1993! A YEAR TO FORGET -- LESSONS FOR 1994?

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Introduction

The October 1 Crop Report forecast 1993 Iowa corn and soybean yields at 105 and 34 bu/ac, respectively. What will the November and January reports indicate? Based on observations as of October 20, with 80% of corn yet to be harvested, 105 bu/ac appears very optimistic. The need for good weather for both in-field drying and corn harvest are paramount at this time. The oat crop was the worst in recent history and problems with 1993 forage crops have been well documented.

Federal government dollars will help some, but by any measure the 1993 crop season will be remembered as one of the worst of this era. The economic consequences to Iowa agriculture will be felt for years. Remember, the USDA yield estimates are based on harvested acres. They don't include the 2 to 3 million acres that for one reason or another (not planted, flooded out, etc.) will produce no crop. For some the crop season ended early via 0-92.

Trying to document the 1993 crop season in a short paper is very difficult. The variation in conditions from region to region, field to field, or even within a field, were so great that generalizations don't always apply. I'll attempt to comment on what I believe were the major issues. The second part of the assignment is to look ahead to 1994. This is made even more difficult by the fact that in my 30 years of experience I have not been through a year like 1993.

Early Season

Our problems started with the latter part of 1992. Conditions were wet and cold. Harvest was delayed and less than normal fall work was completed. Record yields were produced from a late maturing 1992 crop. Many were impressed that a cooler than normal July and August produced a record crop. Remember, the 1992 crop was planted on time and parts of the northern Iowa crop didn't fully mature and were very wet at harvest. Some of the corn wasn't harvested till spring. Minnesota, Wisconsin and Michigan had serious maturity problems with the 1992 crop. So, based on 1992 record yields, when very wet conditions hit this year, the simplistic "rain makes grain" slogan was often repeated by some folks.

By April and May soils were filled beyond field capacity with moisture and even small rains prevented field work. At normal planting time a great deal of tillage, fertilization, manure spreading, spraying, etc., had not been done. Farmers were trying to decide how they could go

ahead and plant and maybe delay some fertilization, herbicide applications, etc. They tried to speed up things by doing less tillage and yet deal with the residue that the huge 1992 crop had produced.

Less than 10% of the corn was planted by May 10. In 1992 86% of the corn was planted by May 10 and 97% by May 17. About half the corn was in by May 20 in 1993 and about 15% remained to be planted by June 1. The story was much the same for soybeans. Only 35 to 40% of the beans were planted in May -- in 1992 97% of the beans were in by May 31. About 20% of the 1993 bean crop was planted after June 20. Research results indicate that what one can expect from very late planted corn and beans will vary greatly from year to year. In seasons like 1991 corn planted in early June or beans in late June made very respectable yields. For reasons that will be discussed later, 1993 was not one of those years. May and June were wet, but nothing like what July and August would be.

With the planting delays came many changes in management plans in an attempt to get planting done. Hybrid maturities were switched in some cases and if the rest of the season could have been known, more changes would have been made. Nitrogen and herbicide applications were delayed and in some cases missed all together or put on in a rather untimely fashion. Many acres never were cultivated and not by choice. People were still making nitrogen and herbicide applications and cultivating in July.

Planting delays were most serious in parts of northwest, north central and south central Iowa. West central and southwest were better off in both planting progress and crop appearance through the summer. Bottom land had problems in all regions of the state. Soils that are top producers in dry years were some of the worst in 1993. Any soil that is poorly drained had serious problems.

Later on I'll review temperatures for the entire growing season. However, as the crop was planted about three weeks late, the consequences of this needs looking at. Table 1 gives the weekly temperature departures for May and early June. The three weeks ending on May 16 were warmer than normal while late May and early June were very cold. Not only did the crop miss roughly 200 growing degree units during the warm period, the crop faced very cold conditions at planting and during early growth. Lack of early root and shoot growth was due to cold air and soil temperatures. The impact was most noticeable on corn following corn which grew very slowly during early growth stages.

In late June and early July all sorts of unusual soybean planting methods were tried. Numerous beans were broadcast either by ground or air. Where incorporation with a disk or field cultivator was possible stands were normally good. Some were unable, due to wet soils, to work the beans into the soil. In some cases this worked fairly well and in others the results were so-so. In one ISU trial drilled, broadcast - disked in and broadcast - no incorporation treatments yielded 42.0, 40.4 and 30.4 bu/ac, respectively.

Table 1. 1993 temperature departure from normal for crop reporting districts in Iowa.*

Crop district	Temperature (°F) for week ending						
	5-2	5-9	5-16	5-23	5-30	6-6	6-13
NW	-2	5	2	-6	-5	-10	1
NC	1	8	3	-7	-4	-10	2
NE	2	10	5	-7	-3	-9	3
WC	-1	5	2	-6	-4	-10	1
C	2	7	4	-6	-4	-10	2
EC	4	10	5	-6	-3	-10	3
SE	2	5	3	-5	-3	-9	2
SC	3	6	3	-5	-3	-10	3
SE	4	9	4	-5	-3	-10	4

*Adapted from Iowa Agricultural Statistics Reports.

Mid-season

The floods of July and August destroyed considerable crop acreage. They put all kinds of debris on river bottoms and caused numerous other soil physical problems. Wet conditions resulted in loss of N by leaching and denitrification. These topics will be considered in detail by other speakers.

While the floods were very dramatic, the more serious crop problem of maturity delay was becoming a worry. Normally about 50% of the corn acreage has reached the silk stage by July 20-25 and even the latest fields are silked by the first few days of August. In 1993 about 25% of the crop silked the last week of August. According to the crop report, 50% of the state's corn reached silk stage on August 6 or 7 and 20% was still not silked by August 15. By adding 60 days to the silk date one can get a rough idea of possible physiological maturity dates. For example, adding 60 days to silk dates of July 25, August 5 and August 15 gives maturity dates of September 23, October 4 and October 14, respectively. It is obvious that corn silking after August 15, especially in northern Iowa, had little chance of maturity. Records indicate the last Iowa corn crop to silk later than 1993 was in 1947 when the average date was August 10. Incidently, the state average yield that year was 30 bu/ac.

Although a warm August and September and a late freeze would have been helpful, the problem of late silking corn is much greater than maturing before a frost. Late silking corn, even

when it matures before frost, will yield considerably less than corn that silks on July 20. One of the main reasons early planted corn yields more is that silk date is earlier. Important vegetative and grain filling stages happen when photosynthesis potential is greater. Consider that a late silking field is trading a three week period in late July and early August for the last week of September and the first two weeks of October. Yield reductions of 20 to 30% are common for an August 10 silk date and over 40% for August 20. This is based on studies where early freeze was not a problem and the corn, except for late silk, was "good" corn. Much of the late silking 1993 Iowa crop was stunted, N deficient, etc., in addition to being behind in maturity.

Corn progress was behind normal for several reasons. Late planting is an obvious reason, but in some areas corn planted in early May was also behind -- why? Growing degree unit accumulation (Tables 2 and 3) was behind normal except in east central and southeast Iowa. The most serious delays were in northwest Iowa. Cold soils in May and early June, N deficiency, wet soils, lack of sunshine, and other factors contributed. Silking delays are obvious in a planting date test at our Northeast Research Farm near Nashua (Table 4). In contrast, the silk dates at our Southeast Iowa Research Center were closer to normal when related to planting dates. GDU accumulations were closer to normal in that region of the state. Soybean yields in southeast Iowa were much better than corn.

In July it was observed that common rust was very prevalent on corn. Normally a minor disease, that comes late in the season, rust was present much earlier than normal. Reports of buggy whip and green snap were fairly common in corn. Soil differences were dramatic as crops looked the worst on flat and poorly drained soils. The crop looked better on the sloping loess soils of west central and southwest Iowa and on similar soils in other regions of the state.

The typical observation of the soybean crop was that, in addition to being late, plants were short -- especially those that had been planted late. Plant color wasn't too bad and diseases were not as bad as one would expect based on excessive moisture.

Table 2. 1993 Growing Degree Units from May 1 to dates indicated.*

District	June 13	July 4	Aug. 1	Aug. 29	Oct. 3
NW	478	879	1478	2082	2408
NC	504	923	1518	2111	2427
NE	535	962	1562	2162	2507
WC	524	968	1596	2230	2585
C	558	1014	1642	2274	2629
EC	596	1068	1713	2358	2745
SW	578	1059	1723	2400	2785
SC	596	1085	1754	2434	2822
SE	651	1170	1864	2564	3044

*Adapted from Iowa Agricultural Statistics Reports.

Table 3. 1993 Growing Degree Units cumulative departure from average from May 1 to dates indicated (above average except where designated minus).*

District	June 13	July 4	Aug. 1	Aug. 29	Oct. 3
NW	-86	-131	-197	-200	-324
NC	-41	-57	-96	-77	-189
NE	9	15	-9	23	-56
WC	-78	-103	-170	-170	-298
C	-29	-36	-88	-71	-191
EC	19	36	15	51	-38
SW	-51	-58	-117	-104	-233
SC	-24	-46	-102	-89	-228
SE	8	35	14	54	-53

*Adapted from Iowa Agricultural Statistics Reports.

Table 4. A comparison of 1993 silking dates versus normal at Northeast Iowa Research Farm.

Planted		Silked	
1981-92	1993	1981-92	1993
April 23	April 25	July 19	July 29
May 5	May 9	July 22	August 6
May 18	May 20	July 29	August 10
June 1	June 1	August 5	August 13

Table 5. 1993 Iowa regional precipitation departure from average in inches (above average except where designated minus).*

District	April	May	June	July	August	September	Season
NW	1.2	2.5	4.2	3.5	2.6	-1.1	12.9
NC	1.2	1.9	3.1	3.6	4.3	-1.7	12.4
NE	1.5	0.4	4.4	4.3	4.6	-0.9	14.3
WC	0.3	1.0	1.8	5.0	3.0	-1.1	10.0
C	0.0	1.7	3.8	7.3	8.4	0.3	21.5
EC	1.2	1.4	4.5	6.6	5.7	0.8	20.2
SW	-1.5	3.0	3.5	10.4	2.0	1.5	18.9
SC	-0.3	1.7	1.8	11.0	2.0	1.5	17.7
SE	0.5	1.2	5.0	7.4	4.0	0.9	19.0

*Adapted from Iowa Agricultural Statistics Reports.

Late Season

The rains persisted, but the temperatures did warm up the last three weeks of August, which was positive. September was about normal precipitationwise (Table 5). However, the coldest September on record (5.5 degrees below normal) was not what was needed. The GDU accumulation became negative in all areas. Compare GDUs for August 29 and October 3 in Table 3. A damaging frost occurred on September 15 in northwest and parts of west central

Iowa. Frosts on September 27, September 29 and October 2 stopped growth in northern Iowa while a freeze on October 10 hit most of the state. Yield reductions were mainly from the September 15 frost in northwest Iowa. Yield losses due to frosts occurring during the September 27-October 2 period were modest. Crops were not mature, but very little grain filling was taking place. Some quality losses may have been more important. Silk dates indicated a serious problem; a cold September and somewhat early frost dates did not help. The result was poor yields of wet and low test weight corn. Bean yields were extremely variable, but were typically well below normal. Some bean fields were cut short due to brown spot and other diseases related to "wet feet".

In early to mid-September another problem became obvious in far too many corn fields -- plants were dying prematurely. This was most obvious in what earlier had appeared to be "good corn" areas. The net result was as if corn had frozen 2-3 weeks before maturity. These fields lost considerable yield due to lack of the grain filling that would have occurred if they had stayed alive. The only "good news" was that the grain moisture content was lower because these fields went into their dry down phase sooner than fields that stayed alive.

Why did these fields die early? When scattered plants die early, there normally is stalk rot and/or corn borer involved and some of this was observed. However, in fields that died rapidly and uniformly it was likely a combination of several problems. Remember, the excess soil moisture the crop faced all year resulted in a less extensive than normal root system. Add the worst rust problem in memory, N problems, and "self cannibalization" results. Sometimes this problem is greater in fields with good kernel set. As a heavy demand is put on the plant to translocate carbohydrates to the ear the less than healthy plant can't meet this demand and survive. The result was early and sudden death of most plants in a field well ahead of expected maturity based on silk date. Yields, test weight, and grain moisture were all lower than expected at harvest. Stalk and root quality may have been poor. The problem was greater in some hybrids.

Late maturity and the resulting wet grain was a major problem (Table 6). The first couple weeks of October, though cool, provided decent drying weather. This brought bean moisture down to where it was okay to combine and dried corn several points. By late October some corn was very wet and in need of some good drying weather. If this does not occur, considerable corn acreage could go into winter unharvested.

Table 6. 1993 Growing Degree Unit accumulation and departure from May 1 to various dates.*

District	September 26	October 3	October 10	October 17
NW	2355 (-309)	2408 (-324)	2473 (-319)	2508 (-335)
NC	2383 (-166)	2427 (-189)	2497 (-176)	2534 (-188)
NE	2467 (-32)	2507 (-56)	2578 (-40)	2616 (-48)
WC	2528 (-283)	2585 (-298)	2658 (-289)	2694 (-307)
C	2581 (-168)	2629 (-191)	2704 (-179)	2743 (-192)
EC	2699 (-12)	2745 (-38)	2819 (-27)	2861 (-37)
SW	2725 (-218)	2785 (-233)	2861 (-225)	2900 (-244)
SC	2768 (-205)	2822 (-228)	2896 (-225)	2937 (-240)
SE	2994 (-25)	3044 (-53)	3126 (-42)	3122 (-58)

*Adapted from Iowa Agricultural Statistics Reports.

How serious quality issues, other than test weight, are at this time unknown. Such items as protein and oil content of both crops are likely problems. Will the beans from the very late planted soybeans remain green? Will the mycotoxin problem develop in corn grain? How will this year's crop hold up through handling and storage?

Lessons for 1994?

The "lesson" from 1993 is that excess rain can reduce yields. In a state where too little rain is a more common problem the memory and economic consequences of 1993 will last for many years. At least those who believed the simplistic "rain makes grain" slogan learned that one can get too much of a "good" thing. But the question really is -- how should I manage my corn and soybeans in 1994 based on response to management and events in 1993?

Part of this paper title is "A Year to Forget" and in many ways this may be the best answer. Should one make big management changes based on hopefully a once in a lifetime wet season? What about following the drought of 1988? There may be some circumstances that may carry into 1994 that will suggest some adjustments. But to make major shifts based on 1993 alone would seem rather foolhardy. What might be different as one looks ahead?

Were you able to get the 1993 corn crop harvested and do your "normal" fall tillage, fertilization, manure applications, etc.? That subsoil moisture will be at least at field capacity is a given going into the spring. Will the loss of soil structure (compaction) that occurred in 1993 be

a problem? Getting nitrogen applied and not losing it were and are issues. Problems of debris, tillage and soil conservation are big in producers' minds as of now. The other three speakers and many of the workshop sessions will deal with these topics in detail.

Being "on time" with spring planting will have a special urgency next year. Wet soils, an increased crop acreage in 1994, delayed harvest, tillage, fertilizer and manure application delays, etc., all could prevent this from happening. Much will depend on November and April weather. Telling producers that planting on time is important will not be needed. How to manage the above issues so that this can happen will be. How to be timely and not run up production costs or risk yields will be important. Help producers set priorities relative to limited input dollars.

How does one select corn hybrids or soybean varieties for next year? How valuable will variety tests or on-farm results from 1993 be? If a top hybrid was hit hard by common rust in 1993, does one grow it in 1994? If a top normally adapted hybrid didn't mature, had a lower test weight and yielded less than one of early maturity, do you drop it for 1994? The best answer would seem to be a reasonable amount of diversification in each case -- but, putting great emphasis on 1993 results indicates you are planning for a similar year in 1994. It is possible, but what are the odds? I suspect climatologists will be trying to out-predict each other right up to planting time and beyond.

It is not the purpose of this paper to detail management suggestions for 1994, but it is time to be thinking about it. After a devastating year like 1993 it would not be uncommon to carry 1993 issues into 1994. As mentioned, as it relates to some topics, this might be appropriate. However, in most cases one may be better off planning for an "average" year -- whatever that is.