NINTH
ANNUAL

WESTERN DAKOTA

CROPS DAY RESEARCH REPORT

HETTINGER ARMORY
DECEMBER 3, 1992

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9th ANNUAL WESTERN DAKOTA CROPS DAY

DECEMBER 3, 1992

HETTINGER ARMORY

MST

9:00 am Registration
Coffee and doughnuts. Free time to view exhibits and visit with Ag Industry Program Sponsors.

10:30 Welcome and Introductions

10:45 Crop Variety Updates and Highlights of Ongoing Crop Production Research
Pat Carr, Agronomist, Dickinson Research Center

Eric Eriksmoen, Agronomist, Hettinger Research Extension Center

12:00 Lunch
Provided by Program Sponsors. Free time to visit with sponsors.

1:00 Ag Industry Update
Treflan TR10 - Spring Application on Spring Wheat
Mr. Cal Thorson, DowElanco, Bismarck, ND.

Tips of Establishing Alfalfa
Mr. Bob Clow, Dahlgren & Co., Dickinson, ND.

Herbicide Weed Control in Fallow
Mr. Rick Hartfiel, Monsanto, Dickinson, ND.

1:45 Benefits from Diversifying the Cropping System.
Dr. John Gardner, Superintendent/Agronomist, Carrington Research Extension Center, Carrington, ND.

2:15 Nitrogen and Phosphorus - New Thoughts on a Familiar Story.
Dr. Jay Goos, Associate Professor, NDSU Soil Science Dept., Fargo, ND.

2:45 Conclusion
Drawing for door prizes, coffee and opportunity to visit with sponsors.

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ACKNOWLEDGEMENTS

The Hettinger Research Extension Center and Dickinson Research Center gratefully acknowledge and thank the following companies and organizations for their financial support and participation in this year's Western Dakota Crops Day. Those listed below have provided for the noon meal and have sponsored the event in total. We thank them for their past and present commitment and support.

1992 WESTERN DAKOTA CROPS DAY SPONSORS

HETTINGER CHAMBER OF COMMERCE
NORTH DAKOTA CROP IMPROVEMENT ASSOCIATION
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DAHLGREN & COMPANY
GOLDEN HARVEST

We also acknowledge and thank the following individuals for their willingness to cooperate with us at our off-station plot sites. Their participation has enabled us to gather valuable information which would not otherwise be possible.

Darly Birdsall, New Leipzig
Neil and Monte Freitag, Scranton
August and Perry Kirschmann, Regent
Dale and Calvin Hepper, Selfridge
Daryl Anderson, Reeder
Amos Gietzen, Glen Ullin
Ted Reich, Beulah
Pat Doll, Hannover
Golden Valley SCD, Beach

Dickinson Research Center

Growing Conditions 1990-92

Above-normal precipitation between September through December of 1991 allowed for some recharge of soil moisture going into the 1992 growing season. Establishment of the winter wheat nursery at the Dickinson Research Center (DRC) was rated as good. Precipitation between January and March was comparable to the 100 year average and provided sufficient soil moisture for generally excellent plant stand establishment at the DRC in the spring of 1992.

Unusually warm temperatures coupled with less than normal amounts of precipitation from mid-April to late May stressed all crops at the DRC, particularly the small grains. A killing frost on May 26 (24° F) caused considerable damage to many crops at the DRC and in the surrounding area. For example, buckwheat plant stands in plots at the DRC were reduced up to 60 percent because of the freezing temperature.

Timely rains and unusually cool temperatures from mid-June through August were ideal for cool season crops at the DRC but poor for corn, sunflower, and grain sorghum. Recropped spring wheat yield averaged 51 bu/ac - almost unheard of for recropped wheat in the Missouri Slope region. Grain producers in the southwest whose fields received similar amounts of precipitation and occurred in areas where cool temperatures dominated during June and July reported similar yield levels. We at the DRC recognize that not all producers in the Missouri Slope region were as fortunate as we were!

Perhaps the greatest revelation of 1992 was how influential temperature can be on crop yield. While precipitation was generally timely during 1992, total precipitation during the growing season was comparable to the 100 year average. Moreover, considerably less than "normal" amounts of precipitation were received from April through June, although more was received during July and August (see data below). However, July and August temperatures averaged almost 7° F cooler than normal and provided almost optimum growing conditions for many crops produced in the southwest. Overall, the 1992 crop production season must be considered exceptional for many Missouri Slope producers.

1990-92 Weather Data Summary

Average Precipitation (inches)

	1989-90	1990-91	1991-92	100-year Average
Sept. - Dec.	3.00	1.53	3.65	3.16
Jan. - March	0.57	0.74	1.52	1.55
Apr. - June	8.98	8.42	7.29	5.23
July - Aug.	1.29	2.05	3.88	5.12
Total	13.84	12.74	15.52	15.88

Average Temperature (F)

April	42	44	40	41
May	51	55	55	54
June	63	65	61	61
July	67	70	61	69
August	69	71	62	67

GROWING CONDITIONS
HETTINGER RESEARCH EXTENSION CENTER
-1992-

PERFECT SMALL GRAIN GROWING CONDITIONS! Not quite but almost.

Hettinger went into an extremely dry Fall during 1991. Hard red winter wheat trials were planted into dry soil resulting in poor and uneven emergence prior to freeze up. Several inches of wet snow fell during the last days of October. This moisture melted and moved into the soil with little run off. Mild temperatures and lack of precipitation prevailed throughout most of the 1991/1992 winter.

Soil water recharge was greater then 4 feet on fallow and was between 2 and 3 feet on previously cropped soil going into the 1992 planting season. The year's planting season started around April 1, two weeks earlier then normal, with several growers planting small grain crops throughout the last half of March.

Very little precipitation fell during April and May causing severe moisture stress on recrop throughout the area. The Station received almost 1 1/2 inches of rain during a very localized thunderstorm on May 10. The rains started to fall in mid June and continued through the first week of August, 31 days of measurable precipitation out of 54, resulting in a total of over 10 inches of moisture.

Row crops were planted during the end of April and first part of May, again, about 2 weeks ahead of normal.

Cool night time temperatures and mild day time temperatures prevailed throughout the growing season, creating ideal small grain growing conditions and poor row crop growing conditions. These cool conditions delayed small grain maturity by about two weeks and resulted in no grain sorghum yields and relatively poor corn yields. The area was hit by a hard frost, down to 20 degrees in low lying areas, on May 26 causing some crop injury. Alfalfa, soybeans and buckwheat were severely injured. Many crops were also under moisture stress and stress from herbicide applications at that time. This frost also vernalized the spring seeded winter wheat trial and winter wheat plot borders. A light frost on June 6 and again on August 25 also caused some injury to sensitive crops. Scattered areas of hail destroyed crops including all of the crops at the New Leipzig plot site.

Reports of disease and insect outbreaks were scattered and inconsistent. Several small grain foliar diseases were observed, however, infestations were minor and occurred late in the growing season.

WEATHER DATA SUMMARY
HETTINGER

Precipitation (inches)	1989-90	1990-91	1991-92	37 year average
Sept. - Dec.	4.88	0.94	4.60	3.10
Jan. - March	1.14	1.41	1.63	1.23
April - June	5.62	9.85	7.95	7.81
July - August	1.88	2.78	6.06	3.62
Total	13.52	14.98	20.24	15.76

Average Temperature F	1990	1991	1992	37 year average
April	43.5	45.2	42.7	42.8
May	52.2	55.2	57.4	54.3
June	65.7	66.0	62.5	63.9
July	70.5	70.0	61.4	70.4
August	71.5	72.0	62.7	68.8
September	63.9	58.6	56.6	57.1

Growing Degree Units (50-86)	1990	1991	1992	37 year average
May	68	258	357	136
June	471	480	412	416
July	636	620	376	625
August	666	682	441	583
Total	1841	2040	1586	1760

	28 F	32 F	Normal 32 F
Date of last frost	May 26	June 6	May 18
Date of first frost	Sept. 28	Aug. 25	Sept. 20
Frost free days	125	80	125

INTERPRETING STATISTICAL ANALYSIS

Field research involves the testing of one or more variables such as crop varieties, fertilizers, tillage methods, etc. Field testing of such variables are conducted in order to determine which variety, tillage method, or fertilizer etc. is best for the particular area of production. The main objectives of crop production research are to determine the best means of producing the crop and how to maximize yield and economic return from farming.

Agricultural researchers use statistics as a tool in helping to differentiate the production variables in question so that real and meaningful conclusions can be drawn from a relatively large amount of data. One of these tools is the Coefficient of Variability (C.V.%). This statistic gives an indication of the amount of variation in an experimental trial. Trials conducted at Hettinger use four replications or repetitions of the variable in question. For example, the variety Stoa HRSW appeared four times (four replications) in the HRSW variety trial. In this case, the C.V.% for yield of the Hettinger HRSW variety trial was 14.0%. This C.V.% is a relative measure of how much the yield of all HRSW varieties varied between replications. In other words, C.V.% is a measure of the precision or effectiveness of the trial and procedures used in conducting the trial.

More can be said about a field trial with a relatively low C.V.% (15 or less) than one with a C.V.% of over 15. Attempts are made to control human error and some environmental conditions such as conducting field studies on a uniform soil so variability between replicates is minimized with a resulting low value for C.V.% (15 or less). In summation, a trial with a C.V.% of 8 is more precise and more can be concluded from it than a trial with a C.V.% of 18.

Another important statistical tool is the Least Significant Difference or LSD. If the yield of variety A exceeds variety B by more than the LSD 5% value you can conclude that under like environmental conditions, variety A will significantly out-yield variety B 95% of the time. The LSD value allows you to separate varieties, tillage practices, or any other variable and determine whether or not they are actually different. The LSD 1% value is always larger than the value for LSD 5% and is used in the same manner. If the yield of variety A exceeds variety B by more than the LSD 1% value you can conclude that under like environmental conditions, variety A will significantly out-yield variety B 99% of the time. Little confidence can be placed in variety or treatment differences unless the results differ by more than the LSD value.

DRYLAND SPRING WHEAT TRIAL-FALLOW DICKINSON, ND, 1992

Variety	Heading Date	Ht	Leaf Disease	Test Wt	Protein	Yield 1992	Yield 1991	Yield AVG
	June	IN	%	LBS	%		BU/A	
Krona	18	29	21	63	14.8	86	---	---
Bergen	17	28	15	63	14.3	82	46	64
Vance	18	30	31	63	14.8	80	42	61
Gus	18	32	28	62	14.4	79	40	59
Norm	17	29	20	62	14.2	79	42	60
Wheaton	18	28	19	63	15.3	75	---	---
2371	16	28	25	62	15.0	73	39	56
Sharp	16	32	38	65	14.1	73	42	57
Fjeld	16	25	35	63	15.6	70	---	---
Dalen	15	26	24	65	15.8	70	27	48
Amidon	17	34	17	62	15.0	69	34	51
MinnPro	17	30	21	62	14.6	69	40	54
Grandin	16	32	28	64	15.3	68	43	55
Baker	13	21	69	63	15.2	66	---	---
Express	15	24	34	63	14.5	66	---	---
Marshall	16	26	20	63	15.7	65	45	55
Nomad	17	23	27	62	15.7	63	---	---
Pasqua	18	32	25	63	14.9	63	39	51
Leader	18	34	37	63	14.7	62	---	---
CDC Makwa	17	36	31	63	14.5	62	---	---
Waldron	16	34	44	62	13.2	61	---	---
Lew	19	33	58	64	15.5	60	---	---
Telemark	16	25	38	63	13.9	60	---	---
Coteau	17	33	18	63	14.3	59	---	---
2369	17	25	23	64	----	59	49	54
Rumanic	15	30	49	62	15.5	59	---	---
Nordic	17	29	33	64	15.6	58	---	---
Hi Line	15	25	56	64	15.5	58	---	---
Len	17	28	31	63	----	57	40	48
Cutless	18	31	58	62	15.3	57	36	46
Butte 86	16	29	46	64	14.4	56	38	47
Stoa	17	30	33	62	15.5	56	40	48
Prospect	17	29	38	63	15.7	56	38	47
2375	17	32	30	63	16.4	54	41	47
2370	16	31	42	62	14.1	52	38	45
Dutchboy	17	28	30	63	16.4	50	---	---
CDC Teal	15	27	61	62	15.6	47	---	---
XW398A4	17	29	13	63	15.6	91	---	---
MT 8849	17	31	18	63	15.5	87	---	---
ND 678	17	32	19	63	----	78	---	---
ND 676	17	34	33	65	15.0	74	---	---
ND 671	15	30	45	63	----	72	---	---
ND 675	16	32	42	64	16.1	66	---	---
N-870306	16	23	28	63	15.8	64	---	---
ND 682	17	29	33	63	15.7	60	---	---
ND 673	17	33	30	66	15.9	60	---	---
ND 677	17	30	28	63	15.8	60	---	---
XW397A3	17	29	37	64	15.1	57	---	---
SD 3056	15	29	37	63	15.6	56	---	---
ND 674	17	30	25	64	15.5	56	---	---
ND 681	17	33	28	62	16.8	56	---	---
ND 679	18	33	27	62	15.3	50	---	---
ND 680	17	33	33	63	15.7	50	---	---
Mean	17	29.6	32.6	63.1	15.2	64.5		
C.V. %	0.5	9.4	35.5	1.6	6.6	23.2		
LSD .05	1.2	4.5	18.7	1.0	NS	20.9		

Planting date: April 14
Planting rate: Approximately 62 lb/ac (roughly 900,000 PLS/ac)
Fertilizer applied: 33 lb 11-55-0
Herbicide applied: 2.5 pt Hoelon + 1 pt Buctril
Harvest date: August 20

*Note: Tan Spot and Septoria were principle fungal foliar pathogens; BYD and WSM viruses also were present.

1992 Hettinger Hard Red Spring Wheat Variety Trial

Variety	Test weight	Grain protein	Heading date	Ht	Yield 1990	1991	1992	2yr	3yr
	lbs/bu	%	June	cm	bu/A				
Nordic	62.2	12.6	19	77	56.8	77.0	88.9	83.0	74.2
2371	60.7	14.4	19	81	59.1	72.7	84.2	78.4	72.0
Gus	60.7	15.2	19	82	56.7	64.2	90.7	77.4	70.5
Prospect	60.4	13.6	18	84	55.5	74.0	81.2	77.6	70.2
Bergen	61.0	14.0	18	72	47.3	80.3	80.8	80.6	69.5
Marshall	60.4	13.6	20	75	49.8	69.4	88.9	79.2	69.4
Norm	59.1	14.0	18	82	50.6	70.7	85.5	78.1	68.9
Vance	61.2	14.1	23	88	53.9	66.2	85.8	76.0	68.6
Amidon	60.0	14.8	18	90	41.8	73.6	86.0	79.8	67.1
Grandin	62.8	14.9	18	85	52.8	68.9	78.8	73.8	66.8
Stoa	60.0	14.4	20	94	50.3	65.0	76.3	70.6	63.9
Len	61.5	14.8	20	79	44.7	68.5	73.7	71.1	62.3
2370	59.5	14.6	16	75	39.9	69.8	76.9	73.4	62.2
Butte 86	62.1	14.5	17	87	41.7	70.0	74.7	72.4	62.1
Sharp	63.3	14.4	16	86	43.3	62.3	77.6	70.0	61.1
Alex	61.6	14.2	20	96	38.3	60.1	81.0	70.6	59.8
Cutless	59.0	15.6	18	80	44.2	57.5	47.8	52.6	49.8
Krona	59.8	13.2	20	77		75.0	98.0	86.5	
Dalen	61.8	14.6	16	76		76.3	83.9	80.1	
2375	61.0	14.4	16	71		74.7	78.4	76.6	
Hi-Line	61.6	14.2	17	74		68.0	77.2	72.6	
Pasqua	61.5	15.3	22	100		57.5	73.7	65.6	
Genesis	59.8	12.8	16	86			87.4		
Dutchboy	58.6	13.8	21	78			86.0		
Express	60.4	14.6	17	74			81.5		
Nomad	60.2	13.8	19	64			80.3		
Teal	61.5	15.3	17	86			79.7		
Makwa	61.2	15.2	22	104			78.8		
Rumanick	60.4	15.0	15	90			72.0		
Baker	62.0	16.2	17	44			37.3		
MT8849	60.5	14.2	21	84			106.1		
N87-0306	61.2	14.5	17	68			93.3		
XW398A4	62.1	14.4	18	68			92.8		
ND678	60.6	14.4	19	97			90.7		
ND657	61.2	15.5	18	84			87.6		
XW397A3	60.9	14.6	22	83			87.1		
ND673	62.2	14.2	21	99			87.1		
ND679	61.6	15.0	23	98			86.9		
ND676	63.0	14.4	18	85			84.3		
ND674	62.5	15.4	19	86			83.8		
ND681	62.1	15.1	21	97			82.3		
ND675	62.7	15.5	19	82			79.2		
ND682	62.1	14.4	20	94			78.9		

Continued on next page.

Variety	Test weight	Grain protein	Heading date	Ht	Yield 1990	Yield 1991	Yield 1992
	lbs/bu	%	June	cm	------bu/A------		
SD3056	61.6	15.6	16	78			78.3
ND671	62.9	14.4	15	87			78.1
ND677	61.4	14.5	20	93			75.2
ND680	61.8	15.6	20	96			73.7
Trial mean	61.2	14.6	19	83	48.4	68.4	81.4
C.V. %	2.0	2.4	0.2	7	17.4	9.3	14.0
LSD 5%	1.7	0.5	1	9	13.6	8.9	16.3
LSD 1%	2.3	0.7	2	12	18.2	11.7	21.8
# of reps	4	4	4	4	4	4	4

Planting date: April 3 Harvest date: August 18
Seeding rate: 1.1 million live seeds/A (approx. 1.1 bu/A)
Fertilizer applied: 44 lbs/A 11-52-0
Yield goal: 60 bu/A
Herbicide application: 1/6 oz/A Express + 3/4 pt/A Bronate
Hard frost (24 deg F) on 5/26/92 caused minor plant injury.
Yields are adjusted to 12.5% moisture.

1992 Regent Hard Red Spring Wheat Variety Trial

Variety	Test weight	Grain protein	Plant height	Yield 1990	Yield 1991	Yield 1992	Yield 2yr	Yield 3yr
	lbs/bu	%	cm	----------bu/A----------				
Amidon	61.7	15.5	85	27.9	60.0	80.1	70.0	56.0
Nordic	62.1	14.0	78	31.6	61.4	69.0	65.2	54.0
Butte 86	62.5	16.0	73	41.7	62.5	53.1	57.8	52.4
Grandin	62.9	16.0	78	29.7	62.5	64.7	63.6	52.3
Stoa	61.4	15.9	75	26.8	58.9	64.3	61.6	50.0
2375	61.2	15.4	69	30.1	62.0	54.7	58.4	48.9
2371	60.2	15.5	70		65.6	50.9	58.2	
Sharp	63.4	15.6	79		60.8	52.9	56.8	
Krona	60.7	13.8	67			76.8		
Norm	58.2	14.7	69			68.5		
ND657	61.3	16.4	77			61.8		
ND671	62.6	16.4	69			41.8		
Trial mean	61.5	15.4	74	31.3	61.6	61.5		
C.V. %	1.1	4.7		14.4	7.3	11.9		
LSD 5%	1.0	0.9		ns	ns	11.4		
LSD 1%	1.4	1.3		ns	ns	16.1		
# of reps	4	4	1	4	4	4		

Planting date: April 7 Harvest date: August 21
Seeding rate: 1.1 million live seeds/A (approx. 1.1 bu/A)
Fertilizer applied: 44 lbs/A 11-52-0 + 60 lbs/A 46-0-0
Yield goal: 60 bu/A
Herbicide application: Dakota TP

1992 Scranton Hard Red Spring Wheat Variety Trial

Variety	Test weight	Grain protein	Plant height	Yield 1990	1991	1992	2yr	3yr
	lbs/bu	%	cm	bu/A				
Nordic	62.8	12.7	71	35.5	40.2	47.1	43.6	40.9
Grandin	63.9	14.7	69	30.7	36.4	44.6	40.5	37.2
2375	61.5	14.1	58	29.6	43.2	38.7	41.0	37.2
Stoa	60.9	14.5	76	29.3	32.1	47.4	39.8	36.3
Amidon	59.6	14.7	83	26.4	32.9	47.6	40.2	35.6
Butte 86	63.1	14.9	71	31.5	34.3	40.4	37.4	35.4
2371	62.4	14.4	64		37.9	47.6	42.8	
Sharp	64.4	14.5	79		39.4	43.5	41.4	
Krona	61.4	12.9	60			53.0		
Norm	62.6	14.2	65			49.0		
ND671	63.6	15.3	66			44.0		
ND657	61.4	15.0	67			43.5		
Trial mean	62.3	14.3	69	30.5	36.8	45.5		
C.V. %	1.1	2.3		16.2	7.0	13.3		
LSD 5%	1.1	0.5		ns	3.7	9.4		
LSD 1%	1.5	0.7		ns	4.9	13.3		
# of reps	4	4	1	4	4	4		

Planting date: April 7 Harvest date: August 12
Seeding rate: 1.1 million live seeds/A (approx. 1.1 bu/A)
Fertilizer applied: 52 lbs/A 11-52-0
Yield goal: 60 bu/A
Herbicide application: 2 pt/A Hoelon + 1 pt/A Buctril + 1.5 oz/A MCPE

1992 Selfridge Hard Red Spring Wheat Variety Trial

Variety	Test weight	Grain protein	Plant height	Yield 1989	1990	1992	2yr	3yr
	lbs/bu	%	inches	bu/A				
Nordic	60.2	12.7	32	47.8	66.9	77.0	72.0	63.9
Amidon	59.7	13.8	33	38.8	60.8	69.1	65.0	56.2
Butte 86	62.0	14.5	33	39.9	54.6	68.0	61.3	54.2
Stoa	60.7	14.0	36	40.6	58.0	61.2	59.6	53.3
Grandin	61.3	14.1	32	40.0	53.1	62.7	57.9	51.9
2375	60.0	14.0	26		60.8	63.2	62.0	
Krona	57.8	13.0	30			76.7		
Norm	58.0	13.6	30			69.4		
2371	58.8	14.4	27			63.2		
Sharp	62.5	14.1	30			62.3		
ND657	59.8	14.5	33			66.7		
ND671	62.5	14.7	36			53.2		
Trial mean	60.3	13.9	32	40.3	59.0	66.0		
C.V. %	1.6	3.5		7.3	9.0	9.8		
LSD 5%	1.5	0.8		4.5	7.3	10.1		
LSD 1%	2.2	1.1		6.3	9.8	14.2		
# of reps	4	4	1	4	4	4		

Planting date: April 6 Harvest date: August 20
Seeding rate: 1.1 million live seeds/A (approx. 1.1 bu/A)
Fertilizer applied: 44 lbs/A 11-52-0
Yield goal: 60 bu/A
Herbicide application: 2 pt/A Hoelon + 1 pt/A Buctril + 1.5 oz/A MCPE

1992 Hettinger and Off-Station HRS Wheat Variety Trials
Combined Means - 4 Locations*

Variety	Test weight	Grain protein	Plant height	Yield 1990	1991	1992	2yr	3yr
	lbs/bu	%	cm	bu/A				
Nordic	61.8	13.0	77	47.7	59.5	70.5	65.0	59.2
Amidon	60.2	14.7	86	39.2	55.5	70.7	63.1	55.1
Grandin	62.7	15.0	78	41.6	55.9	62.7	59.3	53.4
2375	60.9	14.5	66	40.2	60.0	58.8	59.4	53.0
Butte 86	62.4	15.0	79	42.4	55.6	59.0	57.3	52.3
Stoa	60.8	14.7	84	41.1	52.0	62.3	57.2	51.8
2371	60.5	14.7	71		58.7	61.5	60.1	
Sharp	63.4	14.6	80		54.2	59.1	56.6	
Krona	59.9	13.2	70			76.1		
Norm	59.5	14.1	73			68.1		

* Hettinger, Regent, Scranton and Selfridge

DRYLAND SPRING WHEAT TRIAL DICKINSON AND OFF-STATION SITES, 1992

Variety	Dickinson	Beach	Beulah	Glen Ullin	Hannover	Manning	Average 6 Sites
				BU/AC			
2369	59	68	--	68	62	38	59
2375	54	66	87	71	65	41	64
Bergen	82	64	84	75	68	33	68
Norm	79	63	96	70	75	43	71
Grandin	68	63	84	73	71	40	66
Stoa	56	62	87	65	65	43	63
Amidon	69	61	100	76	73	46	71
Butte 86	56	60	81	56	58	41	59
Len	57	60	80	67	65	41	62
Sharp	73	59	78	57	64	34	61
Gus	79	59	82	68	67	46	67
2371	73	57	85	71	73	36	66
Cutless	57	44	69	56	57	39	54
Roblin	--	--	71	--	--	--	--
Mean	--	60.5	83.3	67.0	66.5	40.0	
C.V.%	--	9.8	6.0	10.0	10.5	12.8	
LSD .05	--	8.5	7.1	9.6	10.0	7.3	
Seeding date	14 Apr	16 Apr	29 Apr	30 Apr	28 Apr	14 Apr	
Harvest date	14 Aug	12 Aug	20 Aug	18 Aug	31 Aug	14 Aug	
				TEST WEIGHT (LB/BU)			
2369	64	63.5	--	61.5	60.5	63.0	62.5*
2375	63	62.5	63.5	62.5	60.0	63.5	62.5
Bergen	63	60.0	63.0	62.0	60.5	63.5	62.0
Norm	62	63.0	63.0	60.0	60.5	61.0	61.6
Grandin	64	63.0	61.0	63.0	60.5	64.5	62.7
Stoa	62	62.0	62.5	62.0	60.0	63.0	61.9
Amidon	62	--	62.0	61.0	60.5	61.0	61.3*
Butte 86	64	62.5	64.0	63.5	61.0	64.0	63.2
Len	63	60.0	61.0	60.0	60.5	63.5	61.3
Sharp	65	65.0	63.5	61.5	60.0	65.5	63.4
Gus	62	62.5	63.0	60.5	60.0	63.0	61.8
2371	62	62.0	60.0	59.0	59.0	62.0	60.7
Cutless	62	62.0	63.0	62.5	59.5	63.5	62.1
Roblin	--	--	--	--	--	--	--
				PROTEIN %			
2369	--	13.5	--	12.2	12.4		12.7***
2375	16.4	14.2	13.2	13.3	12.4		13.9*
Bergen	14.3	14.1	13.2	12.6	11.7		13.2*
Norm	14.2	14.2	13.2	12.6	11.7		13.2*
Grandin	15.3	14.3	12.8	12.5	11.5		13.3*
Stoa	15.5	13.8	13.6	12.5	12.6		13.6*
Amidon	15.0	14.3	12.6	13.5	12.0		13.5*
Butte 86	14.4	14.3	13.3	13.1	11.6		13.3*
Len	--	13.9	13.8	12.4	11.0		12.8**
Sharp	14.1	14.3	13.8	13.0	10.8		13.2*
Gus	14.4	14.6	14.0	12.4	13.4		13.8*
2371	15.0	14.5	13.2	12.9	11.3		13.4*
Cutless	15.3	15.1	14.0	15.3	14.8		14.9*

* 5 site average
** 4 site average
*** 3 site average

Seeding rate: Approximately 60 lb/ac (roughly 900,000 PLS/ac)
Fertilizer applied: 50 lb 11-55-0/ac
Herbicide applied: 2.5 pt Hoelon + 1 pt Buctril

Recrop Small Grain Trials - Dickinson

Small grain varietal evaluations were conducted in a field where corn was planted in 1991 at the Dickinson Research Center. This field was next to a summer fallowed field where small grain varietal trials also were conducted so that comparisons could be made between recropped and summer fallowed evaluations.

Approximately 5.5 inches of plant available water (PAW) was contained in the top 30 inches of soil in the fallowed field just prior to planting. By contrast, only approximately 2 inches of PAW occurred within the same depth in the recropped field. The limited supply of water along with warm, dry conditions from April through mid-May severely stressed small grains, particularly in the recropped field. However, cool temperatures in June and July, coupled with timely rains, resulted in recropped yields close to, and in some cases even surpassing, yields achieved in the fallowed field. For example, average yield of hard red spring wheat varieties were roughly 80% of that achieved in the fallowed field (see below). Clearly, exceptional recropped yields were achieved at the Dickinson Research Center in 1992 (if only this was the rule and not the exception!).

DRYLAND SPRING WHEAT TRIAL-RECROP DICKINSON, ND, 1992

VARIETY	HEADING DATE	HEIGHT	TEST WEIGHT	PROTEIN	YIELD
	JUNE	IN	LBS	%	BU/A
Krona	15	24	61	13	67
2375	14	28	62	17	59
Gus	16	25	61	17	56
Marshall	16	26	62	15	56
Stoa	16	29	61	16	52
Len	16	28	62	16	52
Amidon	16	30	62	16	52
Grandin	15	26	63	16	50
Sharp	14	25	63	16	49
Norm	16	26	61	16	47
Butte 86	15	28	62	17	47
Pasqua	16	31	62	16	46
Bergen	16	23	61	16	45
2370	15	25	62	16	44
Cutless	16	26	62	18	44
Mean	15	27	62	16	51
C.V. %	0.3	6.6	0.9	1.2	14
LSD .05	1	3	0.8	3.4	10

Planting date: April 14
Planting rate: Approximately 62 lb/ac (roughly 900,000 PLS/ac)
Fertilizer applied: 46 lb urea/ac
Herbicide applied: 2.5 pt Hoelon + 1 pt Buctril/ac

1992 Hettinger HRSW Variety Recrop Trial

Variety	Grain yield bu/A	Test weight lbs/bu	Grain protein %
Nordic	46.9	61.3	14.2
Vance	45.0	59.9	16.0
2370	44.8	59.5	15.7
Krona	43.3	60.0	14.6
Amidon	40.8	60.5	16.1
Grandin	40.8	61.7	15.8
Gus	36.8	59.3	16.7
Len	36.0	60.1	15.8
Stoa	35.0	59.4	16.5
Norm	34.8	60.6	15.6
Sharp	34.8	61.4	15.7
Prospect	33.9	59.7	15.4
Pasqua	33.4	58.9	16.3
Marshall	31.4	60.8	16.1
Alex	30.5	60.2	16.4
2371	29.8	59.9	16.2
Bergen	28.8	60.1	16.6
2375	28.3	60.0	16.6
Cutless	24.1	59.4	16.9
Dalen	23.7	61.3	16.6
Butte 86	23.6	60.1	17.2
Hi-Line	22.4	60.0	17.1
Trial mean	34.0	60.2	16.1
C.V. %	28.5	1.1	4.1
LSD 5%	14.3	0.9	1.0

Planting date: April 3
Seeding rate: 1.1 million live seeds/A (approx. 1.1 bu/A)
Fertilizer applied: 44 lbs/A 11-52-0
Yield goal: 60 bu/A
Herbicide application: 1/6 oz/A Express + 3/4 pt/A Bronate
2 pt/A Hoelon
Harvest date: August 28

Dryland Durum Trial-Fallow Dickinson, ND, 1992

	Heading	Test				Yield		
Variety	Date	Height	Weight	Protein	Seeds/LB	1992	1991	AVG
	June	IN	LBS	%			BU/A	
Laker	18	29	62	22	8038	51	---	---
Regal	18	34	63	--	9394	50	---	---
Plenty	16	32	62	--	9383	50	---	---
Monroe	16	28	63	--	8333	49	48	48
Renville	16	27	63	23	8465	47	37	42
Stockholm	16	26	62	--	8945	47	---	---
Lloyd	16	25	62	23	8537	47	34	40
Sceptre	16	28	61	24	9636	45	---	---
Ward	16	34	62	--	9622	44	---	---
Medora	16	29	62	22	9298	44	44	44
Vic	16	29	61	24	8841	43	36	39
Rugby	17	32	62	--	9727	43	---	---
Fjord	18	31	62	--	9162	39	---	---
D86398	16	25	63	--	9024	48	---	---
D87240	16	25	63	--	8705	47	---	---
D86741	15	30	61	--	8738	46	---	---
D87121	16	29	62	--	9316	45	---	---
D87130	16	28	62	--	9713	45	---	---
D87122	16	30	62	--	8973	45	---	---
D8460	17	30	61	--	9139	44	---	---
D87141	16	27	63	--	9422	43	---	---
D87436	17	30	62	--	8900	43	---	---
D871534	16	24	62	--	8743	43	---	---
D87450	16	33	62	--	9217	43	---	---
D861523	16	31	61	--	9122	38	---	---
Mean	16	29	62	22.8	9059	45	---	---
C.V.%	0.4	7.1	1.0	6.1	2.8	13	---	---
LSD .05	NS	3.4	0.9	3.6	361.4	NS	---	---

Planting date: April 14
Planting rate: Approximately 70 lb/ac (roughly 800,000 PLS/ac)
Fertilizer applied: 33 lb 11-55-0
Herbicide applied: 2.5 pt Hoelon + 1 pt Buctril
Harvest date: August 14

1992 Hettinger Durum Variety Trial

Variety	Test weight	Grain protein	Heading date	Plant height	Yield				
					1990	1991	1992	2yr	3yr
	lbs/bu	%	June	cm	bu/A				
Regal	62.9	17.3	18	100	41.5	73.2	91.4	82.3	68.7
Sceptre	61.4	17.7	18	85	52.3	67.6	86.2	76.9	68.7
Renville	62.0	18.0	18	84	48.0	71.4	85.4	78.4	68.3
Ward	62.6	17.8	17	84	44.6	75.7	75.5	75.6	65.3
Lloyd	61.0	16.8	19	77	45.1	69.2	81.1	75.2	65.1
Vic	62.6	17.8	18	97	43.5	68.9	82.6	75.8	65.0
Medora	62.2	18.2	17	92	42.1	66.0	85.5	75.8	64.5
Rugby	62.7	17.8	18	85	45.5	67.1	78.9	73.0	63.8
Monroe	61.6	17.3	15	80	50.8	63.4	71.0	67.2	61.7
Laker	61.9	17.4	20	83		65.9	82.5	74.2	
Plenty	60.9	18.0	19	87			86.5		
D86398	61.8	17.7	19	86			85.5		
D87240	60.4	17.7	18	90			85.0		
D87130	62.2	17.7	18	78			81.6		
D8460	61.4	17.9	18	73			81.4		
D87122	62.1	18.0	19	79			80.5		
D86741	62.1	17.6	17	76			75.1		
D861523	61.9	17.6	16	82			73.6		
D87436	61.8	17.0	18	80			72.8		
D87141	62.1	17.8	17	81			72.6		
D87450	60.1	17.0	16	75			68.1		
D87121	61.6	17.4	15	81			68.1		
Trial mean	61.8	17.6	18	83	48.3	70.6	79.6		
C.V. %	1.2	2.0	0.2	12	26.3	11.5	11.3		
LSD 5%	1.1	0.5	1	15	ns	ns	13.3		
LSD 1%	1.5	0.7	2	20	ns	ns	18.1		
# of reps	4	4	4	4	4	4	4		

Planting date: April 3, 1992 Harvest date: August 18, 1992
Seeding rate: 1.1 million live seeds/A (approx. 1.1 bu/A)
Fertilizer applied: 44 lbs/A 11-52-0
Yield goal: 60 bu/A
Herbicide application: 1/6 oz/A Express + 3/4 pt/A Bronate

DRYLAND DURUM TRIAL-RECROP DICKINSON, ND, 1992

VARIETY	HEADING DATE	HEIGHT	TEST WEIGHT	PROTEIN	YIELD
	JUNE	IN	LBS	%	BU/A
Sceptre	16	29	62	23	48
Monroe	16	30	63	23	48
Laker	17	29	62	21	47
Vic	16	29	62	24	45
Lloyd	15	24	63	21	43
Renville	15	29	63	22	42
Medora	15	30	63	23	40
Mean	16	28	63	22	45
C.V. %	0.3	4.5	0.5	1.5	12
LSD .05	1	2.3	0.4	2.7	NS

Planting date: April 14
Planting rate: Approximately 70 lb/ac (roughly 800,000 PLS/ac)
Fertilizer applied: 46 lb urea/ac
Herbicide applied: 2.5 pt Hoelon + 1 pt Buctril
Harvest date: August 17

DRYLAND DURUM TRIAL DICKINSON AND OFF-STATION SITES, 1992

Variety	Dickinson	Beach	Beulah	Glen Ullin	Hannover	Manning	Average 6 Sites
			BU/AC				
Renville	47	69	75	71	62	44	61
Monroe	49	65	69	68	56	45	58
Medora	44	60	73	62	55	40	55
D87450	43	65	68	61	56	37	55
D8460	44	62	67	58	53	40	54
Mean	---	61.7	70.6	64.0	56.3	41.3	
C.V.%	---	8.3	6.5	7.3	4.6	16.4	
LSD .05	---	NS	NS	7.2	4.0	NS	
Seeding date (April)	14	16	29	30	28	14	
Harvest date (August)	14	11	20	18	31	14	
			TEST WEIGHT (LB/BU)				
Renville	63.0	59.0	64.0	62.0	61.0	63.5	62.1
Monroe	63.0	58.0	63.0	61.0	60.5	63.5	61.5
Medora	62.0	55.0	62.5	62.5	60.5	64.0	61.1
D87450	62.0	60.5	63.5	62.0	60.5	63.5	62.0
D8460	61.0	58.0	64.0	64.0	59.5	63.5	61.7

Seeding rate: Approximately 70 lb/ac (roughly 800,000 PLS/ac)
Fertilizer applied: 50 lb 11-55-0/ac
Herbicide applied: 2.5 pt Hoelon + 1 pt Buctril

1992 Regent Durum Variety Trial

Variety	Test weight	Grain protein	Plant height	Yield 1990	1991	1992	2yr	3yr
	lbs/bu	%	cm	bu/A				
Medora	61.1	16.9	95	28.6	60.5	80.0	70.2	56.4
Renville	59.8	16.8	94	27.8	65.5	75.8	70.6	56.4
Vic	61.8	17.1	83	28.2	60.7	77.2	69.0	55.4
Ward	61.6	16.9	86	24.4	63.6	76.2	70.0	54.7
Monroe	61.3	16.8	78	26.0	62.4	64.7	63.6	51.0
Sceptre	59.4	16.4	80			80.3		
Trial mean	60.8	16.8	86	27.0	61.1	75.7		
C.V. %	1.3	2.6		19.3	6.0	7.4		
LSD 5%	1.5	ns		ns	ns	10.2		
LSD 1%	2.3	ns		ns	ns	ns		
# of reps	4	4	1	4	4	4		

Planting date: April 7 Harvest date: August 21
Seeding rate: 1.1 million live seeds/A (approx. 1.1 bu/A)
Fertilizer applied: 44 lbs/A 11-52-0 + 60 lbs/A 46-0-0
Yield goal: 60 bu/A
Herbicide application: Dakota TP***
***Dakota TP is not labeled for use on durum and does cause severe crop injury.

1992 Scranton Durum Variety Trial

Variety	Test weight	Grain protein	Plant height	Yield 1990	1991	1992	2yr	3yr
	lbs/bu	%	cm	bu/A				
Monroe	62.3	16.2	70	37.7	39.4	50.5	45.0	42.5
Medora	63.8	16.8	78	35.5	35.5	52.7	44.1	41.1
Ward	62.9	16.7	76	33.0	37.3	51.4	44.4	40.6
Renville	61.6	16.2	81	33.3	36.5	50.3	43.4	40.0
Vic	63.8	16.4	78	35.2	33.8	46.3	40.0	38.4
Sceptre	61.5	16.4	65			50.0		
Trial mean	62.7	16.5	75	34.9	35.5	50.2		
C.V. %	2.0	1.4		16.3	7.5	6.0		
LSD 5%	ns	0.4		ns	ns	5.5		
# of reps	4	4	1	4	4	4		

Planting date: April 7 Harvest date: August 12
Seeding rate: 1.1 million live seeds/A (approx. 1.1 bu/A)
Fertilizer applied: 52 lbs/A 11-52-0
Yield goal: 60 bu/A
Herbicide application: 2 pt/A Hoelon + 1 pt/A Buctril + 1.5 oz/A MCPE

1992 Selfridge Durum Variety Trial

Variety	Test weight	Grain protein	Plant height	Yield 1989	1990	1992	2yr	3yr
	lbs/bu	%	inches	bu/A				
Renville	61.8	15.3	37	42.4	45.8	60.5	53.2	49.6
Ward	61.9	16.1	32	40.8	43.6	55.1	49.4	46.5
Vic	62.2	16.0	35	39.6	44.8	51.4	48.1	45.3
Medora	62.5	15.7	38	39.2	45.2	51.0	48.1	45.1
Monroe	61.2	15.8	29	36.4	44.6	47.2	45.9	42.7
Sceptre	61.4	15.1	32			58.8		
Trial mean	61.8	15.6	34	39.8	44.8	54.0		
C.V. %	0.8	2.8		10.4	14.0	4.8		
LSD 5%	0.9	0.8		ns	ns	4.7		
LSD 1%	ns	ns		ns	ns	7.4		
# of reps	4	4	1	4	4	4		

Planting date: April 6 Harvest date: August 20
Seeding rate: 1.1 million live seeds/A (approx. 1.1 bu/A)
Fertilizer applied: 44 lbs/A 11-52-0
Yield goal: 60 bu/A
Herbicide application: 2 pt/A Hoelon + 1 pt/A Buctril + 1.5 oz/A MCPE

1992 Hettinger and Off-Station Durum Variety Trials

Combined Means - 4 Locations*

Variety	Test weight	Grain protein	Plant height	Yield 1990	1991	1992	2yr	3yr
	lbs/bu	%	cm	bu/A				
Renville	61.3	16.6	88	38.7	57.8	68.0	62.9	54.8
Ward	62.2	16.9	82	36.4	58.9	64.6	61.8	53.3
Medora	62.4	16.9	90	37.8	54.0	67.3	60.6	53.0
Vic	62.6	16.8	87	37.9	54.5	64.4	59.4	52.3
Monroe	61.6	16.5	76	39.8	55.1	58.4	56.8	51.1
Septre	60.9	16.4	78			68.8		

* Hettinger, Regent, Scranton and Selfridge

Dryland Barley Trial-Fallow Dickinson, ND, 1992

Variety	Heading Date	Height	Test Weight	Protein	Seeds/LB	Yield 1992	1991	AVG
	June	IN	LBS	%			BU/A	
Harrington	19	27	50	15	9923	88	62	75
Excel	17	29	48	14	10737	86	69	77
Hector	18	28	51	14	9504	81	69	75
Gallatin	18	26	51	15	10380	80	81	80
Robust	18	29	49	15	10674	80	71	75
Bearpaw	20	28	50	15	9922	80	70	75
Bowman	14	27	50	15	9129	79	73	76
Stark	16	30	51	15	8561	78	74	76
Russell	17	25	48	14	10740	71	70	70
Hazen	18	28	49	16	10549	69	74	71
Morex	15	28	48	16	11004	69	70	69
Azure	18	25	47	16	10869	64	68	66
Wanubet	20	26	55	20	11281	60	55	57
M64	19	27	50	15	10303	84	---	---
B1602	18	25	50	15	10429	77	---	---
ND10981	17	28	48	15	9758	76	---	---
ND11055	17	24	49	15	10674	73	---	---
ND11231	14	26	51	15	8856	71	---	---
B1603	17	25	49	16	11343	66	---	---
Mean	17	26.9	49.7	15	10271	75.4	---	---
C.V. %	0.5	9.9	1.7	3.0	2.1	11.8	---	---
LSD .05	1.5	NS	1.2	1.0	308.7	12.6	---	---

Planting date: April 14
Planting rate: Approximately 62 lb/ac (roughly 850,000 PLS/ac)
Fertilizer applied: 33 lb 11-55-0/ac
Herbicide applied: 2.5 pt Hoelon + 1 pt Buctril
Harvest date: August 13

*Notes: BYDM and WSM viruses were present as was net blotch

1992 Hettinger Barley Variety Trial

Variety	Test weight	Grain protein	Heading date	Ht	Yield 1990	1991	1992	2yr	3yr
	lbs/bu	%	June	cm	bu/A				
Gallatin	50.0	12.6	17	80	101.0	90.2	134.3	112.2	108.5
Stark	51.1	13.0	17	83	86.9	93.1	137.7	115.4	105.9
Excel	49.0	13.2	17	78	53.4	86.7	170.4	128.6	103.4
Hazen	47.2	13.6	18	85	82.0	69.2	153.2	111.2	101.5
Azure	47.6	14.0	17	82	79.7	73.1	147.6	110.4	100.1
Bowman	49.7	13.8	17	75	76.3	92.6	126.0	109.3	98.3
Hector	49.2	13.2	17	79	85.7	78.7	122.9	100.8	95.8
Robust	49.1	14.0	18	87	62.4	71.5	151.0	111.2	95.0
Morex	47.5	13.6	18	82	73.2	74.8	136.7	105.8	94.9
Harrington	48.4	12.7	19	81	70.5	66.6	137.1	101.8	91.4
B1602	49.6	13.6	20	82	50.3	71.6	147.4	109.5	89.8
Bearpaw	48.4	13.0	20	80	62.8	65.0	128.3	96.6	85.4
B1603	48.3	14.0	17	76	58.0	58.5	128.8	93.6	81.8
Wanubet	53.9	14.8	20	81	64.2	52.0	100.8	76.4	72.3
Russell	46.7	12.8	17	75		88.5	124.6	106.6	
ND11055	48.4	12.8	19	83			158.9		
ND10981	47.3	13.4	18	80			157.9		
M64	48.6	13.0	19	80			147.4		
ND11853	51.2	13.0	17	74			125.4		
ND11231	51.4	13.2	17	76			124.1		
I89-294-2	57.4	14.9	17	81			102.4		
Horseford	39.2	13.8		84			88.1		
Trial mean	49.1	13.5	18	80	74.8	76.0	134.1		
C.V. %	1.1	2.5	0.1	8	25.5	16.7	8.3		
LSD 5%	0.8	0.5	1	ns	27.0	17.9	15.8		
LSD 1%	1.0	0.6	1	ns	ns	23.8	21.0		
# of reps	4	4	4	4	4	4	4		

Planting date: April 3 Harvest date: August 18
Seeding rate: 750,000 live seeds/A (approx. 1.25 bu/A)
Yield goal: 80 bu/A
Fertilizer applied: 44 lbs/A 11-52-0
Herbicides applied: 1/6 oz/A Express + 3/4 pt/A Bronate

DRYLAND BARLEY TRIAL-RECROP DICKINSON, ND, 1992

VARIETY	HEADING DATE	HEIGHT	TEST WEIGHT	PROTEIN	YIELD
	JUNE	IN	LBS	%	BU/A
Gallatin	16	25	51	13	78
Harrington	18	25	51	13	78
Bearpaw	19	24	50	13	76
Excel	17	35	48	14	73
Hector	17	26	52	14	72
Bowman	15	26	50	14	70
Stark	15	26	59	14	68
Robust	16	24	49	14	60
Morex	16	28	47	15	60
Azure	16	25	47	14	50
Mean	16	26	49	14	69
C.V. %	0.5	5.7	1.5	NS	8.6
LSD .05	1.3	NS	1.1	4.1	8.6

Planting date: April 14
Planting rate: Approximately 62 lb/ac (roughly 850,000 PLS/ac)
Fertilizer applied: 46 lb urea/ac
Herbicide applied: 2.5 pt Hoelon + 1 pt Buctril/ac
Harvest date: August
*Note: Grain yield was reduced because of bird damage

DRYLAND BARLEY TRIAL DICKINSON AND OFF-STATION SITES, 1992

Variety	Dickinson	Beach	Beulah	Glen Ullin	Hannover	Manning	Average 6 Sites
			BU/AC				
Excel (6R)	86	106	141	106	111	76	104
Gallatin (2R)	80	99	129	113	109	79	101
Stark (2R)	78	94	122	110	109	76	98
ND 11231 (2R)	71	92	135	108	101	73	97
Morex (6R)	69	90	107	92	97	65	87
Bowman (2R)	79	81	102*	91	100	67	87
Mean	---	93.8	122.6	103.5	104.4	72.6	
C.V.%	---	4.3	6.4	4.5	7.5	8.4	
LSD .05	---	6.1	12.0	7.6	NS	9.3	
Seeding date (April)	14	16	29	30	28	14	
Harvest date (August)	11	12	18	19	17	13	
			TEST WEIGHT (LB/BU)				
Excel	48.0	52.0	52.0	50.0	47.5	50.0	49.9
Gallatin	51.0	54.0	52.5	51.0	50.5	53.5	52.1
Stark	51.0	53.0	53.5	54.0	51.5	54.0	52.8
ND 11231	51.0	52.5	53.0	53.0	51.0	52.0	52.1
Morex	48.0	50.5	50.5	49.0	46.5	51.0	49.2
Bowman	50.0	53.5	53.0	53.0	50.5	52.0	52.0

* Notes- Bowman badly lodged at Beulah

Seeding rate: Approximately 60 lb/ac (roughly 900,000 PLS/ac)
Fertilizer applied: 50 lb 11-55-0/ac
Herbicide applied: 2.5 pt Hoelon + 1 pt Buctril

1992 Regent Barley Variety Trial

Variety	Test weight	Grain protein	Plant height	Yield 1990	1991	1992	2yr	3yr
	lbs/bu	%	cm	bu/A				
Bowman	51.2	13.0	65	59.3	83.4	120.0	101.7	87.6
Hector	50.0	13.0	83	62.3	78.4	119.9	99.2	86.9
Excel	49.2	12.5	73		91.2	151.4	121.3	
Stark	52.2	12.9	76		82.9	140.5	111.7	
ND11231	52.3	12.9	73			142.5		
Harrington	49.2	13.0	76			117.2		
Trial mean	50.7	12.9	74.3	60.8	80.9	131.9		
C.V. %	1.2	2.1		20.1	5.6	4.6		
LSD 5%	0.9	ns		ns	6.7	9.0		
LSD 1%	1.3	ns		ns	9.1	12.3		
# of reps	4	4	1	4	4	4		

Planting date: April 7 Harvest date: August 21
Seeding rate: 750,000 live seeds/A (approx. 1.25 bu/A)
Fertilizer applied: 44 lbs/A 11-52-0 + 60 lbs/A 46-0-0
Yield goal: 80 bu/A
Herbicides applied: Dakota TP
Notes: Some herbicide injury was observed.

1992 Scranton Barley Variety Trial

Variety	Test weight	Grain protein	Plant height	Yield 1990	1991	1992	2yr	3yr
	lbs/bu	%	cm	bu/A				
Hector	50.3	12.2	59	60.7	65.8	94.0	79.9	73.5
Bowman	49.8	12.8	60	63.4	60.6	91.6	76.1	71.9
Excel	47.4	12.0	68		67.9	111.0	89.4	
Stark	51.0	12.5	65		71.2	104.2	87.7	
Harrington	50.0	11.9	63			101.9		
ND11231	49.8	12.6	60			93.1		
Trial mean	49.7	12.3	62	62.0	67.0	99.3		
C.V. %	0.5	3.9		20.6	8.3	7.8		
LSD 5%	0.4	0.7		ns	ns	11.5		
LSD 1%	0.5	ns		ns	ns	15.8		
# of reps	4	4	1	4	4	4		

Planting date: April 7 Harvest date: August 12
Seeding rate: 750,000 live seeds/A (approx. 1.25 bu/A)
Fertilizer applied: 52 lbs/A 11-52-0
Yield goal: 80 bu/A
Herbicides applied: 2 pt/A Hoelon + 1 pt/A Buctril + 1.5 oz/A MCPE

1992 Selfridge Barley Variety Trial

Variety	Test weight	Grain protein	Plant height	Yield 1990	1991	1992	2yr	3yr
	lbs/bu	%	inches	bu/A				
Hector	51.8	11.7	31	86.3	56.2	105.7	81.0	82.7
Bowman	51.8	12.4	25	73.2	45.3	95.6	70.4	71.4
Stark	52.3	12.0	27		71.7	115.6	93.6	
Excel	49.3	12.2	32		72.9	113.6	93.2	
Harrington	51.4	11.5	27			114.6		
ND11231	52.3	11.9	27			114.1		
Trial mean	51.5	12.0	28	79.8	63.2	109.7		
C.V. %	0.5	4.1		13.9	15.3	4.7		
LSD 5%	0.4	ns		ns	14.2	7.8		
LSD 1%	0.5	ns		ns	19.3	10.7		
# of reps	4	4	1	4	4	4		

Planting date: April 6 Harvest date: August 20
Seeding rate: 750,000 live seeds/A (approx. 1.25 bu/A)
Fertilizer applied: 44 lbs/A 11-52-0
Yield goal: 80 bu/A
Herbicide application: 2 pt/A Hoelon + 1 pt/A Buctril + 1.5 oz/A MCPE

1992 Hettinger and Off-Station Barley Variety Trials
Combined Means - 4 Locations*

Variety	Test weight	Grain protein	Plant height	Yield 1990	1991	1992	2yr	3yr
	lbs/bu	%	cm	bu/A				
Hector	50.3	12.5	75	73.8	69.8	110.6	90.2	84.7
Bowman	50.6	13.0	66	68.0	70.5	108.3	89.4	82.3
Excel	48.7	12.5	75		79.7	136.6	108.2	
Stark	51.6	12.6	73		79.7	124.5	102.1	
Harrington	49.8	12.3	72			117.7		

* Hettinger, Regent, Scranton and Selfridge

Dryland Oat Trial-Fallow — Dickinson, ND, 1992

Variety	Heading Date	Height	Test Weight	Seeds/LB	Yield 1992	Yield 1991	Yield AVG
	June	IN	LBS			BU/A	
Calibre	20	34	37	14233	104	---	---
Derby	20	33	38	13321	110	---	---
Dumont	19	29	36	15691	97	81	89
Hytest	18	29	36	14858	99	77	88
Monida	20	33	37	14580	112	85	98
Newdak	18	27	35	15147	108	81	94
Otana	20	32	37	15254	104	82	93
Porter	19	31	37	14170	103	77	90
Prairie	17	25	34	14565	97	---	---
Riel	20	33	38	13981	109	81	95
Robert	18	30	37	14426	103	---	---
Steele	19	31	36	15794	94	---	---
Tibor	19	31	38	15324	102	---	---
Troy	20	33	38	15838	106	---	---
Trucker	18	28	34	16073	102	---	---
Valley	19	31	37	14692	97	---	---
ND852107	19	73	36	15324	109	---	---
860416	20	33	37	15272	111	---	---
862095	18	25	40	14087	96	---	---
862915	19	31	44	20432	78	---	---
863328	19	32	37	15972	95	---	---
870258	20	25	37	16316	103	---	---
870393	17	29	37	14175	102	---	---
870952	17	29	38	15012	101	---	---
871914	16	28	37	12226	86	---	---
880224	20	29	39	14492	107	---	---
880925	20	32	34	14970	111	---	---
Mean	20	30.8	36.8	14865	103.1	---	---
C.V.%	0.4	7.0	3.2	4.8	8.5	---	---
LSD .05	1.2	3.6	1.6	1013	NS	---	---

Planting date: April 14
Planting rate: Approximately 60 lb/ac (roughly 900,000 PLS/ac)
Fertilizer applied: 33 lb 11-55-0/ac
Herbicide applied: 1 pt Buctril
Harvest date: August 18

*Notes: Yield was reduced because of bird damage

1992 Hettinger Oat Variety Trial

Variety	Test weight	Heading date	Plant height	Yield				
				1990	1991	1992	2yr	3yr
	lbs/bu	June	cm	bu/A				
Otana	39.5	20	101	102.2	114.9	206.9	160.9	141.3
Monida	38.4	22	91	91.4	111.7	210.1	160.9	137.7
Robert	39.1	23	98	87.7	125.9	198.8	162.4	137.5
Border	36.6	21	89	73.7	127.1	202.3	164.7	134.4
Kelsey	36.9	20	97	80.9	125.0	193.0	159.0	133.0
Riel	39.5	19	104	97.5	106.9	186.3	146.6	130.2
Porter	39.7	23	101	65.1	115.9	208.7	162.3	129.9
Valley	39.9	20	96	77.7	119.5	186.6	153.0	127.9
Dumont	37.4	22	98	74.4	104.1	190.7	147.4	123.1
Newdak	37.2	18	102	75.2	94.6	196.8	145.7	122.2
Steele	38.0	18	106	69.9	100.9	172.1	136.5	114.3
Hytest	42.5	19	104	67.1	88.5	161.1	124.8	105.6
Tibor	42.7	18	116	53.4	88.3	130.9	109.6	90.9
Troy	40.0	20	101		115.1	208.1	161.6	
Prairie	36.0	18	87			205.5		
Durby	39.0	26	120			195.0		
Calibre	38.7	27	115			187.8		
ND870258	39.4	24	88			204.6		
ND880224	38.7	23	105			202.6		
ND880925	37.6	23	98			201.4		
ND870393	38.8	19	104			195.3		
ND870952	40.4	17	97			193.9		
ND852107	37.9	20	100			188.9		
ND860416	39.4	22	102			185.2		
ND871914	40.5	17	92			179.6		
ND862095	41.0	20	102			179.1		
ND863328	39.1	21	102			168.6		
ND862915	44.7	25	110			138.7		
Trial mean	39.2	21	101	77.1	103.4	188.5		
C.V. %	2.1	0.2	8	26.4	24.1	13.4		
LSD 5%	1.1	2	12	ns	35.1	35.2		
LSD 1%	1.5	3	15	ns	ns	46.5		
# of reps	4	4	4	4	4	4		

Planting date: April 3 Harvest date: August 18
Seeding rate: 750,000 live seeds/A (approx. 1.5 bu/A)
Yield goal: 100 bu/A
Fertilizer applied: 44 lbs/A 11-52-0
Herbicides applied: 1 1/2 pt/A Bronate

DRYLAND OAT TRIAL-RECROP DICKINSON, ND, 1992

VARIETY	HEADING DATE	HEIGHT	TEST WEIGHT	YIELD
	JUNE	IN	LBS	BU/A
Riel	20	34	38	136
Monida	20	34	38	134
Hytest	17	33	37	131
Trucker	15	34	36	125
NewDak	17	34	35	124
Valley	17	33	38	124
Dumont	17	35	38	123
Otana	17	33	38	114
Troy	17	36	38	111
Mean	17	34	37	124
C.V. %	0.4	8.4	2.2	7.5
LSD .05	1.1	NS	1.2	14

Planting date: April 14
Planting rate: Approximately 60 lb/ac (roughly 900,000 PLS/ac)
Fertilizer applied: 46 lb urea/ac
Herbicide applied: 1 pt Buctril/ac
Harvest date: August 18

DRYLAND OAT TRIAL DICKINSON AND OFF-STATION SITES, 1992

Variety	Dickinson	Beach	Beulah	Glen Ullin	Hannover	Manning	Average 6 Sites
			BU/AC				
Dumont	97	143	135	134	130	118	126
Monida	112	149	159	130	135	117	132
Troy	106	141	119	133	134	114	124
Otana	104	147	150	137	134	114	131
Newdak	108	140	142	125	130	108	125
Valley	97	131	136	124	130	103	120
Mean	---	141.8	138.9	130.4	132.0	112.5	
C.V.%	---	5.6	18.7	8.8	4.0	10.1	
LSD .05	---	NS	NS	NS	NS	NS	
Seeding date (April)	14	16	29	30	28	14	
Harvest date (August)	17	12	18	18	17	13	
			TEST WEIGHT (LB/BU)				
Dumont	36.0	39.0	40.0	39.0	35.0	40.0	38.2
Monida	37.0	39.0	38.5	38.0	34.0	39.0	37.6
Troy	38.0	40.5	41.0	40.5	38.0	39.0	39.5
Otana	37.0	40.5	39.5	40.0	35.0	39.5	38.6
Newdak	35.0	37.0	37.5	37.0	33.5	36.0	36.0
Valley	37.0	39.5	40.0	39.0	34.0	39.5	38.2

Seeding rate: Approximately 48 lb/ac (roughly 730,000 PLS/ac)
Fertilizer applied: 50 lb 11-55-0/ac
Herbicide applied: 1 pt Buctril/ac

1992 Regent Oat Variety Trial

Variety	Test weight	Plant height	Yield 1990	1991	1992	2yr	3yr
	lbs/bu	cm	bu/A				
Monida	39.5	88	69.0	150.7	192.1	171.4	137.3
Border	38.2	81	72.4	145.6	173.2	159.4	130.4
Otana	40.4	99	69.7	143.3	155.6	149.4	122.9
Newdak	37.9	84	59.1	146.3	162.8	154.6	122.7
Riel	40.0	98	66.3	151.4	145.5	148.4	121.1
Tibor	42.6	104			109.1		
Trial mean	39.8	92	67.3	143.9	158.4		
C.V. %	0.8		19.9	4.9	5.7		
LSD 5%	0.5		ns	ns	13.4		
LSD 1%	0.7		ns	ns	18.4		
# of reps	4	1	4	4	4		

Planting date: April 7 Harvest date: August 21
Seeding rate: 750,000 live seeds/A (approx. 1.5 bu/A)
Fertilizer applied: 44 lbs/A 11-52-0 + 60 lbs/A 46-0-0
Yield goal: 100 bu/A
Herbicides applied: 1 1/2 pt/A Bronate

1992 Scranton Oat Variety Trial

Variety	Test weight	Plant height	Yield 1990	1991	1992	2yr	3yr
	lbs/bu	cm	bu/A				
Newdak	35.1	84	68.2	91.6	156.1	123.8	105.3
Otana	39.1	88	68.5	87.2	151.2	119.2	102.3
Border	36.4	75	71.7	83.5	140.2	111.8	98.5
Monida	38.1	96	59.8	65.4	160.4	112.9	95.2
Riel	37.1	88	75.9	66.7	126.6	96.6	89.7
Tibor	41.4	100			87.4		
Trial mean	37.9	88	68.8	75.5	137.0		
C.V. %	1.0		23.7	30.9	5.7		
LSD 5%	0.6		ns	ns	11.7		
LSD 1%	0.8		ns	ns	16.1		
# of reps	4	1	4	4	4		

Planting date: April 7 Harvest date: August 12
Seeding rate: 750,000 live seeds/A (approx. 1.5 bu/A)
Fertilizer applied: 52 lbs/A 11-52-0
Yield goal: 100 bu/A
Herbicides applied: 1/2 oz/A Harmony Extra + 1 pt/A Buctril

1992 Selfridge Oat Variety Trial

Variety	Test weight	Plant height	Yield 1990	1991	1992	2yr	3yr
	lbs/bu	inches	bu/A				
Monida	38.8	42	85.9	108.8	193.4	151.1	129.4
Border	37.4	35	98.6	101.6	180.3	141.0	126.8
Riel	39.2	42	77.7	104.7	186.1	145.4	122.8
Newdak	37.5	41	66.4	95.6	181.7	138.6	114.6
Otana	39.8	42	76.2	105.3	157.3	131.3	112.9
Tibor	43.2	45			106.0		
Trial mean	39.3	41.2	81.0	99.0	167.5		
C.V. %	1.3		14.4	9.2	7.3		
LSD 5%	0.7		15.2	13.5	18.3		
LSD 1%	1.0		20.7	ns	25.1		
# of reps	4	1	4	4	4		

Planting date: April 6 Harvest date: August 20
Seeding rate: 750,000 live seeds/A (approx. 1.5 bu/A)
Fertilizer applied: 44 lbs/A 11-52-0
Yield goal: 100 bu/A
Herbicides applied: 1 1/2 pt/A Bronate

1992 Hettinger and Off-Station Oat Variety Trials

Combined Means - 4 Locations*

Variety	Test weight	Plant height	Yield 1990	1991	1992	2yr	3yr
	lbs/bu	cm	bu/A				
Monida	38.7	96	76.5	109.2	189.0	149.1	124.9
Border	37.2	84	79.1	114.4	174.0	144.2	122.5
Otana	39.7	99	79.2	112.7	167.8	140.2	119.9
Newdak	36.9	94	67.2	107.0	174.4	140.7	116.2
Riel	39.0	99	79.4	107.4	161.1	134.2	116.0
Tibor	42.5	108			108.4		

* Hettinger, Regent, Scranton and Selfridge

1992 Hettinger Hard Red Winter Wheat Variety Trial

Variety	Test weight	Grain protein	Heading date	Plant height	Winter survival	Yield 1989	Yield 1990	Yield 1992	Yield 2yr	Yield 3yr
	lbs/bu	%	June	cm	%	bu/A	bu/A	bu/A	bu/A	bu/A
Seward	61.6	13.1	15	68	62	48.5	76.4	57.7	67.0	60.9
Arapahoe	61.0	14.5	13	57	74	47.4	76.4	48.3	62.4	57.4
Roughrider	61.9	14.8	13	68	70	46.2	67.9	50.6	59.2	54.9
Siouxland	61.8	13.9	10	66	70	39.1	68.3	57.0	62.6	54.8
Winoka	63.1	14.7	15	73	70	40.5	63.3	55.4	59.4	53.1
Agassiz	61.7	14.0	17	76	72	34.3	60.4	59.2	59.8	51.3
Norstar	61.7	13.5	17	76	45	39.3	63.8	43.3	53.6	48.8
Abilene	62.0	14.2	11	46	66	38.3	58.4	46.5	52.4	47.7
Judith	59.2	14.2	12	57	48		70.0	45.3	57.6	
TAM 107	59.7	13.8	8	45	41			24.6		
ND8844	62.6	14.1	14	70	80			72.7		
ND8944	61.8	12.9	16	69	84			71.3		
ND8933	61.4	13.7	12	68	76			67.4		
ND89142	62.4	13.6	14	74	71			64.6		
ND8892	62.2	14.0	14	71	79			63.9		
ND8930	62.2	14.3	14	77	77			60.6		
ND8955	61.2	13.4	16	66	80			60.2		
ND8530	61.4	14.0	16	72	72			56.4		
Trial mean	61.5	13.9	14	65	73	41.3	67.3	57.2		
C.V. %	1.1	3.9	0.4	16	29	21.5	13.8	29.5		
LSD 5%	0.9	0.6	3	15	30	ns	13.2	23.9		
LSD 1%	1.3	0.8	4	20	40	ns	18.0	31.7		
# of reps	4	4	4	4	4	4	4	4		

Planting date: September 16, 1991 Harvest date: August 10, 1992
Seeding rate: 1.1 million live seeds/A (approx. 1.1 bu/A)
Fertilizer applied: 51 lbs/A 11-52-0 at planting
Yield goal: 60 bu/A
Herbicide application: 1/6 oz/A Express + 3/4 pt/A Bronate

DRYLAND WINTER WHEAT TRIAL-FALLOW BEACH, ND, 1992

Variety	Test Weight	Protein	Yield BU/A		
	LBS	%	1992	1991	AVG
Judith	58	13.1	82	---	---
Rough Rider	61	13.3	71	---	---
Agassiz	62	12.4	68	---	---
Arapahoe	62	13.4	67	---	---
Norstar	59	11.7	65	---	---
Seward	63	13.9	64	---	---
Mean			70		
C.V.%			12.6		
LSD .05			NS		

Planting date: September 26, 1991
Planting rate: 60 lb/ac
Fertilizer applied: 50 lb 18-46-0/ac
Herbicide applied: 2.5 pt Hoelon + 1 pt Buctril
Harvest date: August 12

DRYLAND RYE VARIETY TRIAL-FALLOW DICKINSON, ND, 1992

Variety	Test Weight	Yield 1992
	LBS	
Dacold (W)	56.5	87
Prima (W)	57.5	69
Musketeer (W)	57.5	67
Gazalle (S)	57.0	54
Mean		69.3
C.V. %		9.3
LSD .05		12.8

Planting date: September 12, 1991
Planting rate: 70 lb/ac
Fertilizer applied: 50 lb 18-46-0/ac
Herbicide applied: 2.5 pt Hoelon + 1 pt Buctril
Harvest date: August 19

1992 Hettinger Winter Rye Variety Trial

Variety	Test weight	Heading date	Plant height	Winter survival	Yield 1989	1990	1992	2yr	3yr
	lbs/bu		cm	%	bu/A				
Prima	54.8	5/30	79	81	74.5	70.1	47.0	58.6	63.9
Dakold	52.8	6/8	76	84	61.0	72.4	50.2	61.3	61.2
Musketeer	54.2	5/30	87	55	59.6	67.9	45.2	56.6	57.6
Fredrick	53.6	6/1	89	9	57.8	61.8	18.2	40.0	45.9
Trial mean	53.9	6/2	83	57	59.2	66.5	39.7		
C.V. %	1.4	0.5	9	24	14.0	7.0	36.0		
LSD 5%	1.2	4	12	21	12.2	6.9	22.5		
LSD 1%	ns	6	ns	31	ns	9.4	ns		
# of reps	4	4	4	4	4	4	4		

Planting date: September 16, 1991 Harvest date: August 10, 1992
Seeding rate: 1.1 million live seeds/A
Fertilizer applied: 51 lbs/A 11-52-0 at planting
Yield goal: 80 bu/A
Herbicide application: 1/6 oz/A Express + 3/4 pt/A Bronate

Alternative Oilseed Crops - Dickinson

Safflower is a proven alternative crop in southwestern North Dakota. Safflower can be placed within a small grain rotation to break disease cycles as well as provide an alternative market for primarily small grain producers. Because of its relatively deep rooting system, safflower can use water and plant nutrients which generally are unavailable to small grains. For this reason, safflower can be used to control the formation of saline seeps.

Many other oilseed crops have successfully been grown in southwestern North Dakota. For example, both mustard and flax have been grown on considerable acreage in the past. Other oilseed crops, such as crambe, seem to perform well agronomically in the southwest. If transportation costs to purchasers can be reduced than crambe and other promising oilseed crops may become important components in many dryland cropping systems.

DRYLAND SAFFLOWER TRIAL-FALLOW DICKINSON, ND, 1992

Variety	Date of 1st Flower	HT	Disease	Test WT	Seed/LB	Yield 1992	Yield 1991	Yield AVG
	July	IN	%	LB				
Sigco 25A	29	31	67	41	13126	1977	---	---
Sigco 27A	29	28	63	43	11472	1858	---	---
Montola 2000	27	20	67	38	13230	1857	1185	1521
S 501	26	24	50	40	13844	1658	---	---
Centennial	31	27	53	37	13098	1612	---	---
Sigco 353A	27	23	67	37	12115	1549	---	---
Morlin	31	25	43	37	17128	1573	---	---
Saffire	23	20	63	35	15389	1537	---	---
88B3594	29	25	60	38	12405	1512	---	---
Stirling	24	22	60	36	13203	1475	---	---
90B6011	31	27	60	36	13638	1416	---	---
S 555	29	24	67	36	13008	1312	---	---
Sigco 24A	29	30	67	40	12507	1294	---	---
CW 4440	24	24	63	38	11678	1274	996	1135
88B3006	26	25	57	38	14574	1237	832	1034
Sigco 19A	29	29	76	42	12320	1053	---	---
85B3910	23	19	73	36	14693	1004	---	---
Mean	202	24.9	72	38.2	13276	1485	---	---
C.V.%	1.1	10.8	19.6	4.7	5.9	17.5	---	---
LSD .05	3.8	4.6	NS	2.6	111	433	---	---

Planting date: April 30
Planting rate: Approximately 425,000 PLS/ac
Fertilizer applied: None
Herbicide applied: 1 pt Treflan/ac PPI
Harvest date: October 6

*Note: Alternaria was the principle pathogen observed; cutleaf nightshade pressure was severe

1992 Hettinger Safflower Variety Trial

Variety	Test weight	First flower	Ht	Oil cont	Yield 1990	1991	1992	2yr	3yr
	lbs/bu	July	cm	%	lbs/A				
S-541	39.4	26	50	42.7	1054	877	1298	1088	1076
Finch	42.9	26	50	37.6	875	840	1386	1113	1034
Centennial	39.0	26	44	41.8	882	728	1215	972	942
S-208	39.7	26	50	39.2	724	774	1250	1012	916
Girard	40.5	26	54	39.2	1011	504	1058	781	858
C/W 4440	38.3	26	50	37.1		877	1334	1106	
Montola 2000	38.6	26	45	41.0		700	1361	1030	
Saffire	39.2	25	48	32.0	588		1071	830	
S-501	37.6	26	45	40.8			1346		
Morlin	38.2	26	47	40.7			1264		
S-555	34.8	27	51	41.7			1105		
Stirling	39.8	25	42	34.9			1017		
90B6011	38.2	27	54	40.0			1354		
85B3910	39.4	26	49	39.8			1028		
88B3006	37.4	27	48	40.5			699		
88B3594	37.8	27	40	40.8			694		
Trial mean	38.9	26	48	39.4	804	703	1155		
C.V. %	2.2	0.1	13	2.4	39	19	26		
LSD 5%	1.2	1	ns	1.3	447	216	428		
LSD 1%	1.7	1	ns	1.8	ns	290	571		
# of reps	4	4	4	4	4	4	4		

Planting date: April 16 Harvest date: October 1
Seeding rate: 350,000 live seeds/A
Yield goal: 2000 lbs/A
Fertilizer applied: 44 lbs/A 11-52-0
Herbicides applied: 0.25 oz/A Pinnacle
Pinnacle herbicide caused moderate to severe crop injury.

DRYLAND FLAX TRIAL — DICKINSON, ND, 1992

Variety	Date of First Flower	Height	Test Weight	Seeds//LB	Yield 1992	Yield 1991	Yield AVG
	June	IN	LB			BU/A	
McGregor	14	18	55	75346	28	9	18
Omega	13	17	55	74381	27	---	---
Norlin	13	17	55	68767	27	---	---
Flanders	13	15	55	76251	26	---	---
Linora	15	22	55	69810	25	---	---
Somme	13	17	55	70404	24	---	---
Verne	13	17	55	73209	24	19	21
Flor	14	19	55	74120	24	14	19
Norman	14	17	55	69841	23	---	---
Bison	14	20	55	64631	21	---	---
Neche	14	18	55	69084	18	15	16
Prompt	13	16	55	71264	18	---	---
Linton	11	16	56	69560	18	---	---
Mean	13	17	55	68062	23	---	---
C.V.%	0.5	7	0.7	3.7	11.6	---	---
LSD .05	1.4	2	0.5	3857	4	---	---

Planting date: April 15
Planting rate: Approximately 40 lb/ac (roughly 3,000,000 PLS/ac)
Fertilizer: None
Herbicide: 1 pt Treflan PPI
Harvest date: August

DRYLAND SUNFLOWER TRIAL — DICKINSON, ND, 1992

Variety	Hybrid	Plants/Ac	Test Weight	Yield
			LBS	LBS/AC
Pioneer	6332	14702	28.7	648
Pioneer	6440	14520	27.1	618
Interstate	6111	14520	30.6	560
Pioneer	6445	11979	29.4	528
Pioneer	XF599	13068	27.2	522
Dekalb	DK3904	13794	28.9	499
Interstate	3311	14883	29.9	498
Dekalb	DK3790	12524	31.7	498
Agripro	SF317	12887	27.5	486
Pioneer	XF4211	11253	28.1	456
Pioneer	XF421	14702	29.0	445
Sigco	658	13250	29.6	426
Dahlgren	707	14339	31.0	423
Pioneer	XF429	13250	26.4	407
Mean		13548	28.9	501
C.V.%		12.6	4.4	30
LSD .05		NS	1.8	NS

Planting date: May 29
Planting rate: Planted at 60,000 seeds/ac; thinned to 18,000 plants/ac
Herbicide applied: 1.5 pt Sonalan PPI
Harvest date: October 8

*Note: Poor establishment due to soil crusting; grasshoppers and seed weevils were serious insect pests

1992 Hettinger Flax Variety Trial

Variety	Test weight	Plant height	Yield 1991	Yield 1992	Yield 2yr
	lbs/bu	cm	bu/A	bu/A	bu/A
Flanders	54.3	56	25.3	37.2	31.2
Neche	54.8	56	28.3	33.3	30.8
Somme	54.0	54	29.5	31.8	30.6
Norman	55.1	59	27.6	33.1	30.4
Flor	54.4	52	28.5	32.1	30.3
Culbert	54.9	60	29.0	31.6	30.3
Norlin	55.1	52	27.1	32.4	29.8
Linton	54.1	58	20.9	37.7	29.3
Omega	54.6	52	26.6	31.0	28.8
Linott	55.9	57	30.2	27.5	28.8
Prompt	55.2	52	29.5	27.0	28.2
Vern	54.1	58	27.0	27.5	27.2
McGregor	54.2	61	17.6	33.9	25.8
Dufferin	55.2	60	20.0	30.5	25.2
N802	54.9	56		30.0	
Linora	54.7	57		27.8	
Trial mean	54.7	57	26.5	31.2	
C.V. %	1.7	8	16.2	13.2	
LSD 5%	ns	7	6.2	5.9	
LSD 1%	ns	ns	8.3	7.8	
# of reps	4	4	4	4	

Planting date: April 28 Harvest date: September 3
Seeding rate: 2 million live seeds/A
Fertilizer applied: 44 lbs/A 11-52-0
Yield goal: 25 bu/A
Herbicides applied: 1/2 pt/A MCPE

1992 Hettinger Sunflower Trial

Brand	Hybrid	Yield lbs/A	Test weight lbs/bu	Oil content %
Cargill	SF187	3378	31.5	46.0
Dekalb	DK3790	3082	33.8	47.6
Cargill	SF270	2891	32.9	47.3
Dekalb	DK3904	2839	32.0	44.7
Pioneer	XF4211	2832	30.8	46.6
Dahlgren	DO707	2722	30.1	44.5
ICI	Hysun341	2692	33.1	44.4
Sigco	675	2667	34.6	46.0
Pioneer	6440	2645	32.8	46.1
Pioneer	6322	2607	34.2	48.6
Pioneer	6445	2532	33.4	48.8
Agripro	ST317	2477	32.4	45.7
Interstate	6111	2392	33.3	43.6
Pioneer	XF599	2353	32.6	48.6
ICI	Hysun354	2327	30.0	46.6
Pioneer	XF421	2248	34.2	47.0
Interstate	3311	2164	33.1	45.1
Pioneer	XF429	1817	33.0	49.2
Trial mean		2593	32.7	46.5
C.V. %		20	2.9	
LSD 5%		733	1.4	
LSD 1%		977	1.8	
# of reps		4	4	1

Planting date: May 8 Harvest date: October 12
Seeding rate: 21,000 seeds/A, thinned to 18,000 plants/A
Row spacing: 30"
Yield goal: 2500 lbs/A
Fertilizer applied: 91 lbs/A 18-46-0
Herbicides applied: 1.5 pt/A Treflan EC + 2.25 pt/A Eptam, pre-plant incorporated
Insecticides: 12 oz/1000' row Furidan CR-10 with the seed
1/2 lb/A Parathion on 8/8/92 and on 8/25/92

DRYLAND CANOLA TRIAL DICKINSON, ND, 1992

Variety	Days To Bloom	Height	Oil	Seed/LB	Yield LB/A		
		IN	%		1992	1991	2 Yr
Westar	39	34	35.3	113400	1526	287	908
Parkland	40	28	37.8	170100	1359	-----	-----
Tobin	40	26	36.6	132300	1290	-----	-----
Legend	38	36	34.1	160650	1218	-----	-----
Mean	39	31		144122	1348		
C.V.%	0.5	6.6		19	11.2		
LSD .05	1.7	4		NS	NS		

Planting date: April 27
Planting rate: 8 lb/ac for Westar and Tobin; 5 lb/ac for Parkland and Legend
Fertilizer applied: None
Herbicide applied: 1 pt Treflan/ac PPI
Harvest date: Aug 13

DRYLAND CRAMBE TRIAL DICKINSON, ND, 1992

Variety	Days To Bloom	Height	Oil	Seed/LB	Yield LB/A		
		IN	%		1992	1991	2 Yr
Prophet	38	23	28.7	53550	3269	-----	-----
C-29	37	23	28.9	50715	3210	-----	-----
Bel	38	23	29.7	53550	2998	-----	-----
Enzian							
C-37	37	22	29.0	51975	2884	-----	-----
Bel Ann	37	24	28.8	50715	2880	-----	-----
Indy	37	20	29.3	60750	2687	-----	-----
Meyer	37	24	29.7	53550	2577	521	1549
Mean	37	23		53543	2929		
C.V.%	0.9	7.1		0.6	8.2		
LSD .05	NS	3		5827	351		

Planting date: April 15
Planting rate: Roughly 20 lb/ac
Fertilizer applied: None
Herbicide applied: 1pt Treflan/ac PPI
Harvest date: Aug 10

DRYLAND MUSTARD TRIAL DICKINSON, ND, 1992

Variety	Days To Bloom	Height	Seed/LB	Yield LB/A		
		IN		1992	1991	2 Yr
Cutless (Oriental)	29	38	92965	1814	-----	-----
Common (Brown)	30	38	99825	1568	-----	-----
Tilney (Yellow)	25	24	53104	1496	-----	-----
Mean	28	33	81831	1626		
C.V.%	1.4	7	27	11.9		
LSD .05	4.7	8.9	38198	NS		

Planting date: April 15
Planting rate: 12 lb/ac for Tilney; 6 lb/ac for Cutless and Common Brown
Fertilizer applied: None
Herbicide applied: 1 pt Treflan/ac PPI
Harvest date: Aug 10

1992 Hettinger Canola Variety Trial
Early Planting

Variety	Test weight	First flower	Ht	Oil cont	Yield 1990	1991	1992	2yr	3yr
	lbs/bu		cm	%	lbs/A				
Hyola 41	48.4	6/1	73	36.5	683	2333	2834	2584	1950
Global	50.3	6/10	102	37.0	558	1600	3458	2529	1872
Tobin	50.8	5/28	76	35.5	241	1380	1933	1656	1185
Topas*	49.2	6/6	88	37.2	390	893	2220	1556	1168
Westar*	53.3	6/8	82	35.9	598	1167	764	966	840
Celebra	49.2	6/6	86	37.2	489		3180	1834	
Moneta	50.1	6/12	106	36.7	348		2780	1564	
Golda	49.0	6/11	109	37.4	335		2787	1561	
Evita	49.2	6/8	111	36.6	300		2340	1320	
Condida*	48.6	6/8	87	35.1	307		1360	834	
ICN 024	47.7	6/1	82	36.6			3034		
Hyola 401	49.2	5/30	75	36.8			2714		
Legend	48.3	6/5	84	36.6			2380		
Trial mean	49.4	6/5	89	36.6	490	1526	2458		
C.V. %	2.9	0.5	16	1.7	27	14	21		
LSD 5%	2.1	4	20	0.9	183	328	729		
LSD 1%	2.8	5	27	1.2	245	450	979		
# of reps	4	4	4	4	4	4	4		

Planting date: April 1 Harvest date: Aug. 10 through Sept. 8
* less then 25% crop emergence.

1992 Hettinger Canola Variety Trial
Late Planting

Variety	Test weight	First flower	Ht	Oil cont	Yield 1990	1991	1992	2yr	3yr
	lbs/bu	June	cm	%	lbs/A				
Hyola 41	49.6	24	119	36.4	683	2333	2447	2390	1821
Global	49.5	29	142	35.5	558	1600	2073	1836	1410
Westar	50.8	29	130	36.4	588	1167	1973	1570	1243
Tobin	51.3	16	97	35.4	241	1380	1973	1676	1198
Topas	49.1	29	136	36.2	390	893	1700	1296	994
ICN 024	48.6	24	116	34.5			2253		
Hyola 401	49.5	24	113	36.3			2213		
Legend	47.6	24	122	35.5			2073		
Trial mean	49.5	25	122	35.9	490	1526	2077		
C.V. %	3.1	0.03	8	3.0	27	14	14		
LSD 5%	2.3	1	14	ns	183	328	422		
LSD 1%	3.1	1	19	ns	245	450	575		
# of reps	4	4	4	4	4	4	4		

Planting date: May 12 Harvest date: Aug. 19 through Sept. 10
Seeding rate: 10 lbs/A
Yield goal: 2000 lbs/A
Fertilizer applied: 44 lbs/A 11-52-0
Herbicides applied: 2 1/2 pt/A Sonalan pre-plant incorp.

1992 Hettinger Tame Mustard Variety Trial

Variety	Test weight	First flower	Plant height	Yield 1990	Yield 1991	Yield 1992	Yield 2yr	Yield 3yr
	lbs/bu		cm	lbs/A	lbs/A	lbs/A	lbs/A	lbs/A
Oriental*	51.5	5/31	--	518	940	3668	2304	1709
Brown*	52.0	6/2	--	496	633	3346	1990	1492
Tilney**	55.3	5/28	69	392	1280	2763	2022	1478
Kirby**	55.3	5/29	72	272	1227	2454	1840	1351
Gisilba**	55.7	5/30	62	301	507	1186	846	665
Domo**	52.6	-	--	397	213	987	600	532
Trial mean	53.8	5/30	68	413	800	2529		
C.V. %	0.6	0.2	12	18	14	13		
LSD 5%	0.5	2	ns	109	170	493		
LSD 1%	0.6	2	ns	150	233	682		
# of reps	4	4	4	4	4	4		

Planting date: April 1 Harvest date: August 10* and 19**
Seeding rate: 10 lbs/A
Yield goal: 2000 lbs/A
Fertilizer applied: 44 lbs/A 11-52-0
Herbicides applied: 2 1/2 pt/A Sonalan pre-plant incorp.

1992 Hettinger Crambe Variety Trial

Variety	Test weight	Plant height	Oil content	Yield 1990	Yield 1991	Yield 1992	Yield 2yr	Yield 3yr
	lbs/bu	cm	%	lbs/A	lbs/A	lbs/A	lbs/A	lbs/A
Bel ann	24.9	74	27.1	157	1113	2787	1950	1352
Belenzian	27.6	77	25.5	124	1133	2587	1860	1281
Meyer	26.4	74	31.2	77	1100	1840	1470	1006
Prophet	23.7	76	29.1		1287	2514	1900	
Indy	25.6	74	26.9		1033	2267	1650	
C-29	25.2	72	29.4			2600		
C-37	25.2	73	27.5			2334		
Trial mean	25.5	74	28.1	119	1133	2418		
C.V. %	7.5	10	7.5	34	16	12		
LSD 5%	ns	ns	3.1	ns	ns	442		
LSD 1%	ns	ns	4.2	ns	ns	602		
# of reps	4	4	4	4	4	4		

Planting date: April 14 Harvest date: Aug. 19
Seeding rate: 25 lbs/A
Yield goal: 2000 lbs/A
Fertilizer applied: 44 lbs/A 11-52-0
Herbicides applied: 1 1/2 pt/A Treflan MTF, pre-plant incorp.
12 g/A Muster
Note: All varieties were severely injured by frost on May 26.

Grain Legume Trials - Dickinson

Grain legumes (field peas, lentils, etc.) offer several benefits when incorporated into a crop rotation. With cropping systems primarily involving small grains, grain legumes can contribute nitrogen, break disease and insect cycles, provide an excellent opportunity to control certain grass pests, and enhance soil physical properties. However, grain legumes generally have not been incorporated into crop rotations in the Northern Great Plains, particularly in drier areas.

Lentils, field peas, lupins, and chickpeas are four grain legumes which seem adapted to regions of North Dakota where comprehensive field evaluations have been conducted. Grain legume adaptation trials have produced inconsistent results in the southwest, possibly because only a few varieties have been evaluated. Moreover, these varieties seem less adapted to dry regions than varieties recently developed.

Grain legumes are being screened at the Dickinson Research Center for their agronomic adaptation to growing conditions in the southwest. Results from 1992 indicate tremendous yield potential during cool summers with average amounts of precipitation. Field evaluations over the next few years may provide a more complete picture of the potential grain legumes have in southwestern cropping systems.

Intercropping grain legumes with other crops was evaluated at Dickinson in 1992. Combinations showing particular promise include field peas or lupins with oats (hay - refer to Annual Hay Trial in this report), and lentils with flax.

DRYLAND LENTIL TRIAL — DICKINSON, ND, 1992

Variety	Days To Bloom	Height	Seed/LB	Yield LB/A		
		IN		1992	1991	2 Yr
Crimson	42	12	12651	3255	----	----
Red Chief	38	15	7766	2914	----	----
Rose	38	15	9744	2823	----	----
Eston	41	14	13634	2647	----	----
Brewer	37	13	6440	2503	----	----
Chilean	41	15	8057	2438	----	----
Mean	39	14	9715	2765		
C.V.%	0.6	8.1	3.4	12.8		
LSD .05	1.9	NS	495	535		

Planting date: April 15
Planting rate: Approximately 70 lb/ac [roughly 900,000 PLS/ac]
Fertilizer applied: None
Herbicide applied: 1 pt Treflan/ac PPI
Harvest date: Crimson (Aug 11); others except Laird (Aug 13); Laird (Aug.26)

*Note: While lentil generally is considered to be a poor competitor with weeds (perhaps comparable to flax), no serious weed problem developed in the lentil varietal trial at Dickinson during 1992.

DRYLAND PEA TRIAL - FALLOW DICKINSON, ND, 1992

Variety	Days To First Flower	Height At Full Bloom	Seeds/LB	Yield
		IN		LBS/A
Serius	40	35.0	1767.6	4321.4
Tipu	40	46.6	2295.7	4239.3
Century	41	43.8	2152.2	3777.7
Trapper	40	38.4	3208.0	3454.6
Mean	40	41.0	2355.9	3948.2
C.V.%	0.2	14.0	4.2	10.1
LSD .05	0.6	11.4	157.2	641.5

Planting date: April 15
Planting rate: Approximately 180 lb/ac [roughly 325,000 PLS/ac]
Fertilizer applied: None
Herbicide applied: 1 pt Treflan/ac PP
Harvest date: Aug 12

DRYLAND LUPIN TRIAL - FALLOW DICKINSON, ND, 1992

Variety	Date of First Flower	Height At Full Bloom	Seeds/LB	Yield
	June	IN		LBS/A
L2109N	9	24.7	1275.1	3420.2
L2085	9	18.5	1809.9	2728.3
Primorski	8	29.8	1235.3	2507.7
1030NH	8	27.8	1297.6	2455.6
Ultra	9	22.0	1523.5	2226.3
Semu A	9	23.6	1441.1	2154.4
Juno	20	22.8	3789.9	679.0
Manru	26	30.8	3506.8	420.9
Mean	12	25.0	1984.9	2074.0
C.V.%	0.5	3.8	4.8	14.3
LSD .05	1.3	1.7	140.7	435.8

Planting date: April 15
Planting rate: Approximately 105 lb/ac [roughly 200,000 PLS/ac]
Fertilizer applied: None
Herbicide applied: 1 pt Treflan/ac PPI
Harvest date

*Note: Sprayed 8 oz Asana/ac on 3 separate occasions to prevent blister beetle feeding.

DRYLAND CHICKPEA TRIAL - FALLOW DICKINSON, ND, 1992

Variety	Days To Flower	Height	Seeds/LB	Yield
		IN		LBS/A
NG451532	26	14	2944.3	2534
Sarah	28	12	3064.9	2484
UC27	27	17	861.6	1117
Surutato	32	12	843.7	947
UC15	33	15	923.9	807
Mean	29.1	14.1	1727.7	1587
C.V.%	6.3	8.1	3.3	22.1
LSD .05	3.4	2.2	89.2	538

Planting date: May 4
Planting rate: Approximately 60 lb/ac for UC15, UC27, Surutato; 120 lb/ac for Sarah and NG451532
Fertilizer applied: None
Herbicide applied: 1 pt Treflan/ac PPI
Harvest date:

1992 Hettinger Pinto Bean Variety Trial

Variety	Test weight	Yield 1989	1990	1992	2yr	3yr
	lbs/bu	lbs/A				
Nodak	60.4	729	864	1438	1151	1010
Fiesta	59.2	597	925	1431	1178	984
Othello	60.3	850	607	1492	1050	983
Sierra	59.5	793	758	1135	946	895
Topaz	56.6	621		1285	953	
Bill Z	58.8			1538		
Trial mean	59.1	713	830	1386		
C.V. %	0.9	24	18	17		
LSD 5%	0.8	ns	ns	ns		
LSD 1%	1.1	ns	ns	ns		
# of reps	4	4	3	4		

Planting date: May 12 Harvest date: September 18
Seeding rate: 60 lbs live seeds/A
Fertilizer applied: 44 lbs/A 11-52-0
Yield goal: 2500 lbs/A
Herbicide application: 2.5 pt/A Basagran + 1 pt/A Poast
Approximately 20% frost kill to all varieties on 5/26/92

1992 Hettinger Navy Bean Variety Trial

Variety	Test weight	Yield 1988	1989	1992	2yr	3yr
	lbs/bu	lbs/A				
Hyden	62.0	203	1657	1503	1580	1121
Norstar	64.4	437	1483	910	1197	943
Mayflower	62.6		1763	1038	1400	
Schooner	62.8			532		
Crestwood	63.0			245		
Trial mean	62.9	320	1609	846		
C.V. %	1.0	78	22	22		
LSD 5%	1.1	ns	ns	293		
LSD 1%	1.6	ns	ns	420		
# of reps	3	4	4	3		

Planting date: May 12 Harvest date: September 18
Seeding rate: 45 lbs live seeds/A
Fertilizer applied: 44 lbs/A 11-52-0
Yield goal: 2500 lbs/A
Herbicide application: 2.5 pt/A Basagran + 1 pt/A Poast
Approximately 20% frost kill to all varieties on 5/26/92

Forage Production Research - Dickinson

Production of forages has and will continue to be an integral component of many cropping systems in southwestern North Dakota. Hence, a major thrust of the agronomy program at the Dickinson Research Center is to evaluate the quantity and quality of both annual and perennial forages in the southwest. These evaluations compare "traditional" forages (e.g., oats) will lupin, forage rape, and other alternative forages. Alternative forage production strategies (e.g., intercropping) also are being explored.

Intercropping lupin or field pea with oats demonstrated potential as an alternative hay crop during 1992. Average crude protein content of Dumont oats/lupin hay was higher than Dumont oat hay, and yield of the intercrop was comparable to the oat grown alone (refer to Dryland Annual Hay trial - Dickinson Table). Lupin and field pea varietal trials suggest that relatively high grain yields of these two legumes are possible. It will be important to scrutinize these and other alternative forages over the next few years to more accurately determine how well adapted they are to growing conditions in the Southwest.

DRYLAND ALTERNATIVE HAY TRIAL-FALLOW DICKINSON, ND, 1992

Crop	Variety	HT	Hay Field		Hay Quality			Grain Yield
			12% M	DM Basis	Protein	ADF	NDF	
		IN	Tons/A			%		LBS/A*
Barley	Bowman	30	6.4	5.6	9.8	37.8	62.3	------
Speltz	Common	49	6.1	5.4	7.2	42.6	64.2	871.8
Triticale	----	42	6.0	5.3	8.8	39.4	60.5	1749.6
Rye	Gazelle	53	5.6	4.9	5.8	44.0	64.6	752.8
F. Rape	Essex	27	5.4	4.8	12.2	30.8	33.1	75.4
Lupin	Ultra	28	1.8	1.6	15.5	45.5	56.2	452.4
Fababean	Outlook	36	1.7	1.5	8.1	42.6	51.8	285.4
Mean		37.8	13.9	4.2	9.6	40.4	56.1	698.0
C.V.%		0.4	14.8	14.8	27.9	4.9	4.2	21.9
LSD .05		4.7	3.0	0.9	NS	4.9	5.8	229.9

*Severe shattering problem among small grains

Planting date: April 30
Planting rate: Barley (62 lb/ac); Speltz and Triticale (75 lb/ac); Rye (60 lb/ac); Rape (6 lb/ac); Lupin (150 lb/ac); Fababean (120 lb/ac)
Harvest date: Cut for hay on July 22 and harvested for grain on September 4

*Note: Lupin and fababean sprayed with 8 oz Asana/ac for blister beetles on two occasions

1992 Hettinger Oat Hay Variety Trial

Variety	Yield 12% moist.	Heading date	Plant height
	Tons/A		cm
Magnum	6.41	7/4	130
Monida	6.09	6/28	114
Dumont	6.05	6/27	106
Mammoth	6.00	6/29	125
Robert	5.75	6/28	96
Steele	5.65	6/22	100
Valley	5.58	6/23	93
Tibor	5.49	6/20	110
Border	5.26	6/26	94
Otana	5.24	6/24	107
Horseford*	5.21	--	87
Byrd	5.15	6/27	100
Hytest	5.08	6/20	100
Trial mean	5.61	6/26	105
C.V. %	13.20	0.2	
LSD 5%	ns	2	
# of reps	4	4	1

Planting date: April 14
Planting rate: 750,000 live seeds/A
Fertilizer applied: 44 lbs/A 11-52-0
Herbicides applied: 1.5 pt/A Bronate
Harvest date: July 15 (soft dough)
* Horseford forage barley

1992 Hettinger Millet Hay Variety Trial

Variety	Yield	Moisture	Plant height
	tons/A	%	cm
Rise Proso	10.60	67	91
Sunup Proso	9.80	65	104
Golden German Proso	9.00	71	80
Red Proso	9.00	66	107
White Proso	8.60	65	90
Siberian Proso	7.47	67	74
Hybrid Pearl	4.27	70	65
Trial mean	8.39	67	87
C.V. %	18		
LSD 5%	2.28		
LSD 1%	3.11		
# of reps	4	1	1

Planting date: May 12 Harvest date: August 7 (milk stage)
Seeding rate: 15 lbs/A
Fertilizer applied: 44 lbs/A 11-52-0
Herbicide application: 1 pt/A 2,4-D

DRYLAND MILLET TRIAL-FALLOW DICKINSON, ND, 1992

Variety	Harvest Moist.	Hay Yield 12%M	Hay Yield DM Basis	Hay Yield 5-Yr Avg	Hay Quality Protein	Hay Quality ADF	Hay Quality NDF
	%		Tons/Ac			- % -	
German Foxtail	71	5.4	4.7	---	----	----	----
Siberian	66	4.9	4.3	2.5	10.1	36.7	64.5
White Proso	74	3.6	3.2	2.2	11.6	36.7	67.5
Red Proso	75	3.1	2.7	2.2	10.6	36.6	66.2
Pearl	--	---	---	---	----	----	----
Mean	71.5	4.3	3.7	---	10.8	36.7	
C.V.%	2.6	17.1	17.1	---	4.5	6.3	
LSD .05	3.0	1.2	1.0	---	NS	NS	

Variety	Height	Test Weight	Grain Yield*
	In	Lbs	Bu/Ac**
German Foxtail	33	47.2	20.5
Siberian	32	52.9	38.8
White Proso	34	56.5	10.7
Red Proso	35	55.0	13.8
Pearl	--	55.0	4.4
Mean	33.4	53.5	17.6
C.V.%	10.4	1.8	39.1
LSD .05	NS	1.2	8.9

*Shattering was severe for all varieties
**Test weight for millets are: 48 lbs for foxtail and 56 lbs for Proso and Pearl

Seeding date: May 6
Seeding rate: Foxtail millets (20 lb/ac); Proso and Pearl millets (30 lb/ac)
Fertilizer applied: None
Herbicide applied: 1 pt Buctril/ac
Harvest date: Proso millets cut for hay on July 22; German and Siberian millets cut on August 5. Grain harvested on September 11

DRYLAND ANNUAL HAY TRIAL-FALLOW DICKINSON, ND, 1992

Crop	Variety	Hay Yield		Hay Quality		
		12% M	DM Basis	Crude Protein	ADF	NDF
		Tons/Ac		- % -		
Oat	Otana	5.8	5.1	7.3	42.8	64.8
Oat + Pea*	Mag/Mag	5.4	4.8	8.9	39.2	60.3
Oat	Mammoth	5.3	4.7	6.9	41.9	64.2
Oat	Dumont	4.5	4.0	8.5	42.0	65.1
Oat + Pea2**	Mag/Mag	4.5	4.0	9.0	42.2	64.5
Oat	Hytest	4.5	4.0	6.7	39.8	60.2
Oat + Lupin	Dum/Ultra	4.3	3.8	11.4	41.8	62.5
Oat	Byrd	4.3	3.8	7.1	41.4	63.3
Oat + Pea***	Byrd/Trap	4.2	3.7	8.7	40.7	62.6
Pea	Magnus	3.7	3.3	6.3	34.7	48.4
Pea	Trapper	2.5	2.2	9.0	31.7	44.7
Mean		4.4	3.9	8.2	39.8	60.1
C.V.%		21.8	21.8	19.2	6.2	4.6
LSD .05		1.4	1.2	NS	5.5	6.2

*60% Magnum oat and 40% Magnum pea
**40% Magnum oat and 60% Magnum pea
***40% Byrd oat and 60% Trapper pea

Crop	Variety	Plant Height		Grain Yield	
		Oat	Companion	Oat	Companion
				Bu/Ac*	
Oat	Otana	43	---	36	-
Oat + Pea	Mag/Mag	51	25	18	1
Oat	Mammoth	52	---	32	-
Oat	Dumont	41	---	35	-
Oat + Pea	Mag/Mag	50	23	28	1
Oat	Hytest	41	---	26	-
Oat + Lupin	Dum/Utra	41	27	37	1
Oat	Byrd	37	---	41	-
Oat + Pea	Byrd/Trap	42	34	32	1
Pea	Magnus	--	37	--	4
Pea	Trapper	--	34	--	9
Mean		44.2	30.0	31.9	2.9
C.V.%		4.3	12.2	27.2	55.1
LSD .05		2.8	5.5	12.6	2.3

*Severe shattering of oats and peas occurred

Seeding date: April 30
Seeding rate: Oats were seeded at 60 lb/ac; oat/pea mixtures were seeded at 80 lb/ac; oat/lupin mixture was seeded at 40 lb oat and 80 lb lupin/ac.
Harvest date: Cut for hay on July 3 and harvested for grain on September 3.

DRYLAND CORN TRIAL-FALLOW DICKINSON, ND, 1992

Brand	Hybrid	Height	Harvest Moisture	Silage Yield 70% M	Silage Yield DM Basis	Test Weight	Yield 1992
		Ft	%	Tons/A	Tons/A	LBS	Bu/A
Cenex	1185E	6.5	68	18.6	5.6	41.0	29.6
Dekalb	Unnamed	6.3	66	18.5	5.5	38.6	21.6
Great Lakes	GL220	6.7	62	18.4	5.5	43.1	22.8
Jacques	3320	7.0	64	18.3	5.5	45.7	29.7
Jacques	2650	6.8	64	18.2	5.5	47.1	34.6
Dahlgren	D5892	7.2	64	18.0	5.4	37.7	22.5
Great Lakes	GL350	6.7	64	18.0	5.4	45.0	28.5
Interstate	359SG	6.0	63	17.3	5.2	52.1	43.6
Pioneer	3979	5.8	62	17.1	5.1	54.6	50.9
Cargill	C809	7.0	67	17.1	5.1	49.2	44.2
Dekalb	DK372	6.7	66	16.9	5.1	45.6	37.3
Cenex	1195E	6.3	65	16.8	5.1	50.9	44.2
Interstate	401SG	5.9	66	16.8	5.1	50.7	39.6
Interstate	Frida	7.3	61	16.5	4.9	54.6	51.0
Interstate	Silo King	7.0	64	16.5	4.9	54.5	41.8
Dekalb	DK363	6.7	67	16.5	4.9	38.2	37.7
Pioneer	3963	6.5	65	16.5	4.9	50.7	45.6
Cenex	3088	6.7	65	16.3	4.9	48.5	44.3
Dahlgren	D5802	6.3	64	16.2	4.9	47.1	43.2
Cargill	2217	7.2	67	16.1	4.8	43.9	28.1
Interstate	Econo Silage	6.5	64	15.9	4.8	51.0	45.2
Cenex	4038	6.2	67	15.9	4.8	51.0	44.4
Dekalb	DK401	7.5	68	15.8	4.7	41.4	30.5
Great Lakes	GL306	6.3	66	15.8	4.7	46.2	31.4
Cargill	C2037	6.0	68	15.6	4.7	46.4	32.0
Interstate	3222	7.0	68	15.4	4.6	42.7	25.2
Interstate	232A	6.5	68	15.2	4.6	46.1	37.8
Cenex	3083	6.5	68	14.9	4.5	48.7	27.9
Mean		6.6	65	16.8	5.0	47.0	36.1
C.V.%		4.5	4.5	12.2	12.2	3.1	18.7
LSD .05		0.5	4.2	NS	NS	2.1	9.5

Planting date: May 14
Planting rate: Planted 60,000 seed/ac; thinned to 18,000 plants/ac
Fertilizer applied: None
Herbicide applied: None
Harvest date: Silage cut on September 21; grain harvested on October 2 and dried

1992 Hettinger Hybrid Corn Trial

Brand	Hybrid	Relative maturity days	Grain yield bu/A	Test weight lbs/bu	Silage yield Tons/A	Harvest moisture %
Pioneer	3979	76	54.4	47.0	9.45	75.5
Dekalb	DK363	86	52.9	36.9	9.02	81.5
Dahlgren	DC5802	80	52.7	43.7	8.60	81.9
Pioneer	3963	79	50.5	44.9	8.22	82.2
Great Lakes	GL350	90	46.4	41.6	10.26	79.7
Great Lakes	GL220	80	45.7	42.3	8.43	81.6
Great Lakes	GL306	85	45.7	43.7	11.12	79.1
Jacques	3220	85	43.9	41.9	11.92	74.5
Golden Harv.	H2266	90	41.9	40.3	9.77	81.0
Jacques	4120	90	40.5	40.4	12.28	76.0
Interstate	3222	87	29.5	38.2	10.08	79.4
Dahlgren	DC5892	88	27.3	34.5	10.95	79.7
Trial mean			44.3	41.3	10.01	79.3
C.V. %			10.3	3.5	11.29	
LSD 5%			7.7	2.5	1.62	
LSD 1%			10.5	3.3	2.17	
# of reps			3	3	4	1

Planting date: May 8 Harvest date: Silage - September 16
Grain - October 23
Seeding rate: 21,000 seeds/A, thinned to 18,000 plants/A
Fertilizer applied: 91 lbs/A 18-46-0
Herbicides applied: 0.5 oz/A Accent + 1/2 pt/A 2,4-D +
2 pt/A Scoil
Insecticide applied: 12 oz/1000' row Furidan CR-10
Grain yields are on a 13.5% moisture bases.
Silage yields are on a 70% moisture bases.

1992 Regent Hybrid Corn Trial

Brand	Hybrid	Relative maturity	Grain yield	Test weight	Silage yield	Harvest moisture
		days	bu/A	lbs/bu	Tons/A	%
Dahlgren	DC5862	85	56.8	50.9	12.02	68.4
Great Lakes	GL350	90	52.3	48.1	10.89	68.2
Golden Harv.	H2266	90	47.0	48.2	9.19	68.5
Pioneer	3963	79	45.8	48.6	11.56	67.0
Pioneer	3979	76	43.5	47.5	8.84	71.4
Interstate	3222	87	42.7	45.0	11.77	69.5
Dahlgren	DC5892	88	42.2	44.8	9.43	71.3
Dahlgren	DC0528	85	40.3	48.4	9.61	72.6
Great Lakes	GL220	80	35.8	45.6	9.66	71.4
Great Lakes	GL306	85	35.3	46.5	8.70	71.4
Trial mean			44.2	47.4	10.17	70.0
C.V. %			27.9	7.7	17.27	
LSD 5%			ns	ns	2.54	
# of reps			4	4	4	1

1992 New Leipzig Hybrid Corn Trial

Brand	Hybrid	Relative maturity	Silage yield	Harvest moisture
		days	Tons/A	%
Interstate	3222	87	11.43	61.0
Great Lakes	GL306	85	10.80	68.0
Golden Harv.	H2266	90	10.50	64.5
Dahlgren	DC5892	88	10.40	70.7
Great Lakes	GL220	80	9.16	69.5
Dahlgren	DC5862	85	8.92	58.0
Pioneer	3979	76	8.31	43.5
Pioneer	3963	79	8.21	66.5
Great Lakes	GL350	90	7.80	72.0
Dahlgren	DC0528	85	6.81	72.0
Trial mean			9.23	64.6
C.V. %			18.80	
LSD 5%			2.51	
LSD 1%			3.38	
# of reps			4	1

Planting date: May 8 Harvest date: Silage - September 16
Grain - October 26
Seeding rate: 21,000 seeds/A, thinned to 18,000 plants/A
Fertilizer applied: Regent, 81 lbs/A 46-0-0
Fertilizer applied: New Leipzig, 44 lbs/A 11-52-0
Herbicides applied: 3 pt/A Prowl, pre-emergence
0.5 oz/A Accent + 1/2 pt/A 2,4-D post emerg.
Insecticide applied: 12 oz/1000' row Furidan CR-10
Silage yields are on a 70% moisture bases.
The New Leipzig trial was hailed out prior to grain harvest.

DRYLAND CORN TRIAL-RECROP DICKINSON, ND, 1992

Brand	Hybrid	Day To Tasseling	Height	Harvest Moisture	Yield 70% Moisture	Yield DM Basis
			FT	%	TONS/A	TONS/A
Dahlgren	5802	65	6.0	60	11.3	3.4
Great Lakes	GL306	69	6.7	58	10.7	3.2
Interstate	232A	66	6.1	53	10.1	3.0
Jacques	3220	66	6.5	69	9.6	2.9
Cargill	2217	73	6.2	66	9.3	2.8
Cenex	1195E	65	5.7	70	8.8	2.6
Pioneer	3979	63	5.5	66	7.0	2.1
Mean		67	6.1	63	9.5	2.9
C.V.%		1.9	9.8	17.2	18.5	18.5
LSD .05		2.2	NS	NS	NS	NS

Planting date: May 13
Planting rate: Planted at 60,000 seed/ac; thinned to 18,000 PLS/ac
Fertilizer applied: None
Herbicide applied: None
Harvest date: Cut for silage on September 16

*Note: Birds completely stripped cobs of kernels so grain yield could not be determined

DRYLAND GRAIN SORGHUM VARIETY TRIAL DICKINSON, ND, 1992

Brand	Hybrid	Test Weight	Yield
		LB	BU/AC
Dekalb	DK18	48	2.9
Jacques	J-111E	45	0.7
Northrup King	1210	46	1.8
Northrup King	18803	44	0.9
Agripro	ST3280	47	2.3
Dekalb	DKX109	47	2.3
Mean		--	1.8
C.V.%		--	52.2
LSD .05		--	1.4

Seeding date: May 8
Seeding rate: 75,000 seed/ac
Fertilizer applied: None
Herbicide applied: 1 pt Buctril/ac
Harvest date: October 13

DRYLAND ALFALFA VARIETY TRIAL — DICKINSON, ND, 1992

Variety	Stand Est.	Harvest Moisture	Hay Field 12% M	Hay Field DM Basis	Recovery* Rating
	%	%	Tons/AC		
Brazer XL(PI)	96	66	2.6	2.3	8.3
Legend(PI)	76	68	2.5	2.2	9.3
740	92	66	2.3	2.0	9.3
Blazer XL(PI)	88	67	2.3	2.0	9.0
Vernal	90	67	2.2	2.0	9.3
Ladak	78	67	2.2	1.9	8.7
WL-225	91	68	2.2	1.9	9.3
Blazer(PI)	94	67	2.2	1.9	8.7
Legend(C)	91	69	2.2	1.9	9.3
Travois	74	69	2.0	1.8	9.3
640	81	68	1.9	1.6	9.3
Roughrider(PI)	70	69	1.7	1.5	9.0
Milkmaker II	82	67	1.7	1.5	9.3
Mean	84.8	67.6	2.2	0.5	9.1
C.V.%	17.1	2.3	19.6	19.6	8.4
LSD .05	NS	NS	NS	NS	NS

*1=Poor 10=Excellent

Planting date: April 15
Planting rate: 9 lb seed/ac
Fertilizer applied: none
Herbicide applied: 1 pt Treflan/ac PPI; 1 pt Buctril/ac PE
Harvest date: Cut for hay on July 22

Buckwheat Production - Dickinson

North Dakota is the leading producer of buckwheat in the U.S. A traditionally important buckwheat producing area within North Dakota has been the Missouri Slope region. When grown under contract, buckwheat production (and other alternative crops) can be quite profitable. In addition, buckwheat can be incorporated into small grain crop rotations to break disease and weed cycles. Recent research also suggests that buckwheat may be able to utilize phosphorus which cannot be used by many other crops. Lastly, buckwheat can provide primarily small grain producers with the opportunity to move into new markets.

MinnDak Growers Ltd. specializes in the marketing of buckwheat and other alternative crops in the southwestern part of North Dakota. Steve Edwardson and others at MinnDak are excellent sources of information on the market potential of buckwheat, safflower, and selected other alternative crops discussed in this report.

The buckwheat varietal trial at Dickinson was destroyed by a hail storm in 1991. In 1992, 50 to 60 of the buckwheat seedlings in the varietal trial failed to survive a late frost in May. Moreover, the buckwheat trial was conducted in a recrop (corn) field. Still, buckwheat varieties averaged almost 1300 lb/ac.

In addition to the buckwheat varietal trial summarized in the table below, a planting date X planting rate X buckwheat variety trial also was conducted in 1992. Though not provided in this report, the data reveal that seed yield was increased as the seeding rate was increased from 35 to 55 lb seed/ac. Yield was similar among the varieties compared (Mancan, Manor, and 85624). Average seed yield tended to be slightly more when buckwheat was planted on May 20 rather than May 8, probably because seedlings planted later had not emerged when the killing frost occurred in late May.

DRYLAND BUCKWHEAT TRIAL - RECROP DICKINSON, ND, 1992

Variety	Height	Test Weight	Seeds/LB	Yield
				LB/A
	IN	LBS		
Common	93.7	22.8	19934	1650
Exp 85624	83.3	31.7	14338	1260
Giant American	90.7	27.3	16679	1178
Manor	98.0	26.1	17428	1137
Mancan	90.0	26.1	17365	1094
Mean	91.1	41.9	17149	1264
C.V.%	10.8	2.3	5.3	16.4
LSD .05	18.5	2.2	1394	320

Planting date: May 8
Planting rate: 45 lb seed/ac
Fertilizer applied: 46 lb urea/ac
Herbicide applied: None
Harvest Date: August 18

1992 Hettinger Buckwheat Variety Trial

Variety	Test weight	Plant height	Yield 1990	1991	1992	2yr	3yr
	lbs/bu	cm	lbs/A				
Tokyo	47.7	110	265	288	3020	1654	1191
Mancan	42.8	110	338	252	2647	1450	1079
Mannor	42.9	112	188	194	2474	1334	952
Giant American	39.9	121	214	181	2200	1190	865
Trial mean	43.3	113	236	246	2585		
C.V. %	1.1	7	50	65	14		
LSD 5%	0.7	ns	ns	ns	571		
LSD 1%	1.0	ns	ns	ns	805		
# of reps	4	4	4	4	4		

Planting date: May 29 Harvest date: September 3
Seeding rate: 700,000 live seeds/A
Fertilizer applied: 44 lbs/A 11-52-0
Yield goal: 2000 lbs/A

1992 Hettinger Specialty Crops Trial

Crop	Test weight	Ht	Seed date	Harv. date	Yield 1990	1991	1992	2yr	3yr
	lbs/bu	cm			lbs/A				
Proso millet	49.5	97	5/29	9/18	630	1147	1416	1282	1064
Coriander	22.5	90	5/29	10/1	2093	713	778	746	1195
Garbanzo beans	poor	emerg	5/29	--		0	0	0	
Natto beans	poor	emerg	5/29	--	0	403	0	202	134
Field peas	65.4	85	5/29	9/18	0	735	1774	1254	836
Fenugreek (CA)	59.1	60	5/12	9/18			1001		
Fenugreek (MI)	57.8	75	5/12	9/18			1303		
Camelina	53.4	67	5/12	9/1	0		504	252	
Amaranth	60.7	135	5/12	9/18			423		
Speltz	42.3	106	5/12	8/27			3174		
Spring rye	50.9	125	5/12	8/27			3557		

This trial was not replicated.

1992 HETTINGER BROADLEAF and GRASS HERBICIDE TRIAL
on Hard Red Spring Wheat

Treatment	Rate	Control			Grain Yield	Dock*	Approx. Cost/A
		Bdlf	Wiot	Fxtl			
	oz/A	%			bu/A	%	$
2,4-D amine	6	24.2	8.0	72.0	27.4	12.1	0.42
2,4-D ester	6	67.0	12.5	0	44.4	3.3	0.54
Banvel SGF+MCPA amine	1.5+4	93.3	2.5	0	40.6	10.3	0.75
Banvel SGF+MCPA ester	1.5+4	97.5	0	48.5	40.2	5.3	0.87
Banvel+MCPA ester	1.5+4	98.7	0	12.5	34.3	10.4	1.29
Buctril+MCPA	4+4	98.7	1.0	68.5	37.6	10.7	1.96
Bromoxynil-gel+MCPA	4+4	94.4	0	12.5	36.3	11.1	
Buctril+2,4-D ester	3+6	93.2	0	0	36.1	9.8	1.65
Curtail	9.5	27.8	2.5	72.0	29.5	12.1	2.09
Curtail M	9.5	99.0	0	0	31.3	15.2	2.56
Starene+2,4-D amine	1+6	97.7	2.5	0	40.6	6.0	
Starene+2,4-D am+Tordon	1+6+.125	95.7	2.5	12.5	35.5	13.0	
Harmony Ext+2,4-D es+X-77	.2+4+.25%	97.9	0	42.5	42.4	7.2	2.55
Ally+2,4-D ester+X-77	.06+4+.25%	91.5	2.5	22.5	36.6	7.0	1.92
Amber+2,4-D ester+X-77	.2+4+.25%	99.0	22.5	12.5	41.4	5.9	2.41
Express+2,4-D ester+X-77	.2+4+.25%	99.0	2.5	12.5	35.4	15.0	4.17
Dakota TP	6.5	17.1	5.8	84.8	28.3	9.6	4.19
Tiller	6.6	53.7	45.0	82.2	32.2	7.9	3.69
Cheyenne TP+Harmony Extra	7.3+.22	97.6	81.8	68.8	68.8	5.3	16.30
Dakota TP+Buctril	8.7+4	91.9	25.8	0	30.1	12.6	6.96
Dakota TP+Banvel SGF	6.5+1	97.6	12.0	22.5	32.4	10.5	4.36
Stampede EDF+MCPA+PO	17+4+.25G	94.4	1.0	45.0	28.0	16.4	5.29
Untreated		0	0	0	29.8	9.3	0.00
Trial mean		79.4	13.4	30.1	35.0	9.8	
C.V. %		21.7	133.0	110.4	20.8	62.9	
LDS 5%		25.3	26.1	48.7	10.7	9.1	
LSD 1%		34.4	35.5	66.2	ns	ns	
# of reps		4	4	4	4	4	

Planting date: 4/16/92
Variety: Grandin HRSW
Harvest date: 8/14/92
Application date: 5/19/92
Crop growth stage: 3.5 leaf
Temperature: 82 F
Humidity: 70%
Sky: Clear & Sunny
Wind: 5 mph N
Rainfall: 5/22/92 - 0.30"
Hard frost: 5/26 & 6/6/92

Weed and growth stage
Wildoat: 3.5 leaf
Foxtail: 1 - 3.5 leaf
Kochia: 0.5 - 1.5 inches
Russian thistle: 1 - 2.5 inches

X-77 is a surfactant
PO is petroleum oil concentrate

Notes: * = % dockage was composed mainly of wildoat seed.
Very small population of foxtails made this rating very difficult.

Variety = Grandin

Treatment	Grain yield	Test weight	Plant height
	bu/A	lbs/bu	cm
1	103.8	60.9	87
2	89.5	59.6	86
3	77.1	60.1	83
4	98.7	59.9	88
5	93.7	62.6	83
6	85.4	59.3	86

Variety = Len

Treatment	Grain yield	Test weight	Plant height
	bu/A	lbs/bu	cm
1	76.2	58.1	83
2	81.7	58.3	87
3	82.7	57.1	89
4	81.3	56.5	86
5	81.7	59.5	87
6	75.7	61.1	85

Variety = ND671

Treatment	Grain yield	Test weight	Plant height
	bu/A	lbs/bu	cm
1	79.9	62.5	87
2	97.8	62.2	86
3	89.5	62.2	91
4	78.1	63.4	81
5	not treated		
6	89.5	62.6	92

Variety = Stoa

Treatment	Grain yield	Test weight	Plant height
	bu/A	lbs/bu	cm
1	104.7	60.4	97
2	103.3	58.5	101
3	96.9	59.5	96
4	98.3	61.7	94
5	90.0	58.3	100
6	101.0	58.3	94

Treatment Means

Treatment	Grain yield	Test weight	Plant height
	bu/A	lbs/bu	cm
1	91.6	60.0	86
2	89.0	59.9	86
3	89.2	59.8	84
4	90.3	59.9	84
5	89.2	60.6	84
6	88.5	59.8	85

Treatments

1 = 1.7 pt/A Tiller
2 = 0.5 pt/A Assert + 1.5 pt/A Avenge
3 = 1.0 pt/A Assert
4 = 3.0 pt/A Avenge
5 = 1.5 pt/A Dakota
6 = Untreated

Planting date: 4/15/92
Date of Application: 5/28/92
Crop Growth Stage: 4.5 leaf
Temperature: 65 F
Wind: 10 mph South
Harvest date: 8/18/92
Note: Hard Frost (24 F) on 5/26/92

1992 HETTINGER WILDOAT HERBICIDE X HRSW VARIETY TRIAL

This trial was conducted in order to observe possible varietal interactions with different wildoat herbicides. Ten hard red spring wheat varieties were treated with 5 different herbicides or herbicide combinations plus an untreated check.

This trial was not replicated and therefore no definitive answers may be made however, this trial does allow for possible assumptions to be made.

Possible negative interactions with respect to yield appear in the varieties Alex, Butte 86 and ND671. There does not appear to be any treatment mean over all varieties which is significantly higher or lower then the other treatment means for grain yield, test weight or plant height.

Variety = 2369

Treatment	Grain yield	Test weight	Plant height
	bu/A	lbs/bu	cm
1	90.5	60.0	77
2	85.9	59.6	84
3	79.0	62.0	76
4	83.1	62.0	75
5	81.7	60.6	77
6	76.7	59.3	78

Variety = 2375

Treatment	Grain yield	Test weight	Plant height
	bu/A	lbs/bu	cm
1	101.0	60.1	81
2	82.2	60.0	76
3	84.5	59.7	73
4	90.0	60.1	75
5	90.5	61.6	79
6	81.3	60.0	71

Variety = Alex

Treatment	Grain yield	Test weight	Plant height
	bu/A	lbs/bu	cm
1	79.4	57.3	93
2	84.5	58.0	95
3	95.5	58.2	91
4	92.3	58.2	95
5	84.5	60.7	80
6	97.8	57.5	93

Variety = Amidon

Treatment	Grain yield	Test weight	Plant height
	bu/A	lbs/bu	cm
1	98.7	56.5	93
2	93.2	60.2	96
3	106.5	58.8	96
4	105.6	55.7	90
5	95.5	55.7	89
6	92.8	57.6	97

Variety = Butte 86

Treatment	Grain yield	Test weight	Plant height
	bu/A	lbs/bu	cm
1	100.1	63.0	84
2	93.7	62.8	78
3	91.4	62.6	85
4	81.3	62.0	86
5	87.2	61.0	86
6	94.1	60.5	80

Variety = Dalen

Treatment	Grain yield	Test weight	Plant height
	bu/A	lbs/bu	cm
1	81.3	61.6	70
2	78.1	59.4	69
3	88.6	57.3	68
4	94.6	59.5	75
5	99.6	62.4	73
6	90.5	62.1	74

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1992 HETTINGER WILDOAT HERBICIDE TRIAL
on Hard Red Spring Wheat

Treatment	Rate	Wildoat Control	Grain Yield	Dockage	Approx. Cost/A
	oz/A	%	bu/A	%	$
Hoelon	12	42	13.1	30.5	4.92
Hoelon + Sun-it	12 + 16	77	13.3	28.2	6.52
Hoelon + Sun-it	16 + 16	70	15.4	20.0	8.16
Assert + X-77	5 + .25%	51	8.8	45.0	4.15
Assert + Sun-it	5 + 32	75	15.5	32.8	7.15
Assert + Scoil	5 + 32	79	15.7	41.4	7.79
Avenge	10	13	12.4	49.6	3.00
Avenge+Assert+X-77	6+2.5+.25%	51	15.7	42.5	4.00
Cheyenne TP	7.3	82	18.3	29.4	16.30
Tiller	9.4	40	15.9	34.2	5.26
Untreated		0	10.3	48.5	0.00
Trial mean		62	13.9	36.6	
C.V. %		39	48.8	31.7	
LDS 5%		38	ns	17.9	
LSD 1%		54	ns	25.1	
# of reps		4	4	4	

Planting date: 4/16/92
Variety: Grandin HRSW
Harvest date: 8/14/92
Application date: 5/19/92
Crop growth stage: 3.5 leaf
Weed & growth stage: Wildoat - 3.5 leaf
Temperature: 77 F
Humidity: 62%
Sky: Clear & Sunny
Wind: 5 mph NE
Rainfall: 5/22/92 - 0.30"
Hard frost: 5/26 & 6/6/92
Trial was sprayed with 1 pt/A Bronate on 6/9/92

1992 Hettinger Reduced Rates of Broadleaf Herbicides on Hard Red Spring Wheat

Treatment*	Rate	Broadleaf Control	Grain Yield	Dockage	Approx. Cost/A**
	oz/A	%	bu/A	%	$
Express	1/6	97	33.7	7.2	3.18
Express	1/10	95	28.5	11.7	1.90
Express	1/15	79	28.9	11.2	1.27
Harmony Extra	1/3	96	28.1	9.6	3.64
Harmony Extra	1/6	95	36.7	11.3	1.82
Harmony Extra	1/10	90	30.9	9.8	1.09
Ally	1/10	96	32.4	10.9	2.60
Ally	1/15	99	38.8	13.6	1.73
Ally	1/20	88	34.3	5.3	1.30
Amber	1/4	93	33.3	6.2	2.57
Amber	1/8	94	35.3	4.9	1.28
Amber	1/10	97	30.0	13.1	1.03
MCPA ester	8	90	29.4	11.8	0.96
Untreated		0	29.5	6.2	0.00
Trial mean		86	32.2	9.4	
C.V. %		15	30.8	62.2	
LDS 5%		10	ns	ns	
LSD 1%		13	ns	ns	
# of reps		4	4	4	

Planting date: 4/16/92
Variety: Grandin HRSW
Harvest date: 8/14/92
Application date: 5/19/92
Crop growth stage: 3.5 leaf
Temperature: 77 F
Humidity: 62%
Sky: Clear & Sunny
Wind: 5 mph NE
Rainfall: 5/22/92 - 0.30"
Hard frost: 5/26 & 6/6/92

Weed and growth stage
Kochia: 0.5"-1.5"
Russian thistle: 1"-2.5"

* 1 pt/A Scoil (methylated seed oil) and 8 oz/A MCPA ester was added to all treatments.

** Approximate price of treatment excluding the price of MCPA ester and Scoil.

1992 Hettinger Downy Brome Control in Hard Red Winter Wheat

The objective of this trial was to compare various herbicides and application timings for control of downy brome in winter wheat.

Arapahoe HRWW was planted into dry soil on September 20, 1991. Less than 5 percent of the crop emerged prior to freeze up and almost no winter wheat emerged the following spring and therefore no crop was harvested. The study area had a past infestation of downy brome and Fall population counts were greater than 100 plants per square foot. Plots were rated for percent downy brome control on May 14 and again on June 11, 1992. Results are shown in the following table.

Treatment	Rate	Timing*	Control
	oz/A		%
Check			0
Amber 75 WG	0.57	PPI	70
Amber	0.57	PP	69
Amber	0.57	PEI	87
Amber	0.57	PE	68
Amber	0.57	POST	6
Ally 75 WG	0.49	PEI	91
Ally	0.49	PE	62
Finesse 75 WG	0.49	PEI	87
Finesse	0.49	PE	88
Treflan TR10	120	SPG	95
C.V. %			28
LSD 5%			25
LSD 1%			33
# of reps			4

* Timing of Application — Date

PPI	= Pre-plant incorp.	9/20/91
PP	= Pre-plant no incorp.	9/20/91
PEI	= Pre-emerg incorp.	9/20/91
PE	= Pre-emerg no incorp.	9/20/91
Post	= Post emerg.	4/29/92
SPG	= Spring incorp.	4/6/92

Results indicate that all of the treatments with the exception of post applied Amber had significant downy brome control. Amber and Ally treatments when applied pre-emergence incorporated, both Finesse treatments and the Treflan treatment were the only treatments which could be considered as having acceptable control (greater than 85%).

1992 Hettinger Crop Tolerance to Avenge Wildoat Herbicide

This trial was conducted to determine varietal tolerances to Avenge wildoat herbicide. Four pints per acre (actual product) of Avenge was applied to hard red spring wheat, barley and durum varieties (see following table). Crop injury was determined by visual comparison with untreated checks.

Several varieties of HRSW and durum were injured by Avenge and are noted in the following table. There were no barley varieties exhibiting injury caused by Avenge. This trial was not replicated.

Planting Date: 4/2/92
Planting Rate: HRSW and durum - 1.1 million live seeds/A
Barley - 750,000 live seeds/A
Fertilizer Applied: 44 lbs/A 11-52-0
Herbicide Applied: Avenge at 4 pt/A (product) - 5/13/92
1/6 oz/A Express + 3/4 pt/A Bronate - 5/12/92
Carrier: Water at 10 gal/A
Crop Injury Ratings: 0 = none
1 = leaf spotting
2 = stunting, chlorosis and/or necrosis

HRSW		Durum		Barley	
Variety	Injury	Variety	Injury	Variety	Injury
Stoa	0	Ward	0	Hector	0
Butte 86	1	Medora	1	Harrington	0
2375	1	Renville	1	Bowman	0
Amidon	0	Vic	1	Stark	0
Grandin	1	Monroe	1	Gallatin	0
Sharp	0	Sceptre	0	Bearpaw	0
2371	0	Rugby	0	Wanubet	0
Krona	0	Laker	0	Excel	0
Nordic	1	Lloyd	0	Morex	0
ND657	1	Regal	0	Russell	0
ND671	1	D8460	0	Azure	0
Norm	1	D86398	1	Robust	0
Len	1	D86741	1	B1602	0
Marshall	1	D87121	0	B1603	0
Prospect	0	D87122	0	Hazen	0
Vance	1	D87130	0	M64	0
Gus	1	D87141	2	ND11055	0
Bergen	1	D87240	2	ND11853	0
2370	1	D87436	0	ND10981	0
Pasqua	2	D87450	0	ND11231	0
Dalen	0	D861523	1		
Hi-Line	0				
Cutless	1				
Alex	2				
Genesis	0				

1992 HETTINGER CORN HERBICIDE TRIAL

Product	Timing*	Rate oz/A	Broadleaf %	Grass %	Cost/A $
Eradicane + Prowl	PPI PE	32 24	3	86	10.71
Eradicane + Banvel	PPI Post	32 4	70	88	7.62
Eradicane + 2,4-D	PPI Post	32 8	85	83	6.18
Eradicane + Buctril	PPI Post	32 16	99	75	11.38
Eradicane	PPI	32	8	85	5.46
Bladex + Banvel	PPI Post	16 4	87	32	4.95
Bladex + 2,4-D	PPI Post	16 8	95	27	3.52
Bladex + Buctril	PPI Post	16 16	99	3	8.72
Bladex	PPI	16	27	30	2.80
Prowl + Banvel	PE Post	24 4	53	57	7.41
Prowl + 2,4-D	PE Post	24 8	87	58	5.98
Prowl + Buctril	PE Post	24 16	99	37	11.18
Prowl	PE	24	7	3	5.26
Banvel	Post	4	57	27	2.15
2,4-D	Post	8	87	40	0.72
Buctril	Post	16	99	43	5.93

Continued on next page.

Product	Timing*	Rate	Broadleaf	Grass	Cost/A
		oz/A	%	%	$
Accent +	Post	1/4	90	98	9.82
2,4-D +		8			
Scoil		24			
Accent +	Post	1/4	70	17	11.26
Banvel +		4			
Scoil		24			
Accent +	Post	1/4	33	98	9.11
Scoil		24			
Accent +	Post	1/4	3	96	6.72
NIS (Spray Booster)		.25%			
Accent	Post	1/4	8	72	6.32
Untreated			0	0	0.00
Trial mean			58	52	
C.V. %			30	49	
LSD 5%			24	37	
LSD 1%			33	49	
# of reps			3	3	

Planting date: 5/29/92

* = Application Timing: PPI = Pre-plant incorporated 5/29/92
PE = Pre-emergence 5/29/92
Post = 6/23/92

Notes: Bladex 4L was used on all Bladex treatments.
LV4 was used on all 2,4-D treatments.

Reference to commercial products and trade names are made with no intended endorsement. Herbicides, treatments and treatment rates used in this trial do not imply endorsement of non-labeled uses. USE ALL PESTICIDES ONLY AS LABELED.

Small Grain Seeding Rate Studies - Dickinson

Hard red spring wheat and oat trials were conducted at the Dickinson Research Center (DRC) to determine how the seeding rate influences grain yield and quality. The data fail to reveal any grain yield or quality advantage by increasing the rate from 0.75 to 1.5 million seed/ac for spring wheat, or 0.7 to 1.3 million seed/ac for oats.

DRYLAND WHEAT SEEDING RATE TRIAL — DICKINSON, ND, 1992

Variety	Seeding Rate	Plants/Ac	Ht	Test WT	Yield
	PLS/AC	Established	IN	LB	BU/Ac
Pasqua	750,000	416343	33	61.7	56
	1,000,000	729360	32	61.6	57
	1,250,000	708087	32	61.9	55
	1,500,000	1139625	32	62.0	54
2375	750,000	595644	33	61.9	55
	1,000,000	744555	33	62.2	52
	1,250,000	817491	33	62.5	55
	1,500,000	939051	33	62.4	56
Butte 86	750,000	455850	33	62.7	50
	1,000,000	650346	33	63.5	51
	1,250,000	768867	32	63.1	48
	1,500,000	1045416	33	62.9	49
Amidon	750,000	480162	33	62.1	53
	1,000,000	619957	33	62.0	52
	1,250,000	996792	33	62.4	53
	1,500,000	1075806	31	62.0	49
Mean		761459	33	62.3	52.8
C.V. %		12.7	3.9	0.8	5.3
Seeding Rate		***	NS	NS	NS

Planting date: April 27
Fertilizer applied: 76 lb urea/ac
Herbicide applied: 1 pt Buctril
Harvest date: August 17

DRYLAND OAT SEEDING RATE TRIAL — DICKINSON, ND, 1992

Variety	Seeding Rate	Plants/Ac	Ht	Test Wt	Seeds/LB	Yield
	PLS/AC	Established	IN	LB		BU/Ac
Hytest	700,000	516630	37.5	34.6	12854	115
	1,000,000	753672	34.4	35.2	12424	121
	1,300,000	1030210	37.0	35.2	12465	120
Otana	700,000	559176	36.3	35.4	12220	107
	1,000,000	553098	37.0	36.0	12320	103
	1,300,000	847881	35.2	35.8	12048	117
Dumont	700,000	528786	34.0	36.2	12349	110
	1,000,000	562215	35.2	35.4	12083	111
	1,300,000	805335	33.6	36.1	12988	116
Mean		684112	35.6	35.6	12417	111.8
C.V.%		18.0	2.8	1.2	5.3	10.7
Seeding rate		**	NS	NS	NS	NS

Planting date: April 27
Fertilizer applied: 76 lb urea/ac
Herbicide applied: 1 pt Buctril
Harvest date: August 17

1992 Hettinger Crambe Date and Rate of Planting Trial

Planting date	Yield	Test weight	Oil content	Plant height	Plant Stand/A
	lbs/A	lbs/bu	%	cm	1000's
April 1	883	24.6	27.2	66	48
April 15	2295	24.4	30.0	73	498
April 29	2465	25.0	28.9	94	664
May 13	2722	24.8	29.7	108	529
Trial mean	2078	24.7	29.0	86	435
C.V. %	18	3.0	9.9	15	57
LSD 5%	263	ns	2.0	9	174
LSD 1%	350	ns	2.7	12	231
# of reps	16	16	16	16	16

Seeding rate	Yield	Test weight	Oil content	Plant height	Plant Stand/A
lbs/A	lbs/A	lbs/bu	%	cm	1000's
10	1917	24.7	28.1	85	212
20	2189	24.8	29.5	84	498
30	2207	24.8	29.4	88	524
40	1997	24.7	28.8	85	506
Trial mean	2078	24.7	29.0	86	435
C.V. %	40	3.2	10.4	25	72
LSD 5%	ns	ns	ns	ns	223
# of reps	16	16	16	16	16

Variety: Meyer
Fertilizer applied: 44 lbs/A 11-52-0
Herbicides applied: 2.5 pt/A Sonalan, pre-plant incorp.
Notes: Severe frost injury to crop on April 1 planting date.

Variety X Phosphorus Efficiency Trial - Dickinson

Comparisons between three hard red spring wheat varieties (Butte 86, Marshall, and 2375) to additions of phosphorus on a low-P soil revealed that these varieties respond differently to phosphorus additions. Grain yield of Butte 86 was increased 8 bu/ac by additions of 80 lb P/ac (400 lb 0-45-0/ac). By contrast, grain yield of both Marshall and 2375 was unaffected by phosphorus additions. Similar data were collected in 1991, indicating that 2375, Marshall, and possibly other spring wheat varieties may be better able to utilize phosphorus on low-P soils, as indicated by soil test results, than Butte 86.

	Phosphorus Level (lb/ac)				
	0	10	20	40	80
			BU/A		
Butte 86	31	33	34	35	38
Marshall	36	42	40	42	40
2375	41	36	42	36	40

Root Rot Control of Small Grains

The efficacy of DB Green, Imazilil, and DB Green + Imazilil in controlling the dryland root rot fungus was conducted at the Dickinson Research Center in 1992. Growing conditions were not conducive to fungal growth. Data failed to indicate a significant benefit from using either product, either alone or in combination.

DRYLAND SEED TREATMENT STUDY-BARLEY DICKINSON, ND, 1992

Variety	Seed Treatment	Plants/Ac	Height	Test Weight	Yield 1992	Yield 1991	Yield Avg
			IN	LB		BU/A	
Bowman	DB Green	435600	30	50.8	80	34	57
Bowman	DB Green + Imazilil	392040	27	50.3	78	35	56
Bowman	--------	435600	28	50.8	77	32	54
Morex	DB Green	522720	31	48.7	74	--	--
Morex	DB Green + Imazilil	522720	29	48.5	74	--	--
Morex	--------	479160	32	48.8	73	--	--
Mean		466092	29.6	49.7	76.1	--	--
C.V.%		13.9	2.5	1.3	6.2	--	--
LSD .05		NS	1.3	1.0	NS	--	--

Planting date: April 27
Planting rate: Approximately 62 lb/ac (roughly 900,000 PLS/ac)
Fertilizer rate: None
Herbicide applied: 2.5 pt Hoelon + 1 pt Buctril
Harvest date: August 13

DRYLAND SEED TREATMENT STUDY-HRSW DICKINSON, ND, 1992

Variety	Seed Treatment	Plants/Ac	Height	Test Weight	Yield 1992	Yield 1991	Yield Avg
			IN	LB		BU/A	
Amidon	DB Green + Imazilil	566280	35	62.2	65	21	43
Amidon	--------	522720	33	62.5	64	19	41
Stoa	DB Green	522720	34	60.9	64	24	44
Amidon	DB Green	696960	33	62.6	63	22	42
Stoa	--------	566280	33	61.2	61	22	41
Stoa	DB Green + Imazilil	566280	30	61.4	59	23	41
Mean		561924	32.9	61.8	62.6	--	--
C.V.%		21.3	9.1	0.8	6.3	--	--
LSD .05		NS	NS	0.7	NS	--	--

DRYLAND SEED TREATMENT STUDY-DURUM DICKINSON, ND, 1992

Variety	Seed Treatment	Plant/Ac	Height	Test Weight	Yield 1992	Yield 1991	Yield Avg
			IN	LB		BU/A	
Ward	DB Green + Imazilil	522720	34	62.1	60	30	45
Ward	--------	566280	34	62.1	58	30	44
Vic	DB Green	522720	32	59.9	57	29	43
Vic	--------	566280	33	59.8	55	28	41
Ward	DB Green	479160	32	62.5	54	29	41
Vic	DB Green + Imazilil	435600	35	59.2	50	27	38
Mean		522720	33.2	60.9	56	--	--
C.V.%		9.6	7.0	0.7	12.5	--	--
LSD .05		NS	NS	0.6	NS	--	--

Planting date: April 27
Planting rate: Approximately 62 lb/ac for HRSW and 70 lb/ac for durum
Fertilizer applied: None
Herbicide applied: 2.5 pt Hoelon + 1 pt Buctril
Harvest date: August 17

1992 Hettinger HRSW Foliar Disease Survey

Foliar diseases are a constant and continuing threat to hard red spring wheat production in North Dakota. Foliar diseases are caused by fungi, bacteria and viruses, and are present every year and are found in every spring wheat field. The magnitude of severity is different for every field and changes according to varietal tolerance, disease pathogen population and environmental conditions.

Varietal tolerance is our best source of disease control and is achieved by genetically altering the wheat plant so as to limit the disease infection.

Disease pathogens are blown in from southern states or may be present in soils or on stubble. Populations of disease pathogens in the soil and on stubble are altered by tillage and by crop rotations.

Environmental conditions play the greatest role in a disease cycle. Foliar diseases typically present more of a problem during warm and humid conditions, however, some disease problems are amplified during dry conditions (common root rot). The timing of a disease infestation according to the crop growth stage is critical.

The flag leaf is the primary "factory" for head development and kernel production. If this leaf becomes infected during early seed development, losses in yield, test weight and quality are almost always assured. Infections which occur after the kernel is in the soft dough stage generally do not incur significant yield losses.

The following survey was conducted on 49 different HRSW varieties grown at Hettinger. Disease severity is the percentage of the flag leaf surface area affected by disease. This is followed by check marks which correspond to specific disease pathogens found on that variety. This survey was conducted on July 22, 1992.

Variety	Disease severity	Tan spot	Leaf blotch	Spot blotch	Glume blotch	Leaf rust	Stem rust	Bact*
Stoa	45	x	x	x	x			
Butte 86	40	x	x	x	x			
2375	25	x	x	x	x	x		
Amidon	15	x	x	x	x			
Grandin	25	x	x		x			
Sharp	35	x	x		x			x
2371	20	x	x		x			
Krona	20	x	x		x			
Nordic	30	x	x		x	x	x	
Len	50	x	x		x			
Marshall	55	x	x		x	x	x	
Prospect	25	x	x		x	x	x	

continued on next page.

1992 Hettinger HRSW Foliar Disease Survey continued.

Variety	Disease severity	Tan spot	Leaf blotch	Spot blotch	Glume blotch	Leaf rust	Stem rust	Bact*
Vance	20	x	x	x	x	x		
Gus	35	x	x		x			
Bergen	35	x	x		x			x
2370	30	x	x		x	x		x
Pasqua	45	x	x		x		x	
Dalen	45	x	x		x			x
Norm	25	x	x		x	x		x
HiLine	55	x	x		x	x	x	
Cutless	30	x	x		x			
Alex	25	x	x		x			
Makwa	30	x	x		x	x	x	x
Teal	20	x	x		x	x	x	
Dutchboy	35	x	x		x			x
Nomad	45	x	x		x	x	x	x
Express	55	x	x		x	x	x	x
Genesis	45	x	x		x	x	x	
Rumanick	35	x	x		x	x		
Baker	45	x	x		x	x	x	
AC Minto	10	x	x		x			
MT8849	30	x	x		x	x	x	x
ND671	35	x	x		x	x	x	
ND657	20	x	x		x			x
XW397A4	45	x	x		x	x	x	x
N870306	30	x	x		x	x	x	
XW397A3	25	x	x	x	x			x
ND673	45	x	x		x			x
ND674	20	x	x		x			x
ND675	45	x	x		x			
ND676	35	x	x		x			
ND677	45	x	x		x	x	x	
ND678	20	x	x		x			
ND679	25	x	x		x	x	x	
ND680	45	x	x		x			
ND681	40	x	x					x
ND682	20	x	x					x
SD3056	55	x	x	x	x			
BW148	15	x	x		x	x		

* Bacterial Leaf Blight

1992 Hettinger Companion Crops Trial

Growing two crops together is a common practice in many areas of the world. Corn and beans, corn and pumpkins or squash, and canola and peas are a few crops that have been grown together. This trial was conducted in order to look at various crop combinations, their growth habits, crop interactions, agronomic characteristics, and cultural practices associated with their production.

Considerations as to which crops to grow together were based on crops with similar maturities, crops which could be easily separated after harvest and crops which benefit from each other such as the nitrogen fixing ability of legumes (peas and lentils) or one crop providing a structure for the other crop to vine on such as the lentil/flax combination.

The table below shows mean yields of each "primary" crop when grown alone and when grown with other selected "companion" crops. Other factors which became apparent in this trial were the lack of herbicides which would be safe on both crops and over competition of one crop to the other (HRSW to flax, HRSW to lentils).

	Primary Crop					
	HRSW	Barley	Oats	Peas	Flax	Lentils
	bu/A	bu/A	bu/A	lbs/A	bu/A	lbs/A
Companion crop						
None	63.0	93.0	129.6	2874	26.0	903
HRSW				1387	5.2	101
Barley				1627		
Oats				1867		
Peas	42.7	62.6	55.2			
Flax	70.1					580
Lentils	72.0				22.5	
Trial mean	62.0	78.0	92.4	1939	17.9	528
C.V. %	8.7	12.0	14.5	17	18.7	24
LSD 5%	8.4	17.0	24.3	504	5.4	205
LSD 1%	11.8	26.6	38.1	712	7.9	299
# of reps	4	4	4	4	4	4

1992 Hettinger Fall vs. Spring Planted HRWW Trial

Hard red winter wheat (HRWW) is typically planted in the Fall of the year allowing the seed to germinate and produce foliage prior to freeze up. HRWW must be exposed to near freezing temperatures following germination to vernalize, a requirement for head development. Although cold tolerance (winterhardiness) varies between varieties, even the most winter hardy varieties will die at soil temperatures of 0 F. If HRWW could be planted in early Spring, the crop may be able to avoid these killing temperatures and still vernalize.

This study was initiated to investigate agronomic and quality characteristics among and between HRWW varieties which were Fall and early Spring planted.

HRWW was planted in small replicated plots on September 16, 1991 and on February 28, 1992. Plots were planted using double disc openers with a 7 inch row spacing. Plots were harvested on August 10, 1992.

Statistically significant gains in yield and test weight were observed for Spring planted Abilene and Arapahoe over the Fall planted treatments. There were no statistical differences between Fall and Spring planted treatments for percent protein. Heading date, plant height and winter survival were all significantly increased for Spring planted treatments over Fall planted treatments.

Variety	Planting date*	Yield	Test weight	Grain protein	Heading date	Plant height	Winter survival
		bu/A	lbs/bu	%	June	cm	%
Abilene	F	46.5	62.0	14.2	11	46	66
	S	72.4	63.6	14.2	17	57	97
Seward	F	57.7	61.6	13.1	15	68	62
	S	80.3	61.9	13.0	22	79	98
Arapahoe	F	48.3	61.0	14.5	13	57	74
	S	71.6	61.8	14.7	17	68	98
Trial mean	F	50.8	61.5	13.9	13	57	67
	S	74.8	62.4	14.0	19	68	98
Difference		24.0	0.9	0.1	6	11	31
C.V. %		25.4	0.7	3.4	0.3	11	18
LSD 5%		23.8	0.7	ns	2	10	23
LSD 1%		ns	0.9	ns	3	ns	31

* F = Fall (9/16/91), S = Spring (2/28/92)
ns = no statistical difference between Fall and Spring planted treatments.

Cropping Systems Research - Dickinson

A major research objective of agronomists at the Dickinson Research Center is to identify and/or develop alternatives to the traditional practice of summer fallowing cropland in alternate years. While the yield stability which this practice offers small grain producers is undeniable, soil conservation mandates and shrinking margins of profit suggest that alternatives are needed to maintain the long-term viability of crop production in the southwest.

A long-term cropping systems experiment begun in the early 1980s was continued in 1992. Among other comparisons within this experiment are several involving different recropping options with a spring wheat/summer fallow rotation. Results of some 1992 comparisons are summarized below.

Continuous wheat VS wheat/fallow. Continuous spring wheat yields were 66 to 70 percent of wheat yields produced in fallowed plots in 1992, depending on whether or not recropped plots were tilled prior to planting. Since the production period of fallowed plots was twice that of recropped plots (24 compared to 12 months), however, a more accurate agronomic comparison resulted when grain yield produced on fallowed plots was divided by 2 (or recropped grain yields is multiplied by 2). When this was done, as the "Annual" column in the table below shows, yield produced in fallowed plots was significantly less than that produced in recropped plots.

Stoa Spring Wheat - Fallow VS Recrop (HRSW)

System	Test Weight	Grain Yield BU/AC	
	LBS	1992	Annual*
Fallow	60.3	42	21
NTCC**	60.3	29	29
DDCC***	61.0	28	28
Mean	60.5	33.4	26.3
C.V. %	2.3	9.4	6.2
LSD .05	NS	7.2	3.7

* Because grain is produced in fallowed plots only in alternate years while in every year in recropped plots, yield produced in fallowed plots was divided by two so yields could be compared for the same production period.

** No-tillage continuous spring wheat

*** Double-disced continuous spring wheat

Wheat on corn VS wheat/fallow. Wheat grain yield grown in recropped sunflower plots (see below) or recropped corn plots (data not provided) was not significantly different from yield produced in fallowed plots in 1992. When production period differences were taken into account as described above, recropped yields were significantly greater than yields produced on fallowed plots.

Stoa Spring Wheat - Fallow VS Recrop (Sunflower)

System	Test Weight	Grain Yield
	LBS	BU/AC
Fallow	61.2	50
Recrop	61.0	38
Mean	61.1	44
C.V. %	1.2	15.7
LSD .05	NS	NS

Western Dakota Crops Day 1992
Hettinger, ND

Benefits from Diversifying the Cropping System

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To gain a broader understanding of the soil and how it behaves with regard to water, nutrients, and organic matter, we've taken a couple of years to look at both native prairie and farm sites across North Dakota. In western North Dakota, we used the south unit of the TR National Park as a window to look back at what these soils were and compare them to what we farm today. We found the lack of tillage and the perennial plants of the prairie have a great influence on the soil. Organic matter was 50% greater than farmed sites. Other factors, influenced by organic matter, were also significantly different. The soil was less compacted, had aggregates which were more water stable, and the soil profile contained only 25% of the nitrate nitrogen commonly found in farm fields. While these differences are expected, they do serve as a reference point to compare different kinds of cropping systems. Can we make the soil less erodible and more productive simply by changing our cropping systems? Will these agronomic benefits also be profitable; in other words, can we afford diversifying the cropping system?

The predominate cropping systems in southwestern North Dakota include the production of wheat, barley, a few other annual grasses, and fallow. Annual plants do not have the root systems that perennial plants have. Up to 50% of the above ground dry matter produced from our crop plants are also harvested for grain, resulting in considerable less organic matter returned to the soil each year. During the fallow year, the organic matter that is present is mineralized, releasing nutrients such as nitrogen, but at the same time reducing the total organic matter content of the soil. Over time, the lack of soil cover from fallow, and decreasing organic matter content have increased the vulnerability to erosion.

Management, specifically changes in tillage practices, have been the first response to protect these soils from erosion. Reduced or no-tillage systems have been successful in reducing the rate of soil erosion, increasing infiltration of rainfall, and reducing evaporation. Over the past decade, across much of western North Dakota, tillage has been reduced but rotations have remained the same. How to use the additional water conserved in reduced tillage systems will no doubt be the next step in successfully diversifying the cropping system.

One option is to lengthen the rotation with the inclusion of additional crops. While these could be simply adding more annual cereal crops, there are greater agronomic benefits from choosing a diverse set of crops in rotation. We've found the inclusion of buckwheat, for example, to have several unique benefits. First, since it is planted more than a month later than the spring cereals it uses soil moisture during a different time of the year and weeds which are often a problem in spring crops are seldom found in buckwheat fields. Buckwheat is also suspected of influencing how the soil mineralizes phosphorous, making it more available to crops which follow. Other crop options such as lentils or other grain legumes can fix their own nitrogen and serve as an important break in grass crop disease cycles. Though rotations which include too many grain legumes might deplete soil organic matter more quickly than wheat, since they typically have less straw, careful inclusion of grain legumes in rotation can reduce the overall amount of nitrogen fertilizer needed while maintaining, or improving, wheat yield.

Another option to intensify the rotation is through the use of cover crops, or fallow substitutes. Though cover crops can be used across all types of tillage practices, they might work best with some level of minimum tillage. Choosing the right cover crop and the specific management practices the crop requires are necessary to avoid using too much soil moisture. If properly managed, using leguminous cover crops during the fallow year can prevent leaching of water and nutrients down below the rooting depth, fix enough nitrogen for at least two following crops, add soil organic matter, and improve overall soil tilth. Some examples of fallow substitutes that are being successfully used in southwestern North Dakota include over-wintering types, such as yellow-blossomed sweetclover, and annual types, such as black lentils.

In our studies on the experiment station and the farm, we've found the agronomic benefits of diversifying the cropping system are certain. Crop productivity, soil condition, and long-term yield stability can be almost always be improved. A common characteristic of these alternative cropping systems is their crop diversity and regular incorporation and conservation of organic matter in the soil. Interestingly, these are both characteristics of the prairie from which they have evolved. Whether these improved agronomic practices can be made economically beneficial is largely dependent upon the motivation of the farmer. Often, these practices require new skills and different management. Costs and benefits have to viewed from a whole-farm level. For example, cash savings from reducing tillage may have to be invested in cover crop seed. Likewise, moisture captured through minimum or no-tillage may have to be spent on growing your own nitrogen and organic matter. Each farm will no doubt be unique in picking and choosing among all the options available.

As always, agriculture's future seems destined to change. While yield and productivity will remain important goals of any agricultural system, new challenges appear certain in our future, particularly those which deal with preserving environmental quality. We have become used to finding economical routes to provide soil fertility, control weeds, and save time. In the future perhaps we'll also become just as creative about increasing crop diversity and building soil organic matter in a profitable way.