LONG-TERM DRYLAND ROTATION RESULTS 1990 TO 2012

THE DAKOTA LAKES STAFF

INTRODUCTION:

The most important mission of the research enterprise at Dakota Lakes is to create conditions appropriate for research scientists from the main campus and/or from cooperating institutions like the USDA-ARS. For this reason three base rotations were established on the dryland portion of the main station starting with the 1990 growing season. These rotations were Winter Wheat-Corn-Broadleaf; Wheat (Spring or Winter)-Winter Wheat-Corn-Broadleaf (changed to W-W-C-C-Bl in 2004); and Winter Wheat-Broadleaf-Corn-Broadleaf. The broadleaf crop options in 1990 were very limited. It is not that way today.

By default, the broadleaf crops grown prior to winter wheat at Pierre normally have to be cool-season broadleaf types to allow enough time for moisture recharge between broadleaf harvest and winter wheat seeding. Peas, canola, lupine, lentil, chickpea, flax, and several forages have been used as cool-season broadleaf crops. The broadleaf crop grown prior to spring wheat or corn can be either warm or cool-season species. Soybean, sunflower, safflower, and cowpea have all been used as warm-season crops.

The three rotations used present a very diverse set of rotational intervals and crop sequences. This creates differing conditions that are important for testing treatments such as new varieties. For instance, the alternate year broadleaf rotation (Winter Wheat-Broadleaf-Corn-Broadleaf) was designed to present an environment that had low disease pressure and high winter-kill potential for the winter wheat. It is used for AYT trials by the wheat breeding project. Conversely, the Spring Wheat-Winter Wheat-Corn-Corn-Broadleaf rotation presents a situation for winter wheat that is low in winter-kill potential because of the spring wheat stubble. This same stubble can harbor leaf diseases and root diseases of wheat should be more common, so it provides the opportunity to test for the disease reaction of new and existing varieties. Similarly, rotations where corn follows one or two years of wheat production experiences the best moisture conditions possible at Pierre, but it also has cold soil conditions with the potential for it to be excessively wet.. Corn following a broadleaf will have better early growth but may have less available moisture depending on the preceding crop and the weather. When combined with the irrigation capability of the station, an almost unlimited suite of conditions can be created.

The other goal of maintaining these three rotations is to document long-term trends that occur in soil properties, weed populations, etc. Hopefully, problems that will be encountered by farmers in the future will be encountered at Dakota Lakes in time for solutions to be found before it is a widespread. Conversely, positive trends might also appear. Most research by Universities and industry is focused on very short-term goals with little attention being paid to long-term changes. These rotations have been 25%, 33%, and 50% low-residue broadleaf crops. There is a definite difference between the rotations in terms of the amount of surface residue that can be maintained. The good performance of the rotations with more residue during dry periods will spur more research. Information gleaned from this production information and from the Wheat Commission No-till Rotation studies at Redfield and in Northern Lyman County has been incorporated into training tools and extension fact sheets.

PERFORMANCE OF DRYLAND ROTATIONS AT THE DAKOTA LAKES RESEARCH FARM – MAIN UNIT 1993-2012

WINTER WHEAT
CORN
COOL SEASON BROADLEAF

	WINTER WHEAT	CORN	FLAX/Pea/ CHICKPEA[1]
1993	83	131	30 bu/a (flax)
1994	41	105	22 (flax)
1995	51	90	18 (flax)
1996	60	95	17 (flax)
1997	65	127	1650 lb/a (CP)
1998	85	102	2187(CP)
1999	78	95	1169(CP)
2000	81	66	705(CP)
2001	56[3]	86	2364(CP)
2002	28/56 (pea)	3	8 bu/a (pea)
2003	34	38	45 bu/a (pea)
2004	63	123	45 (pea)
2005	92	43	28 (pea)
2006	59	10	18 (pea)
2007	74	68	58 (pea)
2008	68	100	30 (pea)
2009	30	110	38 (pea)
2010	94	149	27(flax)/54(pea)
2011	65	120	48 (pea)
2012	99	30	46 (pea)
AVE	66	85	23/1600/38

[3] Spring Wheat – Due to winter kill

PERFORMANCE OF DRYLAND ROTATIONS AT THE DAKOTA LAKES RESEARCH FARM – MAIN UNIT 1993-2012

SPRING WHEAT
WINTER WHEAT
CORN or SORGHUM
WARM SEASON BROADLEAF
Changed to W-W-C-C-BL in 2004

	SPRING WHEAT	WINTER WHEAT	CORN		SOYBEAN
1993	69	72	120		33
1994	32	41	120		28
1995	51	56	111		36
1996	58	58	105		24
1997	49	71	115		43
1998	64	84	137		29
1999	66	77	121		45
2000	32	53	68		23
2001	56	54[3]	91		24
2002	5	12	8		2
2003	46	26	42		10
2004	40	56	82	110	34
2005	44	56	32	7	22
2006	22	24	0	0	8
2007	44	70	56	82	1019[5]
2008	62[6]	68	58	45	32
2009	27	49	104	93	22
2010	66[3]/88[6]	84	130/131[7]	133	35
2011	46[3]/67[6]	56	122/125[7]	130	40
2012	33[3]/94[6]	92	24/81[7]	34	20
AVE	41	57	82	70	27

[3] Spring Wheat – Due to winter kill
[5]Chickling vetch [6] Winter wheat
[7]Sorghum

PERFORMANCE OF DRYLAND ROTATIONS AT THE DAKOTA LAKES RESEARCH FARM – MAIN UNIT 1993-2012

WINTER WHEAT
WARM SEASON BROADLEAF
CORN/SORGHUM
COOL SEASON BROADLEAF

	WINTER WHEAT	SOYBEAN	CORN	LENTIL/ F. PEA[4]
1993	54	41	120	1150(Lentil) lb/a
1994	32	28	65	1200
1995	60	32	108	800
1996	58	24	75	1000
1997	45	47	142	42 (F Pea)bu/a
1998	94	34	114	20
1999	92	43	119	63
2000	81	26	50	33
2001	51[3]	24	86	37
2002	28	6	0	6
2003	24	6	2	47
2004	64	41	56	47
2005	57	20	5	39
2006	24	19	0	18
2007	76	57	60	67
2008	67	35	70	43
2009	51	47	103	41
2010	78	25	134/117[7]	56
2011	80	41	152/135[7]	17
2012	86	22	18/45[7]	48
AVE	61	31	74	1050/39

[3] Spring Wheat – Due to winter kill [7]Sorghum

[4] Field Peas in Bushels/Acre.