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### South Dakota Seed Quality: A Drillbox Survey

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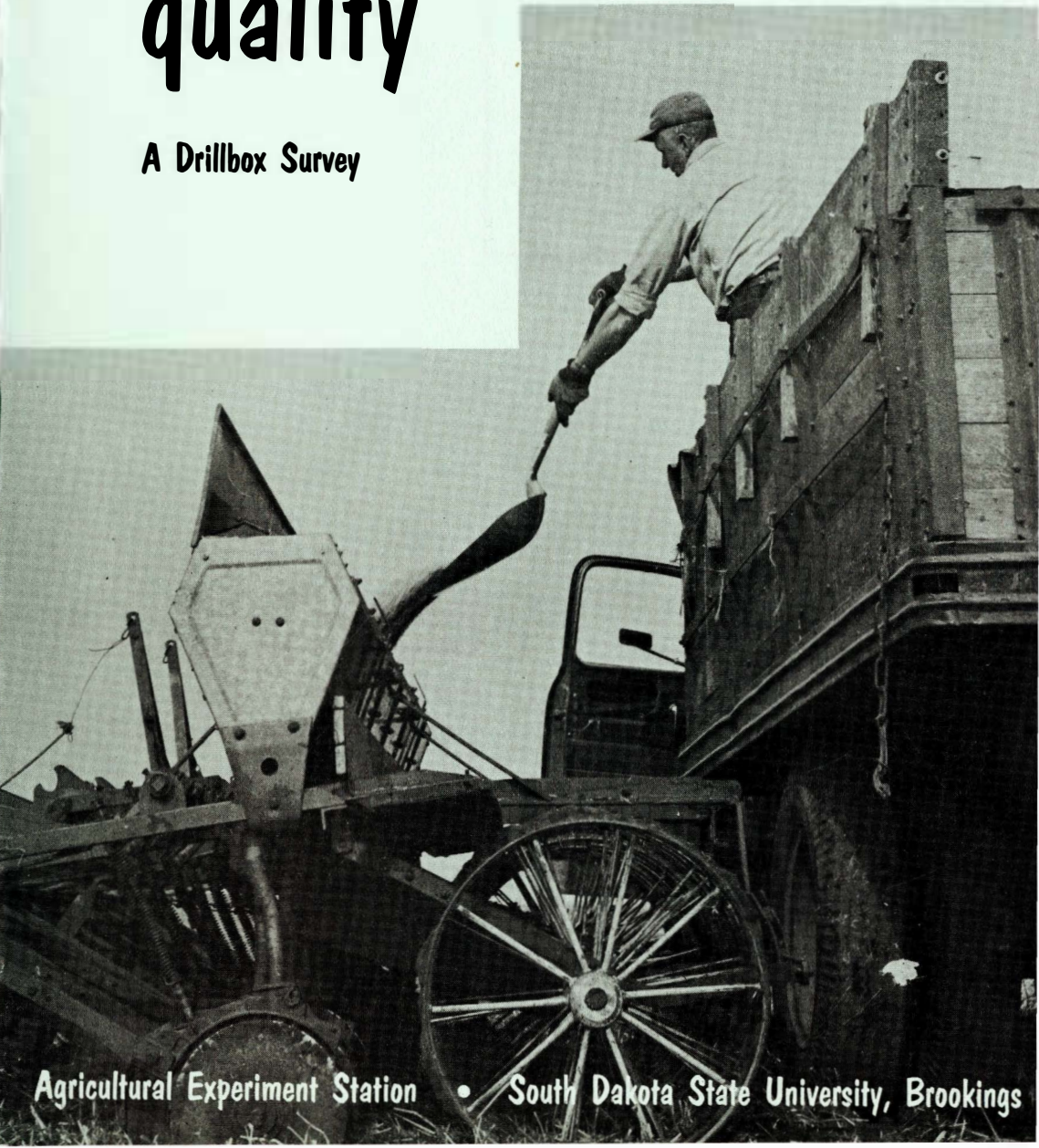
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# South Dakota seed quality

A Drillbox Survey



Agricultural Experiment Station • South Dakota State University, Brookings

The number per pound of noxious or common weeds or crop seeds in a seed sample is reported back in one or two days time if "purity only" is requested of seed samples sent to the Seed Testing Laboratory, South Dakota State University, Brookings, S. D., 57006.

Identifications are made free of charge by the Seed Laboratory on all individual seeds sent to it.

Specific crop variety identifications can seldom be made by examination of the seed. Purchasing certified seed insures correct variety identification.

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## Summary and Conclusions

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A total of 450 seed samples of oats, wheat, barley and flax was collected from farmer's drill boxes in 23 eastern South Dakota counties and analyzed for purity and germination. Samples represented nearly 0.5% of the total acreage of these spring grain crops planted in South Dakota in 1969.

About one out of five of all samples had contamination of one or more of the primary noxious weed seeds. Twelve percent of the samples contained quackgrass seed and 6% contained field bindweed seeds.

More than 6,000 acres of crop land were actually planted with these primary noxious weed infested samples. When the total state planted acreage of these four crops is considered, it indicates that almost a million acres of crop land were infested or reinfested with primary noxious weed seeds—more than 300,000 acres of which was with field bindweed.

Seventy-eight percent of the samples contained one or more of the secondary noxious weed seeds, indicating that nearly 4 million acres of cropland were infested or reinfested with secondary noxious weed seeds.

Germination of the samples was excellent. Only six of the 450 germinated less than 80%. Two seed lots used to plant 32 acres did not germinate.

Slightly over half of the seed used was the farmer's own seed and about half of purchased seed was obtained from a neighbor.

Essentially there is no difference between "home cleaned" and "commercially cleaned" seed in noxious and common weed seed content.

It is evident from this survey that in many cases if the seed had been cleaned as claimed, the cleaning job was totally ineffective in removing contamination of other seeds—both noxious and common weeds plus seed of other crops.

Using minimum seed certification standards as a guide for determining planting quality, only 8% of the oats, 19% of the wheat, 10% of the barley and 12% of the flax was of sufficiently high quality to be used for planting purposes.

Yield studies were not made on these samples. Previous yield studies of oats in Pennsylvania and Nebraska both showed a 4 bushel increase in yield in favor of certified seed over uncertified seed.

## A Drillbox Survey

# South Dakota seed quality

by  
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How good is the seed that is planted in South Dakota fields? Is most of it badly contaminated with weed seeds?

Probably the best way to find out is to go to fields as seed is being planted and take samples from drill boxes, bags, trucks, and other containers.

In a 1969 survey, a total of 450 samples of oats, barley, hard red spring wheat, durum wheat, and flax were taken during the spring planting season. These samples were collected in 23 eastern South Dakota counties. Several questions were asked the operator about each seed lot at the time the sample was collected. The samples were analyzed at the Seed Testing Laboratory at South Dakota State University

for percent of pure seed, kind and number per pound of all crop seed, common weed seeds, noxious weed seeds, and germination. A copy of the analysis was sent to the cooperator.

The 450 sample survey represented seed lots actually planted on 39,864 acres. This is about 0.5% of the total acreage planted to these crops in South Dakota in 1969 and should reflect the quality of seed being used in the state.

### RESULTS OF ANALYSES

#### Weed Seeds

Presence of primary and secondary noxious weed seeds plus almost universal occurrence of common weed seeds in the samples planted in eastern South Dakota was both revealing and shocking.

Table 1. Number of drill box survey samples containing primary noxious weed seeds.

|                         | Oats | Spring<br>Wheat | Durum | Flax | Barley | Total |
|-------------------------|------|-----------------|-------|------|--------|-------|
| Number of Samples ..... | 252  | 109             | 27    | 33   | 29     | 450   |
| Primary Noxious Weeds   |      |                 |       |      |        |       |
| Field Bindweed .....    | 22   | 2               | 0     | 0    | 4      | 28    |
| Canada Thistle .....    | 1    | 1               | 0     | 1    | 0      | 3     |
| Leafy Spurge .....      | 1    | 0               | 0     | 0    | 0      | 1     |
| Quackgrass .....        | 34   | 15              | 3     | 2    | 0      | 54    |



Table 3. Number of drill box survey samples containing secondary noxious weed seeds.

|                         | Oats | Spring<br>Wheat | Durum | Flax | Barley | Total |
|-------------------------|------|-----------------|-------|------|--------|-------|
| Number of Samples ..... | 252  | 109             | 27    | 33   | 29     | 450   |
| Secondary Noxious Weeds |      |                 |       |      |        |       |
| Wild Oats .....         | 112  | 38              | 15    | 4    | 14     | 183   |
| Wild Mustard .....      | 90   | 30              | 6     | 9    | 10     | 145   |
| Pennycress .....        | 7    | 12              | 0     | 0    | 1      | 20    |
| Hedge Bindweed .....    | 3    | 0               | 0     | 0    | 0      | 3     |

Almost one out of five (20%) of all seed lots planted were contaminated with primary noxious weed seeds (Table 2). Sale of such contaminated seed for planting purposes is prohibited by the South Dakota Weed and Seed Laws; nevertheless, it is being widely planted by farmers.

Nearly a million acres of good South Dakota crop land were planted to seed containing the very troublesome primary noxious weeds in the spring of 1969, according to estimates shown in Table 2. More than 300,000 acres were planted to seed containing the Number 1 noxious weed of South Dakota — field bindweed (creepers or creeping jenny).

Two-fifths (40%) of all the seed planted contained wild oats and one-third contained wild mustard. Nearly 80% of the seed lots contain-

Table 2. Acres planted to spring grain seed infested with primary noxious weed seeds.

| Primary<br>Noxious<br>Weeds | Samples<br>contam-<br>inat-<br>ed (%) | Acres<br>actually<br>planted<br>with con-<br>taminat-<br>ed seed | Total<br>estimated<br>acres plant-<br>ed with<br>contaminat-<br>ed seed |
|-----------------------------|---------------------------------------|--|---|
| Field Bindweed              | 6.22                                  | 1442   | 303,971   |
| Canada Thistle              | .67                                   | 251  | 32,742  |
| Leafy Spurge                | .22                                   | 50   | 10,751  |
| Quackgrass                  | 12.00                                 | 4281   | 586,440   |
| Total                       |                                       | 6024   | 933,904   |

ed one or more of the secondary noxious weed seeds.

More than 2 million acres were planted with seed containing wild oats in the spring of 1969, as estimated on a statewide basis (Table 4). One and one-half million acres were planted to seed containing wild mustard. In all, nearly 4 million acres (78%) of the total acreage seeded with the four spring planted grains were infested or reinfested with secondary noxious weed seeds.

Table 4. Acres planted to spring grain seed infested with secondary noxious weed seeds.

| Secondary<br>Noxious<br>Weeds | Samples<br>contaminated (%) | Acres actually<br>planted with<br>contaminated seed | Total<br>estimated acres<br>planted with<br>contaminated seed |
|-------------------------------|-----------------------------|---|---|
| Wild Oats .....               | 40.67                       | 20,010  | 2,087,542   |
| Wild Mustard .....            | 32.22                       | 13,550  | 1,574,591   |
| Pennycress .....              | 4.44                        | 866   | 216,982   |
| Hedge Bindweed .....          | .67                         | 292   | 32,742  |
| Total .....                   |                             | 34,718  | 3,911,857   |

Table 5. Common weed seeds found in Seed Laboratory tests of spring planted small grains.

|                         | Oats | Spring Wheat | Durum | Flax | Barley | Total | Percent |
|-------------------------|------|--------------|-------|------|--------|-------|---------|
| Number of Samples ..... | 252  | 109          | 27    | 33   | 29     | 450   |         |
| Common Weeds            |      |              |       |      |        |       |         |
| Wild Buckwheat .....    | 198  | 66           | 17    | 11   | 14     | 306   | 68.00   |
| Yellow Foxtail .....    | 74   | 38           | 16    | 22   | 5      | 155   | 34.44   |
| Green Foxtail .....     | 89   | 42           | 7     | 4    | 4      | 146   | 32.44   |
| Lambsquarters .....     | 20   | 12           | 1     | 2    | 1      | 36    | 8.00    |
| Curled Dock .....       | 14   | 1            | 0     | 0    | 0      | 15    | 3.33    |
| Barnyardgrass .....     | 2    | 5            | 2     | 5    | 0      | 14    | 3.11    |
| Lady's Thumb .....      | 2    | 0            | 0     | 2    | 0      | 4     | .89     |
| Wild Rose .....         | 12   | 3            | 0     | 0    | 0      | 15    | 3.33    |
| Japanese Chess .....    | 4    | 1            | 0     | 0    | 0      | 5     | 1.11    |
| Others .....            | 34   | 12           | 3     | 6    | 0      | 55    | 12.22   |

Wild Buckwheat was by far the most common weed seed in spring-planted small grains. Yellow and green foxtail (pigeon grass) were the most common of the grassy weeds.

Broad-leaved weeds are represented (Table 5) by buckwheat, lambsquarter, pigweed, curled dock and all the noxious weeds except quackgrass and wild oats. Broad-leaved weeds require a much different approach for chemical control than do grassy weeds such as quackgrass, wild oats, yellow and green foxtail, and barnyardgrass.

In all the wide array of available weed killing chemicals, no single chemical or group of chemicals can be sprayed on any one of our crops that will control both broad-leaved and grassy weeds.

Planting weed-free seed each

year on a well prepared seed bed is still the only way of growing a spring grain crop with little or no weed competition.

#### GERMINATION

Germination of the seed lots was excellent with only six of the 450 germinating below 80%. One flax and three oat samples germinated between 60% and 70%. Two samples that did not germinate were insect- and rodent-eaten, contained 34.65% and 53.28%, respectively, of inert matter and were used for planting 32 acres. The two farmers using this seed probably unknowingly were only going through the motions and their efforts would be fruitless in raising a crop.

#### ORIGIN OF SAMPLES

Questions about origin of the seed were asked as samples were taken.

Table 6. Weed seed content of farmer-owned seed compared to purchased seed.

|                      | No. |       | Primary noxious |       | Secondary noxious |       | Common weeds |       |
|----------------------|-----|-------|-----------------|-------|-------------------|-------|--------------|-------|
|                      |     |       |                 |       |                   |       |              |       |
|                      | No. | %     | No.             | %     | No.               | %     | No.          | %     |
| Farmers' Seed .....  | 249 | 56.4% | 42              | 16.8% | 151               | 60.6% | 204          | 81.9% |
| Purchased Seed ..... | 193 | 43.6% | 28              | 14.5% | 108               | 55.9% | 150          | 77.7% |

Nearly 60% of the farmers were using their own seed. About half of the purchased seed was obtained from a neighbor. The remainder of the seed was obtained from a commercial concern, usually the local elevator. The farmer's own seed was contaminated with weeds to a greater extent than was purchased seed, but only about 10% of both kinds were actually free of weed seeds.

### CLEANING SEED BEFORE PLANTING

*Farmers who cleaned their own seed or had it cleaned commercially were planting more weed seeds than the farmers who planted uncleaned seed.* This could be expected because farmers having good seed would probably not bother to have it cleaned. Most farmers who bought seed from their neighbors reported it had been cleaned and all farmers buying seed from the local elevator reported that the seed had been cleaned.

It is evident that most farmers buying seed from their neighbors or from the local elevator are not getting the quality of seed they expect. Seed may or may not have been cleaned, but if it was cleaned, apparently it was done improperly.

### SEED QUALITY FACTORS

Actual planting quality of any seed lot is dependent upon five factors:

- (1) pure seed percent
- (2) germination percent
- (3) free from noxious weed seeds
- (4) absence or very low rates of other crop seeds
- (5) absence of common weed seeds.

Minimum seed quality standards for certified seed have long been regarded throughout the United States as acceptable. Any tested seed lot can be compared with the certification quality standard and its value for planting purposes quickly determined.

Table 8. Minimum seed certification standards for oats and number and percent of samples not meeting all specific standards.

|   | Minimum seed certification standards | Number and percent of samples NOT meeting the standard |       |
|---|--------------------------------------|--|-------|
| Oats (252)                                  |                                      |  |       |
| Pure seed .....                             | 98%                                  | 14   | 5.5%  |
| Other crop seed ..                          | 5/lb.                                | 77   | 30.6% |
| Germination .....                           | 85%                                  | 8  | 3.1%  |
| Common weeds ....                           | .1%                                  | 75   | 29.8% |
| Noxious weeds ....                          | None                                 | 172  | 68.2% |
| Samples that completely met standards ..... |                                      | 21   | 8.3%  |

The specific seed certification standards for wheat, barley and flax are similar to those of oats and are grouped together in Table 9.

Table 7. Weed seed content of "not cleaned," "home cleaned," and "commercially cleaned" seed.

|                                  | Primary noxious |       | Secondary noxious |       | Common weed |       | No weed seed |       |
|----------------------------------|-----------------|-------|-------------------|-------|-------------|-------|--------------|-------|
|                                  | No.             | %     | No.               | %     | No.         | %     | No.          | %     |
| Not Cleaned (72) .....           | 10              | 13.9% | 38                | 52.8% | 59          | 82.0% | 4            | 5.5%  |
| Home Cleaned (82) .....          | 9               | 11.0% | 43                | 52.4% | 59          | 72.0% | 8            | 9.8%  |
| Commercially Cleaned (296) ..... | 52              | 17.6% | 178               | 60.1% | 230         | 77.7% | 31           | 10.5% |



Only 8.3% of the oats samples, 19.0% of the wheat samples, 10.3% of the barley samples and 12.1% of the flax samples were of a sufficiently high quality to meet certification standards.

Over half of the oats and barley and about half of the wheat would have been rejected because of noxious weed seeds if certification standards had been followed. Over 30% of the oats, 48% of the wheat and 80% of the barley samples would have been rejected because of excessive other-crop seeds.

In spite of the high contamination of weed seeds and other crop seeds, 94.5% of the oats, 96.4% of the wheat, 82.2% of the barley and 100% of the flax met the pure seed percentage minimum standard. This indicates that cleaning plants did a good job of removing inert matter but a very poor job of removing seeds of other crops as well as seeds of both common and noxious weeds.

A better and more thorough job of cleaning seed is needed in South Dakota.

#### YIELD STUDIES OF DRILL BOX SAMPLES

Lack of time and funds precluded obtaining yield data from the samples collected in this survey. However, related information is available from two states that have made such studies with oats.

Table 9. Number and percent of wheat, barley, and flax samples NOT meeting specific certification standards.

|  | Wheat (136) |       | Barley (29) |       | Flax (33) |       |
|--|-------------|-------|-------------|-------|-----------|-------|
|  | No.         | %     | No.         | %     | No.       | %     |
| Pure seed .....                            | 5           | 3.6%  | 4           | 13.8% | 0         | 0.0%  |
| Other crop seed .....                      | 66          | 48.5% | 23          | 79.3% | 4         | 12.1% |
| Germination .....                          | 2           | 1.5%  | 1           | 3.4%  | 1         | 3.0%  |
| Common weeds .....                         | 28          | 20.6% | 6           | 20.7% | 29        | 87.8% |
| Noxious weeds .....                        | 63          | 46.3% | 21          | 72.4% | 10        | 30.3% |
| Samples completely meeting standards ..... | 26          | 19.0% | 3           | 10.3% | 4         | 12.1% |

#### Pennsylvania study:

In 1961 the Pennsylvania Agricultural Experiment Station reported on a drill box survey. Oat samples had been divided into two groups: certified and non-certified. Each of these groups were further divided into three type classifications: (1) late tall—Garry, Rodney; (2) medium—Clinton, Clintland; (3) all varieties. The yield results of the study are in Table 10.

Table 10. Comparative yields, Pennsylvania drill box survey 1961.

|                                    | Garry-<br>Rodney<br>types | Clinton-<br>Clint-<br>land<br>types | All<br>Varieties |
|------------------------------------|---------------------------|-------------------------------------|------------------|
| Drill Box Survey                   |                           |                                     |                  |
| Trials, 1961                       |                           |                                     |                  |
| All oat samples ....               | 70.5                      | 60.9                                | 66.0             |
| All non-certified<br>samples ..... | 69.5                      | 60.3                                | 66.0             |
| All certified<br>samples .....     | 74.6                      | 63.2                                | 71.1             |

Oat seed of certified seed quality yielded about 4 bushels more per acre than uncertified seed. This was true of all oat types even when varietal differences were disregarded.

#### Nebraska study:

A drill box survey of oats made in northeastern Nebraska was reported in 1959. The samples were separated into two groups: certified

seed of recommended varieties and common oats.

All farmers' oat samples collected were planted in a replicated test on the northeast Nebraska Experimental Farm at Concord. Yields were obtained on each sample. A summary of the results by the Nebraska Certified Seed News is shown below:

|   | Bushels per acre |      |
|---|------------------|------|
|   | 1957             | 1958 |
| Average yield of common seed .....                          | 33.5             | 56.3 |
| Average yield of certified seed recommended varieties ..... | 40.3             | 60.4 |

The increase in yield of the certified seed was 6.8 bushels per acre in 1957, an increase of 20%. In 1958 the increase was 4.1 bushels per acre (7.5%).

In both states yield advantage of about 4 bushels per acre were obtained in favor of certified oat seed when it and uncertified oat seed were planted in adjacent plots.

Three important advantages are gained in planting certified seed:

- (1) generally it is a recommended adapted variety,
- (2) seed is genetically pure and the desired variety is being planted,
- (3) seed is free of other seeds (crops, common and noxious weeds).

The important advantage is that yields will not be reduced from competition by unwanted plants growing in the field.

