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South Dakota Grain Production: Yesterday and Tomorrow

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South Dakota grain production: yesterday and tomorrow



South Dakota grain production: yesterday and tomorrow

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Grain is near the heart of South Dakota's economy. Production rankings¹ for 1978 showed the state:

first in rye
first in oats
second in flax
third in sunflowers
fourth in spring wheat
fifth in durum wheat
sixth in sorghum
seventh in barley, and
tenth in corn.

Total grain production varies considerably from year to year, mostly because of natural forces.² Rainfall, blight, hail, frost, the timing of the changing seasons--all play critical roles in determining whether our state's farmers have a "good" or a "bad" year.

The "trend line" in Figure 1 shows estimated long-term growth. The positive slope suggests that total grain production in South Dakota has increased, on average, nearly 3.6 million bushels annually. (Deleting 1976, a year of severe drought, from the trend gives an average annual growth of over 4 million bushels.) Long-run increase in production is due to technological advancement, innovations, and improved management practices. Notable innovations include new

hybrids, pesticides, herbicides, fertilizers, harvesting and irrigation equipment, and better irrigation, cropping, and conservation practices.

Factors influencing production patterns in South Dakota

"Production pattern" for a specific crop refers to the share of acres harvested in the various crop reporting districts.

The production pattern of any particular crop over a period of time is subject to various influences: 1) natural forces 2) physical limitations 3) government policies 4) technological change and 5) producer decision-making.

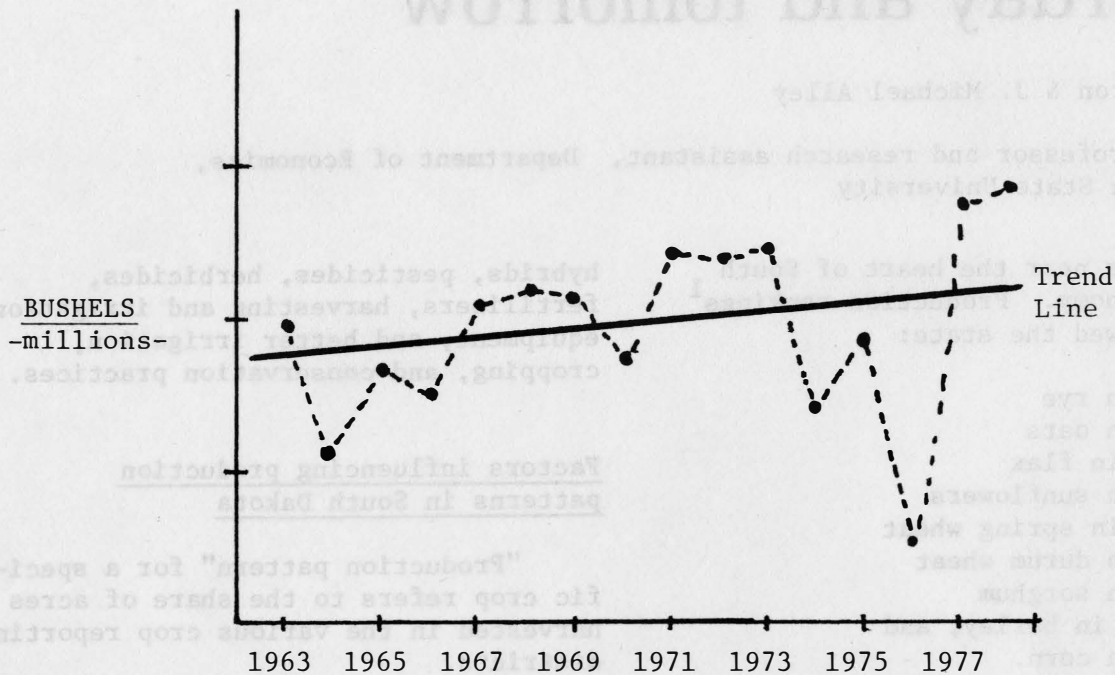
Physical limitations are such things as soil type and climate (Fig. 2). Producer decision-making refers to the cropping decisions made by farmers in response to expected prices and costs. The more variable these two influences are, the more variable the production patterns are likely to be, for they play the critical roles in shaping overall production patterns in South Dakota.

Where land is suited for various cropping or pasturing options, and when the cost/return balance shifts among

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1. South Dakota's Rank In Agriculture, ESCS, USDA June 1979.
 2. Total grain production includes corn, all wheat, barley, oats, flax, sorghum, rye and soybeans.

FIGURE 1

Total Grain Production Trend, SD (1963-1978)



options, producers can switch to the most profitable venture. The recent sunflower explosion is an example of such substitution.

The following analysis examines past production trends in South Dakota and projects future production if historical trends continue.

Trend analysis

The pattern or tendency over time, and not necessarily individual observations at any point in time, is the basis of trend analysis.

Non-linear least squares regression was used to estimate the historical acres harvested and yield trend lines of the 10 major crops from 1964 through 1978. Because 1976 was a year of severe drought it was excluded from the analysis.

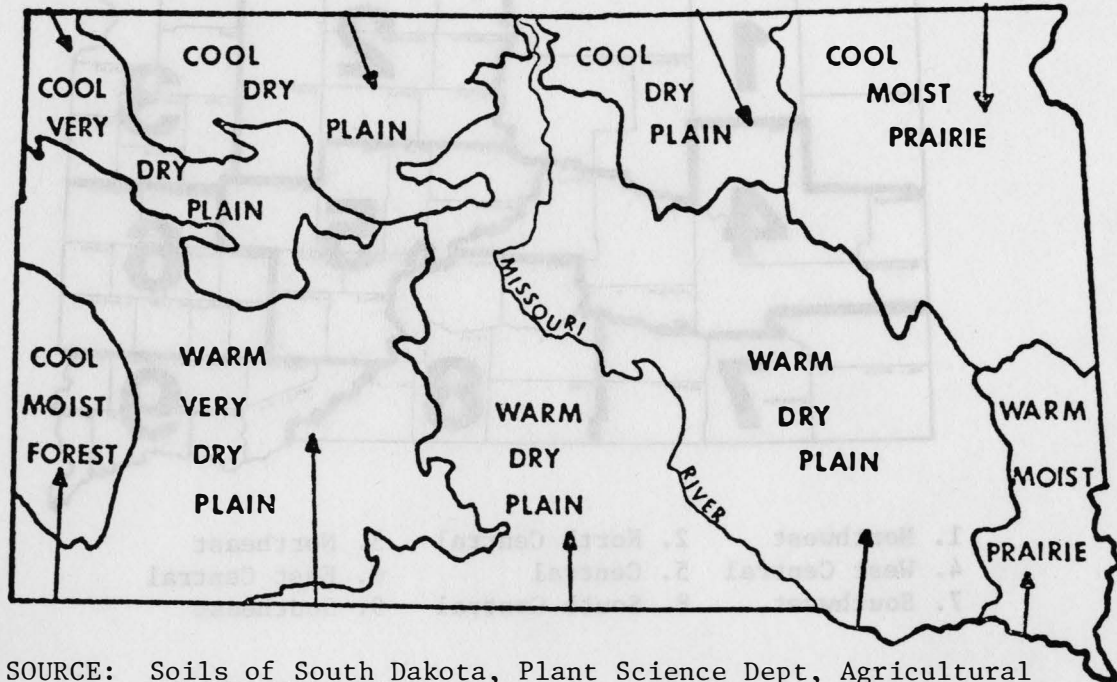
Implicit in the acres harvested trend estimate for each district is the production pattern for the given crop. Implicit in the yield trend estimates is a crude measure of technological adaptation.

The 1985 production estimates were calculated by multiplying the extrapolated historical acreage and yield estimates. Therefore, the credibility of the projections depends upon the validity of the assumption that the future will be a continuation of the past. Consequently, production projections are not definitive forecasts of the future; they are guidelines for private and public long-range planning decisions. Note also that production estimates reflect historical yields and not potential yields, which are much higher in experimental plots or in good growing years.

Throughout the analysis the term

FIGURE 2

RELATIONSHIP AMONG CLIMATE, VEGETATION, AND SOILS IN SOUTH DAKOTA.



SOURCE: Soils of South Dakota, Plant Science Dept, Agricultural Experiment Station, SDSU, in cooperation with the Soil Conservation Service, USDA, Bull 656, May 1978.

"significant" and synonyms of it are used to indicate meaningful changes in either production, acres harvested, or yield trends. Unless specifically noted these terms are based on a combination of statistical considerations and judgment.

The principal source of historical production data is the annual Agricultural Statistics published by the South Dakota Crop & Livestock Reporting Service, USDA. The districts in this bulletin correspond to "crop reporting districts" (Fig. 3).

Although the projections are not based on a simple linear extrapolation of past production, such linear trends are shown on the accompanying graphs. These simplify the projections without

seriously distorting the actual results.

CORN

On average, corn production increased approximately 3 million bushels per year (Fig. 4).³

The average number of acres harvested declined, implying that increased yields were responsible for increased production. Acres harvested declined an estimated 9,000 acres per year whereas yield per acre increased nearly 1.5 bushels annually.

The slope of the yield trend line suggests positive technological impacts.

3. If 1976 is included the annual increase is only 1.5 million bushels.

FIGURE 3
CROP REPORTING DISTRICTS



- | | | |
|-----------------|------------------|-----------------|
| 1. Northwest | 2. North Central | 3. Northeast |
| 4. West Central | 5. Central | 6. East Central |
| 7. Southwest | 8. South Central | 9. Southeast |

Although no figures are available, total irrigated acres in South Dakota increased from an estimated 122,000 acres in 1964 to an estimated 404,000 in 1978.

The five East River districts contained over 95% of all harvested corn acres over the 15-year period. The Southeast and East Central districts are the dominant producers in the 1985 production estimates, which show the two districts accounting for nearly 70% of total projected production (Table 1).

No meaningful changes were detected in the relative shares of acres harvested for any district. However, several counties that experienced substantive increases in relative shares are Beadle, Davison, Spink, and Union. Increases in Beadle, Davison and Spink counties suggest that the margin of corn producing land may be moving west. Minnehaha County is expected to be the leading corn producer in 1985.

Yields grew considerably in all the East River districts, particularly in the Southeast and East Central.

The 1985 yield estimates for counties within these two districts range from the upper 30's in Hanson to the mid-80's in Moody. Major corn producing counties projected to have substantial yield increases in 1985 are Davison, Lake, Miner, Minnehaha, Sanborn, Charles Mix, Walworth, Grant, Roberts, Beadle, Sully, and Spink.

DURUM WHEAT

Durum wheat production increased slightly despite a small decline in yields (Fig. 5). The increase in acres harvested (nearly 4,000 acres per year) accounted for an annual production increase of 57,000 bushels.

The three northern districts were the dominant producers throughout the period. Their projected share of total

FIGURE 4
CORN

Production, Acreage, Yields

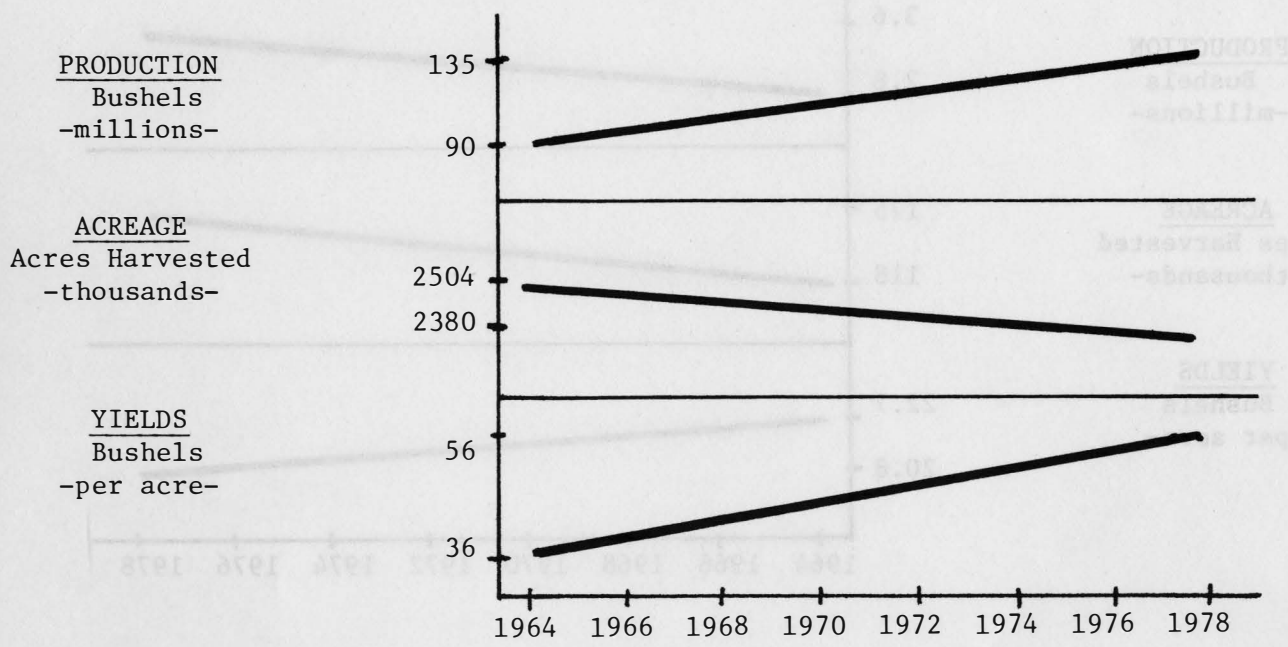


TABLE 1

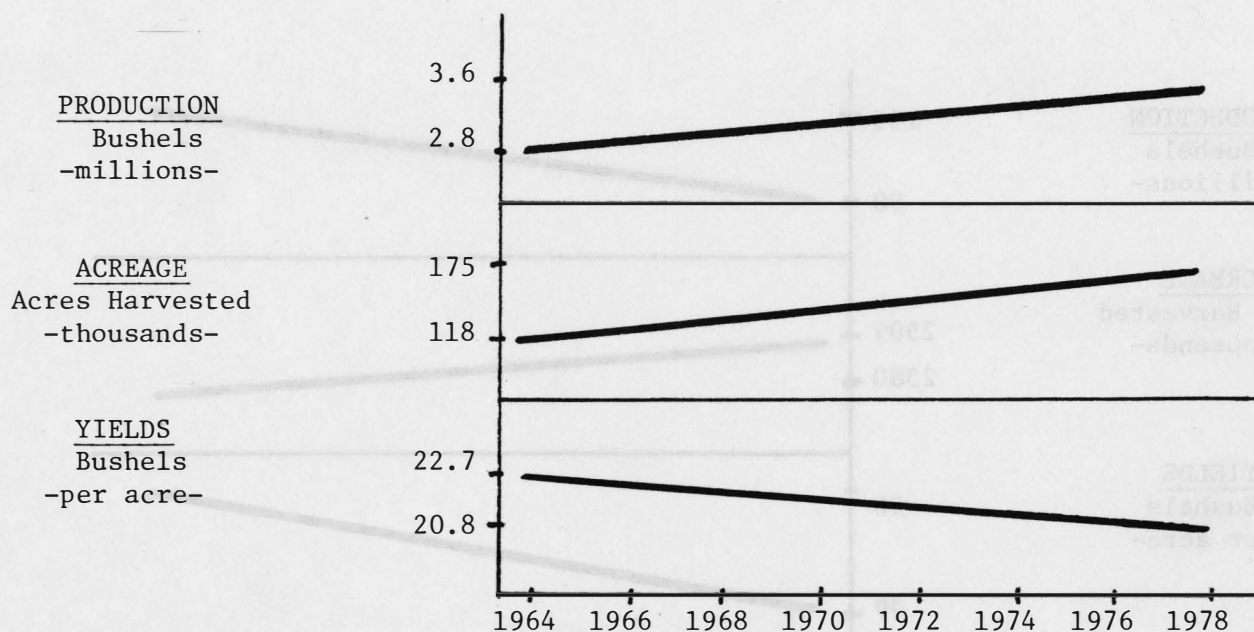
CORN PRODUCTION

District	1965 (bushels)	State Share (%)	1975 (bushels)	State Share (%)	1985* (bushels)	State Share (%)
Northwest	629,940	.68	815,700	.98	900,000	.71
North Central	6,584,900	7.15	5,947,100	7.14	8,900,000	7.03
Northeast	10,826,600	11.77	10,666,900	12.81	13,100,000	10.99
West Central	190,800	.21	201,500	.24	200,000	.16
Central	3,517,000	3.82	4,436,600	5.33	10,700,000	8.46
East Central	28,979,200	31.47	33,189,600	39.87	43,200,000	34.15
Southwest	319,660	.34	469,200	.56	700,000	.55
South Central	1,837,900	2.0	1,529,700	1.84	3,000,000	2.37
Southeast	39,182,700	42.55	25,993,700	31.22	45,000,000	35.57
STATE	92,079,000	100.00	83,250,000	100.00	126,500,000	100.00

*Estimate

FIGURE 5
DURUM WHEAT

Production, Acreage, Yields



production in 1985 is 85%, reflecting a slight increase in their relative shares of acres harvested (Table 2).

Projected 1985 production for the three northern districts is approximately 3.2 million bushels. Edmunds (12.63%), Day (10.25%), Codington, (7.35%), McPherson (7.19%), Harding (5.82%), and Brown (5.22%) counties are expected to be the major producers in 1985.

Yields were constant to slightly lower throughout the period. No significant increase in yields was found in any district or county. Projected 1985 yields among the major producing counties range from 17.5 bushels in McPherson to over 25 bushels in Harding. Highest projected yields are in the Southeast District.

WINTER WHEAT

Winter wheat production increased moderately at an annual rate of 380,000

bushels (Fig. 6). Most of the increase resulted from a substantial increase in acres harvested. Yields were relatively constant.

The majority of winter wheat is produced in West River. The projected 1985 production of the four West River districts is estimated at 19 million bushels, or 81% of total state production (Table 3). These districts are expected to harvest 76% of the state's winter wheat acreage.

Within West River, the West Central and South Central districts have been dominant (on average, 55% of state production).

The West Central and Northwest districts have increased their relative shares of production, whereas the South Central and Southwest district relative shares have declined. These changes reflect a northward movement of the margin of winter wheat planting during these 15 years.

FIGURE 6
WINTER WHEAT

Production, Acreage, Yields

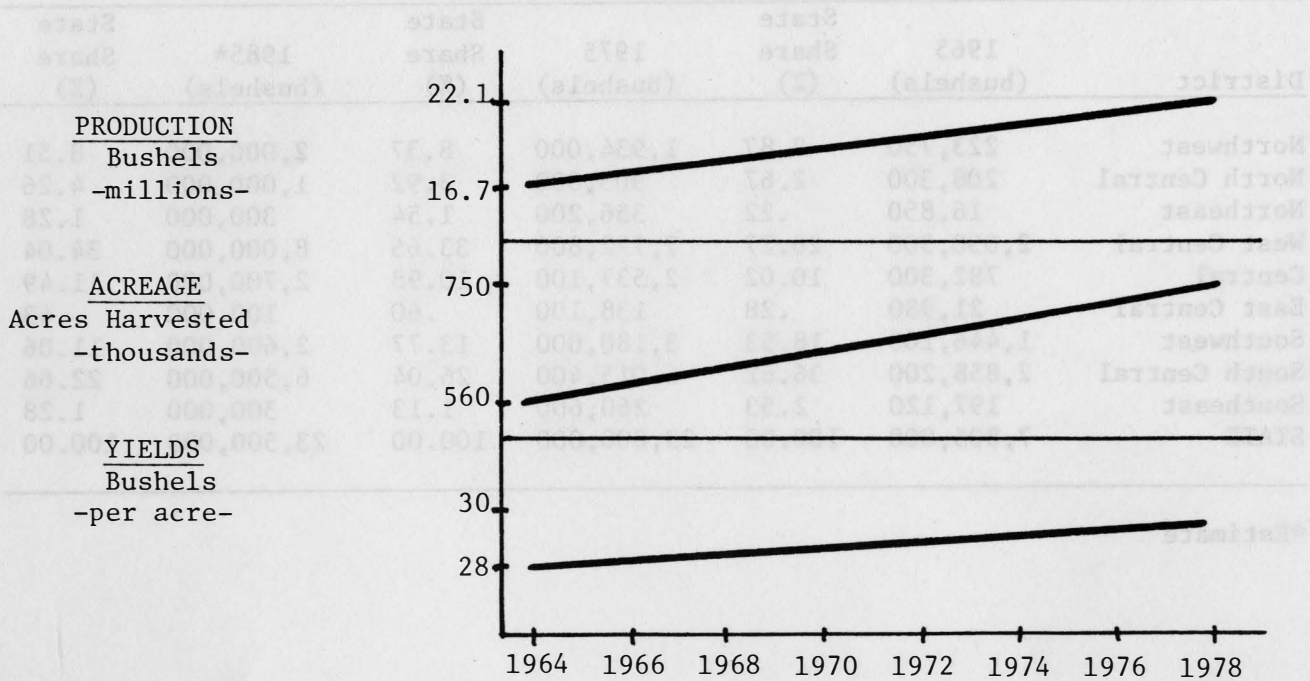


TABLE 2

DURUM WHEAT PRODUCTION

District	1965 (bushels)	State Share (%)	1975 (bushels)	State Share (%)	1985* (bushels)	State Share (%)
Northwest	230,750	10.18	699,900	16.00	609,000	16.28
North Central	665,700	29.38	1,543,700	35.29	1,258,000	33.64
Northeast	903,700	39.88	1,555,100	35.55	1,318,000	35.24
West Central	27,320	1.21	42,300	.97	21,000	.56
Central	264,390	11.67	178,400	3.99	175,000	4.68
East Central	107,520	4.74	191,700	4.38	177,000	4.73
Southwest	7,490	.33	18,200	.42	15,000	.40
South Central	34,490	1.52	38,700	2.03	107,000	2.86
Southeast	24,640	1.09	60,000	1.37	60,000	1.60
STATE	2,266,000	100.00	4,374,000	100.00	3,740,000	100.00

*Estimate

TABLE 3

WINTER WHEAT PRODUCTION

District	1965 (bushels)	State Share (%)	1975 (bushels)	State Share (%)	1985* (bushels)	State Share (%)
Northwest	223,750	2.87	1,934,000	8.37	2,000,000	8.51
North Central	208,300	2.67	905,800	3.92	1,000,000	4.26
Northeast	16,850	.22	356,200	1.54	300,000	1.28
West Central	2,050,300	26.27	7,772,800	33.65	8,000,000	34.04
Central	782,300	10.02	2,537,100	10.98	2,700,000	11.49
East Central	21,980	.28	138,100	.60	100,000	.43
Southwest	1,446,100	18.53	3,180,000	13.77	2,600,000	11.06
South Central	2,858,200	36.62	6,015,400	26.04	6,500,000	22.66
Southeast	197,120	2.53	260,600	1.13	300,000	1.28
STATE	7,805,000	100.00	23,000,000	100.00	23,500,000	100.00

*Estimate

East River counties with projected substantive shares of production include Sully (5.76%), Hand (3.42%), Beadle (1.31%), Potter (2.4%) and Spink (1.6%).

Yields in the Northwest District grew substantially. Yields in West River averaged slightly higher than East River yields. Projected yields in West River range in the upper 20's to upper 30's.

SPRING WHEAT

Spring wheat production increased at an average annual rate of 1.46 million bushels (Fig. 7), due mostly to a substantial increase (nearly 54,000 acres a year) in acres harvested.

Like durum wheat production, most of the spring wheat is produced in the three northern districts. Substantive changes have occurred in the relative shares of production for the North Central and Northeastern districts. In

1961 the North Central District produced over 50% of total spring wheat and the Northeast District produced only 14%. Since then the North Central District's share has declined while the Northeast District's share had increased considerably (Table 4).

In 1985, the North Central District is projected to produce 40% of the spring wheat. The Northeast District will increase its share to 25%.

Yields grew slightly over the period, the highest being in the Northeast District. Projected yields range from the upper teens in the Northwest District to the mid to upper 20's in the North Central and Northeast districts.

OATS

Oats production increased an average of 1.3 million bushels per year (Fig. 8). Acres harvested decreased at

FIGURE 7
SPRING WHEAT

Production, Acreage, Yields

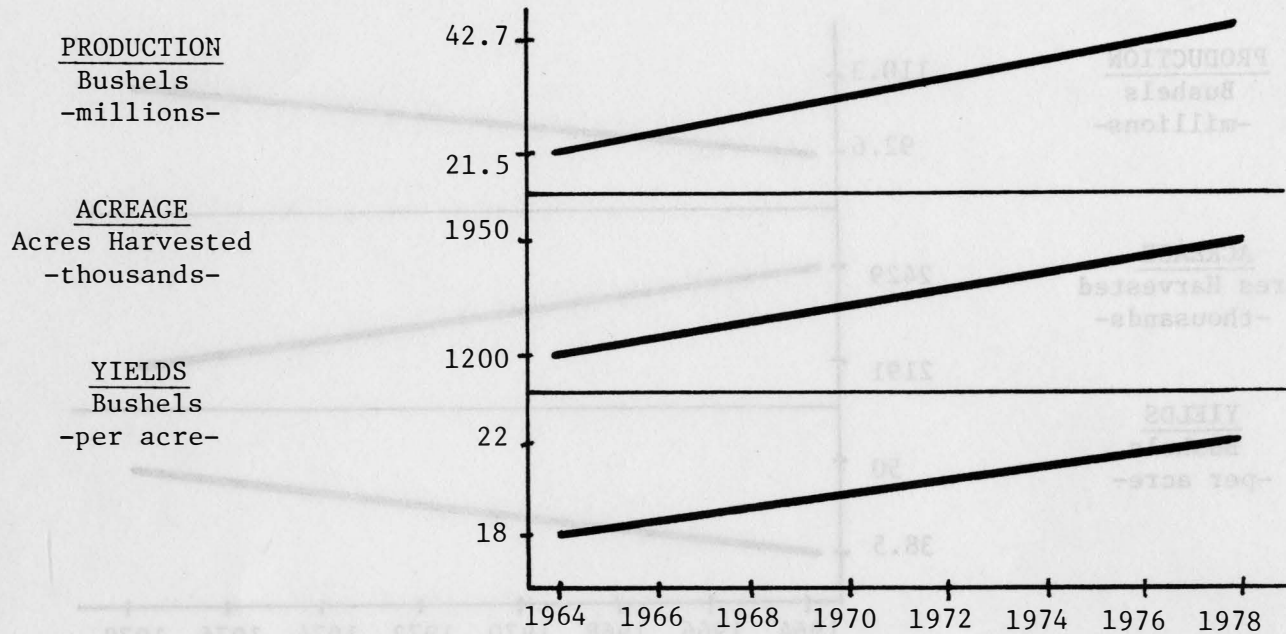


TABLE 4

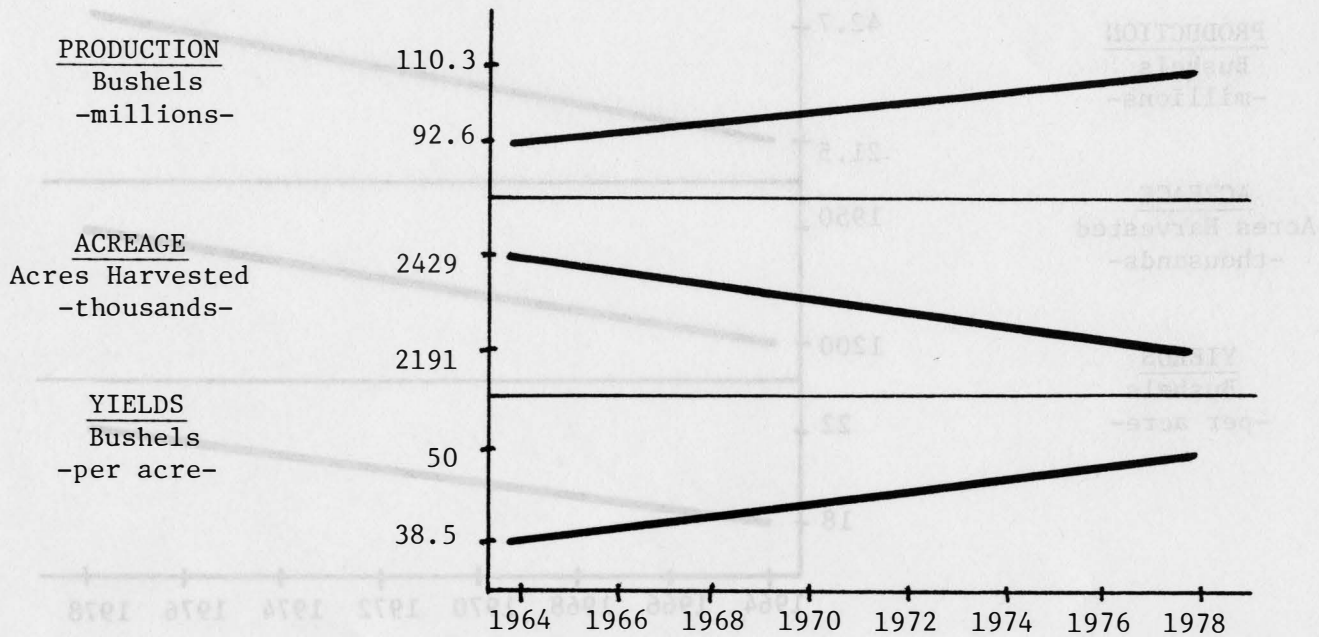
SPRING WHEAT PRODUCTION

District	1965 (bushels)	State Share (%)	1975 (bushels)	State Share (%)	1985* (bushels)	State Share (%)
Northwest	4,963,800	18.53	4,294,800	12.22	5,292,000	12.40
North Central	12,870,800	48.04	15,430,300	43.91	17,113,000	40.11
Northeast	3,615,900	13.50	7,989,100	22.74	10,771,000	25.24
West Central	590,600	2.20	210,900	.60	386,000	.90
Central	3,452,100	12.88	4,378,100	12.46	5,141,000	12.05
East Central	393,850	1.47	1,454,000	4.14	2,310,000	5.41
Southwest	57,400	.21	105,580	.30	168,000	.39
South Central	464,800	1.73	564,000	1.61	708,000	1.66
Southeast	382,750	1.43	709,300	2.02	777,000	1.82
STATE	26,792,000	100.00	35,186,000	100.00	42,666,000	100.00

*Estimate

FIGURE 8
OATS

Production, Acreage, Yields



an annual rate of 17,000 acres a year, while yields increased nearly one full bushel per year.

Ninety percent of all oats were produced in East River (Table 5). Southeast and East Central shares increased nearly 7% over the period. Gregory County is the only county in West River with a projected share of production over 2%.

Substantive increases in yields in the East Central, Central and Southeast districts were responsible for the statewide increase in yields. Yields in these three districts are projected to range from the upper 40's to the upper 60's.

Yields in the North Central and West Central districts grew moderately and are projected to range from the mid-30's to the mid-50's.

FLAX

Flax production declined dramatically at the annual rate of 246,000 bushels (Fig. 9).

While yields were relatively constant, acres harvested declined at a rate of 18,000 acres per year.

There have been no substantive shifts in shares of acres harvested, suggesting that the production decline was uniform among all districts (Table 6).

Several individual counties, however, experienced significant changes in acres harvested. Counties losing a significant share of total production include Deuel, Grant, and Roberts. Counties increasing their relative

TABLE 5

OAT PRODUCTION

District	1965 (bushels)	State Share (%)	1975 (bushels)	State Share (%)	1985* (bushels)	State Share (%)
Northwest	4,570,000	3.95	3,086,900	3.15	3,115,000	3.09
North Central	21,802,800	18.86	12,980,500	13.23	11,004,000	10.93
Northeast	26,462,800	22.89	17,070,400	17.40	15,537,000	15.44
West Central	2,427,300	2.10	941,900	.96	1,301,000	1.29
Central	11,116,700	9.61	8,755,600	8.92	10,664,000	10.59
East Central	25,786,300	22.30	27,830,800	28.36	29,783,000	29.59
Southwest	853,600	.74	333,200	.34	746,000	.74
South Central	4,507,100	3.90	3,738,600	3.81	4,456,000	4.43
Southeast	18,093,400	15.65	23,382,100	23.83	24,054,000	23.90
STATE	115,620,000	100.00	96,120,000	100.00	100,660,000	100.00

*Estimate

FIGURE 9
FLAX

Production, Acreage, Yields

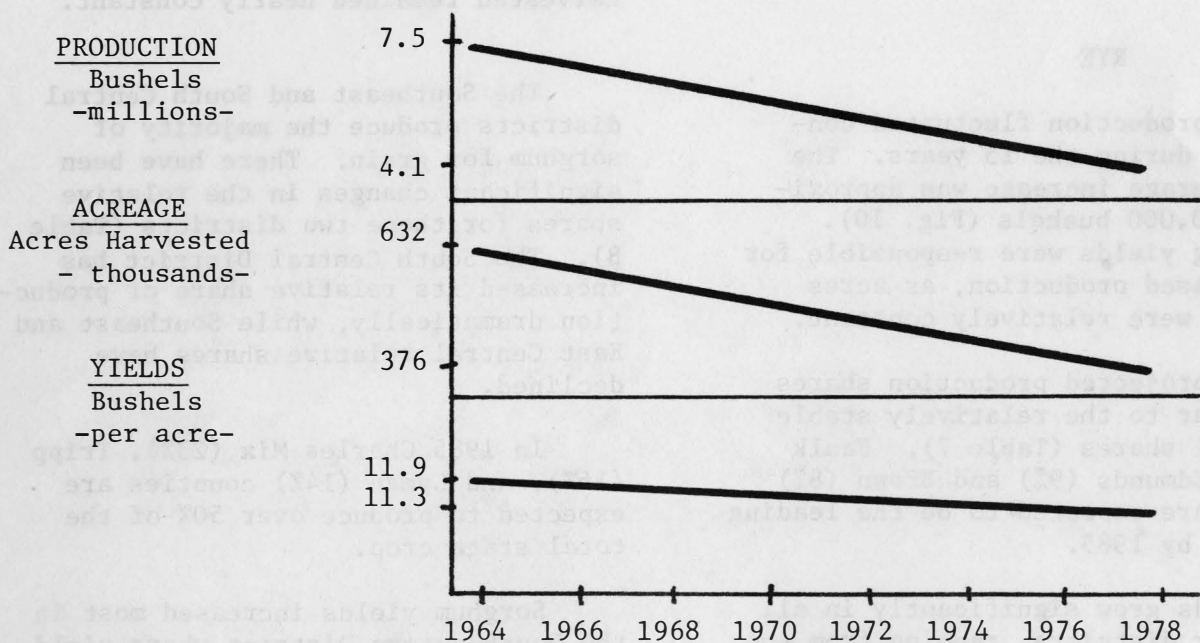


TABLE 6

FLAX PRODUCTION

District	1965 (bushels)	State Share (%)	1975 (bushels)	State Share (%)	1985* (bushels)	State Share (%)
Northwest	141,250	1.77	144,600	3.24	71,000	2.26
North Central	1,214,800	15.25	648,800	14.55	575,000	18.28
Northeast	4,914,900	61.70	2,496,000	55.96	1,770,000	56.26
West Central	10,770	.13	---	---	---	---
Central	63,200	.79	33,500	.75	30,000	.95
East Central	1,598,070	20.06	1,126,600	25.26	699,000	22.22
Southwest	700	.01	---	---	---	---
South Central	8,140	.10	800	.02	---	---
Southeast	14,170	.18	8,800	.20	1,000	.03
STATE	7,966,000	100.00	4,460,000	100.00	3,146,000	100.00

*Estimate

shares include Clark, Hamlin, and Moody. This implies a small shift in flax production to the south and west.

Yields were fairly constant in all districts. The East Central District's historical yields were slightly higher than the others, followed by the North Central and Northeast districts. Projected yields range from 10 to 20 bushels.

RYE

Rye production fluctuated considerably during the 15 years. The annual average increase was approximately 950,000 bushels (Fig. 10). Increasing yields were responsible for the increased production, as acres harvested were relatively constant.

The projected production shares are similar to the relatively stable historical shares (Table 7). Faulk (11.5%), Edmunds (9%) and Brown (8%) counties are expected to be the leading producers by 1985.

Yields grew significantly in all East River districts, ranging from the

low to upper 30's. Highest projected yields are in Marshall County.

SORGHUM

Sorghum production increased moderately at an annual rate of 315,000 bushels (Fig. 11). Improved yields (almost one full bushel a year) were responsible for the increase, as acres harvested remained nearly constant.

The Southeast and South Central districts produce the majority of sorghum for grain. There have been significant changes in the relative shares for these two districts (Table 8). The South Central District has increased its relative share of production dramatically, while Southeast and East Central relative shares have declined.

In 1985 Charles Mix (23%), Tripp (16%), and Lyman (14%) counties are expected to produce over 50% of the total state crop.

Sorghum yields increased most in the Southeastern District where yield

FIGURE 10

RYE

Production, Acreage, Yields

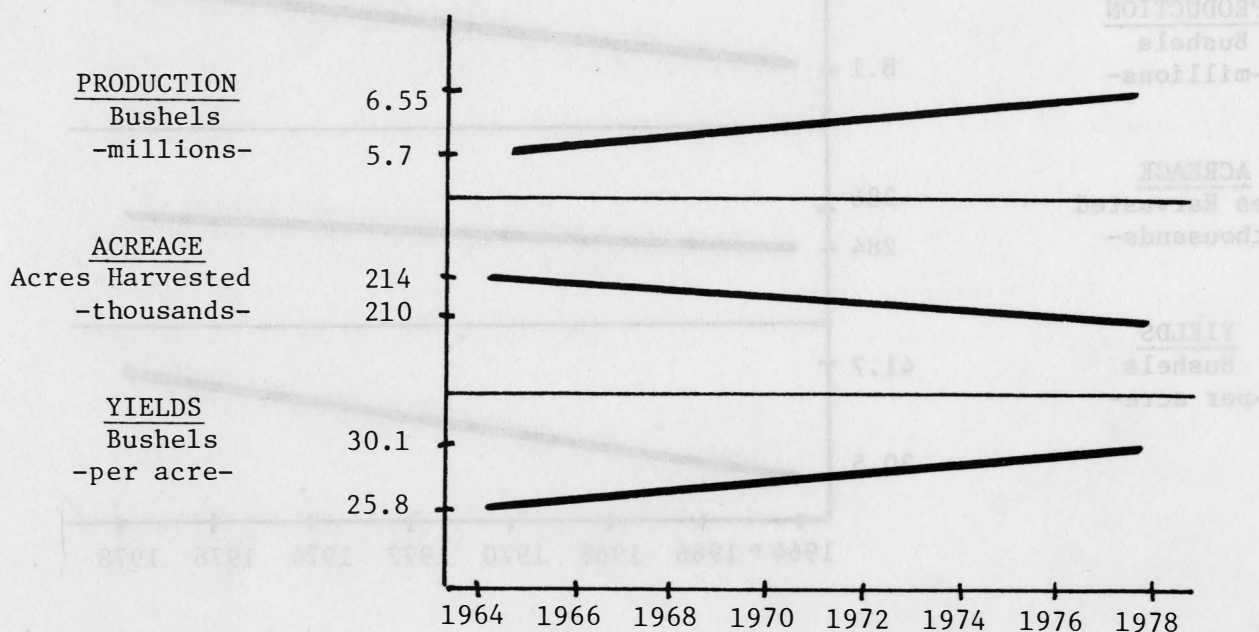


TABLE 7

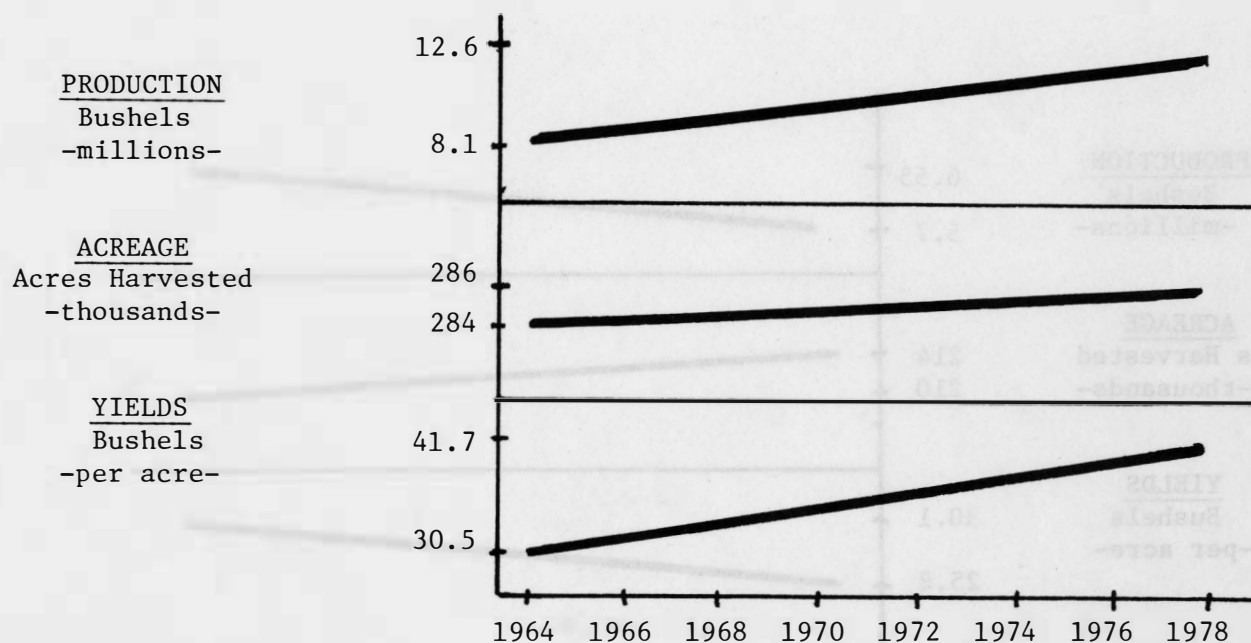
RYE PRODUCTION

District	1965 (bushels)	State Share (%)	1975 (bushels)	State Share (%)	1985* (bushels)	State Share (%)
Northwest	74,180	1.69	70,000	2.98	97,000	1.42
North Central	1,463,900	33.27	936,100	29.90	2,973,000	43.61
Northeast	1,831,900	41.63	748,300	31.90	2,234,000	32.77
West Central	17,190	.39	57,500	2.45	96,000	1.41
Central	390,220	8.87	259,800	11.07	917,000	13.45
East Central	324,430	7.37	117,900	5.03	251,000	3.68
Southwest	82,500	1.88	58,400	2.49	47,000	.69
South Central	117,280	2.67	66,300	2.83	177,000	2.60
Southeast	98,400	2.24	31,700	1.35	26,000	.38
STATE	4,400,000	100.00	2,346,000	100.00	6,818,000	100.00

*Estimate

FIGURE 11
SORGHUM

Production, Acreage, Yields



projections for 1985 range from less than 50 to nearly 60 bushels per acre. Projected yields per acre in the South Central District range from the low to the high 30's.

BARLEY

Barley production increased substantially, at an annual rate of 1.2 million bushels. A significant increase in acres harvested was responsible for the increase, as yields were constant to moderately higher (Fig. 12).

Almost all barley is produced in East River. Significant changes in the shares of acres harvested occurred, as shown in Table 9. All East Central counties, as well as Brule, Hand, Faulk, Potter, Roberts, Douglas and Hutchinson counties, have increases in acres harvested. Counties with declining shares of acres harvested

included Perkins, Brown, Spink, Day, and Marshall.

Most counties in the East Central, Central, and Southeast districts experienced moderately higher yields. All counties in the Southwest and West Central districts experienced slight declines in average yields.

Average yields in 1985 are expected to be as high as 50 bushels per acre in Minnehaha County.

SOYBEANS

Soybean production increased at an annual rate of 423,000 bushels (Fig. 13), the result of both substantially higher yields and more acres harvested. Average statewide yields increased one full bushel a year.

Yankton, Union, and Clay counties experienced dramatic increases in the

TABLE 8

SORGHUM PRODUCTION

District	1965 (bushels)	State Share (%)	1975 (bushels)	State Share (%)	1985* (bushels)	State Share (%)
Northwest	19,250	.17	44,000	.69	24,000	.23
North Central	325,120	2.79	186,700	2.91	288,000	2.72
Northeast	81,420	.70	51,700	.81	53,000	.50
West Central	41,160	.35	192,000	2.99	186,000	1.76
Central	1,152,600	9.89	855,100	13.32	1,345,000	12.70
East Central	1,713,900	14.70	554,100	8.62	579,000	5.47
Southwest	16,250	.14	16,000	.25	10,000	.09
South Central	1,833,500	15.73	2,408,500	37.50	3,558,000	33.59
Southeast	6,474,800	55.54	2,113,900	32.92	4,551,000	42.96
STATE	11,658,000	100.00	6,422,000	100.00	10,591,000	100.00

*Estimate

FIGURE 12
BARLEY

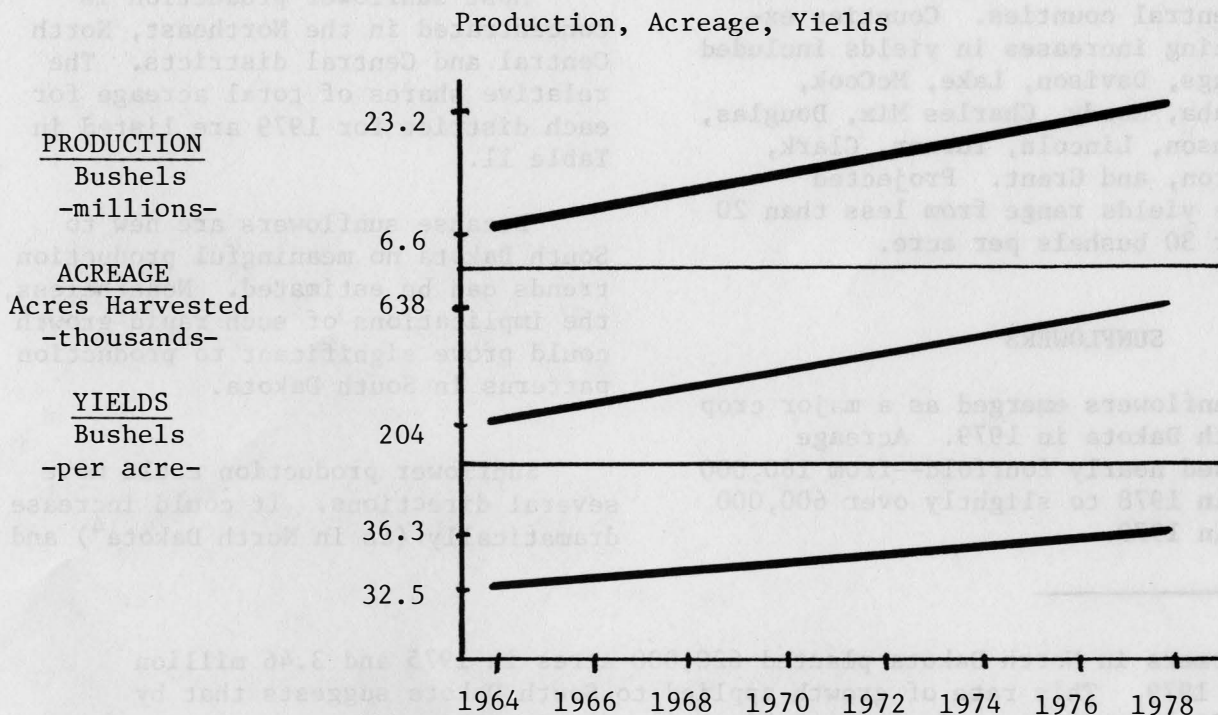


TABLE 9

BARLEY PRODUCTION

District	1965 (bushels)	State Share (%)	1975 (bushels)	State Share (%)	1985* (bushels)	State Share (%)
Northwest	788,500	9.74	725,000	4.40	805,000	3.70
North Central	2,537,300	31.35	4,711,900	28.57	6,918,000	31.90
Northeast	2,052,100	25.35	3,207,000	19.45	3,618,000	16.68
West Central	720,600	8.90	246,800	1.50	185,000	.85
Central	517,500	6.39	1,839,200	11.15	2,716,000	12.52
East Central	578,300	7.14	3,757,700	22.78	5,145,000	23.72
Southwest	309,300	3.82	138,800	.84	171,000	.79
South Central	356,800	4.41	631,200	3.83	784,000	3.61
Southeast	233,600	2.89	1,234,400	7.48	1,346,000	6.21
STATE	8,094,000	100.00	16,492,000	100.00	21,688,000	100.00

*Estimate

share of acres harvested, accounting for the Southeast District's increased share (Table 10). The East Central District's projected share declined slightly, although its absolute production increased.

Highest average yields were found in the Southeast District and several East Central counties. Counties experiencing increases in yields included Brookings, Davison, Lake, McCook, Minnehaha, Moody, Charles Mix, Douglas, Hutchinson, Lincoln, Turner, Clark, Codington, and Grant. Projected average yields range from less than 20 to over 30 bushels per acre.

SUNFLOWERS

Sunflowers emerged as a major crop in South Dakota in 1979. Acreage increased nearly fourfold--from 160,000 acres in 1978 to slightly over 600,000 acres in 1979.

Sunflower acreage in 1979 surpassed the acreage of durum wheat (170,000), barley (525,000), winter wheat (600,000), rye (195,000), soybeans (590,000) and sorghum (310,000), placing it fourth in acreage behind corn, spring wheat, and oats.

Most sunflower production is concentrated in the Northeast, North Central and Central districts. The relative shares of total acreage for each district for 1979 are listed in Table 11.

Because sunflowers are new to South Dakota no meaningful production trends can be estimated. Nonetheless, the implications of such rapid growth could prove significant to production patterns in South Dakota.

Sunflower production could move several directions. It could increase dramatically (as in North Dakota⁴) and

4. Farmers in North Dakota planted 620,000 acres in 1975 and 3.46 million in 1979. This rate of growth applied to South Dakota suggests that by 1983 South Dakota farmers would plant over 3 million acres.

FIGURE 13
SOYBEANS

Production, Acreage, Yields

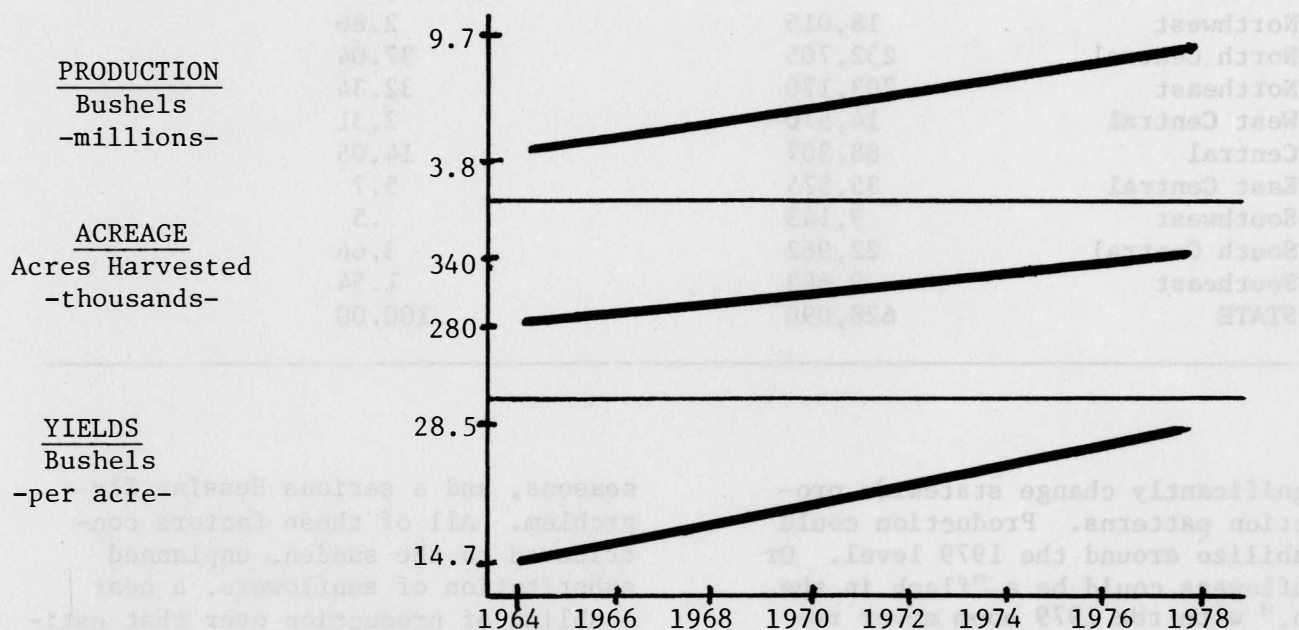


TABLE 10

SOYBEAN PRODUCTION

District	1965 (bushels)	State Share (%)	1975 (bushels)	State Share (%)	1985* (bushels)	State Share (%)
Northwest	2,000	.04	--	--	1,000	.01
North Central	9,100	.16	5,600	.07	7,000	.07
Northeast	541,260	9.56	454,200	5.31	481,000	4.78
West Central	660	.01	1,400	.02	1,000	.01
Central	14,400	.25	8,500	.10	10,000	.10
East Central	1,585,400	28.01	2,088,500	24.43	2,100,000	20.89
Southwest	1,780	.03	--	--	--	--
South Central	12,600	.22	7,100	.08	9,000	.09
Southeast	3,493,800	61.72	5,984,700	70.00	7,445,000	74.05
STATE	5,661,000	100.00	8,550,000	100.00	10,054,000	100.00

*Estimate

TABLE 11
SUNFLOWER ACREAGE

	1979 (acres)	State Share (%)
Northwest	18,015	2.86
North Central	232,705	37.04
Northeast	203,170	32.34
West Central	14,570	2.31
Central	88,307	14.05
East Central	35,575	5.7
Southwest	3,143	.5
South Central	22,962	3.66
Southeast	9,643	1.54
STATE	628,090	100.00

significantly change statewide production patterns. Production could stabilize around the 1979 level. Or sunflowers could be a "flash in the pan," with the 1979 boom never repeated.

Several factors influencing future patterns are:

- (1) a continued high foreign demand for sunflower seed and oil in Europe and the Far East (it is high now);
- (2) the location of an oil processing plant in South Dakota and/or nearby; and
- (3) growing experience with the crop.

A sunflower processing plant would stabilize the somewhat seasonal demand due to the closing of the Duluth ports in winter. If the plant is also capable of crushing flax and soybeans, it may also enhance their production.

The 1979 sunflower crop may be just a one time phenomenon caused by the extensive winter kill in winter wheat, a late spring which delayed planting of crops needing long growing

seasons, and a serious Hessian fly problem. All of these factors contributed to the sudden, unplanned substitution of sunflowers, a near doubling of production over that estimated by the South Dakota Crop Reporting Service prior to spring plantings.

A 1985 projection is not given. There is no historical data base. Some generalizations can be drawn from the limited information available, however.

First, most sunflowers will probably be produced in the Northeast, North Central, and Central districts. Of these, the Central District has the most potential for growth. The area has experienced several bad winter wheat kills over the past few years, and sunflowers are an attractive alternative cash crop for wheat.

Second, sunflowers will probably be substituted for wheat, other small grains, and flax. Soybeans and corn are not suitable in rotation with sunflowers.

Additional Considerations

The sunflower phenomenon is not the only development which may intro-

duce error in the trend analysis projections.

Other developments which could distract the 1985 estimates include new government programs and policies, further development of grain intensive industries such as grain alcohol and fed cattle operations, war, and changes in the international demand and supply for any given crop.

Another influence is the increasing cost of energy, imposing higher crop production and distribution costs. Crops such as corn whose production is relatively energy intensive may become relatively less important--unless their prices rise accordingly.

Although South Dakota farmers harvested a record corn crop in 1979, topping the 200 million bushel mark for the first time, input costs increased to record levels as well. Inclusion of 1979 production in the trend estimate would shift the production trend line (Fig. 4) upward.

A more realistic assessment, considering future input costs, might reduce the corn acreage trend line, which in turn would lower the production trend line.

Conversely, the comparative advantage of crops which are less energy and fertilizer intensive may be enhanced. In South Dakota, this may occur with soybean acreage, which increased by 51% in 1979 primarily because of the expected profitability of soybeans relative to corn.

The greater expected profitability of soybeans was due to the higher expected ratio of price to production costs. Soybeans also have the advantage of adding nitrogen to the soil.

In summary, changes in grain production trends in South Dakota will depend largely on the relative prices, production costs, and profits of the various crops.

For example, unless the price of oats becomes independent from the value of other feed grains and is priced as a special use commodity, oats acreage planted may be less than the trend estimate (Fig. 8) suggests.

If the price of sorghum continues to rise in response to growing export demand, the trend may underestimate actual acreage planted (Fig. 11).

Use these trend analysis projections in conjunction with current market knowledge and an understanding of responses to economic incentives.

District Summaries

The summary of the substantive historical changes between 1964 and 1978 in acres harvested and yields for the various crops within each district is not intended to reveal the direct substitutions that occurred in acres harvested for any given crops.

The substitution possibilities are not discernible in the statistical method.

The changes in acres harvested are estimated absolute changes and not relative share changes. The substantive increases in yields per acre reveal technological advancement in one form or another.

NORTH CENTRAL

Acres Harvested: Durum Wheat - Increase, Oats - Decrease,
Spring Wheat - Slight Decrease

Yields: Rye - Slight Increase, Corn - Moderate Increase,
Spring Wheat - Slight Increase

NORTHWEST

Acres Harvested: Winter Wheat - Increase, Spring Wheat -
Decrease, Barley - Decrease

Yields: Winter Wheat - Increase

NORTHEAST

Acres Harvested: Spring Wheat - Increase, Oats - Decrease,
Flax - Slight Decrease, Barley - Decrease

Yields: Rye - Slight Increase, Corn - Increase, Soybeans -
Increase, Spring Wheat - Increase

WEST CENTRAL

Acres Harvested: Winter Wheat - Increase, Barley - Slight Decrease

Yields: Corn - Increase

CENTRAL

Acres Harvested: Barley - Increase

Yields: Rye, Barley, Corn, Oats - All Increase

EAST CENTRAL

Acres Harvested: Oats - Increase, Flax - Decrease, Barley - Increase,
Sorghum - Decrease

Yields: Corn, Barley, Oats, Rye, Soybeans - All Increase

SOUTHWEST

Acres Harvested: Winter Wheat - Decrease

Yields: Corn - Increase

SOUTH CENTRAL

Acres Harvested: Winter Wheat - Decrease, Sorghum - Increase

Yields: Sorghum - Increase

SOUTHEAST

Acres Harvested: Oats - Increase, Soybean - Increase, Sorghum - Decrease

Yields: Corn, Oats, Sorghum, Soybeans, Rye, Barley - All Increase

Summary

South Dakota's total grain production in 1985 is projected to be 348,566,000 bushels, not counting sunflowers. Slightly more acres will be harvested. Yields will be higher.

Acres and yields have increased for the past 15 years. Another reason for higher production may be the substitution of higher yielding crops for low yielding crops, as in the case of flax where acres harvested have declined significantly.

The relative importance of each grain in terms of acres harvested is shown in Table 12. Notable is the sudden emergence of sunflowers in 1979 which jumped from no rank to fourth. Other changes visible in the table are the decline of harvested acres of oats and flax, and the increase in barley acreage harvested. Other substantive changes that occurred were the increases in acres harvested of soybeans, spring wheat, winter wheat, and durum wheat.

Crops that experienced significant increases in average yields included soybeans, oats, and corn. Crops with moderate gains were sorghum and spring wheat. Increased irrigation and the introduction of new hybrids were largely responsible.

Historically, corn, oats, and spring wheat have been the major crops and are expected to remain so. The rank of each district's share of each crop's production is shown in Table 13. These rankings reflect the changes made over the past 15 years.

The 1985 crop projections are shown in Table 14 for the entire state.

TABLE 12
STATE ACRES HARVESTED
(000's)

Rank	1965	1979	1985 Estimate
1	Oats (2460)	Corn (2500)	Corn (2366)
2	Corn (2361)	Oats (2000)	Oats (2028)
3	Other Spring Wheat (1531)	Other Spring Wheat (1950)	Other Spring Wheat (1907)
4	Flax (569)	Sunflowers (615)	Sunflowers* (615)
5	Winter Wheat (446)	Winter Wheat (600)	Winter Wheat (769)
6	Sorghum (402)	Soybeans (590)	Barley (541)
7	Soybeans (333)	Barley (525)	Soybeans (373)
8	Barley (213)	Flax (350)	Flax (354)
9	Rye (160)	Sorghum (310)	Sorghum (271)
10	Durum Wheat (103)	Rye (195)	Rye (207)
11		Durum Wheat (170)	Durum Wheat (177)

*1979 Actual Acres Harvested

TABLE 13
RANK IN ESTIMATED PRODUCTION BY DISTRICT

Crop	S.E.	S.C.	S.W.	E.C.	C.	W.C.	N.E.	N.C.	N.W.
Corn	1	6	8	2	4	9	3	5	7
Oats	2	6	9	1	5	8	3	4	7
Other Spring Wheat	6	7	9	5	4	8	2	1	3
Durum Wheat	7	6	9	4	5	8	1	2	3
Winter Wheat	7	2	4	9	3	1	8	6	5
Soybeans	1	5	9	2	4	7	3	6	8
Flax	6	7	8	2	5	9	1	3	4
Barley	5	7	9	2	4	8	3	1	6
Rye	9	5	8	4	3	7	2	1	6
Sorghum	1	2	9	4	3	6	7	5	8
Sunflowers*	8	5	9	4	3	7	2	1	6

*1979 Actual Rank

TABLE 14
SOUTH DAKOTA 1985
PROJECTED CROP PRODUCTION
(1,000's of Bushels)

District	Corn	Durum Wheat	Winter Wheat	Spring Wheat	Oats	Flax	Rye	Sorghum	Barley	Soybean	Total
Northwest	900	609	2,000	5,292	3,115	71	97	24	805	1	12,914
North Central	8,900	1,258	1,000	17,113	11,004	575	2,973	288	6,918	7	50,036
Northeast	13,100	1,318	300	10,771	15,537	1,770	2,234	53	3,618	481	49,182
West Central	200	21	8,000	386	1,301	--	96	186	185	1	10,376
Central	10,700	175	2,700	5,141	10,664	30	917	1,345	2,716	10	34,398
East Central	43,200	177	100	2,310	29,783	699	251	579	5,145	2,100	84,344
Southwest	700	15	2,600	168	746	--	47	10	171	--	4,457
South Central	3,000	107	6,500	708	4,456	--	177	3,558	784	9	19,299
Southeast	45,000	60	300	777	24,054	1	26	4,551	1,346	7,445	83,560
STATE	125,700	3,740	23,500	42,666	100,660	3,146	6,818	10,591	21,688	10,054	348,566

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