.04964 162.7676
 ((2)-(1)) 20.8 -4.9 -36.6 4.1 52.1 64.64082 151.6462