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Effects of Corn Ethanol and Soy-Based Biodiesel Production on Soil Erosion and Return of Conservation Reserve Program Land to Crop Production

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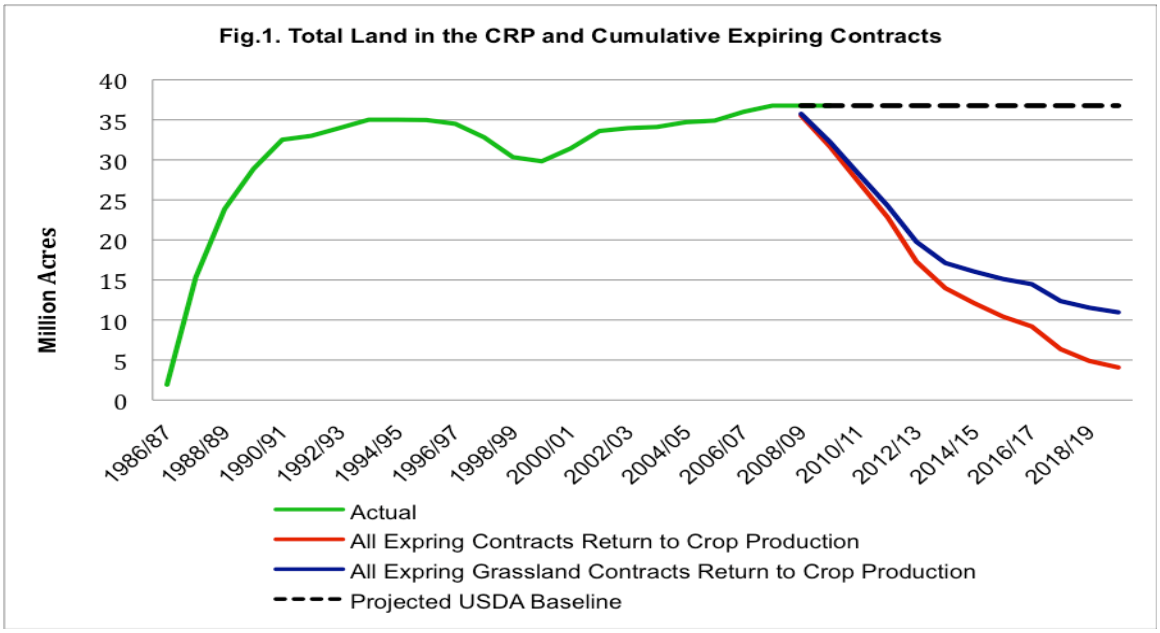
The Conservation Reserve Program (CRP), established by the Food Security Act of 1985, contracted with agricultural landowners to retire highly erodible and environmentally sensitive cropland and pasture from production for 10-15 years.[1] Approximately 36.8 million acres are now in the program (see Figure 1), equal to about 10% of land used for production of the major field crops in the U.S. Many of the contracts are set to expire in the next few years, as show in Figure 1.



Expanding biofuel production obviously increases demand for cropland. Higher crop prices due to expanded biofuel production will induce CRP land to return to production, negating conservation and environmental benefits achieved with the program. However, some CRP contracts are not being renewed by USDA making biofuels even more attractive for converting to cropland.

[1] More information on the CRP is available at http://www.ers.usda.gov/Briefing/ConservationPolicy/retirement.htm

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This Policy Brief compares estimated aggregate economic effects of expanding first generation biofuels—corn ethanol and soy-based biodiesel—from the current level of about 10 billion gallons annually to 30 billion gallons by 2025 with and without CRP land returning to production.[2]

Erosion rates for land that went into CRP averaged 20.71 tons/acre before CRP and only 1.58 tons/acre after being placed in a conserving use in the CRP. Production of corn and soybeans, the feedstocks for 1st generation biofuels, also have relatively high erosion rates. Nationally, erosion rates on these two crops averages about 5 tons/acre on highly erosive land and about 2 tons/acre on average land (Table 1).[3] Expansion of corn and soybean production from current levels will tend to occur on the marginal, more highly erosive land.

Table 1. Average Erosion Rates for Major Crops and for CRP Land (T/ac)

Crop	Not Highly Erosive Land	Highly Erosive Land
Corn	**2.79**	**5.46**
Soybeans	**2.01**	**4.21**
Grain Sorghum	2.12	1.74
Barley	0.49	0.63
Oats	1.17	2.15
Wheat	0.90	1.18
Cotton	3.13	6.62
Hay	0.20	0.86
Peanuts	3.06	4.18
CRP Before	**20.71**	
CRP After	**1.58**	

Estimating how much CRP land would be induced into production by expanded biofuel production is difficult because historical data pertain primarily to a 10-15 year contract period where CRP payments were made. Nevertheless, some insight into the return of CRP land after contracts expire may be gained from examining the economic behavioral relationships for CRP sign-ups related to crop profitability leading up to land being placed in the program. In essence, lower crop prices led to higher sign-ups for eligible CRP land. When contracts expire, it is plausible that the same economic behavior would reverse

[2] A companion briefing paper presents the aggregate economic effects of different levels of biofuel production, assuming that CRP land does not return to production. A companion paper is available at: https://sites.auburn.edu/academic/ag/group/bioenergy/Aggregate%20Economic%20Impacts%20of%20Expanded%20BioFuel%20Pro/Forms/AllItems.aspx

[3] We express our appreciation to Steve Porter, Texas A&M AgriLife Research and Extension Center (Blacklands) for re-aggregating USDA's county level erosion data to the USDA "Farm Resource Regions" used in AGSIM.

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itself and influence return of CRP land to production. We incorporated estimated behavioral relationships for each Farm Resource Region into AGSIM to estimate return of CRP land with expanded biofuel production.

Table 2 presents estimated acreage effects of increasing biofuel production from 10 to 30 billion gallons under two CRP scenarios. First, it is assumed that CRP land does not covert to cropland (CRP fixed) compared to allowing CRP land to convert to cropland (CRP variable). As CRP contracts expire, it is estimated that about 7 million more acres of CRP land would return to crop production with expanded biofuel production. Total U.S. cropland acreage planted would increase about 15 million acres, including the 7 million converted CRP acres. However, if CRP remains fixed then total U.S. acres planted increases only an estimated 10 million acres (Table 2).

Table 2. Estimated Increase in Acreage Planted to Major Crops (millions of acres) from Increasing Biofuel Production from 10 to 30 Billion Gallons Annually

Commodity	CRP Fixed	CRP Variable
Increase in Cropland Acreage , 2026-2030	9.63	14.83
Reduction in CRP Acreage, 2026-2030	0.00	-6.98

Estimated change in soil erosion is shown in Table 3. For expansion of cropland outside the current CRP, two erosion estimates are given, one for average rates on current land and one for erosion on highly erosive cropland. These two estimates are expected to bracket the likely effects on soil erosion of crop acreage changes induced by expanded biofuel production.

If all land remains in the CRP after current contracts expire, increased biofuel production will increase total erosion by 31 to 60 million tons annually, as shown in Table 3. If, however, an estimated 7 million acres of CRP land returns to production with expanded biofuel production, total erosion will increase by 174 to 206 million tons annually.

Table 3. Estimated increase in Soil Erosion at Alternative Levels of BioFuel Production (million tons annually) from Increasing Biofuel Production from 10 to 30 Billion Gallons Annually

Commodity	CRP Fixed	CRP Variable	Difference
Based on NOT Highly Erosive	31.35	174.06	142.71
Based on Highly Erosive	59.84	206.20	146.36

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Return of CRP land to crop production would moderate the aggregate economic effects of expanded biofuel production on crop prices (Table 4) and general food sector well-being (Table 5).

Table 4. Estimated Change in Major Crop Prices from Increasing Biofuel Production from 10 to 30 Billion Gallons Annually

Commodity	CRP Fixed	CRP Variable
Corn ($/bu)	$1.45	$1.31
Soybeans ($/bu)	$0.86	$0.66
Wheat ($/bu)	$0.46	$0.26
Cotton Lint ($/cwt)	$0.01	$0.00
Hay ($/T)	$2.64	$0.76

Table 3. Estimated Change in Economic Surpluses in the Domestic Food Sector (millions of dollars) from Increasing Biofuel Production from 10 to 30 Billion Gallons Annually

Commodity	CRP Fixed	CRP Variable	Difference
Food Consumers' Well Being	-$39,185	-$34,212	$4,973
Net Farm Income	$31,523	$28,175	-$3,347
Biosubsidy Cost to Taxpayers	$10,690	$10,690	$0
Net Surplus Change	-$18,352	-$16,727	$1,625

Return of the CRP land would reduce the net impact of expanded biofuel production on the domestic food sector by an estimated $1.6 billion annually (Table 5) but at the expense of about 145 million ton difference in increased erosion. This suggests the cost or impacted value is $11.13/ ton of soil erosion.

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