Converting Conservation Reserve Program Contracts To Cropland in Oklahoma

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INTRODUCTION

Holders of the 1.3 million acres of Conservation Reserve Program (CRP) contracts in Oklahoma will have to choose the future use of this land in 1997. Many of these acres will eventually be converted back to cropland because they will not meet the requirements of CRP-2. There is a general lack of knowledge and no best management practices guidelines on how these highly erodible lands should be economically converted back to cropland and still remain in compliance. A multi-agency research and demonstration project was funded by Southern Region USDA Sustainable Agriculture Research and Education Program/EP/A Agriculture in Concert with the Environment Program (SARE/ACE) in 1994. The objectives were: 1) to identify dryland production systems for converting the CRP grass (Old World Bluestem [OWB]) *(Andropogon gerurdii)* to annual production of wheat *(Triticum aestivum* L.) and 2) to evaluate the profitability and sustainability of the production system compared to managing the grass for livestock production.

MATERIALS AND METHODS

Field-Scale Evaluation of Cropping Systems

Field studies were conducted on two CRP fields under contract since 1987. The Forgan, OK, site is 160 a of Dalhart fine sandy loam 1-3% slope in Beaver Co. (NW) with 18 in of annual precipitation. The Duke, OK, site is 160 a of LaCasa-Waymouth clay loam, 1-3% slope in Jackson Co. (SW) with 29 in of annual precipitation. In May, 1994, 1995, and 1996, 25 to 30 a were either control burned or mowed and baled to remove the old grass growth. Four replications of 1-a plots were established at Forgan, while one 4-a and three 0.5-a plots were established at Duke. At Forgan, sweep tillage (ST) consisted of undercutting the existing sod with a 36 in V-blade sweep in mid-July. No other tillage was performed during the summer of 1994, but in 1995 an offset disking was needed to control sod regrowth and to smooth the seedbed prior to planting. In 1996, the Tillage was further modified to include two diskings after the sweep tillage. At Duke, disk tillage (DT) consisted of offset disking twice to kill and partially incorporate the sod in July of 1994, 1995, and 1996 and one tandem disking was performed prior to planting in October. In all the no-till (NT) plots, the OWB grass was treated with 1 lb/a of glyphosate in July or August and re-treated with an additional 1 lb/a of glyphosate in September before drilling the wheat. In 1996, the OWB grass was treated once with 2 lb/a of glyphosate in July. All glyphosate was applied with a surfactant and ammonium sulfate. A Tye 10-in-spacing (1994) or Great Plains 7-in-spacing (1995, 19%) no-till drill was used to plant all plots with 70 lb/a of wheat seed and place 100 lb/a of 18-46-0 with the seed. Sixty lb/a of urea-N was applied broadcast at planting or topdressed to plots in March. The wheat was treated in November, 1994 with 10 oz parathion for fall armyworms *(Laphygama frugiperda)*, and in March of 1994 and 1996 with 1/6 oz of chlorsulfuron and 0.25 lb chlorpynfos for broadleaf weed and greenbug control, respectively. Grain was harvested using a plot combine. The ST, DT, and NT plots were maintained after wheat harvest each year and replanted. The ST and DT plots were swept or disked once in July and again in September. The NT plots were treated with 1 Ib/a of glyphosate in September and all plots were annually planted back to wheat.

Small plot herbicide and tillage methods for re-cropping CRP lands to winter wheat

Plots (20 ft x 25 ft) were established at both CRP experimental sites without any pre-treatment and treatments were applied directly to the standing OWB biomass to evaluate the effectiveness of selected tillage-herbicide combinations to kill the sod. Two hundred lb/a of 18-46-0 and 100 lb/a of urea-N were applied to plots that were either moldboard plowed, disk plowed, or no-tilled. Glyphosate was applied at 0.25, 0.5, 0.75, 1.0, and 1.5 lb ai/a and glyphosate-2,4-D mixture (Landmaster BW) at 40 and 54 oz/a were applied across the plots before tillage in either May, June, or July. All tilled plots were disked once before planting wheat at a rate of 80 lb/a, The wheat was topdressed with 100 lb/a of urea-N in March Old world bluestem, weeds, wheat vigor, and stand counts were made periodically. Yields were determined with a plot combine.

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Fertilizer requirements of winter wheat in re-cropping CRP fields

Plots (20 ft x 25 ft were established to evaluate the effects of N and P fertilizers for winter wheat production in re-cropping CRP lands and the decomposition of the grass residues. OWB was treated with 1 lb/a of glyphosate in mid June. Liquid fertilizer was applied to the biomass before the primary tillage treatments of either moldboard plowed, disk plowed, or no-tilled. Fertilizers applied were: 0 lb/a N, 100 lb/a N as 34-0-0, and 100 lb/a N + 50 lb/a of P_2O_5. The plots were planted to wheat at a rate of *80* lb/a. Visual ratings of wheat vigor and stand density were made periodically during the growing season Grain yields were determined with a plot combine.

RESULTS AND DISCUSSION

Wheat yield data for 1994 and 1995 from field-scale plots are shown in Table 1. The 1994 wheat yields ranged from 13 bu/a to 26 bu/a, with the higher yields at Duke. Due mainly to drought conditions in 1995, wheat yields were much lower, ranging from 4 bu/a to 14 bu/a. In general, (NT) wheat yields were significantly higher than ST yields at Forgan in 1994 and the disk (DT) plots at Duke in 1995. At Duke, better herbicide suppression of OWB and soil moisture improved wheat emergence and growth in both systems. Although the crop seemed to grow better under the high residue-NT system, grain yields were not significantly different. Delays in herbicide suppression and tillage of the grass in 1994 depleted soil moisture, especially in the ST plots at Forgan. Sweep tillage was found to be an economically effective means of controlling OWB. If the soil remained dry for several days following tillage and the air temperatures were high, more than 90% of OWB was killed. Rates of glyphosate up to 1.5 lb/a were less reliable in suppressing OWB than tillage. Except when applied in July, glyphosate did not effectively control the grass in small plots (Table 2). Field applications at rates up *to* 2.0 lb/a were also less than satisfactory.

In small plots without prior removal of old grass growth, wheat yields were higher than in similar field studies. This is due to the larger amounts of N fertilizer applied. In this study, wheat yields from disk and moldboard tillage plots were significantly higher than NT yields (Table **3).** The data also shows that glyphosate rates higher than 0.5 lb ai/a did not significantly increase wheat yields. Applying glyphosate before tillage of the plots did increase wheat yields in disked but not in moldboard plowed plots. Large amounts of surface residue interfered with seed placement, row closure, and soil-seed contact during planting. Stand counts were 2.4, 5.8, and 6.6 plants/ft^2 for NT, disk, and moldboard, respectively. Glyphosate applied to the thick residue also reduced its effectiveness in controlling OWB.

In nutrient depleted CRP fields, N fertilizer is essential for producing acceptable wheat yields regardless of tillage method. Data showing wheat yields from fertilized and unfertilized plots are presented (Table 4). Unfertilized small plots yielded 34% and 60% of N-fertilized plots at Forgan and Duke, respectively. Additions of P appeared to increase wheat yields but the amounts were not significant. When the old grass growth was not removed before tillage and herbicide application, highest wheat yields were attained with moldboard tillage.

CONCLUSIONS

Although it is hghly desirable to conserve as much of the fixed C in the surface mulch, there appears to be too much mulch to effectively plant wheat either minimum or NT and get acceptable stands and crop yields unless the mulch is either burned or mowed and baled A controlled burn is an inexpensive and effective way to remove the old *grass* growth and the resulting new grass growth is controlled more effectively with herbicides. Moldboard tillage is an excellent way to bury the old *grass* growth and kill the grass if pre-treatment is not done. With high amounts of supplemental fertilizer, good wheat stands and high crop yields were attained, but this clean till practice makes the soil more susceptible to wind and water erosion and the tillage greatly enhances the mineralization of the residual carbon. Sweep tillage is an effective minimum till system that provides good OWB control and loosens the soil surface. No-till wheat production into control burned and killed OWB *sod* offers the highest degree of soil erosion control and maintenance of organic matter. In most cases, wheat yields have been as good as conventional or minimum till production. However, it is more difficult and costly to chemically control perennial, warm season grasses. Early suppression of OWB is vital to crop production in much of this semi-arid region. Adequate lead time is necessary to allow for partial decomposition of the organic residue and to re-supply the soil profile with moisture. The wheat responses are very dependent on the soil and climate.

Economic evaluation of the cropping systems and livestock *comparisons* have not been completed. The lower wheat yields of these highly erodible lands in a semi-arid region suggests that wheat will provide a negative return due to the high costs of conversion. Many farmers would be better advised to not convert to crop production. They should be advised to re-enroll these.

acres in CRP-2. If they are unsuccessful in getting into the program, then they should consider developing a forage and livestock enterprise. Under managed conditions, the OWB will produce substantial forage that should yield 100 to 150 lb beef/a and a positive cash flow. For many farmers, the final decision about post-CRP land uses will depend on prices of crops and livestock. Loss of government payments in 7 yr will cause many to re-evaluate their earlier decisions.

Table 1. Dryland wheat yields on former CRP lands.

Location	Year	Tillage System[1]	First year	Second-year
			------------(bu/a)------------	
Forgan, OK	1994	ST	13b[3]	
		NT	17a	
	1995[2]	ST	12a	3a
		NT	4b	2a
Duke, OK	1994	DT	24a	
		NT	26a	
	1995[2]	DT	7b	6b
		NT	14a	14a

[1] ST = sweep tillage, DT = disk tillage; NT = no-till
[2] Drought of 1995-96
[3] Letters represent crop yields in each year that were significantly different at $p = 0.05$

Table 2. Percent control of Old World Bluestem in CRP fields four wk after application date shown.

Roundup rate lb/a	DUKE, OK June	DUKE, OK July	FORGAN, OK May	FORGAN, OK July
	------------------	%	------------------	
0.25	33	10	12	37
0.50	59	39	13	47
1.0	73	69	13	87
1.5	61	83	13	93
	$LSD_{.05}$	13	$LSD_{.05}$	9

Table 3. Effects of tillage and herbicides on suppression of intact OWB sod.

TREATMENT	'A	B	C	D	E	F	G
Forgan, OK				bu/a			
No Till	19	20	24	24	24	17	18
Moldboard	29	28	32	31	30	30	31
Disk	27	28	28	31	27	31	31
Duke. OK							
No-Till	17	19	21	24	26	21	18
Moldboard	37	39	39	36	40	38	37
Disk	34	35	39	36	38	38	36

[1]A=Gly, 0.25 lb/a; B=Gly, 0.50 lb/a; C=Gly, 0.75 lb/a; D=Gly, 1.0 lb/a; E=Gly, 1.5 lb/a
F= Gly-2 ,4D, 40 oz/a; G= Gly-2, 4D, 52 oz/a

Table 4. Effect of tillage and fertilizer on wheat yields (small plots)'.

Fertilizer	No-till	Moldboard plow	Disk	Mean
Forgan, OK		bu/a		
0	1	10	6	5.7a
100 lb N/a	14	26	24	21.3b
100 lb N + 50 lb P_2O_5 /a	15	28	25	22.7b
Duke, OK				
0	8	20	14	14.0a
100 lb N/a	22	30	28	26.7b
100 lb N + 50 lb P_2O_5/a	26	32	29	29.0b

'No removal of the old OWB growth before tillage or spraying.