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## EC67-833 Methods of Growing Corn and Grain Sorghum in Nebraska 1964

Herman Delvo

Darwin Ransom

Delbert Lane

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EC 67-833

# METHODS OF GROWING CORN AND GRAIN SORGHUM IN NEBRASKA 1964" \*



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The questionnaire was assembled from questions submitted by E. A. Olson and Delbert Lane of Agricultural Engineering, Dale Flowerday and John Furrer of Agronomy, Robert Roselle of Entomology, and Glenn Vollmar and Larry Bitney of Agricultural Economics. The data were analyzed by Darwin Ransom, State Division of Agricultural Statistics and Herman Delvo, Economics Research Service, USDA.

Arlen Lutz  
State Leader, Programs & Reports

A. V. Nordquist  
State Statistician

# METHODS of GROWING CORN and GRAIN SORGHUM in NEBRASKA

Herman Delvo, Darwin Ransom, and Delbert Lane 1/

## INTRODUCTION

Corn and sorghum are battling each other for the farmer's land, labor and capital.

Corn used to be more profitable to grow than sorghum. However, resistance of corn rootworm to certain chemicals, and development of new hybrid sorghums, changed the picture.

Also, in 1965 the feed grain program was amended to allow these crops to substitute for each other within the feed grain base. So--the farmer is faced with the problem of deciding which crop or what combination of the two crops to produce.

One of his top decisions involves machines used to produce these crops.

The purpose of this study is to give information on the kind and number of operations involved in growing corn and sorghum.

Corn and sorghum are the two most important row crops grown in Nebraska. In 1964, 4,533,000 acres of corn and 2,400,000 acres of sorghum were planted.2/ The distribution of these acreages is shown by Crop Reporting District in Figure 1.

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1/ Agricultural Economist, Farm Production Economics Division, Economic Research Service, U. S. Department of Agriculture, stationed at the University of Nebraska; Agricultural Statistician, State-Federal Division of Agricultural Statistics, Lincoln, Nebraska, and Assistant Professor of Agricultural Engineering, University of Nebraska, respectively.

2/ Nebraska Agricultural Statistics Annual Report 1964, State-Federal Division of Agricultural Statistics, Lincoln, Nebraska, 1966.

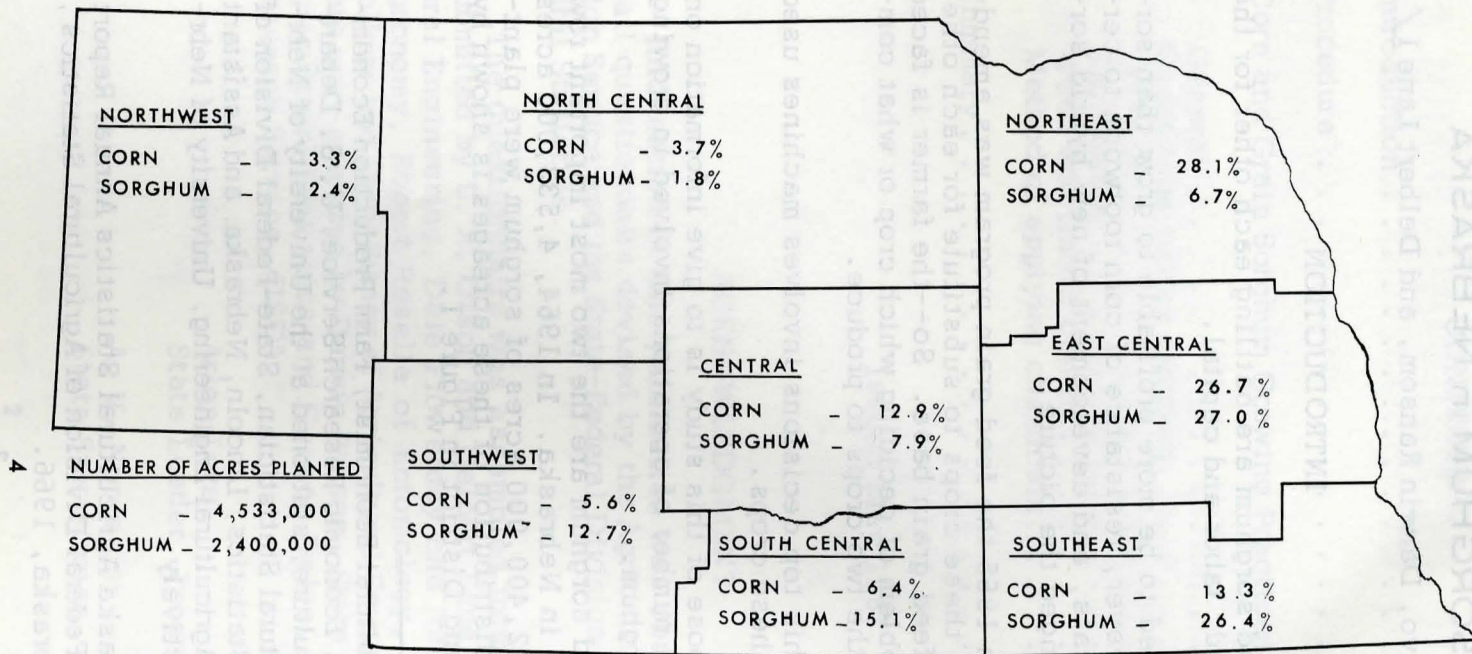


Figure 1. Distribution of Acres Planted to Corn and Sorghum in Nebraska, by Crop Reporting Districts, 1967.

SOURCE: Nebraska Agricultural Statistics Annual Report 1964, State-Federal Division of Agricultural Statistics, Lincoln, Nebraska, 1966.

Most of the corn and sorghum is grown in the eastern part of the state. The northeast and east central had about 55 percent of the corn acreage, the east central and southeast about 53 percent of the sorghum acreage planted in 1964.

Physical and economic conditions are continually changing, therefore data in this report are intended as a "bench mark" for analyzing changes over time and to help in decision-making.

## PROCEDURE

Data were collected, by mail questionnaire, from about 4,200 farmers. The number of farmers and the acreage of corn and grain sorghum reported in the survey are shown by Crop Reporting District in Figure 2.

The survey represents 5.5 percent of the total corn acreage and 5.8 percent of the sorghum acreage planted in 1964. For corn and sorghum the percentage response was fairly uniform throughout the State.

Questionnaires were summarized for each Crop Reporting District and totaled for the State. In interpreting the following tables remember:

1. The percentages are based on the number of acres reported in the survey, except for methods of applying chemicals, which are based on the number of acres treated with chemicals.
2. The data are for the 1964 crop year.
3. The data represent general practices used on a combination of irrigated and dryland acreage. The questionnaire did not provide for separate questions on irrigated acreage.

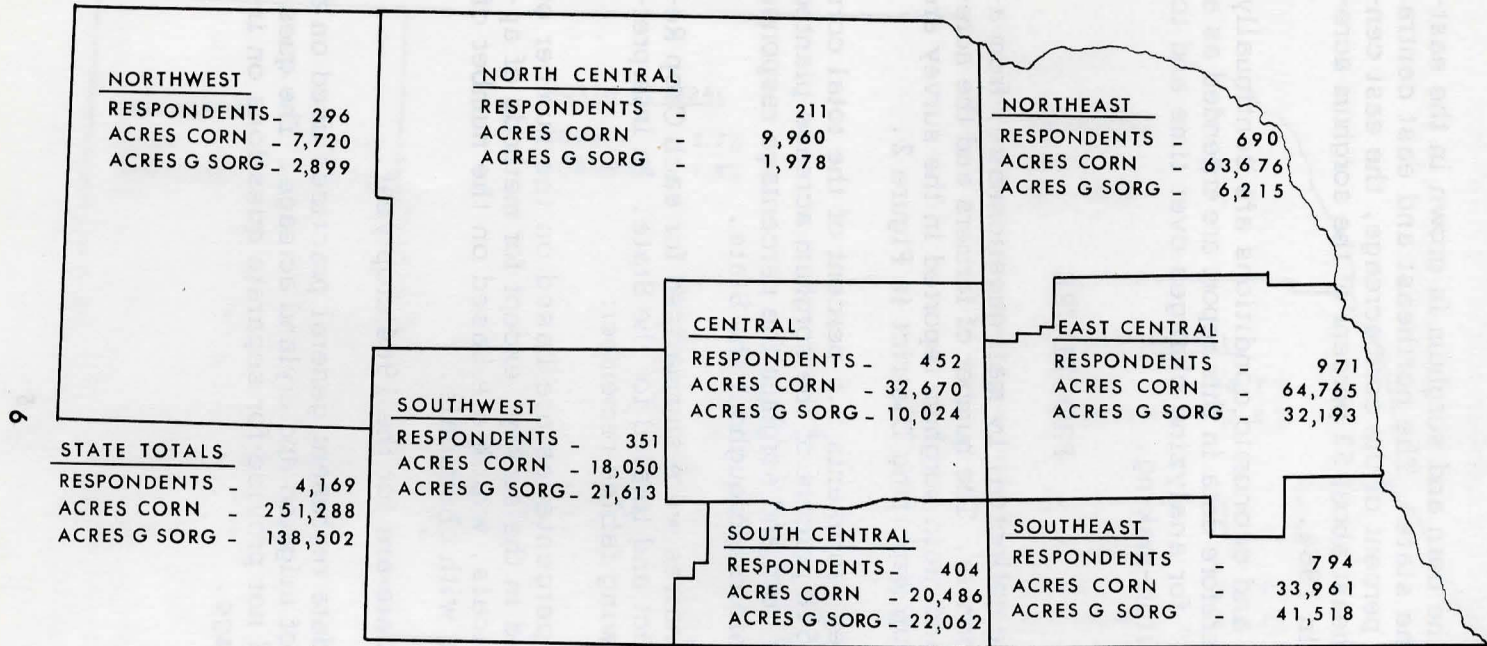


Figure 2. Number of Respondents and Planted Acreage of Corn and Grain Sorghum Reported in the Survey, by Crop Reporting Districts, 1964.

# CORN AND GRAIN SORGHUM GROWING PRACTICES

## General

Corn and grain sorghum are frequently considered interchangeable crops. The same equipment can be used for both.

However, the number of operations and the time at which they are performed may differ considerably.

Selected data, on a State basis, are shown in Table 1. Data show that more of the land planted to corn is plowed than for grain sorghum. Most plowing for both is done in the spring.

Corn is generally cultivated three times, grain sorghum twice. The 55 percent of corn acreage treated with insecticides is mainly for corn rootworm control.

A breakdown of preplant operations is shown in Table 2. Not all farmers performed each operation, and the number of times varied. Therefore, data cannot be interpreted as a percentage of the acreage treated with a particular operation. The percentage of the acreage treated with each operation is shown in Tables 3 and 4.

On a State basis slightly more preplant operations were made for corn than for grain sorghum. The averages were 3.2 and 2.8, respectively.

The difference is less in most Crop Reporting Districts and the difference at the State level is because more corn acreage was grown in the northeast where the average number of operations was the highest.

Of the preplant operations, double disking was used most. Newer, heavier disks are replacing plowing and single disking. The farmer can cover more acres and cut costs per acre.

However, in the northeast, which has most preplant operations for both crops, the common practice is plowing, harrowing and disking. Harrowing accounted for nearly 40 percent of preplant operations.



Table 1. Selected data on methods of growing corn and grain sorghum, based on a percent of total acreage planted in Nebraska, 1964.

Growing practices	Corn %	Grain sorghum %
Preplant operations:		
Plowing - Fall	10	11
Plowing - Spring	40	25
Disking - Single (one or more times)	23	17
Disking - Double (one or more times)	63	71
Harrowed - (one or more times)	54	44
Other preplant operations	18	9
Planting		
Lister planter	61	66
Surface or check row planter	37	26
Grain drill	--	6
Till-plant machine	2	2
Cultivation		
None	1	3
One	2	7
Two	32	52
Three	55	35
Four or more	10	3
Chemical weed and insect control		
Herbicide - preemergence	11	7
Herbicide - postemergence	14	30
Insecticide	56	4

Table 2. Average number of preplanting operations for corn and grain sorghum in Nebraska, by crop reporting districts, 1964.

Operation	Crop	Crop Reporting Districts								State
		NW	NC	NE	CEN	EC	SW	SC	SE	
(Average Number)										
Plowing	Corn	0.64	0.48	0.80	0.37	0.43	0.30	0.20	0.47	0.50
	Grain sorghum	.63	.51	.80	.55	.32	.35	.28	.29	.36
Single disking	Corn	.13	.59	.71	.41	.45	.31	.22	.33	.46
	Grain sorghum	.10	.55	.79	.48	.33	.24	.41	.41	.37
Double disking	Corn	1.07	.74	.63	1.32	1.34	1.18	1.78	1.42	1.16
	Grain sorghum	.72	.86	.92	1.16	1.54	1.04	1.35	1.53	1.36
Harrowing	Corn	.69	.66	1.48	.82	.87	.30	.65	.58	.90
	Grain sorghum	.79	.68	1.33	1.07	.76	.20	.53	.59	.64
Other	Corn	.21	.06	.06	.23	.21	.20	.32	.21	.18
	Grain sorghum	<u>.25</u>	<u>.11</u>	<u>.04</u>	<u>.12</u>	<u>.10</u>	<u>.16</u>	<u>.16</u>	<u>.09</u>	<u>.12</u>
Total	Corn	2.74	2.53	3.68	3.15	3.30	2.29	3.17	3.01	3.20
	Grain sorghum	2.49	2.71	3.88	3.38	3.05	1.99	2.73	2.91	2.85

Table 3. Percent of corn acreage treated with various pre-planting operations in Nebraska, by crop reporting districts, 1964.

Field Operation	Crop Reporting Districts							State	
	NW	NC	NE	CEN	EC	SW	SC		SE
	(Percentage)								
Fall plowed	7	11	12	8	12	3	4	15	10
Spring plowed	57	37	68	29	31	27	16	32	40
Single disked									
Once	5	15	14	4	3	16	4	2	7
Twice	4	17	19	10	9	6	4	7	11
Three times	-	2	5	3	4	1	2	3	3
Four or more times	-	$\frac{1}{35}$	$\frac{1}{39}$	$\frac{2}{19}$	$\frac{3}{19}$	-	$\frac{1}{11}$	$\frac{2}{14}$	$\frac{2}{23}$
Total	$\frac{9}{9}$	$\frac{35}{35}$	$\frac{39}{39}$	$\frac{19}{19}$	$\frac{19}{19}$	$\frac{23}{23}$	$\frac{11}{11}$	$\frac{14}{14}$	$\frac{23}{23}$
Double disked									
Once	21	30	21	22	17	22	13	17	19
Twice	33	22	18	44	41	33	55	47	36
Three times	4	-	2	6	9	6	17	9	7
Four or more times	$\frac{2}{60}$	-	-	$\frac{1}{73}$	$\frac{2}{69}$	$\frac{3}{64}$	$\frac{1}{86}$	$\frac{1}{74}$	$\frac{1}{63}$
Total	$\frac{60}{60}$	$\frac{52}{52}$	$\frac{41}{41}$	$\frac{73}{73}$	$\frac{69}{69}$	$\frac{64}{64}$	$\frac{86}{86}$	$\frac{74}{74}$	$\frac{63}{63}$
Harrowed									
Once	28	20	22	31	36	14	27	31	28
Twice	12	11	29	19	16	8	16	10	18
Three times	3	8	16	3	5	-	2	1	6
Four or more times	$\frac{2}{45}$	-	$\frac{5}{72}$	$\frac{1}{54}$	$\frac{1}{58}$	-	-	$\frac{1}{43}$	$\frac{2}{54}$
Total	$\frac{45}{45}$	$\frac{39}{39}$	$\frac{72}{72}$	$\frac{54}{54}$	$\frac{58}{58}$	$\frac{22}{22}$	$\frac{45}{45}$	$\frac{43}{43}$	$\frac{54}{54}$
Other tillage machines	9	1	2	9	5	5	7	4	5
Separate operation to apply fertilizer	-	5	1	4	6	3	12	8	5
Cutting or shredding stalks	1	-	3	10	10	11	13	9	8
Leveling, floating or planning	11	-	-	-	-	1	-	-	-

Table 4. Percent of grain sorghum acreage treated with various pre-planting operations in Nebraska, by crop reporting districts, 1964.

Field operation	Crop Reporting Districts								State
	NW	NC	NE	CEN	EC	SW	SC	SE	
	(Percentage)								
Fall plowed	7	5	13	14	12	4	12	12	11
Spring plowed	56	46	67	41	20	31	16	17	25
Single disked									
Once	5	4	8	3	2	9	5	1	4
Twice	1	21	20	13	7	6	10	8	8
Three times	1	3	5	1	3	1	4	4	3
Four or more times	-	-	4	4	2	-	1	3	2
Total	<u>7</u>	<u>28</u>	<u>37</u>	<u>21</u>	<u>14</u>	<u>16</u>	<u>20</u>	<u>16</u>	<u>17</u>
Double disked									
Once	26	43	23	29	13	30	14	13	18
Twice	23	17	28	34	49	31	45	47	42
Three times	-	3	3	5	13	4	9	14	10
Four or more times	-	-	1	1	1	-	1	1	1
Total	<u>49</u>	<u>63</u>	<u>55</u>	<u>69</u>	<u>76</u>	<u>65</u>	<u>69</u>	<u>75</u>	<u>71</u>
Harrowed									
Once	23	26	31	27	39	12	32	29	29
Twice	16	21	27	25	10	4	9	10	11
Three times	8	-	12	6	3	-	1	2	3
Four or more times	-	-	3	3	2	-	-	1	1
Total	<u>47</u>	<u>47</u>	<u>73</u>	<u>61</u>	<u>54</u>	<u>16</u>	<u>42</u>	<u>42</u>	<u>44</u>
Rod Weeder	8	-	-	5	-	7	1	-	2
Duckfoot	9	1	-	-	-	2	3	1	1
Other tillage machines	6	2	3	2	1	5	4	-	2
Separate operation to apply fertilizer	-	8	1	1	6	2	6	6	5
Cutting or shredding stalks	-	-	-	4	3	-	2	2	2
Leveling, floating or planing	2	-	-	-	-	-	-	-	-

## Operations Before Planting

The usual ways to prepare the seedbed before planting corn and grain sorghum are plowing, disking and harrowing, shown in Tables 3 and 4.

These data show the percentage of acreage which received a particular operation. They do not show the sequence in which operations were performed.

Tables 3 and 4 indicate that differences in the percentage of acreage treated with various field operations for corn and grain sorghum within each Crop Reporting District are generally small. Exceptions are for plowing in central, east central, and southeast districts and double disking in south central and three northern districts.

However, when comparing data between Crop Reporting Districts it is evident that different methods are used in various parts of the State.

In the northern half of the State, from about 50 to 80 percent of the land is plowed. In the rest of the State the amount plowed varied from about 20 to 55 percent.

Generally, spring plowing is practiced with the amount fall plowed being somewhat dependent on the length of the fall.

Double disking was more common than single disking for both corn and grain sorghum in all Crop Reporting Districts. With either implement the land was generally worked twice.

The single disk was used on about 30 to 40 percent of the acreage planted to both crops in the north central and northeast districts while in the rest of the State the percentage was generally less than 20 percent.

In the central, east central and three southern districts about 65 to 85 percent of corn and grain sorghum acreage was double disked. In the north central and northeast substantially more grain sorghum is double disked than corn acreage, while in the northwest and south central the reverse is true.

Harrowing is done on about half of the acreage, 54 percent for corn and 44 percent for grain sorghum, mainly to smooth the seedbed and kill small weeds. The largest acreage harrowed, nearly three-fourths, was in the northeast which also had the largest amount of plowing.

Other tillage implements, of some significance, were the rod weeder in the northwest and southwest and the duckfoot cultivator in the northwest.

Cutting or shredding of stalks was used more on corn than grain sorghum. Stalks were shredded on about 10 percent of the acreage planted to corn in the central, east central and three southern districts. Stalks were cut or shredded on only about 2 percent of the acreage planted to grain sorghum.

Leveling; floating or planning for irrigation was practiced in the northwest district where it was used on 11 percent of corn acreage and two percent of grain sorghum acreage. This is done to better use irrigation water.

Use of fertilizer before planting was of greatest importance in the south central district where it was used on 12 percent of corn acreage. In other districts, for both corn and grain sorghum, the acreage treated was less than 8 percent.

### Planting

The lister planter was used most for planting corn and grain sorghum, as shown in Tables 5 and 6. However, in the northwest and northeast about 60 percent of corn was planted with a surface or check row planter. In the northwest, this implement is popular with growers of irrigated corn.

The surface planter is used in the northeast because soil temperature is low at planting time and seed has to be placed close to the surface for germination. Also, there is generally adequate surface moisture, and wind erosion is less of a problem in this area.

Table 6 shows that 45 percent of grain sorghum was planted with the grain drill in the northwest. Grain sorghum is a minor crop <sup>3/</sup> in this area and most of it is grown on dry land. Rather than invest in additional equipment farmers use a grain drill.

Till-planting is a relatively new practice and consists of tillage and planting in a single operation. This method was used on about 2 percent of the acreage. Usually no other tillage operation is performed, except possibly shredding of stalks.

### Cultivation

Data on the number of cultivations, Tables 7 and 8, show there is a big difference between practices used for corn and grain sorghum. About 50 percent of corn was cultivated three times, and about 30 percent of grain sorghum was cultivated three times. Two cultivations were common with grain sorghum.

In the northwest where 45 percent of grain sorghum was planted with the grain drill, about 26 percent of the acreage was not cultivated.

The most popular machine was the cultivator, including shovel, disk and duckfoot types. However, when several cultivations were made the rotary hoe or harrow was frequently used for at least one operation.

### Weed and Insect Control

Preemergence weed control was practiced on 11 percent of corn acreage and 7 percent of grain sorghum acreage, as shown in Tables 9 and 10. Postemergence weed control was more prevalent for grain sorghum with about 30 percent of the acreage treated. Preemergence chemicals other than 2,4-D were first recommended for corn in Nebraska in 1961, for grain sorghum in 1963. Atrazine was the most common herbicide used for preemergence weed control while 2,4-D was generally used for post-emergence control.

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<sup>3/</sup> Winter wheat is the most important crop in this area.

Table 5. Percent of corn acreage planted by different methods in Nebraska, by crop reporting districts, 1964.

Planting method	Crop Reporting Districts								State
	NW	NC	NE	CEN	EC	SW	SC	SE	
	(Percentage)								
Surface or check row planter	61	27	60	33	25	19	29	30	37
Lister planter	34	73	39	65	72	80	71	69	61
Till-plant machine	5	-	1	2	3	1	-	1	2
Total	100	100	100	100	100	100	100	100	100



Table 6. Percent of grain sorghum acreage planted by different methods in Nebraska, by crop reporting districts, 1964.

Planting method	Crop Reporting Districts								State
	NW	NC	NE	CEN	EC	SW	SC	SE	
	(Percentage)								
Surface or check row planter	39	32	70	39	28	18	19	23	26
Lister planter	15	63	28	46	68	68	71	74	66
Till-plant machine	1	-	1	1	3	1	1	2	2
Grain drill	45	5	1	14	1	13	9	1	6
Total	100	100	100	100	100	100	100	100	100

Table 7. Percent of corn acreage cultivated using different cultivating methods in Nebraska, by crop reporting districts, 1964.

Cultivating methods	Crop Reporting Districts							State	
	NW	NC	NE	CEN	EC	SW	SC		SE
No cultivation	-	-	1	-	-	-	-	1	1
One cultivation									
Cultivator <sup>a</sup>	3	-	1	1	2	1	1	2	1
Other & non-specified	$\frac{4}{7}$	$\frac{-}{-}$	$\frac{-}{1}$	$\frac{-}{1}$	$\frac{1}{3}$	$\frac{1}{2}$	$\frac{-}{1}$	$\frac{2}{4}$	$\frac{1}{2}$
Total									
Two cultivations									
Cultivator <sup>a</sup>	17	9	19	11	17	43	16	20	18
Rotary hoe & cultivator	8	1	3	2	3	1	1	5	3
Other & non-specified	$\frac{14}{39}$	$\frac{11}{21}$	$\frac{10}{32}$	$\frac{9}{22}$	$\frac{11}{31}$	$\frac{17}{61}$	$\frac{6}{23}$	$\frac{11}{36}$	$\frac{11}{32}$
Total									
Three cultivations									
Cultivator <sup>a</sup>	10	35	24	33	29	11	36	23	26
Rotary hoe & cultivator	12	9	17	6	10	4	7	11	11
Harrow & cultivator	3	8	1	2	2	1	-	1	2
Other & non-specified	$\frac{18}{43}$	$\frac{13}{65}$	$\frac{14}{56}$	$\frac{17}{58}$	$\frac{16}{57}$	$\frac{14}{30}$	$\frac{27}{70}$	$\frac{19}{54}$	$\frac{16}{55}$
Total									
Four or more cultivations									
Cultivator <sup>a</sup>	1	5	1	3	3	-	2	2	2
Rotary hoe & cultivator	6	3	7	6	2	5	2	2	4
Other & non-specified	$\frac{4}{11}$	$\frac{6}{14}$	$\frac{2}{10}$	$\frac{10}{19}$	$\frac{4}{9}$	$\frac{2}{7}$	$\frac{2}{6}$	$\frac{1}{5}$	$\frac{4}{10}$
Total									

<sup>a</sup>Includes shovel, disk and duckfoot types.

Table 8. Percent of grain sorghum acreage cultivated using different cultivating methods in Nebraska, by crop reporting districts, 1964.

Cultivating methods	Crop Reporting Districts								State
	NW	NC	NE	CEN	EC	SW	SC	SE	
	(Percentage)								
No cultivation	26	5	6	3	1	2	1	2	3
One cultivation									
Cultivator <sup>a</sup>	9	4	3	3	3	3	3	3	3
Other & non-specified	9	3	4	4	3	8	3	3	4
Total	<u>18</u>	<u>7</u>	<u>7</u>	<u>7</u>	<u>6</u>	<u>11</u>	<u>6</u>	<u>6</u>	<u>7</u>
Two cultivations									
Cultivator <sup>a</sup>	7	8	24	22	21	37	34	32	29
Rotary hoe	8	-	1	1	1	2	2	-	1
Rotary hoe & cultivator	14	3	5	3	3	5	6	5	5
Harrow & cultivator	-	2	-	-	1	-	-	2	1
Other & non-specified	12	6	11	14	17	24	19	15	16
Total	<u>41</u>	<u>19</u>	<u>41</u>	<u>40</u>	<u>43</u>	<u>68</u>	<u>61</u>	<u>54</u>	<u>52</u>
Three cultivations									
Cultivator <sup>a</sup>	2	40	12	14	22	3	12	14	14
Rotary hoe & cultivator	9	11	22	19	6	5	3	6	7
Harrow & cultivator	-	3	2	3	2	3	1	2	2
Other & non-specified	3	12	4	8	18	6	12	14	12
Total	<u>14</u>	<u>66</u>	<u>40</u>	<u>44</u>	<u>48</u>	<u>17</u>	<u>28</u>	<u>36</u>	<u>35</u>
Four or more cultivations									
Cultivator <sup>a</sup>	-	-	1	1	-	-	1	1	-
Rotary hoe & cultivator	-	3	5	3	1	2	2	1	2
Other & non-specified	<u>1</u>	<u>-</u>	<u>-</u>	<u>2</u>	<u>1</u>	<u>-</u>	<u>1</u>	<u>-</u>	<u>1</u>
Total	<u>1</u>	<u>3</u>	<u>6</u>	<u>6</u>	<u>2</u>	<u>2</u>	<u>4</u>	<u>2</u>	<u>3</u>

<sup>a</sup>Includes shovel, disk and duckfoot types.

About 55 percent of corn acreage was treated for insect control, mainly corn rootworm. Organic phosphates such as thimet, diazinon, and niran were used on about 40 percent of the acreage. Corn rootworm has developed resistance to chlorinated hydrocarbons. However, chlorinated hydrocarbons such as DDT, aldrin, dieldrin, heptachlor and toxaphene were used to control European corn borer and other corn insects on about 4 percent of the acreage.

About 4 percent of grain sorghum acreage was treated for insect control. There are now no serious insect pests of grain sorghum.

Table 9. Percent of corn acreage treated with chemicals for the control of weeds and insects in Nebraska, by crop reporting districts, 1964.

Chemical control	Crop Reporting Districts								State
	NW	NC	NE	CEN	EC	SW	SC	SE	
	(Percentage)								
Preemerg weed control									
Atrazine	3	4	3	8	8	1	3	13	6
2,4-D	-	-	1	-	3	2	-	1	1
Other & non-specified	<u>5</u>	<u>2</u>	<u>4</u>	<u>3</u>	<u>4</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>4</u>
Total	8	6	8	11	15	5	6	18	11
Postemerg weed control									
2,4-D	18	12	13	5	11	11	8	12	11
Atrazine	-	-	1	2	1	-	1	1	1
Other & non-specified	<u>4</u>	<u>6</u>	<u>2</u>	<u>1</u>	<u>2</u>	<u>1</u>	<u>-</u>	<u>2</u>	<u>2</u>
Total	22	18	16	8	14	12	9	15	14
Insect control									
Organic phosphate	4	15	34	42	51	18	46	52	40
Chlorinated hydrocarbon	5	6	6	3	3	6	4	5	4
Comb of organic phos & chlor hydrocarbon	-	1	4	1	1	-	-	-	2
Other & non-specified	<u>12</u>	<u>2</u>	<u>11</u>	<u>12</u>	<u>10</u>	<u>10</u>	<u>8</u>	<u>11</u>	<u>10</u>
Total	21	24	55	58	65	34	58	68	56

Table 10. Percent of grain sorghum acreage treated with chemicals for the control of weeds and insects in Nebraska, by crop reporting districts, 1964.

Chemical control	Crop Reporting Districts							State	
	NW	NC	NE	CEN	EC	SW	SC		SE
	(Percentage)								
Preemergence weed control									
Atrazine	4	-	4	3	5	-	1	4	3
2,4-D	-	2	-	1	1	1	1	1	1
Other & nonspecified	$\frac{1}{5}$	$\frac{1}{3}$	$\frac{1}{5}$	$\frac{4}{8}$	$\frac{3}{9}$	$\frac{2}{3}$	$\frac{2}{4}$	$\frac{3}{8}$	$\frac{3}{7}$
Total									
Postemergence weed control									
2,4-D	14	18	17	17	25	21	12	24	21
Atrazine	1	1	5	2	1	-	-	2	1
Other & nonspecified	$\frac{11}{26}$	$\frac{2}{21}$	$\frac{3}{25}$	$\frac{7}{26}$	$\frac{9}{35}$	$\frac{6}{27}$	$\frac{3}{15}$	$\frac{10}{36}$	$\frac{8}{30}$
Total									
Insect control									
Organic phosphate	-	-	-	1	2	1	1	1	1
Chlorinated hydrocarbon	-	4	3	1	1	-	1	4	2
Other & nonspecified	$\frac{-}{-}$	$\frac{3}{7}$	$\frac{-}{3}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{6}$	$\frac{1}{4}$
Total									

### Method of Applying Chemicals

Generally, herbicides and insecticides were placed above the soil surface, as shown in Tables 11 and 12. This shows that in addition to postemergence chemicals a large amount of preemergence chemicals were also sprayed on the surface and had to be incorporated into the soil by rain or mechanical means.

Data do not show whether chemicals were applied in conjunction with some other field operation or as a separate operation. The 38 percent of the chemicals placed below the soil surface on corn were probably for corn rootworm control.

Table 11. Percent of corn growers using various methods of applying chemicals for the control of weeds and insects in Nebraska, by crop reporting districts, 1964.

Type of application	Crop Reporting Districts									State
	NW	NC	NE	CEN	EC	SW	SC	SE		
	(Percentage)									
All or part placed below the soil surface	13	23	35	38	43	40	37	41	38	
None placed below the soil surface	73	66	54	54	48	50	56	52	53	
Not specified	<u>14</u>	<u>11</u>	<u>11</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>7</u>	<u>7</u>	<u>9</u>	
Total	100	100	100	100	100	100	100	100	100	

Table 12. Percent of grain sorghum growers using various methods of applying chemicals for the control of weeds and insects in Nebraska, by crop reporting districts, 1964.

Type of application	Crop Reporting Districts									State
	NW	NC	NE	CEN	EC	SW	SC	SE		
	(Percentage)									
All or part placed below the soil surface	-	8	4	10	8	4	6	8	7	
None placed below the soil surface	88	61	78	74	74	74	76	73	74	
Not specified	<u>12</u>	<u>31</u>	<u>18</u>	<u>16</u>	<u>18</u>	<u>22</u>	<u>18</u>	<u>19</u>	<u>19</u>	
Total	100	100	100	100	100	100	100	100	100	

## SUMMARY

Many practices still being used, in some areas, are not needed. Tillage operations, such as plowing and disking, are not needed unless a mechanical operation is required to allow air and water intake into the soil. (See EC 61-714 - Nebraska Till-Plant System).

The disk is often used for stalk cutting but this is not necessary if the lister is used for planting.

Harrowing and disking may be used to work down plowing but should not be used unless the soil becomes dense and loses its structure.

Cultivating row crops, for other than weed control or to break up surface crust, serves no useful purpose. However, mechanical incorporation of herbicides and insecticides into the soil improves their effectiveness.

Cut out those unnecessary operations and you can save labor and equipment and cut costs, besides helping the soil.

### Method of Applying Chemicals

Generally, herbicides and insecticides were placed above the soil surface, as shown in Tables 11 and 12. This shows that in addition to post-emergent chemicals a large amount of pre-emergent chemicals were also sprayed on the surface and had to be incorporated into the soil by rain or mechanical means.

Data do not show whether chemicals were applied in conjunction with some other field operation, or as a separate operation. The 36 percent of the chemicals placed above the soil surface on corn were accounted for corn operations.