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Economic Implications of the EPA Analysis of the CAP and Trade Provisions of H.R. 2454 for U.S. Representative Farms

AFPC Research Paper 09-2

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Economic Implications of the EPA Analysis of the CAP and Trade Provisions of H.R. 2454 for U.S. Representative Farms[1]

At the request of Senator Saxby Chambliss, the Agricultural and Food Policy Center (AFPC) at Texas A&M University conducted an analysis of the economic impacts of "The American Clean Energy and Security Act of 2009" (H.R. 2454) on the AFPC database of U.S. representative farms. This report assesses the impacts of H.R. 2454 by including:

- The anticipated energy related cost increases directly experienced by agricultural producers for inputs such as fuel and electricity and indirectly experienced, such as, higher chemical prices resulting from higher energy prices. As discussed, in detail, later in the report, nitrogen fertilizer costs were treated differently as a result of the energy-intensive trade-exposed entities (EITE) provisions in the legislation.
- The expected commodity price changes resulting from producers switching among agricultural commodities and afforestation of land previously employed in agricultural commodity production.
- The estimated benefits to agricultural producers from selling carbon credits.

AFPC currently does not maintain sector level economic models with the amount of detail required to develop estimates of all of the impacts listed above along with their feedback effects. Therefore, we turned to recently published aggregate estimates to use in evaluating the farm level effects. Two analyses (U.S. Environmental Protection Agency (EPA) and Charles River Associates (CRA International)) were evaluated to determine which one provided the most complete data needed to perform the farm level analysis. The estimated energy price changes for the two analyses are not significantly different (Table 1). The CRA International analysis (http://www.nationalbcc.org/images/stories/documents/CRA_Waxman-Markey_%205-20-09_v8.pdf)) did not provide all of the input data required to conduct the farm level analysis. Therefore, AFPC utilized the EPA estimated energy price changes, as well as, estimates of carbon and agricultural commodity prices to evaluate the farm level impacts of H.R. 2454. **The results of this analysis are dependent on the estimated outcomes contained in the EPA analysis of H.R. 2454**.[2] As additional sector level analyses are conducted and estimates are refined, AFPC will update the farm level analysis.

Table 1. Estimated Changes in Inflation Rates Relative to the Base Situation for Motor Fuel, Natural Gas, and Electricity Reported by EPA and CRA International by 2020.

	EPA	CRA International
Motor Fuel	0.04	0.04
Natural Gas	0.085	0.14
Electricity	0.127	0.16

[1] AFPC thanks Dave Miller with Iowa Farm Bureau and Pat Westhoff with FAPRI-Missouri for their review of this manuscript. All errors or omissions are the responsibility of AFPC.

[2] EPA's analysis is the product of several different quantitative models. Carbon price and energy prices employed in this analysis are from EPA's economy-wide modeling (ADAGE and IGEM models), while agricultural commodity prices and land prices are from EPA's ag and forestry sector modeling (FASOM-GHG model). Further, the differences between natural gas prices inclusive and exclusive of carbon allowance costs were inferred from EPA's near-term electricity sector modeling (IPM model) output.

Background on Representative Farms and Process

AFPC has a 26 year history of maintaining a unique dataset of representative farms and utilizing them to evaluate the economic impacts of agricultural policy changes. This analysis was conducted over the 2007-2016 planning horizon using FLIPSIM, AFPC's risk-based whole farm simulation model. Data to simulate farming operations in the nation's major production regions came from producer panel interviews to gather, develop, and validate the economic and production information required to describe and simulate representative crop, livestock, and dairy farms. The FLIPSIM policy simulation model incorporates the historical risk faced by farmers for prices and production.

Panel Process

AFPC has developed and maintains data to simulate 98 representative crop farms, dairies, and livestock operations chosen from major production areas across the United States (Figure 1). Characteristics for each of the operations in terms of location, size, crop mix, assets, and average receipts are summarized in Appendix A. The location of these farms is primarily the result of discussions with staffers for the U.S. House and Senate Agriculture Committees. Information necessary to simulate the economic activity on these representative farms is developed from panels of producers using a consensus-building interview process. Normally two farms are developed in each region using separate panels of producers: one is representative of moderate size full-time farm operations, and the second panel usually represents a farm two to three times larger.

The data collected from the panel farms are analyzed in the whole farm simulation model (FLIPSIM) developed by AFPC. The producer panels are provided pro-forma financial statements for their representative farm and are asked to verify the accuracy of simulated results for the past year and the reasonableness of a seven-year projection. Each panel must approve the model's ability to reasonably reflect the economic activity on their representative farm prior to using the farm for policy analyses.

All of the crop farms are assumed to begin 2007 with 20 percent intermediate-term and long-term debt. Initial debt levels in 2007 for dairy farms were set at 30 percent and initial debt levels for beef cattle ranches were 1 percent for land and 5 percent for cattle and machinery. The representative farms' debt levels at the outset of 2007, the first year of the simulation period, are based on a stratified tabulation of the ERS-USDA Farm Cost and Returns Survey for 2004 (using the survey data for moderate to large size farms in states where AFPC has representative farms), and panel member input.

Scenarios Analyzed

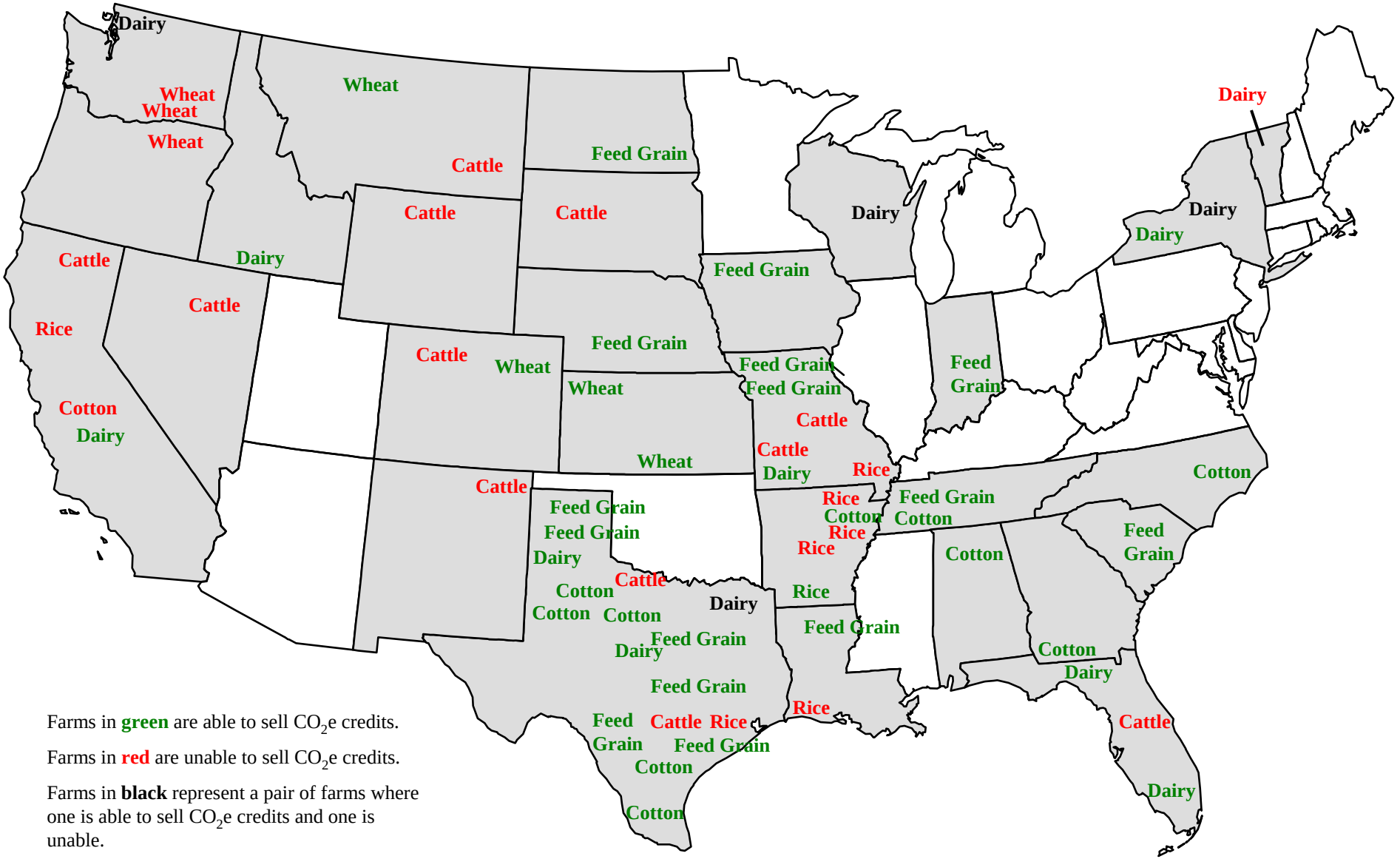
- **Baseline** – Projected prices, policy variables, and input inflation rates from the Food and Agricultural Policy Research Institute (FAPRI) January 2009 Baseline.

- **C&T[3] without Ag Carbon Credits** – Assumes H.R. 2454 becomes effective in 2010. Imposes EPA commodity price forecasts along with estimated energy cost inflation on representative farm inputs.

- **C&T with Ag Carbon Credits** – Assumes H.R. 2454 becomes effective in 2010. Imposes EPA commodity price forecasts along with estimated energy cost inflation on farm inputs, converts farms to no-till production (if applicable) and/or installs a methane digester on dairies over 500 head and sells carbon credits at EPA estimated market prices.

[3] Cap and Trade is abbreviated as C&T throughout this report.

Figure 1. Representative Farms, Dairies, and Ranches Maintained by AFPC



Farms in **green** are able to sell CO_2e credits.

Farms in **red** are unable to sell CO_2e credits.

Farms in **black** represent a pair of farms where one is able to sell CO_2e credits and one is unable.

- **C&T with Ag Carbon Credits and Saturation** – Assumes the farmland reaches carbon saturation in 2014. This scenario represents the loss of revenues that will be experienced by farms at some point due to carbon saturation of the soil. This scenario is not relevant for the analysis of methane digesters on the dairies since saturation is not an issue.

No-till and Methane Digester Assumptions

Cropland requirements for carbon dioxide sequestration specify that land must be engaged in a minimum or no-till cropping program. Higher fuel and input costs have driven the majority of AFPC representative crop farms to participate in some form of reduced tillage; however, very few are truly no-till operations. Extension budgets were examined for states in which representative farms are located. Some states lacked sufficient budgets for no-till practices, so nearby state budgets were used as a proxy. These budgets were used to determine changes in input and overhead costs typically experienced in converting from conventional tillage practices to no-till farming. All AFPC farms with the potential to sequester carbon dioxide (based on Conservation tillage soil offset map available from the Chicago Climate Exchange) were converted to no-till operations using the state budgets as a template. There are also four wheat farms and one cotton farm that do not have the opportunity to participate based on this map. With the exception of one farm in Southeast Arkansas, the AFPC representative rice farms either only produce rice or lack necessary crop rotations to allow conversion to no-till practices. Figure 1 shows the farms that are able to sell carbon dioxide equivalent (CO2e) credits (green) and those that cannot sell CO2e credits (red). Variable costs were adjusted individually for corn, soybeans, grain sorghum, wheat, cotton, barley, and millet. Costs for seed, fertilizer, herbicide, custom application, and insecticide (for some crops) were increased for crops converted to no-till on the representative farms. Fuel costs were reduced for farms converted to no-till. Overhead costs were modified based on overall farm classification determined by enterprises earning the majority of receipts for a farm. Conversion to no-till on the farms involved reducing overhead costs including labor, repairs, and fixed machinery costs. Crop yields were not changed when the switch to no-till was made.

Methane digesters may be beneficial to some confinement dairies, allowing them to generate electricity and reduce greenhouse gases (GHG). The destruction of GHGs makes the dairies eligible to receive carbon credits for their efforts. This study assumed a dairy size of 500 cows or more is necessary to make erecting a methane digester a viable economic option. Sixteen of 22 AFPC representative dairies have sufficient cow numbers to justify a digester based on this assumption. Based on information from Lazarus (2009), a fixed construction cost of $678,064 plus a variable component of $563/cow was assumed for building a digester on those sixteen dairies. Grants were assumed to offset 25 percent of the initial investment cost, and the remainder was financed over a 20 year period at a fixed annual interest rate of 6 percent. Annual maintenance costs for the dairies were increased by five percent of the total investment. Electricity generation was assumed at 1,000 KWH/cow, and electricity costs were offset at the rate of $0.09/KWH. Carbon credits were earned based on carbon dioxide equivalents and regional climatic differences.

For this study, AFPC's representative cattle ranches and rice farms were the only two categories of farms that were assumed not to participate in carbon sequestration activities. In order to participate in the grassland or pastureland carbon sequestration, the ranches would need to reduce their stocking rates substantially which would have substantially changed the economics of the farms. Therefore, we decided they would likely not participate for the purposes of this study. The Chicago Climate Exchange does not currently have a protocol in effect for rice farms therefore we assumed they would be unable to participate.

Commodity Prices, Inflation Rates, and Interest Rates Assumed in the Analysis

Tables 2-4 contain the estimated commodity prices, inflation rates and interest rates for the January 2009 FAPRI Baseline and the prices inferred by AFPC from the EPA H.R. 2454 analysis. The EPA analysis presented estimates for five year time periods (i.e., 2010, 2015 and 2020…) for several carbon price scenarios. AFPC developed annual estimates by interpolating between the five year time periods and alternative carbon price scenarios (as necessary), and applying the percentage changes in the estimated economic variables from the EPA scenario estimates and EPA Baseline to the January 2009 FAPRI Baseline.[4]

The estimated gross and net-to-farmer carbon prices per ton utilized in this study are summarized in Table 5. AFPC assumed that a fee structure similar to that used by the Chicago Climate Exchange (CCX) would likely be imposed under H.R. 2454.

Table 5. Gross and Net-to-Farmer Carbon Prices Utilized in Representative Farm Analysis, 2010 to 2016.[5]

Year	2010	2011	2012	2013	2014	2015	2016
Gross ($/ton)	8.97	9.704	10.438	11.172	11.906	12.64	13.374
Net-to-farmer ($/ton)	7.75	8.41	9.07	9.73	10.40	11.06	11.72

Natural gas prices, inclusive of commensurate allowance costs, were taken from EPA's economy-wide modeling (ADAGE and IGEM models) output. Specifically, prices from EPA's reference scenario (scenario 1) and their basic H.R. 2454 scenario (scenario 2) were used. The changes in the H.R. 2454 scenario prices, relative to the reference scenario, represent an amalgam of price changes due to the inclusion of the new allowance costs and changes in equilibrium market prices (exclusive of the allowance cost). These prices cannot be used in isolation to determine the net effects of H.R. 2454 on production costs for energy-intensive, trade-exposed (EITE) industries (such as nitrogenous fertilizer production) that will be given varying proportions of their needed allowances each year. EPA's economy-wide modeling output did not include natural gas prices exclusive of allowance costs. EPA's near-term electricity sector modeling (IPM model) did contain such prices, however.[6] The percentage changes in non-allowance natural gas prices emanating from IPM were therefore used to decompose the aggregate (allowance cost imposition plus market equilibrium changes) percentage price changes taken

[4] Carbon and energy price changes in the H.R. 2454 scenario, relative to the base scenario, were interpolated between 5-year time periods from EPA's economy-wide modeling (ADAGE/IGEM). EPA's agricultural and forestry sector model (FASOM-GHG) runs were based on fixed carbon price scenarios that do not track the carbon price trajectory from their economy-wide modeling. Therefore, for agricultural commodity prices and land prices, 2-dimensional interpolation between 5-year time periods and carbon price scenarios was employed to infer FASOM-GHG output that is consistent with the economy-wide modeling output. Detailed FASOM-GHG output used for this interpolation emanated from July FASOM-GHG runs, while EPA's agricultural and forestry sector analysis was based on April model runs. The FASOM-GHG modelers report that differences between these two model runs are minimal.

[5] These prices were derived from EPA estimates for 2015 and 2020 and extrapolated and interpolated to provide annual estimates.

[6] The IPM reference case natural gas prices were determined endogenously in IPM, and do not correspond exactly to the reference case natural gas prices from ADAGE/IGEM. The IPM prices only reflect changes in natural gas supply and demand due to changes in electricity sector behavior. EPA notes, however, that demand for natural gas from outside the electricity generation sector does not change significantly in ADAGE.

Table 2. Crop Prices for the January 2009 FAPRI Baseline and the EPA Cap and Trade Scenarios.

		2010	2011	2012	2013	2014	2015	2016
Cotton ($/lb.)	Baseline	0.5585	0.5709	0.5792	0.5912	0.6013	0.6069	0.6137
	EPA H.R. 2454	0.5699	0.5876	0.6022	0.6217	0.6403	0.6553	0.6632
Wheat ($/bu.)	Baseline	5.26	5.41	5.51	5.65	5.78	5.86	5.88
	EPA H.R. 2454	5.30	5.46	5.57	5.71	5.85	5.94	5.91
Sorghum ($/bu.)	Baseline	5.75	6.04	6.18	6.43	6.59	6.69	6.72
	EPA H.R. 2454	5.85	6.18	6.36	6.68	6.90	7.09	7.15
Corn ($/bu.)	Baseline	3.69	3.85	3.88	4.02	4.09	4.14	4.11
	EPA H.R. 2454	3.78	3.97	4.03	4.22	4.33	4.41	4.42
Barley ($/bu.)	Baseline	4.03	4.15	4.18	4.31	4.36	4.39	4.35
	EPA H.R. 2454	4.24	4.38	4.42	4.56	4.63	4.66	4.67
Oats ($/bu.)	Baseline	2.54	2.58	2.60	2.67	2.72	2.75	2.76
	EPA H.R. 2454	2.61	2.66	2.69	2.77	2.82	2.87	2.93
Soybeans ($/bu.)	Baseline	8.78	9.08	9.30	9.55	9.78	9.94	9.99
	EPA H.R. 2454	9.01	9.33	9.58	9.86	10.13	10.33	10.41
Rice ($/cwt.)	Baseline	11.87	12.05	12.53	13.02	13.27	13.68	13.64
	EPA H.R. 2454	11.97	12.17	12.68	13.20	13.47	13.92	13.90
Soybean Meal ($/ton)	Baseline	242.97	239.41	241.20	245.51	250.19	252.78	252.00
	EPA H.R. 2454	241.69	238.48	240.60	245.24	250.27	253.21	255.46
All Hay ($/ton)	Baseline	130.94	128.88	128.46	129.58	131.30	133.84	136.05
	EPA H.R. 2454	134.12	133.77	135.40	138.98	143.61	149.57	151.75

Table 3. Livestock and Milk Prices for the January 2009 FAPRI Baseline and the EPA Cap and Trade Scenarios.

		2010	2011	2012	2013	2014	2015	2016
Culled Cows ($/cwt.)	Baseline	0.5736	0.5847	0.5928	0.5944	0.6093	0.6093	0.6096
	EPA H.R. 2454	0.5786	0.5907	0.5999	0.6025	0.6186	0.6196	0.6210
Feeder Cattle ($/cwt.)	Baseline	1.1402	1.2240	1.2805	1.3127	1.3260	1.3255	1.3287
	EPA H.R. 2454	1.1091	1.1864	1.2361	1.2616	1.2683	1.2611	1.2536
Fed Cattle ($/cwt.)	Baseline	0.9497	0.9848	1.0079	1.0175	1.0240	1.0239	1.0258
	EPA H.R. 2454	0.9176	0.9515	0.9739	0.9832	0.9895	0.9894	1.0001
Culled Sows ($/cwt.)	Baseline	0.3991	0.4209	0.4344	0.4178	0.4055	0.3970	0.3873
	EPA H.R. 2454	0.4125	0.4363	0.4517	0.4358	0.4244	0.4169	0.4090
Market Hogs ($/cwt.)	Baseline	0.5302	0.5502	0.5625	0.5477	0.5397	0.5368	0.5333
	EPA H.R. 2454	0.5443	0.5663	0.5804	0.5666	0.5598	0.5583	0.5571
All Milk ($/cwt.)	Baseline	14.23	16.00	16.52	16.70	16.88	17.16	17.45
	EPA H.R. 2454	14.49	16.36	16.98	17.26	17.54	17.95	18.29
California Milk ($/cwt.)	Baseline	12.82	14.45	14.90	15.01	15.20	15.48	15.78
	EPA H.R. 2454	13.05	14.78	15.31	15.51	15.80	16.20	16.54
Florida Milk ($/cwt.)	Baseline	18.37	20.21	20.75	20.93	21.09	21.37	21.68
	EPA H.R. 2454	18.71	20.67	21.33	21.63	21.93	22.36	22.72
Idaho Milk ($/cwt.)	Baseline	12.97	14.78	15.36	15.60	15.81	16.11	16.43
	EPA H.R. 2454	13.21	15.12	15.79	16.12	16.43	16.85	17.22
Missouri Milk ($/cwt.)	Baseline	14.61	16.44	17.00	17.19	17.38	17.66	17.97
	EPA H.R. 2454	14.88	16.81	17.47	17.77	18.06	18.48	18.84
New York Milk ($/cwt.)	Baseline	14.34	16.16	16.73	16.95	17.15	17.45	17.76
	EPA H.R. 2454	14.60	16.53	17.19	17.51	17.82	18.25	18.62
Texas Milk ($/cwt.)	Baseline	14.72	16.54	17.11	17.32	17.52	17.81	18.13
	EPA H.R. 2454	14.99	16.92	17.58	17.90	18.21	18.63	19.00
Vermont Milk ($/cwt.)	Baseline	15.28	17.09	17.66	17.88	18.09	18.38	18.70
	EPA H.R. 2454	15.55	17.48	18.15	18.48	18.80	19.23	19.60
Washington Milk ($/cwt.)	Baseline	13.44	15.24	15.82	16.07	16.28	16.59	16.91
	EPA H.R. 2454	13.68	15.59	16.26	16.60	16.92	17.35	17.72
Wisconsin Milk ($/cwt.)	Baseline	15.04	16.88	17.42	17.59	17.75	18.03	18.33
	EPA H.R. 2454	15.32	17.27	17.91	18.18	18.45	18.86	19.21

Table 4. Inflation Rates for the January 2009 FAPRI Baseline and the EPA Cap and Trade Scenarios.

		2010	2011	2012	2013	2014	2015	2016
Seed	Baseline	0.0053	0.0429	0.0324	0.0398	0.0290	0.0138	0.0177
	EPA H.R. 2454	0.0058	0.0432	0.0327	0.0401	0.0293	0.0141	0.0181
Nitrogen Fertilizer	Baseline	-0.0678	0.0695	0.0329	0.0500	0.0300	-0.0050	0.0068
	EPA H.R. 2454	-0.0678	0.0608	0.0202	0.0330	-0.0139	-0.0388	-0.1170
P & K Fertilizer	Baseline	0.0036	0.0690	0.0401	0.0314	0.0213	0.0067	0.0097
	EPA H.R. 2454	-0.0429	0.0841	0.0483	0.0662	0.0470	0.0128	0.0254
Herbicide	Baseline	-0.0277	0.0087	0.0046	0.0112	0.0059	0.0001	0.0082
	EPA H.R. 2454	-0.0262	0.0095	0.0055	0.0122	0.0069	0.0011	0.0093
Insecticide	Baseline	-0.0005	0.0232	0.0058	0.0103	0.0086	0.0083	0.0184
	EPA H.R. 2454	0.0009	0.0240	0.0067	0.0112	0.0096	0.0093	0.0194
Fuel and Lube	Baseline	-0.0427	0.0906	0.0758	0.0538	0.0072	-0.0315	-0.0042
	EPA H.R. 2454	0.0078	0.1198	0.1066	0.0862	0.0412	0.0040	0.0329
Machinery	Baseline	0.0087	0.0227	0.0106	0.0222	0.0221	0.0209	0.0289
	EPA H.R. 2454	0.0097	0.0232	0.0112	0.0228	0.0227	0.0216	0.0296
Wages	Baseline	0.0125	0.0047	0.0142	0.0198	0.0235	0.0262	0.0257
	EPA H.R. 2454	0.0366	0.0183	0.0286	0.0350	0.0395	0.0430	0.0433
Supplies	Baseline	0.0110	0.0377	0.0174	0.0207	0.0089	-0.0050	0.0009
	EPA H.R. 2454	0.0119	0.0382	0.0180	0.0213	0.0095	-0.0043	0.0016
Repairs	Baseline	0.0031	0.0100	0.0123	0.0166	0.0157	0.0116	0.0091
	EPA H.R. 2454	0.0041	0.0106	0.0129	0.0172	0.0164	0.0123	0.0098
Services	Baseline	-0.0066	0.0096	-0.0068	0.0021	0.0000	-0.0016	0.0121
	EPA H.R. 2454	0.0173	0.0232	0.0076	0.0173	0.0160	0.0152	0.0297
Long-Term Interest Rate	Baseline	0.0773	0.0904	0.0977	0.1017	0.1047	0.1061	0.1069
	EPA H.R. 2454	0.0797	0.0946	0.1040	0.1104	0.1160	0.1201	0.1240
Intermediate-Term Interest Rate	Baseline	0.0626	0.0732	0.0791	0.0824	0.0847	0.0859	0.0866
	EPA H.R. 2454	0.0645	0.0766	0.0842	0.0894	0.0939	0.0973	0.1003
Savings Account Interest Rate	Baseline	0.0214	0.0251	0.0271	0.0282	0.0290	0.0294	0.0297
	EPA H.R. 2454	0.0221	0.0262	0.0289	0.0306	0.0322	0.0333	0.0344
Land Prices	Baseline	0.0241	0.0209	0.0097	0.0163	0.0314	0.0397	0.0390
	EPA H.R. 2454	0.0960	0.0383	0.0246	0.0291	0.0422	0.0485	0.0433

from EPA's economy-wide modeling. These forecast prices are available from EPA each five years, and intermediate years are interpolated.

Total emissions allowances under H.R. 2454 grow through 2016 to 5,482 million tons of CO2e, and decline thereafter (H.R. 2454 section 721). A varying proportion of these allowances are given freely to EITE industries (H.R. 2454 section 782). The EITE allowances are contained in Table 6. Two percent of total allowances are given to EITE industries in 2012 and 2013. Fifteen percent of total allowances are provided in 2014, and this percentage declines slowly thereafter. The variation in these two quantities results in a varying number of allocations being provided to EITE industries. The large increase in allowances provided to EITE industries in 2014 corresponds to most of these industries, including nitrogenous fertilizer producers, being phased in under section 722 of the bill as entities whose emissions are regulated.

Table 6. Total Allowances Given to EITE Industries

Year	Total Allowances
2012	92.5
2013	90.9
2014	764.9
2015	736.3
2016	791.6

Industries eligible for EITE status and benefits are not explicitly specified, making it difficult to determine the extent to which EITE allocations will cover EITE industries' emissions under existing production levels and technologies. To estimate this, we employ the analysis provided by the Peterson Institute for International Economics.[7] That analysis finds that the set of presumed EITE-eligible industries emit an estimated 665.4 million tons of CO2e annually. EITE industries are thus somewhat over-compensated. Using the proportions of EITE allowance coverage (assuming constant emissions of 665.4 million tons CO2e) for each year, we interpolated and extrapolated, as appropriate, from the allocation-inclusive and -exclusive natural gas prices to arrive at final net natural gas input cost changes (relative to the reference scenario) that will be realized by nitrogenous fertilizer producers under H.R. 2454 in 2014 through 2016. Before 2014, nitrogenous fertilizer producers are not covered entities, and simply pay for natural gas exclusive of allowance costs.

Measures of Economic Performance

Five alternative measures of economic performance are provided for each of the farms. These are:

- **Average Annual Total Cash Receipts** – Average annual cash receipts in 2010 - 2016 from all sources, including market sales, counter-cyclical/ACRE, direct payments, marketing loan gains/loan deficiency payments, crop insurance indemnities, and other farm related receipts.

- **Average Annual Total Cash Costs** – Average annual cash costs in 2010 - 2016 from all sources including variable, overhead, and interest expenses.

[7] "Ensuring US Competitiveness and International Participation"; testimony by Trevor Houser before the US House of Representatives Committee on Energy and Commerce, April 23, 2009.

- **Average Annual Net Cash Farm Income** – Equals average annual total cash receipts minus average annual cash expenses in 2010 - 2016. Net cash farm income is used to pay family living expenses, principal payments, income taxes, self employment taxes, and machinery replacement costs.

- **Average Ending Cash Reserves in 2016** – Equals total cash on hand at the end of the year in 2016. Ending cash equals beginning cash reserves plus net cash farm income and interest earned on cash reserves less principal payments, federal taxes (income and self employment), state income taxes, family living withdrawals, and actual machinery replacement costs (not depreciation).

- **Average Ending Real Net Worth** – Real Equity (inflation adjusted) at the end of the year in 2016. Equals total assets including land minus total debt from all sources.

Results

The farm level results are presented in Tables 7-13. The results section will provide a brief summary by measure of economic performance. Average ending cash reserves in 2016 will be highlighted as the most appropriate measure to evaluate this type of long-run decision. In other words, will the farm be better off or worse off at the end of the period based on cash on hand at the end of the year.

The general naming convention for the representative farms follows the pattern described below. The first two letters of a farm name indicate the state where it is located. If a farm has four letters, the third is generally a regional indicator. The last letter of a farm name indicates the type of operation (i.e., G for Feedgrain/Oilseed, W for Wheat, C for Cotton, R for Rice, D for Dairy, and B for Beef Ranches). A few exceptions exist where states contain multiple farms and the third and fourth letters of the farm name are both regional indicators. Numbers on crop farms indicate acres of cropland and numbers on dairies and ranches indicate numbers of cows.

For a detailed analysis of the representative farms under the Baseline scenario, refer to AFPC Working Paper 09-1, Representative Farms Economic Outlook for the January 2009 FAPRI/AFPC Baseline.

Average Annual Total Cash Receipts

All of the crop farms and dairies are expected to realize slightly higher average annual cash receipts under the C&T without Ag Carbon Credits scenario due to slightly higher crop and milk prices resulting from instituting cap and trade (Table 7). The lone exception is the 12 cattle ranches that realize slightly lower receipts due to lower calf prices. As mentioned earlier, some of the price increase is expected to result from shifting between crops as one becomes relatively more expensive to produce, but there is also the price increasing effect of shifting land out of commodity production to forestry.

As one would expect, the C&T with Ag Carbon Credits scenario results in slightly higher cash receipts than the Baseline and C&T without Ag Carbon Credits scenario. The amount of the carbon credits is relatively small with many farms averaging less than $10,000 per year higher receipts (Appendix B). Again, the exceptions are rice farms and the cattle ranches. AFPC knows of no mechanism for rice farms to sell carbon credits. The lone rice farm that is expected to benefit from selling carbon credits is the ARMR7500 farm which has a significant amount of land dedicated to the production of other commodities. Carbon credits are assumed to be earned on the land not in the rotation for rice production.

The last scenario (C&T with Ag Carbon Credits and Saturation) was analyzed to provide an indication of farms no longer being able to sell carbon credits because their land has become saturated for carbon sequestration purposes. Losing the revenue from selling carbon credits in 2015 and 2016 has a relatively small effect on the annual average cash receipts on the farms who were selling carbon credits.

Table 7. Average Annual Total Cash Receipts for AFPC Representative Feedgrain/Oilseed and Wheat Farms, 2010-2016.

	Baseline --$1,000--	C&T with No Ag Carbon Credits --$1,000--	C&T with Ag Carbon Credits --$1,000--	C&T with Ag Carbon Credits and Saturation --$1,000--
Feedgrain/Oilseed				
IAG1350	820.9	854.2	862.1	859.5
IAG3400	2,021.2	2,102.6	2,122.4	2,115.8
NEG1960	1,518.0	1,583.5	1,593.8	1,590.3
NEG4300	3,077.8	3,213.3	3,234.6	3,227.2
MOCG2050	1,010.9	1,049.6	1,061.5	1,057.5
MOCG4000	1,981.8	2,056.1	2,078.2	2,070.4
MONG1850	1,065.1	1,096.1	1,106.6	1,103.1
ING1000	546.0	566.5	572.3	570.4
ING2200	1,278.5	1,324.5	1,337.3	1,333.0
NDG2180	709.4	730.8	738.9	736.2
NDG7500	2,919.5	3,015.0	3,037.0	3,027.6
TXNP3000	1,564.5	1,611.8	1,627.0	1,621.9
TXNP8000	4,293.6	4,443.0	4,488.5	4,474.5
TXHG2000	528.8	546.4	554.2	551.6
TXPG2500	1,536.2	1,570.0	1,582.5	1,578.3
TXMG1800	689.6	709.7	716.7	714.4
TXPG3760	3,092.5	3,221.2	3,239.0	3,233.0
TXWG1600	504.1	518.7	521.8	520.8
TXUG1200	753.1	775.9	778.3	777.5
TNG900	408.3	423.6	428.8	427.1
TNG2750	1,345.4	1,389.4	1,405.5	1,400.1
LANG2500	1,958.8	2,009.1	2,020.8	2,016.9
LAG2640	1,749.7	1,796.0	1,811.4	1,806.3
SCG1500	939.0	962.0	968.5	966.3
SCG3500	1,880.9	1,938.9	1,959.1	1,952.3
Wheat				
WAW1725	658.4	664.5	664.5	664.5
WAW5500	1,968.6	1,990.5	1,990.5	1,990.5
WAAW3500	391.2	393.8	393.8	393.8
KSCW2000	518.1	529.0	536.7	534.1
KSCW4500	1,100.2	1,124.4	1,141.7	1,135.9
KSNW2800	518.7	526.3	530.4	529.0
KSNW5000	1,274.0	1,303.3	1,311.6	1,308.8
COW3000	418.1	426.2	431.5	429.7
COW5640	788.8	798.5	808.6	805.3
MTW4500	551.6	556.3	570.2	565.6
ORW3600	485.6	488.9	488.9	488.9

Table 7 (continued). Average Annual Total Cash Receipts for AFPC Representative Cotton and Rice Farms, 2010-2016.

	Baseline	C&T with No Ag Carbon Credits	C&T with Ag Carbon Credits	C&T with Ag Carbon Credits and Saturation
	--$1,000--	--$1,000--	--$1,000--	--$1,000--
Cotton				
CAC4000	6,690.1	6,891.7	6,891.7	6,891.7
TXSP2500	684.2	699.4	705.8	703.7
TXSP3745	1,132.4	1,160.3	1,169.2	1,166.2
TXRP2500	377.0	383.1	388.0	386.4
TXCB2250	788.2	808.5	817.3	814.4
TXCB8000	2,928.7	3,005.5	3,039.6	3,029.2
TXVC4500	1,636.8	1,668.5	1,676.7	1,673.9
TXEC5000	2,053.6	2,101.9	2,122.9	2,115.9
GAC2300	1,910.6	1,966.5	1,976.6	1,973.2
TNC1900	1,107.1	1,136.0	1,146.9	1,143.3
TNC4050	1,932.8	1,972.9	1,996.5	1,988.6
ARNC5000	3,808.4	3,893.8	3,923.6	3,913.8
ALC3000	1,363.3	1,397.9	1,415.4	1,409.5
NCC1500	909.7	926.0	934.8	931.8
Rice				
CAR550	668.4	675.0	675.0	675.0
CAR2365	2,974.0	3,006.2	3,006.2	3,006.2
CABR1300	1,652.0	1,668.7	1,668.7	1,668.7
CACR715	945.5	954.8	954.8	954.8
TXR1350	522.7	528.1	528.1	528.1
TXR3000	1,279.9	1,293.5	1,293.5	1,293.5
TXBR1800	931.2	941.3	941.3	941.3
TXER3200	1,495.9	1,518.1	1,518.1	1,518.1
LASR1200	783.1	791.4	791.4	791.4
ARMR7500	5,052.9	5,168.9	5,204.7	5,193.7
ARSR3240	1,898.7	1,930.3	1,930.3	1,930.3
ARWR1200	773.5	787.4	787.4	787.4
ARHR3000	1,986.5	2,025.9	2,025.9	2,025.9
MOWR4000	2,705.8	2,755.6	2,755.6	2,755.6

Table 7 (continued). Average Annual Total Cash Receipts for AFPC Representative Dairies and Ranches, 2010-2016.

	Baseline --$1,000--	C&T with No Ag Carbon Credits --$1,000--	C&T with Ag Carbon Credits --$1,000--	C&T with Ag Carbon Credits and Saturation --$1,000--
Dairies				
CAD1710	6,950.8	7,178.8	7,391.7	7,391.7
WAD250	1,121.3	1,157.9	1,157.9	1,157.9
WAD850	3,732.1	3,861.2	3,960.7	3,960.7
IDD1000	4,655.2	4,806.1	4,923.2	4,923.2
IDD3000	13,633.5	14,087.2	14,438.4	14,438.4
TXCD550	2,092.4	2,161.6	2,230.1	2,230.1
TXCD1300	5,131.5	5,296.2	5,458.0	5,458.0
TXED450	1,686.0	1,738.5	1,738.5	1,738.5
TXED1000	4,089.9	4,228.6	4,353.1	4,353.1
TXND3000	12,093.9	12,511.6	12,885.1	12,885.1
WID145	811.4	837.0	837.0	837.0
WID775	4,096.4	4,229.6	4,316.7	4,316.7
NYWD1200	5,468.6	5,643.5	5,778.4	5,778.4
NYWD600	2,678.4	2,763.8	2,831.3	2,831.3
NYCD110	532.9	549.2	549.2	549.2
NYCD550	2,795.5	2,881.1	2,942.9	2,942.9
VTD140	631.6	651.4	651.4	651.4
VTD400	1,923.4	1,986.7	1,986.7	1,986.7
MOCD500	2,210.2	2,282.9	2,341.4	2,341.4
MOGD500	1,268.9	1,309.5	1,368.0	1,368.0
FLND550	2,562.5	2,643.6	2,712.1	2,712.1
FLSD1500	7,041.9	7,260.2	7,446.9	7,446.9
Ranches				
MTB500	330.5	321.1	321.1	321.1
WYB335	298.4	295.7	295.7	295.7
COB250	234.8	233.3	233.3	233.3
MOB250	312.5	311.4	311.4	311.4
MOCB400	297.3	289.5	289.5	289.5
NMB240	185.1	180.2	180.2	180.2
FLB1155	723.1	703.9	703.9	703.9
NVB700	409.2	396.7	396.7	396.7
CAB500	328.8	316.4	316.4	316.4
SDB375	257.4	249.6	249.6	249.6
TXSB200	167.8	163.9	163.9	163.9
TXRB500	465.7	452.8	452.8	452.8

Average Annual Total Cash Costs

Average annual total cash costs differ from the Baseline under all three alternative scenarios (Table 8). Costs under the C&T without Ag Carbon Credits scenario differ from the Baseline due to different rates of change for input prices resulting from cap and trade legislation. Costs differ from the base under C&T with Ag Carbon Credits due to imposition of those same higher costs; however, this scenario also incurs different costs as a result of conversion to no-till on farms eligible for carbon credits and construction of methane digesters on eligible dairy farms. Slightly different average annual costs are experienced by some farms between the C&T with Ag Carbon Credits and C&T with Ag Carbon Credits and Saturation resulting from higher operating interest costs in the Saturation scenario.

Average Annual Net Cash Farm Income

Average annual net cash farm income is defined in this study as average annual total cash receipts minus average annual total cash costs. As a result of this formula, the average annual net cash farm income differs between scenarios in the same ways that average annual total receipts and average annual total cash costs differ (explained above). In general, the feedgrain/oilseed farms located in or near the Corn Belt and the wheat farms located in the Great Plains, have higher average annual net cash farm income under the three cap and trade alternatives (Table 9). Most cotton and dairy farms and all of the rice farms and ranches are experiencing lower net cash farm incomes under the cap and trade alternatives. The rice farms and cattle ranches, are assumed to not participate in carbon sequestration activities so they experience higher costs, without carbon revenue and their commodity prices do not increase enough to offset higher costs so they experience lower average annual net cash farm incomes.

Average Ending Cash Reserves in 2016

Ending cash reserves in 2016 is the cumulative effect of average annual net cash farm income with the additional impacts of principal payments on loans, income taxes, and family living expenses. As revenues and costs change, income taxes and principal payments on loans will differ. AFPC has chosen this measure to highlight some of the farm level results. As indicated in Table 10, most (17 of 25) of the feedgrain farms have higher average ending cash reserves under either of the C&T without Ag Carbon Credits or C&T with Ag Carbon Credits scenarios. In addition, all but a few of the feedgrain/oilseed farms end the analysis period with higher cash reserves even under the saturation scenario. Eight of 11 wheat farms are better off under the C&T with Ag Carbon Credits scenario relative to the Baseline, while one cotton and no rice farms or cattle ranches are better off. One dairy (WID145) is better off because it produces and sells excess corn and soybeans which are projected to see much higher prices as a result of cap and trade.

Table 11 provides a summary of the farms with higher and lower (relative to the Baseline) average ending cash reserves in 2016. Twenty-seven out of 98 representative farms are expected to be better off at the end of the period in terms of their ending cash reserves.

Figure 2 shows the locations of the representative farms that, based on average ending cash reserves in 2016, are better off in green and worse off in red. Clearly it is easy to see that in general, the only real winners assuming EPA's analysis of cap and trade would be feedgrain/oilseed and plains wheat farms.

Table 8. Average Annual Total Cash Costs for AFPC Representative Feedgrain/Oilseed and Wheat Farms, 2010-2016.

	Baseline --$1,000--	C&T with No Ag Carbon Credits --$1,000--	C&T with Ag Carbon Credits --$1,000--	C&T with Ag Carbon Credits and Saturation --$1,000--
Feedgrain/Oilseed				
IAG1350	612.0	623.2	623.6	623.7
IAG3400	1,415.9	1,443.9	1,440.1	1,440.2
NEG1960	1,010.3	1,038.8	1,031.1	1,031.1
NEG4300	2,061.4	2,121.1	2,102.1	2,102.1
MOCG2050	522.6	533.6	526.2	526.2
MOCG4000	841.3	862.8	839.0	839.0
MONG1850	834.2	854.3	846.6	846.7
ING1000	433.7	442.4	440.9	441.0
ING2200	910.8	931.9	920.8	920.8
NDG2180	440.9	453.5	430.7	430.7
NDG7500	1,705.2	1,739.9	1,640.1	1,640.1
TXNP3000	1,390.0	1,487.5	1,518.8	1,519.0
TXNP8000	3,709.1	3,942.6	4,045.9	4,046.4
TXHG2000	459.8	466.0	465.7	465.7
TXPG2500	1,298.3	1,382.3	1,370.0	1,370.1
TXMG1800	583.9	601.9	626.2	626.3
TXPG3760	3,566.5	3,748.4	3,817.8	3,818.1
TXWG1600	446.8	457.9	438.6	438.7
TXUG1200	768.1	803.0	807.1	807.1
TNG900	435.2	444.0	450.1	450.2
TNG2750	929.2	936.0	933.8	933.9
LANG2500	1,427.1	1,483.3	1,482.9	1,482.9
LAG2640	1,492.3	1,537.1	1,587.1	1,587.2
SCG1500	913.4	941.8	952.2	952.3
SCG3500	1,463.9	1,489.0	1,473.4	1,473.5
Wheat				
WAW1725	344.4	349.8	349.8	349.8
WAW5500	1,322.8	1,360.8	1,360.8	1,360.8
WAAW3500	227.3	238.4	238.4	238.4
KSCW2000	328.0	337.2	331.9	331.9
KSCW4500	625.1	643.6	624.7	624.7
KSNW2800	389.8	398.8	395.8	395.8
KSNW5000	914.5	934.8	949.6	949.6
COW3000	228.1	231.0	233.3	233.3
COW5640	468.7	479.3	480.2	480.3
MTW4500	363.3	367.8	365.7	365.7
ORW3600	201.1	213.3	213.3	213.3

Table 8 (continued). Average Annual Total Cash Costs for AFPC Representative Cotton and Rice Farms, 2010-2016.

	Baseline	C&T with No Ag Carbon Credits	C&T with Ag Carbon Credits	C&T with Ag Carbon Credits and Saturation
	--$1,000--	--$1,000--	--$1,000--	--$1,000--
Cotton				
CAC4000	5,184.7	5,481.8	5,481.8	5,481.8
TXSP2500	762.1	819.4	851.8	851.9
TXSP3745	1,189.4	1,273.2	1,306.4	1,306.5
TXRP2500	348.1	371.8	370.0	370.1
TXCB2250	669.1	688.2	717.9	717.9
TXCB8000	2,565.0	2,632.0	2,716.4	2,716.7
TXVC4500	1,286.2	1,339.9	1,326.1	1,326.1
TXEC5000	1,689.8	1,792.3	1,897.8	1,897.9
GAC2300	1,824.8	1,902.8	1,968.9	1,969.1
TNC1900	851.9	871.4	932.9	933.0
TNC4050	3,098.8	3,223.9	3,606.1	3,606.6
ARNC5000	3,334.0	3,431.3	3,736.9	3,737.3
ALC3000	1,163.6	1,194.4	1,259.9	1,260.3
NCC1500	808.5	826.9	865.1	865.3
Rice				
CAR550	641.2	700.6	700.6	700.6
CAR2365	2,758.0	2,963.8	2,963.8	2,963.8
CABR1300	1,417.0	1,495.5	1,495.5	1,495.5
CACR715	839.9	900.8	900.8	900.8
TXR1350	513.3	551.4	551.4	551.4
TXR3000	1,046.5	1,113.9	1,113.9	1,113.9
TXBR1800	1,002.1	1,085.6	1,085.6	1,085.6
TXER3200	1,601.8	1,708.0	1,708.0	1,708.0
LASR1200	628.1	670.5	670.5	670.5
ARMR7500	4,548.3	4,781.7	4,896.0	4,896.5
ARSR3240	1,554.5	1,641.6	1,641.6	1,641.6
ARWR1200	1,214.7	1,314.4	1,314.4	1,314.4
ARHR3000	1,978.1	2,102.0	2,102.0	2,102.0
MOWR4000	2,051.1	2,152.3	2,152.3	2,152.3

Table 8 (continued). Average Annual Total Cash Costs for AFPC Representative Dairies and Ranches, 2010-2016.

	Baseline --$1,000--	C&T with No Ag Carbon Credits --$1,000--	C&T with Ag Carbon Credits --$1,000--	C&T with Ag Carbon Credits and Saturation --$1,000--
Dairies				
CAD1710	6,188.8	6,472.3	6,625.1	6,625.1
WAD250	900.9	936.2	936.2	936.2
WAD850	3,162.8	3,280.4	3,397.5	3,397.5
IDD1000	3,841.0	4,049.8	4,171.6	4,171.6
IDD3000	11,087.2	11,678.3	11,895.7	11,895.7
TXCD550	1,750.4	1,821.1	1,916.3	1,916.3
TXCD1300	4,707.0	4,948.5	5,087.9	5,087.9
TXED450	1,554.2	1,634.1	1,634.1	1,634.1
TXED1000	3,723.8	3,897.5	4,027.9	4,027.9
TXND3000	10,592.6	11,168.7	11,382.8	11,382.8
WID145	526.8	549.7	549.7	549.7
WID775	2,779.5	2,908.2	3,011.7	3,011.7
NYWD1200	4,614.2	4,841.3	4,971.9	4,971.9
NYWD600	2,660.9	2,805.0	2,931.1	2,931.1
NYCD110	340.0	357.2	357.2	357.2
NYCD550	2,518.2	2,669.3	2,788.0	2,788.0
VTD140	562.9	588.5	588.5	588.5
VTD400	1,688.1	1,752.8	1,752.8	1,752.8
MOCD500	1,983.2	2,054.6	2,172.7	2,172.7
MOGD500	899.6	937.8	1,027.9	1,027.9
FLND550	2,100.9	2,180.8	2,286.2	2,286.2
FLSD1500	6,825.5	7,165.4	7,312.6	7,312.6
Ranches				
MTB500	221.9	236.0	236.0	236.0
WYB335	314.1	349.5	349.5	349.5
COB250	202.0	214.1	214.1	214.1
MOB250	171.2	173.5	173.5	173.5
MOCB400	219.0	229.3	229.3	229.3
NMB240	157.1	168.6	168.6	168.6
FLB1155	619.8	651.4	651.4	651.4
NVB700	348.0	373.8	373.8	373.8
CAB500	438.3	482.8	482.8	482.8
SDB375	158.2	167.8	167.8	167.8
TXSB200	123.2	129.4	129.4	129.4
TXRB500	314.1	327.3	327.3	327.3

Table 9. Average Annual Net Cash Farm Income for AFPC Representative Feedgrain/Oilseed and Wheat Farms, 2010-2016.

	Baseline	C&T with No Ag Carbon Credits	C&T with Ag Carbon Credits	C&T with Ag Carbon Credits and Saturation
	--$1,000--	--$1,000--	--$1,000--	--$1,000--
Feedgrain/Oilseed				
IAG1350	208.9	231.0	238.5	235.8
IAG3400	605.3	658.7	682.4	675.6
NEG1960	507.7	544.7	562.7	559.2
NEG4300	1,016.4	1,092.3	1,132.5	1,125.1
MOCG2050	488.3	516.0	535.3	531.3
MOCG4000	1,140.6	1,193.3	1,239.2	1,231.4
MONG1850	230.9	241.8	260.1	256.4
ING1000	112.3	124.1	131.4	129.4
ING2200	367.6	392.6	416.5	412.2
NDG2180	268.6	277.3	308.2	305.5
NDG7500	1,214.3	1,275.2	1,396.9	1,387.5
TXNP3000	174.5	124.4	108.2	102.9
TXNP8000	584.5	500.4	442.6	428.1
TXHG2000	69.0	80.4	88.6	85.9
TXPG2500	237.9	187.7	212.5	208.2
TXMG1800	105.7	107.8	90.6	88.1
TXPG3760	-474.0	-527.2	-578.8	-585.1
TXWG1600	57.3	60.8	83.2	82.1
TXUG1200	-15.0	-27.0	-28.8	-29.6
TNG900	-26.9	-20.4	-21.2	-23.1
TNG2750	416.2	453.4	471.7	466.2
LANG2500	531.7	525.8	537.9	534.0
LAG2640	257.4	258.9	224.3	219.0
SCG1500	25.7	20.2	16.4	14.1
SCG3500	417.0	449.9	485.7	478.8
Wheat				
WAW1725	314.0	314.7	314.7	314.7
WAW5500	645.8	629.7	629.7	629.7
WAAW3500	163.9	155.4	155.4	155.4
KSCW2000	190.1	191.8	204.9	202.2
KSCW4500	475.2	480.8	517.0	511.2
KSNW2800	128.8	127.5	134.6	133.2
KSNW5000	359.5	368.4	362.0	359.2
COW3000	190.0	195.2	198.2	196.4
COW5640	320.1	319.2	328.4	325.0
MTW4500	188.3	188.5	204.5	199.8
ORW3600	284.5	275.6	275.6	275.6

Table 9 (continued). Average Annual Net Cash Farm Income for AFPC Representative Cotton and Rice Farms, 2010-2016.

	Baseline	C&T with No Ag Carbon Credits	C&T with Ag Carbon Credits	C&T with Ag Carbon Credits and Saturation
	--$1,000--	--$1,000--	--$1,000--	--$1,000--
Cotton				
CAC4000	1,505.4	1,409.9	1,409.9	1,409.9
TXSP2500	-77.9	-120.0	-146.0	-148.2
TXSP3745	-57.0	-113.0	-137.2	-140.3
TXRP2500	28.9	11.3	18.0	16.3
TXCB2250	119.1	120.4	99.4	96.4
TXCB8000	363.7	373.6	323.2	312.5
TXVC4500	350.6	328.6	350.6	347.8
TXEC5000	363.9	309.6	225.1	218.0
GAC2300	85.8	63.8	7.7	4.1
TNC1900	255.2	264.6	214.0	210.3
TNC4050	-1,166.0	-1,251.1	-1,609.5	-1,617.9
ARNC5000	474.5	462.5	186.7	176.6
ALC3000	199.7	203.4	155.4	149.3
NCC1500	101.2	99.1	69.6	66.5
Rice				
CAR550	27.2	-25.5	-25.5	-25.5
CAR2365	216.0	42.4	42.4	42.4
CABR1300	235.1	173.2	173.2	173.2
CACR715	105.5	54.0	54.0	54.0
TXR1350	9.4	-23.2	-23.2	-23.2
TXR3000	233.4	179.7	179.7	179.7
TXBR1800	-70.9	-144.3	-144.3	-144.3
TXER3200	-105.9	-189.8	-189.8	-189.8
LASR1200	155.0	120.9	120.9	120.9
ARMR7500	504.6	387.2	308.7	297.2
ARSR3240	344.2	288.7	288.7	288.7
ARWR1200	-441.1	-526.9	-526.9	-526.9
ARHR3000	8.4	-76.1	-76.1	-76.1
MOWR4000	654.7	603.3	603.3	603.3

Table 9 (continued). Average Annual Net Cash Farm Income for AFPC Representative Dairies and Ranches, 2010-2016.

	Baseline --$1,000--	C&T with No Ag Carbon Credits --$1,000--	C&T with Ag Carbon Credits --$1,000--	C&T with Ag Carbon Credits and Saturation --$1,000--
Dairies				
CAD1710	762.0	706.5	766.6	766.6
WAD250	220.4	221.7	221.7	221.7
WAD850	569.3	580.7	563.2	563.2
IDD1000	814.2	756.3	751.6	751.6
IDD3000	2,546.3	2,409.0	2,542.8	2,542.8
TXCD550	341.9	340.5	313.8	313.8
TXCD1300	424.5	347.7	370.1	370.1
TXED450	131.8	104.4	104.4	104.4
TXED1000	366.1	331.1	325.2	325.2
TXND3000	1,501.3	1,342.9	1,502.3	1,502.3
WID145	284.6	287.2	287.2	287.2
WID775	1,316.9	1,321.4	1,305.0	1,305.0
NYWD1200	854.3	802.3	806.5	806.5
NYWD600	17.4	-41.1	-99.9	-99.9
NYCD110	193.0	192.0	192.0	192.0
NYCD550	277.3	211.8	154.9	154.9
VTD140	68.6	62.9	62.9	62.9
VTD400	235.3	233.9	233.9	233.9
MOCD500	227.0	228.2	168.7	168.7
MOGD500	369.3	371.7	340.2	340.2
FLND550	461.6	462.8	425.9	425.9
FLSD1500	216.4	94.8	134.4	134.4
Ranches				
MTB500	108.7	85.0	85.0	85.0
WYB335	-15.7	-53.8	-53.8	-53.8
COB250	32.8	19.3	19.3	19.3
MOB250	141.3	137.9	137.9	137.9
MOCB400	78.3	60.2	60.2	60.2
NMB240	28.0	11.7	11.7	11.7
FLB1155	103.3	52.6	52.6	52.6
NVB700	61.2	22.9	22.9	22.9
CAB500	-109.6	-166.3	-166.3	-166.3
SDB375	99.1	81.8	81.8	81.8
TXSB200	44.6	34.5	34.5	34.5
TXRB500	151.6	125.4	125.4	125.4

Table 10. Average Ending Cash Reserves for AFPC Representative Feedgrain/Oilseed and Wheat Farms, 2016.

	Baseline	C&T with No Ag Carbon Credits	C&T with Ag Carbon Credits	C&T with Ag Carbon Credits and Saturation
	--$1,000--	--$1,000--	--$1,000--	--$1,000--
Feedgrain/Oilseed				
IAG1350	785.7	890.8	945.8	927.0
IAG3400	1,813.1	2,043.0	2,203.0	2,155.7
NEG1960	2,250.7	2,427.5	2,544.1	2,519.6
NEG4300	4,455.6	4,819.3	5,080.4	5,028.1
MOCG2050	1,268.1	1,402.6	1,531.7	1,503.4
MOCG4000	4,669.6	4,935.5	5,231.1	5,175.9
MONG1850	-180.7	-136.1	-18.0	-43.4
ING1000	-227.8	-176.4	-127.0	-141.1
ING2200	800.2	925.7	1,084.8	1,054.3
NDG2180	1,223.0	1,267.1	1,469.3	1,450.1
NDG7500	6,315.1	6,636.4	7,398.6	7,331.6
TXNP3000	336.9	16.6	-86.7	-123.7
TXNP8000	1,988.3	1,485.3	1,144.0	1,042.0
TXHG2000	-139.7	-81.0	-23.7	-42.5
TXPG2500	88.6	-234.6	-66.4	-96.5
TXMG1800	-267.4	-272.2	-391.4	-408.5
TXPG3760	-5,096.1	-5,486.4	-5,891.8	-5,935.9
TXWG1600	-248.0	-237.3	-89.8	-97.4
TXUG1200	-822.8	-917.3	-931.6	-937.4
TNG900	-815.9	-781.9	-790.7	-803.8
TNG2750	852.8	1,031.4	1,156.1	1,117.6
LANG2500	1,430.8	1,394.3	1,479.7	1,451.9
LAG2640	816.0	809.5	602.9	565.9
SCG1500	-525.6	-576.8	-604.2	-620.4
SCG3500	1,587.9	1,755.0	1,995.7	1,946.9
Wheat				
WAW1725	1,502.1	1,505.6	1,505.6	1,505.6
WAW5500	2,557.0	2,486.6	2,486.6	2,486.6
WAAW3500	408.5	352.1	352.1	352.1
KSCW2000	606.6	606.2	696.0	677.5
KSCW4500	1,852.5	1,875.8	2,114.4	2,072.9
KSNW2800	130.4	112.2	159.2	149.3
KSNW5000	1,271.9	1,306.5	1,280.3	1,260.6
COW3000	709.5	730.9	755.8	743.3
COW5640	964.4	948.1	1,016.6	992.3
MTW4500	694.0	687.2	810.0	776.4
ORW3600	1,248.6	1,201.2	1,201.2	1,201.2

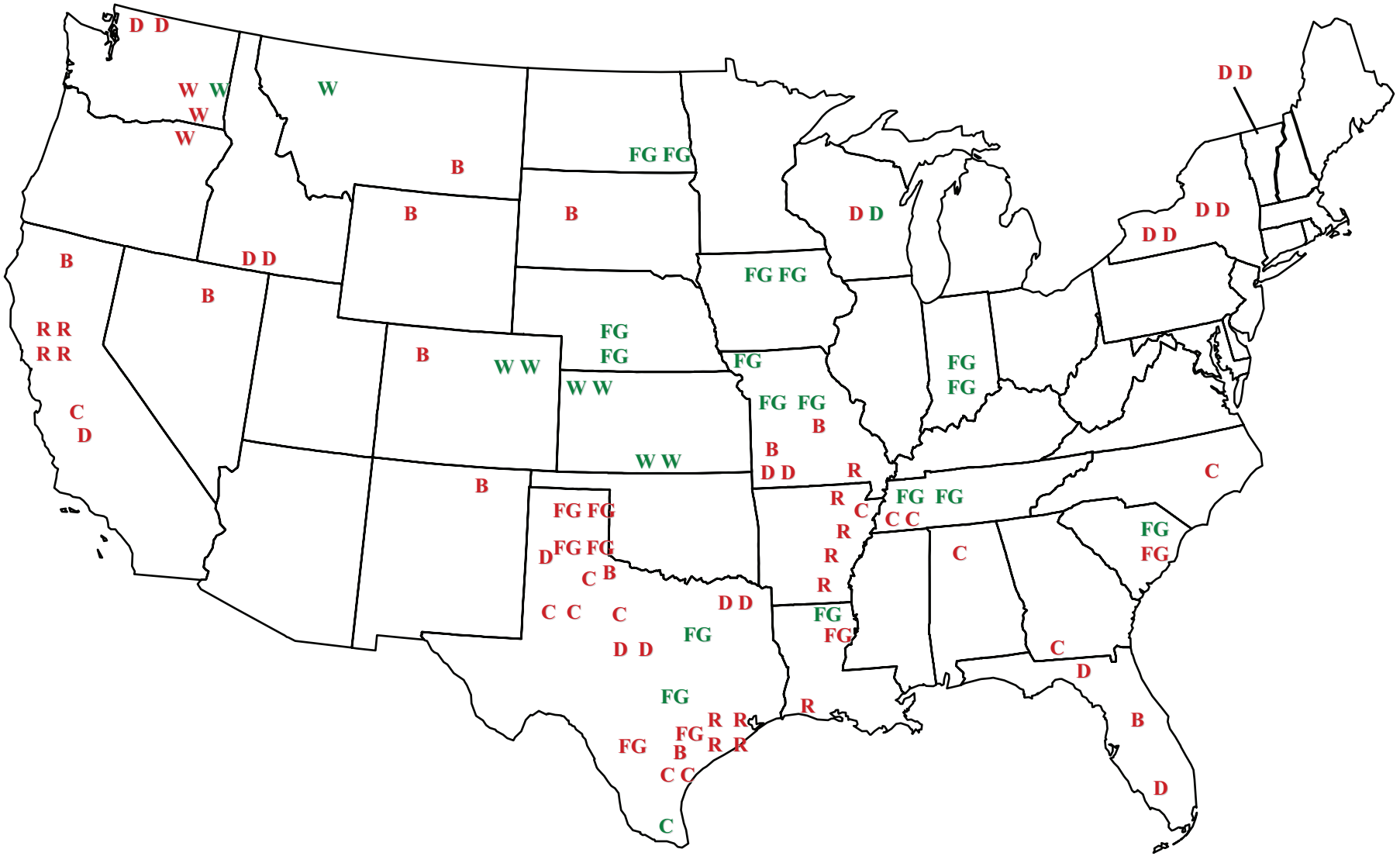
Table 10 (continued). Average Ending Cash Reserves for AFPC Representative Cotton and Rice Farms, 2016.

	Baseline	C&T with No Ag Carbon Credits	C&T with Ag Carbon Credits	C&T with Ag Carbon Credits and Saturation
	--$1,000--	--$1,000--	--$1,000--	--$1,000--
Cotton				
CAC4000	8,276.0	7,803.7	7,803.7	7,803.7
TXSP2500	-1,145.9	-1,444.0	-1,642.3	-1,658.1
TXSP3745	-1,860.6	-2,265.6	-2,457.0	-2,479.1
TXRP2500	-288.6	-412.2	-365.6	-377.7
TXCB2250	50.0	43.7	-97.6	-118.7
TXCB8000	106.4	105.4	-201.8	-277.0
TXVC4500	907.2	776.6	917.6	897.7
TXEC5000	1,655.1	1,344.2	821.5	771.1
GAC2300	-1,310.5	-1,468.9	-1,837.9	-1,863.0
TNC1900	703.8	740.2	434.8	408.6
TNC4050	-12,719.1	-13,334.5	-16,078.1	-16,136.9
ARNC5000	-156.0	-265.5	-2,019.6	-2,090.7
ALC3000	-707.6	-720.3	-1,036.2	-1,079.5
NCC1500	-391.4	-422.8	-617.9	-639.5
Rice				
CAR550	-532.0	-892.6	-892.6	-892.6
CAR2365	-215.2	-1,320.1	-1,320.1	-1,320.1
CABR1300	352.4	-35.2	-35.2	-35.2
CACR715	163.6	-149.1	-149.1	-149.1
TXR1350	-773.6	-1,006.0	-1,006.0	-1,006.0
TXR3000	966.4	648.2	648.2	648.2
TXBR1800	-1,499.0	-2,009.8	-2,009.8	-2,009.8
TXER3200	-1,820.8	-2,399.8	-2,399.8	-2,399.8
LASR1200	525.7	327.1	327.1	327.1
ARMR7500	-932.9	-1,694.8	-2,195.9	-2,276.6
ARSR3240	314.6	-28.6	-28.6	-28.6
ARWR1200	-5,473.8	-6,083.5	-6,083.5	-6,083.5
ARHR3000	-2,704.3	-3,297.2	-3,297.2	-3,297.2
MOWR4000	1,530.5	1,235.9	1,235.9	1,235.9

Table 10 (continued). Average Ending Cash Reserves for AFPC Representative Dairies and Ranches, 2016.

	Baseline --$1,000--	C&T with No Ag Carbon Credits --$1,000--	C&T with Ag Carbon Credits --$1,000--	C&T with Ag Carbon Credits and Saturation --$1,000--
Dairies				
CAD1710	402.9	49.6	101.3	101.3
WAD250	145.1	137.6	137.6	137.6
WAD850	1,327.8	1,363.3	1,023.6	1,023.6
IDD1000	2,820.6	2,546.3	2,284.7	2,284.7
IDD3000	8,914.3	8,190.3	8,501.3	8,501.3
TXCD550	1,410.1	1,401.4	1,024.7	1,024.7
TXCD1300	854.9	362.6	227.4	227.4
TXED450	-16.1	-201.4	-201.4	-201.4
TXED1000	352.2	117.1	-166.4	-166.4
TXND3000	6,008.8	5,120.3	5,650.2	5,650.2
WID145	1,026.7	1,038.7	1,038.7	1,038.7
WID775	7,129.8	7,181.1	6,859.8	6,859.8
NYWD1200	3,476.4	3,202.3	2,948.9	2,948.9
NYWD600	-1,844.7	-2,261.2	-2,909.7	-2,909.7
NYCD110	602.1	587.1	587.1	587.1
NYCD550	-478.9	-898.8	-1,491.0	-1,491.0
VTD140	-111.0	-156.9	-156.9	-156.9
VTD400	221.8	197.8	197.8	197.8
MOCD500	-337.6	-354.6	-908.2	-908.2
MOGD500	1,653.9	1,661.3	1,253.1	1,253.1
FLND550	983.3	978.3	563.3	563.3
FLSD1500	-2,186.7	-2,960.1	-3,001.6	-3,001.6
Ranches				
MTB500	304.0	153.6	153.6	153.6
WYB335	-645.1	-918.6	-918.6	-918.6
COB250	-54.7	-148.6	-148.6	-148.6
MOB250	601.4	578.6	578.6	578.6
MOCB400	212.3	97.0	97.0	97.0
NMB240	-106.2	-226.3	-226.3	-226.3
FLB1155	-56.6	-400.8	-400.8	-400.8
NVB700	-123.5	-394.0	-394.0	-394.0
CAB500	-1,397.6	-1,802.6	-1,802.6	-1,802.6
SDB375	344.8	230.8	230.8	230.8
TXSB200	-148.0	-228.3	-228.3	-228.3
TXRB500	704.6	553.5	553.5	553.5

Figure 2. Representative Farms, Dairies, and Ranches Analyzed Under the C&T with Ag Carbon Credits Scenario Showing Higher and Lower Ending Cash in 2016.



Farms, dairies, and ranches are classified as "green" if their ending cash in 2016 is higher under the C&T with Ag Carbon Credits scenario compared to the Baseline. Similarly, those classified as "red" had lower ending cash in 2016 under the alternative versus the Baseline.

Legend

FG: Feedgrain	D: Dairy
W: Wheat	B: Beef Cattle
C: Cotton	R: Rice

Table 11. Representative Farms by Type That Have Higher or Lower Ending Cash Reserves For the C&T with Ag Carbon Credits Scenario Relative to the Baseline.

Farm Type	Higher	Lower	Total
Feedgrain/Oilseed	17	8	25
Wheat	8	3	11
Cotton	1	13	14
Rice	0	14	14
Dairy	1	21	22
Cattle Ranches	0	12	12
Total	27	71	98

Table 12 indicates the average level of carbon prices necessary for the farms to be as well off as under the Baseline. Obviously, for some farms such as rice and the cattle ranches, since they are assumed not to participate, no level of carbon prices would make them as well off as the Baseline. For other farms that are better off relative to the Baseline under the cap and trade scenarios, most notably the feedgrain/oilseed farms and plains wheat farms, they are marked as such. While a few farms would be as well off as the Baseline with only slightly higher carbon prices each year, there are also several farms that would need $80 per ton per year or more to make them as well off as the Baseline.

Average Ending Real Net Worth

Ending real net worth in 2016 differs by scenario based on the differences in ending cash as seen in the previous financial measure and the rate of land appreciation and the general rate of inflation. Land ownership arrangements are unique, so farms owning more land will experience greater changes in wealth through changing land values than those owning little or no land. For the livestock operations, the market value of the livestock on hand will differ as prices change relative to the baseline. In general, most all of the farms are projected to increase their real net worth relative to the Baseline (Table 13).

Summary and Conclusions

At the request of Senator Saxby Chambliss, the Agricultural and Food Policy Center conducted an analysis of the economic impacts of cap and trade provisions of "The American Clean Energy and Security Act of 2009" (H.R. 2454) on their database of U.S. representative farms. This report assesses the impacts of H.R. 2454 by including:

- The anticipated energy related both direct and indirect cost increases.
- The expected commodity price changes resulting from producers switching among agricultural commodities.
- The estimated benefits to agricultural producers from selling CO2e credits.

AFPC utilized the EPA estimated energy price changes, as well as, their estimates of carbon and agricultural commodity prices to evaluate the farm level impacts of H.R. 2454. The results of this analysis are dependent on the projected outcomes in the EPA analysis of H.R. 2454. AFPC assumed that a fee structure similar to that used by the Chicago Climate Exchange (CCE) would likely be imposed under H.R. 2454 for CO2e trading.

Table 12. Average Annual CO_2e Price Needed to Achieve Projected Baseline 2016 Ending Cash Reserves Prior to Implementation of Cap and Trade Legislation.

Feedgrain/Oilseed	--$/ton CO_2e--
IAG1350	Better than Baseline
IAG3400	Better than Baseline
NEG1960	Better than Baseline
NEG4300	Better than Baseline
MOCG2050	Better than Baseline
MOCG4000	Better than Baseline
MONG1850	Better than Baseline
ING1000	Better than Baseline
ING2200	Better than Baseline
NDG2180	Better than Baseline
NDG7500	Better than Baseline
TXNP3000	45.0
TXNP8000	35.0
TXHG2000	Better than Baseline
TXPG2500	25.0
TXMG1800	30.0
TXPG3760	60.0
TXWG1600	Better than Baseline
TXUG1200	60.0
TNG900	Better than Baseline
TNG2750	Better than Baseline
LANG2500	Better than Baseline
LAG2640	30.0
SCG1500	25.0
SCG3500	Better than Baseline
Wheat	
WAW1725	Better than Baseline
WAW5500	No Opportunity
WAAW3500	No Opportunity
KSCW2000	Better than Baseline
KSCW4500	Better than Baseline
KSNW2800	Better than Baseline
KSNW5000	Better than Baseline
COW3000	Better than Baseline
COW5640	Better than Baseline
MTW4500	Better than Baseline
ORW3600	No Opportunity

Table 12 (continued). Average Annual CO_2e Price Needed to Achieve Projected Baseline 2016 Ending Cash Reserves Prior to Implementation of Cap and Trade Legislation.

	--$/ton CO_2e--
Cotton	
CAC4000	No Opportunity
TXSP2500	90.0
TXSP3745	80.0
TXRP2500	30.0
TXCB2250	30.0
TXCB8000	25.0
TXVC4500	Better than Baseline
TXEC5000	60.0
GAC2300	70.0
TNC1900	40.0
TNC4050	>$100.0
ARNC5000	90.0
ALC3000	30.0
NCC1500	40.0
Rice	
CAR550	No Opportunity
CAR2365	No Opportunity
CABR1300	No Opportunity
CACR715	No Opportunity
TXR1350	No Opportunity
TXR3000	No Opportunity
TXBR1800	No Opportunity
TXER3200	No Opportunity
LASR1200	No Opportunity
ARMR7500	60.0
ARSR3240	No Opportunity
ARWR1200	No Opportunity
ARHR3000	No Opportunity
MOWR4000	No Opportunity

Table 12 (continued). Average Annual CO_2e Price Needed to Achieve Projected Baseline 2016 Ending Cash Reserves Prior to Implementation of Cap and Trade Legislation.

Dairies	--$/ton CO_2e--
CAD1710	20.0
WAD250	No Opportunity
WAD850	40.0
IDD1000	60.0
IDD3000	20.0
TXCD550	50.0
TXCD1300	35.0
TXED450	No Opportunity
TXED1000	35.0
TXND3000	20.0
WID145	Better than Baseline
WID775	50.0
NYWD1200	60.0
NYWD600	>$100.0
NYCD110	No Opportunity
NYCD550	>$100.0
VTD140	No Opportunity
VTD400	No Opportunity
MOCD500	90.0
MOGD500	80.0
FLND550	50.0
FLSD1500	35.0
Ranches	
MTB500	No Opportunity
WYB335	No Opportunity
COB250	No Opportunity
MOB250	No Opportunity
MOCB400	No Opportunity
NMB240	No Opportunity
FLB1155	No Opportunity
NVB700	No Opportunity
CAB500	No Opportunity
SDB375	No Opportunity
TXSB200	No Opportunity
TXRB500	No Opportunity

Table 13. Average Ending Real Net Worth for AFPC Representative Feedgrain/Oilseed and Wheat Farms, 2016.

	Baseline	C&T with No Ag Carbon Credits	C&T with Ag Carbon Credits	C&T with Ag Carbon Credits and Saturation
	--$1,000--	--$1,000--	--$1,000--	--$1,000--
Feedgrain/Oilseed				
IAG1350	2,702.4	3,033.1	3,086.8	3,068.4
IAG3400	8,406.4	9,440.2	9,596.6	9,550.4
NEG1960	4,813.6	5,239.0	5,352.9	5,329.0
NEG4300	10,936.8	11,858.9	12,114.0	12,063.0
MOCG2050	8,602.0	9,661.2	9,787.5	9,759.8
MOCG4000	16,685.5	18,460.3	18,749.2	18,695.2
MONG1850	7,580.8	8,584.0	8,699.4	8,674.6
ING1000	2,816.7	3,234.6	3,282.8	3,269.1
ING2200	8,447.8	9,542.0	9,697.4	9,667.6
NDG2180	2,075.8	2,180.8	2,378.4	2,359.6
NDG7500	12,473.7	13,386.6	14,131.4	14,065.9
TXNP3000	2,011.2	1,855.1	1,754.2	1,718.0
TXNP8000	6,753.0	6,688.6	6,355.0	6,255.4
TXHG2000	1,357.9	1,582.2	1,638.3	1,619.8
TXPG2500	3,787.3	3,871.0	4,035.3	4,005.9
TXMG1800	874.5	932.7	816.2	799.4
TXPG3760	159.0	424.0	27.9	-15.2
TXWG1600	983.8	1,117.3	1,261.4	1,254.0
TXUG1200	-541.9	-633.3	-647.3	-653.0
TNG900	288.7	424.2	415.7	402.9
TNG2750	5,013.2	5,593.6	5,715.4	5,677.8
LANG2500	7,182.5	7,757.5	7,840.9	7,813.8
LAG2640	1,768.9	1,782.3	1,580.4	1,544.3
SCG1500	710.6	779.8	753.0	737.1
SCG3500	8,911.4	10,040.3	10,275.5	10,227.8
Wheat				
WAW1725	2,868.8	3,017.7	3,017.7	3,017.7
WAW5500	9,234.4	9,889.6	9,889.6	9,889.6
WAAW3500	2,036.9	2,183.2	2,183.2	2,183.2
KSCW2000	2,460.3	2,673.9	2,761.7	2,743.6
KSCW4500	4,549.6	4,821.1	5,054.2	5,013.7
KSNW2800	2,270.0	2,494.2	2,540.2	2,530.5
KSNW5000	4,936.3	5,385.5	5,359.9	5,340.7
COW3000	2,262.8	2,464.1	2,488.4	2,476.2
COW5640	3,639.9	3,892.3	3,959.2	3,935.5
MTW4500	3,790.0	4,191.4	4,311.3	4,278.5
ORW3600	2,512.0	2,601.3	2,601.3	2,601.3

Table 13 (continued). Average Ending Real Net Worth for AFPC Representative Cotton and Rice Farms, 2016.

	Baseline	C&T with No Ag Carbon Credits	C&T with Ag Carbon Credits	C&T with Ag Carbon Credits and Saturation
	--$1,000--	--$1,000--	--$1,000--	--$1,000--
Cotton				
CAC4000	26,872.0	29,072.2	29,072.2	29,072.2
TXSP2500	-263.1	-485.9	-679.7	-695.1
TXSP3745	-22.1	-324.6	-511.6	-533.3
TXRP2500	342.6	279.0	324.5	312.8
TXCB2250	1,462.0	1,599.3	1,461.2	1,440.5
TXCB8000	2,110.3	2,194.1	1,893.9	1,820.5
TXVC4500	4,009.5	4,171.4	4,309.3	4,289.8
TXEC5000	3,251.9	3,030.2	2,519.4	2,470.2
GAC2300	3,899.2	4,377.9	4,017.3	3,992.8
TNC1900	3,676.3	4,027.3	3,728.9	3,703.2
TNC4050	-6,198.7	-6,110.5	-8,791.5	-8,849.0
ARNC5000	6,929.1	7,400.8	5,686.7	5,617.2
ALC3000	966.4	961.4	652.8	610.4
NCC1500	3,014.0	3,321.5	3,130.9	3,109.7
Rice				
CAR550	1,730.0	1,647.2	1,647.2	1,647.2
CAR2365	7,012.4	6,809.2	6,809.2	6,809.2
CABR1300	5,425.8	5,679.0	5,679.0	5,679.0
CACR715	2,848.6	2,915.6	2,915.6	2,915.6
TXR1350	813.5	754.6	754.6	754.6
TXR3000	1,653.1	1,343.4	1,343.4	1,343.4
TXBR1800	-877.1	-1,374.5	-1,374.5	-1,374.5
TXER3200	-438.1	-889.6	-889.6	-889.6
LASR1200	1,010.0	832.4	832.4	832.4
ARMR7500	6,980.3	6,691.5	6,201.9	6,123.0
ARSR3240	4,000.7	3,922.2	3,922.2	3,922.2
ARWR1200	-1,873.8	-2,156.6	-2,156.6	-2,156.6
ARHR3000	2,689.8	2,558.8	2,558.8	2,558.8
MOWR4000	14,032.0	15,118.5	15,118.5	15,118.5

Table 13 (continued). Average Ending Real Net Worth for AFPC Representative Dairies and Ranches, 2016.

	Baseline --$1,000--	C&T with No Ag Carbon Credits --$1,000--	C&T with Ag Carbon Credits --$1,000--	C&T with Ag Carbon Credits and Saturation --$1,000--
Dairies				
CAD1710	21,762.2	23,420.0	23,470.5	23,470.5
WAD250	4,374.9	4,757.5	4,757.5	4,757.5
WAD850	10,251.5	11,069.6	10,737.7	10,737.7
IDD1000	10,216.3	10,472.3	10,216.8	10,216.8
IDD3000	32,867.1	33,950.4	34,254.3	34,254.3
TXCD550	5,860.8	6,222.2	5,854.1	5,854.1
TXCD1300	8,093.7	7,932.3	7,800.2	7,800.2
TXED450	3,288.5	3,382.5	3,382.5	3,382.5
TXED1000	6,587.7	6,750.8	6,473.8	6,473.8
TXND3000	19,793.8	19,154.3	19,672.1	19,672.1
WID145	3,792.0	4,083.5	4,083.5	4,083.5
WID775	12,572.5	13,044.9	12,731.0	12,731.0
NYWD1200	14,080.0	14,610.9	14,363.4	14,363.4
NYWD600	3,654.7	3,671.4	3,037.7	3,037.7
NYCD110	1,822.2	1,904.7	1,904.7	1,904.7
NYCD550	5,315.3	5,289.6	4,711.0	4,711.0
VTD140	1,308.4	1,386.2	1,386.2	1,386.2
VTD400	4,760.9	5,154.0	5,154.0	5,154.0
MOCD500	4,079.7	4,380.4	3,839.4	3,839.4
MOGD500	4,012.0	4,180.6	3,781.7	3,781.7
FLND550	6,401.5	6,923.4	6,517.8	6,517.8
FLSD1500	11,086.6	11,651.8	11,611.2	11,611.2
Ranches				
MTB500	6,024.6	6,546.7	6,546.7	6,546.7
WYB335	3,816.8	4,038.0	4,038.0	4,038.0
COB250	22,239.8	25,236.7	25,236.7	25,236.7
MOB250	3,656.8	3,979.8	3,979.8	3,979.8
MOCB400	5,262.4	5,798.1	5,798.1	5,798.1
NMB240	6,918.9	7,724.1	7,724.1	7,724.1
FLB1155	51,559.0	58,329.5	58,329.5	58,329.5
NVB700	5,831.9	6,218.3	6,218.3	6,218.3
CAB500	4,251.8	3,822.8	3,822.8	3,822.8
SDB375	6,894.3	7,574.9	7,574.9	7,574.9
TXSB200	3,548.0	3,899.0	3,899.0	3,899.0
TXRB500	9,140.9	10,026.2	10,026.2	10,026.2

AFPC has developed and maintains data to simulate 98 representative crop farms, dairies, and livestock operations chosen from major production areas across the United States. The location of these farms is primarily the result of discussions with staffers for the U.S. House and Senate Agriculture Committees. Information necessary to simulate the economic activity on these representative farms is developed from panels of producers using a consensus-building interview process.

The economic impacts of H.R. 2454 on the representative farms over the 2010-2016 period were analyzed for the following scenarios.

- Baseline – Food and Agricultural Policy Research Institute (FAPRI) January 2009 Baseline.
- C&T without Ag Carbon Credits – EPA estimated costs and prices.
- C&T with Ag Carbon Credits – EPA estimated costs and prices.
- C&T with Ag Carbon Credits and Saturation after 2014 – EPA estimated costs and prices.

Five alternative measures of economic performance were used for the farms. These are:

- Average Annual Total Cash Receipts
- Average Annual Total Cash Costs
- Average Annual Net Cash Farm Income
- Average Ending Cash Reserves in 2016
- Average Ending Real Net Worth in 2016

Results show that all of the crop farms and dairies are expected to realize slightly higher average annual cash receipts under the C&T scenarios due to slightly higher crop and milk prices resulting from instituting cap and trade. The lone exception is the 12 cattle ranches that realize slightly lower receipts due to lower calf prices. As one would expect, the C&T with Ag Carbon Credits scenario results in slightly higher cash receipts than the Baseline and C&T without Ag Carbon Credits scenario. The amount of the carbon credits is relatively small with many farms averaging less than $10,000 per year higher receipts. Losing the revenue from selling carbon credits in 2015 and 2016 due to saturation for carbon sequestration has a relatively small effect on the annual average cash receipts for the farms who were selling carbon credits.

Costs under the C&T without Ag Carbon Credits scenario differ from the Baseline due to different rates of change for input prices resulting from cap and trade legislation. Costs differ from the base under C&T with Ag Carbon Credits due to imposition of those same higher costs and expenses incurred for conversion to no-till on farms eligible for carbon credits and construction of methane digesters on eligible dairy farms.

In general, the feedgrain/oilseed farms located in or near the Corn Belt and wheat farms located in the Great Plains, have higher average annual net cash farm income under the three cap and trade alternatives. Most cotton and dairy farms and all of the rice farms and ranches will likely experience lower net cash farm incomes under the cap and trade alternatives. The rice farms and cattle ranches, are assumed to not participate in carbon sequestration activities so they experience higher costs, without carbon revenue and their commodity prices do not increase enough to offset higher costs.

Most of the feedgrain and plains wheat farms have higher average ending cash reserves under either of the C&T without Ag Carbon Credits or C&T with Ag Carbon Credits scenarios. In addition, all but a few of the feedgrain/oilseed farms end the analysis period with higher cash reserves even under the saturation scenario. Eight wheat farms are better off under the C&T with Ag Carbon Credits scenario, while one

cotton and no rice farms or cattle ranches are better off. One dairy (WID145) is better off because it produces and sells surplus corn and soybeans which are projected to see higher prices as a result of cap and trade.

The average level of carbon prices necessary for the farms to be as well off as under the Baseline were estimated for farms who would be worse off under the C&T with Ag Carbon Credits scenario. Given the assumptions in this study, for some farms such as rice and the cattle ranches, no level of carbon prices would make them as well off as the Baseline. While a few farms would be as well off as the Baseline with only slightly higher carbon prices each year, there are also several farms that would need carbon prices of $80 per ton per year or more to make them as well off as the Baseline.

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Appendix A: Description of Representative Farms

2008 CHARACTERISTICS OF PANEL FARMS PRODUCING FEEDGRAINS AND OILSEEDS

IAG1350 IAG1350 is a 1,350-acre northwestern Iowa (Webster County) grain farm. The farm is moderate-sized for the region and plants 810 acres of corn and 540 acres of soybeans annually. Sixty-nine percent of this farm's 2008 receipts come from corn production.

IAG3400 This 3,400-acre large-sized grain farm is located in northwestern Iowa (Webster County). It plants 2,040 acres of corn and 1,360 acres of soybeans each year, realizing 70 percent of receipts from corn production.

NEG1960 South central Nebraska (Dawson County) is home to this 1,960-acre grain farm. This farm plants seventy-five percent of cultivated acres to corn and fifteen percent to soybeans. Alfalfa is grown on the remaining land. The farm produces both yellow and white food-grade corn on 56 percent of the corn acres. Eighty-two percent of gross receipts are derived from corn sales.

NEG4300 This is a 4,300-acre grain farm located in south central Nebraska (Dawson County). This operation plants 2,666 acres of corn and 1,118 acres of soybeans each year. Remaining acres are planted to alfalfa. A portion (40 percent) of the corn acreage is food-grade corn. In 2008, 72 percent of total receipts were generated from corn production.

MOCG2050 MOCG2050 is a 2,050-acre grain farm located in central Missouri (Carroll County) and plants 1,025 acres of corn and 1,025 acres of soybeans annually. This farm is located in the Missouri River bottom, an area with a large concentration of livestock production. This proximity allows grain producers in this area to supply feed to livestock producers at a premium to other areas of Missouri. This farm generated 61 percent of its total revenue from corn and 39 percent from soybeans during 2008.

MOCG4000 A 4,000-acre central Missouri (Carroll County) grain farm with 1,975 acres of corn, 1,975 acres of soybeans, and 50 acres of wheat. This farm is located in the Missouri River bottom, an area with a large concentration of livestock production. This proximity allows area grain producers to supply feed to livestock producers at a premium to other areas of Missouri. Corn sales accounted for 59 percent of farm receipts and soybeans accounted for 40 percent in 2008.

MONG1850 MONG1850 is a 1,850-acre diversified northwest Missouri grain farm centered in Nodaway County. MONG1850 plants 900 acres of corn, 900 acres of soybeans, and 200 acres of hay annually. The farm also has a 200-head cow-calf herd. Proximity to the Missouri River increases marketing options for area grain farmers due to easily accessible river grain terminals. In 2008, 48 percent of the farm's total receipts were from corn, 38 percent from soybeans, and 13 percent from cattle sales.

ING1000 Shelby County, Indiana, is home to this 1,000-acre moderate-sized feedgrain farm. This farm annually plants corn and soybeans in a 50/50 rotation. Due to this farm's proximity to Indianapolis, land development pressures will likely constrain further expansion of this farm's operations. Fifty-six percent of 2008 receipts came from corn sales.

ING2200 ING2200 is a large-sized grain farm located in east central Indiana (Shelby County). This farm plants 1,100 acres to corn and 1,100 acres to soybeans each year. In 2008, 58 percent of gross receipts were generated by corn sales.

NDG2180 NDG2180 is a 2,180-acre, moderate-sized, south central North Dakota (Barnes County) grain farm that plants 480 acres of wheat, 300 acres of corn, and 1,300 acres of soybeans. The remaining acres are enrolled in the Conservation Reserve Program. The farm generated 57 percent of 2008 receipts from soybean sales.

NDG7500 This is a 7,500-acre, large-sized grain farm in south central North Dakota (Barnes County) that grows 3,750 acres of soybeans, 2,000 acres of corn, 1,200 acres of wheat, and 300 acres of dry peas annually. The remaining acreage is enrolled in the Conservation Reserve Program. Soybean and corn sales accounted for 80 percent of 2008 receipts.

TXNP3000 This is a 3,000-acre feedgrain farm located on the northern High Plains of Texas (Moore County). This farm plants 630 acres of cotton, 960 acres of irrigated corn, 240 acres of irrigated sorghum for seed production, and 870 acres of irrigated wheat annually.

TXNP8000 TXNP8000 is a large-sized feedgrain farm located in the northern Texas Panhandle (Moore County). This farm annually plants 1,872 acres of irrigated cotton, 3,120 acres of irrigated corn, 867 acres of sorghum (587 acres of dryland and 280 acres of irrigated production for seed), and 1,555 acres of winter wheat (968 acres irrigated and 587 acres dryland).

TXHG2000 This 2,000-acre grain farm is located on the Blackland Prairie of Texas (Hill County). On this farm, 1,000 acres of corn, 500 acres of sorghum, 250 acres of cotton, and 250 acres of wheat are planted annually. Feedgrain sales accounted for 67 percent of 2008 receipts with cotton accounting for 19 percent of sales. Forty beef cows live on 300 acres of improved pasture and contribute approximately four percent of total receipts.

TXPG2500 The Texas Panhandle is home to this 2,500-acre farm (Deaf Smith County). Annually, cotton is planted on 200 irrigated acres, 1,242 acres are planted to wheat (875 irrigated and 367 dryland), and 875 irrigated acres are planted to corn. Sixty-three percent of 2008 cash receipts were generated by corn sales.

TXMG1800 This 1,800-acre farm is located on the Coastal Plain of southeast Texas (Wharton County). TXMG1800 farms 600 acres of cotton, 620 acres of sorghum, 480 acres of corn, and 100 acres of soybeans. In 2008, feedgrain and oilseed sales comprised 48 percent of total cash receipts on this operation.

TXPG3760 TXPG3760 is a predominately irrigated farm located in the Texas Panhandle (Castro County). Annually, 1,878 acres are planted to corn and 564 acres are planted to cotton. In 2008, 59 percent of cash receipts were generated from corn sales.

TXWG1600 This 1,600-acre farm is located on the Blackland Prairie of Texas (Williamson County). TXWG1600 plants 1,000 acres of corn, 300 acres of sorghum, 200 acres of cotton, and 100 acres of winter wheat annually. Additionally, this farm has a 50-head beef cow herd that is pastured on rented ground that cannot be farmed. Feedgrain sales accounted for 68 percent of 2008 receipts with cotton accounting for 23 percent of sales.

TXUG1200 TXUG1200 is a grain farm located in Uvalde County, Texas. This farm plants 550 acres of corn, 300 acres of grain sorghum, 200 acres of cotton, and 150 acres of wheat each year. All crops except wheat are grown under irrigation. In 2008, feedgrain sales accounted for 58 percent of farm receipts.

TNG900 This is a 900-acre, moderate-sized grain farm in West Tennessee (Henry County). Annually, this farm plants 500 acres of corn, 400 acres of soybeans, and 100 acres of wheat (planted before soybeans) in a region of Tennessee recognized for the high level of implementation of conservation practices by farmers. Sixty percent of 2008 farm receipts were from sales of corn.

TNG2750 West Tennessee (Henry County) is home to this 2,750-acre, large-sized grain farm. Farmers in this part of Tennessee are known for their early and continued adoption of conservation practices. TNG2750 plants 1,100 acres of corn, 550 acres of wheat, and 1,650 acres of soybeans (550 of which are double-cropped after wheat). The farm generated 40 percent of its 2008 gross receipts from sales of corn and 43 percent from soybeans.

LANG2500 This is a 2,500-acre, large-sized northeast Louisiana (Madison Parish) diversified farm. This farm harvests 500 acres of rice, 800 acres of soybeans, 250 acres of cotton, and 950 acres of corn. For 2008, 55 percent of farm receipts came from corn and soybean sales.

LAG2640 This is a 2,640-acre diversified farm located in northern Louisiana (Morehouse Parish). LAG2640 plants 924 acres of cotton, 1,056 acres of corn, and 660 acres of soybeans each year. During 2008, 52 percent of farm receipts were generated from corn and soybean sales.

SCG1500 SCG1500 is a moderate-sized, 1,500-acre diversified farm in South Carolina (Barnwell County) consisting of 525 acres of corn, 525 acres of cotton, 75 acres of soybeans, and 75 acres of wheat.

SCG3500 A 3,500-acre, large-sized South Carolina (Clarendon County) grain farm with 2,100 acres of corn, 700 acres of wheat, and 1,400 acres of soybeans (700 double-cropped after wheat). The farm generated 54 percent of 2008 receipts from corn sales and 26 percent from soybean sales, with an additional 15 percent coming from wheat sales. Timing precludes further expansion of relatively lucrative double-cropped acres.

2008 CHARACTERISTICS OF PANEL FARMS PRODUCING WHEAT

WAW1725 This is a 1,725-acre moderate-sized wheat farm in the Palouse of southeastern Washington (Whitman County). It plants 1,147 acres of wheat, 120 acres of barley, and 458 acres of dry peas. Disease concerns dictate rotating a minimum acreage of barley and peas to maintain wheat yields. This farm generated 75 percent of 2008 receipts from wheat.

WAW5500 A 5,500-acre, large-sized wheat farm in the Palouse of southeastern Washington (Whitman County). Annually, this farm allocates 3,055 acres to wheat, 611 acres to barley, and 1,204 acres to dry peas. Diseases that inhibit wheat yield dictate the rotation of a minimum acreage of barley and peas. Wheat sales accounted for 72 percent of 2008 receipts.

WAAW3500 South central Washington (Adams County) is home to this 3,500-acre, large-sized wheat farm. Annually, this farm plants 1,500 acres of wheat in a wheat-fallow rotation. Additionally, 500 acres are enrolled in a CRP contract. In 2008, wheat sales accounted for 95 percent of the farm's gross receipts.

KSCW2000 South central Kansas (Sumner County) is home to this 2,000-acre, moderate-sized wheat farm. KSCW2000 plants 1,200 acres of winter wheat, 200 acres of sorghum, and 400 acres of soybeans each year. For 2008, 63 percent of gross receipts came from wheat.

KSCW4500 A 4,500-acre, large-sized wheat farm in south central Kansas (Sumner County) that plants 2,700 acres of winter wheat, 450 acres of sorghum, 675 acres of corn, and 675 acres of soybeans. Sixty-three percent of this farm's 2008 total receipts were generated from sales of winter wheat.

KSNW2800 This is a 2,800-acre, moderate-sized northwest Kansas (Thomas County) wheat farm. This farm plants 1,400 acres of winter wheat (wheat-fallow rotation), 467 acres of corn, and 233 acres of sorghum. KSNW2800 also owns 80 head of beef cows. This farm generated 58 percent of 2008 receipts from wheat and 32 percent of its receipts from feedgrains.

KSNW5000 KSNW5000 is a 5,000-acre, large-sized northwest Kansas (Thomas County) wheat farm that annually plants 2,325 acres of winter wheat, 1,013 acres of corn, 382 acres of sorghum, and 130 acres of soybeans. This farm also runs 100 head of beef cows. The farm generated 46 percent of receipts from wheat and six percent from cattle during 2008.

COW3000 A 3,000-acre northeast Colorado (Washington County), moderate-sized wheat farm that plants 970 acres of winter wheat, 805 acres of millet, and 600 acres of corn each year. This farm generated 39 percent of its receipts from wheat, 33 percent from millet, and 26 percent from corn.

COW5640 A 5,640-acre, large-sized northeast Colorado (Washington County) wheat farm. It plants 2,256 acres of wheat, 490 acres of millet, and 490 acres of corn. During 2008, 77 percent of gross receipts came from wheat sales and 12 percent came from corn sales.

MTW4500 North-central Montana (Chouteau County) is home to this 4,500 acre farm on which 2,330 acres of wheat (1,711 acres of winter wheat, 619 acres of spring wheat) are planted each year. In 2008, 99 percent of cash income came from wheat.

ORW3600 A 3,600-acre large-sized wheat farm located in northeastern Oregon (Morrow County). This farm plants 1,600 acres annually in a wheat-fallow rotation, with 400 additional acres enrolled in a CRP contract. Ninety-five percent of this farm's 2008 total receipts came from wheat sales.

2008 CHARACTERISTICS OF PANEL FARMS PRODUCING COTTON

CAC4000 A 4,000-acre cotton farm located in Kings County, California, CAC4000 plants 1,333 acres to cotton, 267 acres to hay, 2666 acres of silage, and harvests 400 acres of almonds. Twenty-nine percent of 2008 receipts came from cotton sales.

TXSP2500 A 2,500-acre Texas South Plains (Dawson County) cotton farm that is moderate-sized for the area. TXSP2500 plants 1,958 acres of cotton (1,658 dryland, 300 irrigated), 190 acres of sorghum (160 dryland, 30 irrigated), 95 acres of wheat, and 50 acres of peanuts. For 2008, 81 percent of receipts came from cotton.

TXSP3745 The Texas South Plains (Dawson County) is home to this 3,745-acre, large-sized cotton farm that grows 2,916 acres of cotton (2,406 dryland, 510 irrigated), 120 acres of wheat, 120 acres of peanuts, and has 288 acres in CRP. Cotton sales comprised 81 percent of 2008 receipts.

TXRP2500 TXRP2500 is a 2,500-acre cotton farm located in the Rolling Plains of Texas (Jones County). This farm plants 1,117 acres of cotton and 825 acres of winter wheat each year. The area is limited by rainfall, and the farm uses a conservative level of inputs. Seventy-six percent of 2008 farm receipts came from cotton sales. Seventeen head of beef cows generated two percent of farm receipts.

TXCB2250 A 2,250-acre cotton farm located on the Texas Coastal Bend (San Patricio County) that farms 1,000 acres of cotton, 1,125 acres of sorghum, and 125 acres of corn annually. Sixty-three percent of 2008 cash receipts were generated by cotton.

TXCB8000 Nueces County, Texas is home to this 8,000-acre farm. Annually, 2,800 acres are planted to cotton and 5,200 acres to sorghum. Cotton sales accounted for 49 percent of 2008 receipts.

TXVC4500 This 4,500-acre farm is located in the lower Rio Grande Valley of Texas (Willacy County) and plants 2,388 acres to cotton (500 irrigated and 1,888 acres dryland), 1,887 acres to sorghum, and 225 acres of sugarcane. In 2008, 52 percent of TXVC4500's cash receipts were generated by cotton sales.

TXEC5000 This 5,000-acre farm is located on the Eastern Caprock of the Texas South Plains (Crosby County). Annually, 3,650 acres are planted to cotton (2,650 irrigated and 1,000 dryland), 300 acres to dryland wheat, and 550 acres of grain sorghum (300 irrigated and 250 acres dryland). In 2008, cotton sales accounted for 94 percent of gross receipts.

GAC2300 Southwest Georgia (Decatur County) is home to a 2,300-acre cotton farm that plants 1,495 acres to cotton, 575 acres to peanuts, and 230 acres to corn. This farm was added during 2001 to represent resurgent cotton production in the Deep South. In 2008, farm receipts were comprised largely of cotton sales (62 percent) and peanut sales (32 percent).

TNC1900 A 1,900-acre, moderate-sized West Tennessee (Fayette County) cotton farm. TNC1900 consists of 990 acres of cotton, 440 acres each of soybeans and corn, and 30 acres enrolled in CRP. Cotton accounted for 69 percent of 2008 gross receipts, with corn and soybeans contributing 18 percent and 13 percent, respectively.

TNC4050 TNC4050 is a 4,050-acre, large-sized West Tennessee (Haywood County) cotton farm. This farm plants 2,670 acres of cotton, 820 acres of soybeans, 560 acres of corn, and 328 acres of wheat each year. During 2008, cotton sales generated 74 percent of gross receipts.

ARNC5000 Far northeast Arkansas (Mississippi County) is home to this 5,000-acre cotton farm. ARNC5000 plants all its acres to cotton annually, generating 100 percent of its receipts from cotton.

ALC3000 A 3,000-acre cotton farm located in northern Alabama (Lawrence County) that plants 1,500 acres to cotton, 1,350 acres to corn, and 150 acres to soybeans annually. Cotton sales accounted for 62 percent of total farm receipts during 2008.

NCC1500 This is a 1,500-acre cotton farm located on the upper coastal plain of North Carolina (Wayne County). NCC1500 plants 575 acres of cotton, 325 acres of wheat, and 650 acres of soybeans annually. Cotton accounted for 47 percent of this farm's 2008 receipts with 21 percent coming from soybean sales.

2008 CHARACTERISTICS OF PANEL FARMS PRODUCING RICE

CAR550 CAR550 is a 550-acre moderate-sized rice farm in the Sacramento Valley of California (Sutter and Yuba Counties) that plants 500 acres of rice annually. This farm generated 100 percent of 2008 gross receipts from rice sales.

CAR2365 This is a 2,365-acre rice farm located in the Sacramento Valley of California (Sutter and Yuba Counties) that is large-sized for the region. CAR2365 plants 2,240 acres of rice annually. Ninety-nine percent of 2008's total receipts were generated from rice sales.

CABR1300 The Sacramento Valley (Butte County) is home to CABR1300, a 1,300-acre rice farm. CABR1300 harvests 1,200 acres of rice annually, generating 100 percent of 2008 farm receipts from rice sales.

CACR715 CACR715 is a 715-acre rice farm located in the Sacramento Valley of California (Colusa County). This farm harvests 650 acres of rice each year. During 2008, 100 percent of farm receipts were realized from rice sales.

TXR1350 This 1,350-acre rice farm located west of Houston, Texas (Colorado County) is moderate-sized for the region. TXR1350 harvests 450 acres of first-crop rice and 360 acres of ratoon rice. The farm generated 98 percent of its receipts from rice during 2008.

TXR3000 TXR3000 is a 3,000-acre, large-sized rice farm located west of Houston, Texas (Colorado County). This farm harvests 1,200 acres of first-crop rice and 1,080 acres of ratoon rice annually. TXR3000 realized 100 percent of 2008 gross receipts from rice sales.

TXBR1800 The Texas Gulf Coast (Matagorda County) is home to this 1,800-acre rice farm. TXBR1800 harvests 1,200 acres of rice annually (600 acres of first-crop rice and 600 acres of ratoon rice) and realized 100 percent of 2008 farm receipts from rice sales.

TXER3200 This 3,200-acre rice farm is large for the Texas Gulf Coast (Wharton County). TXER3200 harvests 1,067 acres of first-crop rice and 960 acres of ratoon rice each year. The farm also grows 427 acres of soybeans and 640 acres of grain sorghum annually. Eighty-five percent of 2008 receipts came from rice sales.

LASR1200 A 1,200-acre southwest Louisiana (Acadia, Jeff Davis, and Vermilion parishes) rice farm, LASR1200 is moderate-sized for the area. This farm harvests 660 acres of rice and 250 acres of soybeans. During 2008, 88 percent of gross receipts were generated from rice sales.

ARMR7500 ARMR7500 is a 7,500-acre diversified rice farm in southeast Arkansas (Desha County) that plants 1,500 acres of cotton, 1,875 acres of rice, 2,375 acres of soybeans, and 1,500 acres of corn. For 2008, 27 percent of gross receipts came from cotton sales, 37 percent from rice sales, 15 percent from corn sales, and 15 percent from soybean sales.

ARSR3240 ARSR3240 is a 3,240-acre, large-sized Arkansas (Arkansas County) rice farm that harvests 1,620 acres of rice, 1,620 acres of soybeans, and 324 acres of wheat each year. Seventy-three percent of this farm's 2008 receipts came from rice sales.

ARWR1200 East central Arkansas (Cross County) is home to this 1,200-acre rice farm. Moderate-sized for the region, ARWR1200 annually plants 600 acres to rice, 600 acres to soybeans, and 60 acres of double-cropped wheat. During 2008, rice sales generated 73 percent of gross receipts.

ARHR3000 ARHR3000 is a 3,000-acre large-sized northeast Arkansas (Lawrence County) rice farm that annually harvests 1,450 acres of rice, 1,250 acres of soybeans, and 300 acres of corn. Rice sales accounted for 72 percent of 2008 farm receipts.

MOWR4000 A 4,000-acre rice farm located in southeast Missouri (Butler County), MOWR4000 is large-sized for the region. Seventy-three percent of receipts for this farm came from rice sales in 2008.

2008 CHARACTERISTICS OF PANEL DAIRIES PRODUCING MILK

CAD1710 A 1,710-cow, large-sized central California (Tulare County) dairy. The farm plants 1,200 acres of hay/silage for which it employs custom harvesting. Milk sales generated 94 percent of 2008 total receipts.

WAD250 A 250-cow, moderate-sized northern Washington (Whatcom County) dairy. This farm plants 200 acres of silage and generated 92 percent of its 2008 gross receipts from milk sales.

WAD850 An 850-cow, large-sized northern Washington (Whatcom County) dairy. This farm plants 605 acres for silage annually. During 2008, 95 percent of this farm's gross receipts came from milk.

IDD1000 A 1,000-cow, moderate-sized Idaho (Twin Falls County) dairy. This farm plants no crops. Milk sales accounted for 92 percent of IDD1000's gross receipts for 2008.

IDD3000 A 3,000-cow, large-sized Idaho (Twin Falls County) dairy. This farm plants 2,000 acres for silage annually. Milk sales represent 94 percent of this farm's gross receipts.

TXCD550 A 550-cow, moderate-sized central Texas (Erath County) dairy. TXCD550 plants 1,100 acres of hay each year. Milk sales represented 94 percent of this farm's 2008 gross receipts.

TXCD1300 A 1,300-cow, large-sized central Texas (Erath County) dairy. TXCD1300 plants 680 acres of silage and 440 acres of hay annually. During 2008, milk sales accounted for 94 percent of receipts.

TXED450 A 450-cow, moderate-sized northeast Texas (Hopkins County) dairy. This farm has 850 acres of improved pasture and 50 acres of hay. During 2008, milk sales represented 91 percent of annual receipts.

TXED1000 A 1,000-cow, large-sized northeast Texas (Hopkins County) dairy. This farm plants 1,025 acres of hay/silage. This farm generated 95 percent of 2008 receipts from milk sales.

TXND3000 A 3,000-cow, large-sized dairy located in the South Plains of Texas (Bailey County). This farm plants 180 acres of sorghum for silage annually. Milk sales account for 94 percent of 2008 gross receipts.

WID145 A 145-cow, moderate-sized eastern Wisconsin (Winnebago County) dairy. The farm plants 180 acres of silage, 90 acres for hay, 150 acres of corn, and 130 acres of soybeans. Milk constituted 86 percent of this farm's 2008 receipts.

WID775 A 775-cow, large-sized eastern Wisconsin (Winnebago County) dairy. The farm plants 696 acres of hay and 454 acres of silage each year. Milk sales comprised 95 percent of the farm's 2008 receipts.

NYWD1200 A 1,200-cow, large-sized western New York (Wyoming County) dairy. This farm plants 1,900 acres of silage and 200 acres of corn annually. Milk sales accounted for 95 percent of the gross receipts for this farm in 2008.

NYWD600 An 600-cow, moderate-sized western New York (Wyoming County) dairy. This farm plants 600 acres of silage, 450 acres of haylage, 100 acres of corn, and 50 acres of hay annually. Milk sales accounted for 94 percent of the gross receipts for this farm in 2008.

NYCD110 A 110-cow, moderate-sized central New York (Cayuga County) dairy. The farm plants 30 acres for hay, 90 acres for corn, and 185 acres for silage annually. Milk accounted for 91 percent of the gross receipts for 2008 on this dairy.

NYCD550 A 550-cow, large-sized central New York (Cayuga County) dairy. This farm plants 625 acres of hay and haylage and 475 acres of silage. Milk sales make up 93 percent of the 2008 total receipts for this dairy.

VTD140 A 140-cow, moderate-sized Vermont (Washington County) dairy. VTD140 plants 30 acres of hay, and 190 acres of silage annually. Milk accounted for 92 percent of the 2008 receipts for this farm.

VTD400 A 400-cow, large-sized Vermont (Washington County) dairy. This farm plants 100 acres of hay and 900 acres of silage annually. Milk sales represent 93 percent of VTD400's gross receipts in 2008.

MOCD500 A 500-cow, large-sized southwest Missouri (Dade County) dairy. The farm plants 210 acres of hay, 320 acres of silage, and 70 acres of improved pasture annually. Milk accounted for 94 percent of gross farm receipts for 2008.

MOGD500 A 500-cow, grazing dairy in southwest Missouri (Dade County). The farm plants 40 acres of silage annually, and grazes cows on 345 acres of improved pasture. Milk accounted for 93 percent of gross farm receipts for 2008.

FLND550 A 550-cow, moderate-sized north Florida (Lafayette County) dairy. The dairy grows 130 acres of hay each year. All other feed requirements are purchased in a pre-mixed ration. Milk sales accounted for 94 percent of the farm receipts.

FLSD1500 A 1,500-cow, large-sized south central Florida (Okeechobee County) dairy. FLSD1500 plants 100 acres of hay and 400 acres of silage annually. Milk sales represent 94 percent of 2008 total receipts.

2008 CHARACTERISTICS OF PANEL RANCHES PRODUCING BEEF CATTLE

MTB500 A 500-cow ranch located on the eastern plains of Montana (Custer County), MTB500 runs cows on a combination of owned land and land leased from federal, state, and private sources. Federal land satisfies one quarter of total grazing needs. The ranch owns 14,000 acres of pasture. 640 acres of hay are produced annually on the owned land. Also, all deeded acres are leased for hunting. Cattle sales represented 98 percent of this ranch's 2008 receipts.

WYB335 This 335-cow ranch is located in north central Wyoming (Washakie County). The ranch leases 2000 AUMs from the U.S. Forest Service and owns 1,000 acres of range. In response to drought, the ranch has begun leasing 700 acres of private pasture. Annually, the ranch harvests 305 acres of alfalfa and grass hay on owned ground. The ranch backgrounds two-thirds of its calves for ninety days. In 2008, cattle sales accounted for 74 percent of gross receipts, while hay sales accounted for 25 percent.

COB250 This 250-cow ranch is located in northwestern Colorado (Routt County). Federal land provides seven percent of the ranch's grazing needs. The ranch owns 2,300 acres of rangeland, and the cattle graze federal land during the summer. COB250 harvests 450 acres of hay each year at a projected yield of 2.5 tons per acre. Cattle sales accounted for 65 percent of the ranch's 2008 total receipts.

MOB250 A 250-cow beef cattle operation is the focal point of this diversified livestock and crop farm located in southwest Missouri (Dade County). MOB250 plants 120 acres of corn, 120 acres of wheat, 160 acres of soybeans, and 560 acres of hay. Improved pasture makes up another 570 acres of this ranch. During 2008, cattle sales comprised 48 percent of gross receipts.

MOCB400 MOCB400 is a 400-cow beef cattle farm located in central Missouri (Dent County). This farm consists of 1,060 acres of owned ground and 500 acres of leased ground. Annually, 410 acres of hay are harvested on owned land. 2008 cattle sales represented 93 percent of MOCB400's cash receipts.

NMB240 NMB240 is a 240-cow ranch located in northeastern New Mexico (Union County). In 2002, this ranch liquidated 20 percent of its mature cowherd in response to oppressive drought, culling 60 of its 300. With improving range conditions, ranchers have opted to fill the gap with summer stockers. Accordingly, 200 summer stocker steers were added to this ranch. During 2008, 83 percent of gross receipts were derived from cattle sales with the balance of receipts generated from fee hunting.

FLB1155 This is a 1,155-cow ranch located in central Florida (Osceola County). FLB1155 runs cows on 5,400 acres of owned improved pasture, from which 3,560 acres of hay are harvested annually. Sales of sod are a burgeoning source of agricultural income for area ranches. During 2008, cattle sales represented 85 percent of total receipts.

NVB700 NVB700 is a 700-cow ranch located in northeastern Nevada (Elko County). The operation consists of 1,300 acres of owned hay meadow and 8,725 acres of owned range, supplemented by 4,450 AUMs leased from the U.S. Forest Service. Each year, the ranch harvests 975 acres of hay. Annually, cattle sales represent all of the ranch's receipts.

CAB500 Located in the northern Sacramento Valley (Tehama County, California), this 500-cow operation covers 10,000 acres of deeded and privately owned leased range. Additionally, 2,000 AUMs are leased from the federal government. All 2008 receipts were generated by the cow-calf operation.

SDB375 SDB375 is a 375-cow West River (Meade County, South Dakota) beef cattle ranch. This operation produces hay on 1,150 acres of owned cropland, and runs its cows on 6,700 acres of owned native range. In 2008, calf and culled cow/bull sales accounted for 100 percent of gross receipts.

TXSB200 A 200-head cow-calf operation is the central focus of this full-time agricultural operation in south central Texas (Gonzales County). Faced with continued drought, the ranch liquidated 30% of its mature cowherd in 2006. Contract broiler production is an important source of agricultural revenue for this ranch; even so, cattle sales accounted for 69 percent of 2008 gross receipts.

TXRB500 The western Rolling Plains of Texas (King County) is home to this 500-head cow-calf operation. This ranch operates on 20,000 acres (half owned, half leased) of native range. After weaning, calves are placed on wheat pasture and then either sold as feeder cattle or retained as replacement females. Eighty percent of 2008 receipts came from cattle sales, while 20 percent came from fee hunting.

Appendix B. Average Annual Revenue Generated from Selling CO2e for AFPC Representative Farms, 2010-2016.

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Feedgrain/Oilseed	
IAG1350	7,884.8
IAG3400	19,857.9
NEG1960	10,337.8
NEG4300	22,096.8
MOCG2050	11,973.2
MOCG4000	23,362.3
MONG1850	10,513.0
ING1000	5,840.6
ING2200	12,849.3
NDG2180	8,098.9
NDG7500	28,229.4
TXNP3000	15,185.5
TXNP8000	42,052.1
TXHG2000	7,787.4
TXPG2500	12,459.9
TXMG1800	7,008.7
TXPG3760	17,732.9
TXWG1600	3,115.0
TXUG1200	2,336.2
TNG900	5,256.5
TNG2750	16,061.6
LANG2500	11,681.1
LAG2640	15,419.1
SCG1500	6,570.6
SCG3500	20,442.0
Wheat	
WAW1725	0.0
WAW5500	0.0
WAAW3500	0.0
KSCW2000	7,787.4
KSCW4500	17,521.7
KSNW2800	4,088.4
KSNW5000	8,244.9
COW3000	5,256.5
COW5640	10,143.1
MTW4500	13,955.1
ORW3600	0.0

Appendix B (continued). Average Annual Revenue Generated from Selling CO2e for AFPC Representative Farms, 2010-2016.

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Cotton	
CAC4000	0.0
TXSP2500	6,391.5
TXSP3745	8,952.6
TXRP2500	4,867.1
TXCB2250	8,760.9
TXCB8000	31,149.7
TXVC4500	8,322.8
TXEC5000	21,026.1
GAC2300	10,075.0
TNC1900	10,921.9
TNC4050	23,654.3
ARNC5000	29,202.9
ALC3000	17,521.7
NCC1500	8,760.9
Rice	
CAR550	0.0
CAR2365	0.0
CABR1300	0.0
CACR715	0.0
TXR1350	0.0
TXR3000	0.0
TXBR1800	0.0
TXER3200	0.0
LASR1200	0.0
ARMR7500	32,853.2
ARSR3240	0.0
ARWR1200	0.0
ARHR3000	0.0
MOWR4000	0.0

Appendix B (continued). Average Annual Revenue Generated from Selling CO2e for AFPC Representative Farms, 2010-2016.

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Dairies	
CAD1710	40,914.2
WAD250	0.0
WAD850	14,006.7
IDD1000	16,478.2
IDD3000	49,435.6
TXCD550	13,159.8
TXCD1300	31,104.0
TXED450	0.0
TXED1000	23,926.9
TXND3000	71,779.6
WID145	0.0
WID775	9,153.1
NYWD1200	14,173.1
NYWD600	7,086.6
NYCD110	0.0
NYCD550	6,495.7
VTD140	0.0
VTD400	0.0
MOCD500	8,239.1
MOGD500	8,239.1
FLND550	13,159.8
FLSD1500	35,889.3
Ranches	
MTB500	0.0
WYB335	0.0
COB250	0.0
MOB250	0.0
MOCB400	0.0
NMB240	0.0
FLB1155	0.0
NVB700	0.0
CAB500	0.0
SDB375	0.0
TXSB200	0.0
TXRB500	0.0