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TEXAS REPRESENTATIVE FEEDGRAIN FARMS

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Introduction

The Agricultural and Food Policy Center at Texas A&M University (AFPC), and researchers from the Food and Agricultural Policy Research Institute at the University of Missouri (FAPRI-MU), University of California at Merced and University of California at Santa Cruz have teamed together in a grant project to study farmer adaptation to climate change. This project is supported by Agriculture and Food Research Initiative Competitive Grant no. 2012-68002-19872 from the USDA National Institute of Food and Agriculture (NIFA). However, any findings and views expressed are the authors' own, and might not reflect those of USDA or NIFA. The AFPC's primary role in this project is to gather farmers' perceptions and potential reactions to possible climate change impacts on localized growing conditions.

This working paper is the first step in a multi-step approach to gather information from producers and pass this information along to climate change modelers. Specifically, the AFPC has met with and gathered data from producers from select representative farms representing different parts of the United States on their perception of climate change. Additionally, in the latter years of the project, the AFPC will follow up with these same producers and present distributions of localized weather, yield, and price estimates under various climate change scenarios. Representative farm panels will gauge their adaptation strategy when confronted with different circumstances caused by climate change.

The two Texas representative farms (TXNP3000 and TXNP10000) were chosen to participate in this study. Detailed information about the two Texas farms and the data gathered from the producers is presented in the Methodology section. Other representative farms in the study include: IAG1350, IAG3400, NEG2400, NEG4300, KSNW4000, KSNW5500, NDG2500, NDG8000, MOCG2300, MOCG4000, and ALC3000. Figure 1 shows the location of the representative farms involved in this study. An advantage of this selection of farms is that they represent key corn-growing regions in the Corn Belt, as well as locations to the North and South of this region. Project results will investigate climate information needs of farmers in and near the main corn area and how they adapt to potential changes in growing conditions and markets, including in the course of crop selection.

Methodology and Description of the Representative Farm Process

Panel Process

AFPC has developed and maintains data to simulate 96 representative crop farms, dairies, and livestock operations chosen from major production areas across the United States. The representative farm approach treats a farm business unit as a unique system characterized by local features and resources to which the farm manager adapts. Local conditions are internalized in the creation and simulation of each farm.

Figure 1. Locations of AFPC Representative Farms Utilized in Climate Project.

Information necessary to simulate the economic activity on these representative farms is developed from panels of producers using a consensus-building interview process. Producers in a location have been chosen that represent full time producers in the area utilizing the expertise of local extension staff who serve as facilitators. The panel members are tasked with providing the data needed to build a farm that is representative of their operations. Data include size of operation, land tenure, commodities produced, production practices, fixed costs, variable costs, equipment complement, yields, and prices received for their commodities. These data span the most recent 1-3 years. Often, 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 farms two to three times larger.

Once the farm level data are reviewed, the panel data are combined with the latest baseline projections of agricultural commodity markets and rates of change in input costs produced by FAPRI-MU and associated institutions (FAPRI-MU, 2013) and simulated using the Farm Level Income and Policy Simulation (FLIPSIM) model (Richardson and Nixon, 1986). 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 six-year projection (Richardson *et al*., 2013). 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. If panelists determine that the financial results are not valid, the input data will be revised. This process continues until the panel judges that the Representative Farm has been correctly constructed.

Description and Characteristics of Texas Representative Farms

The two Moore County Texas feed grain and oilseed farms are located near Dumas, Texas, in the panhandle of Texas. Figure 1 shows the geographic location of this tandem of representative farms along with the other representative farms included in this project. Original development of these representative farms occurred over 20 years ago; some original participants and relatives of those participants are still cooperating with the AFPC representative farm project. These farms were originally established as irrigated feedgrain operations. Although the typical cropmix for farms in this area has evolved over time, these farms are still predominantly irrigated feedgrain farms, with a heavy focus on growing high input, high yielding corn.

As of our most recent update in January 2013, the moderate-sized farm (TXNP3000) plants 2400 acres of irrigated crops (80%), 300 acres of non-irrigated crops (10%), and leaves the remaining 300 acres fallow (10%) each year. The irrigated crops consist of 960 acres of corn, 720 acres of wheat, 240 acres of sorghum, and 480 acres of cotton while the non-irrigated crops consist of 150 acres of cotton and 150 acres of wheat. AFPC simulations of the representative farm financial performance, based on aggregate market data from the FAPRI December 2013 baseline, suggest that this farm generated 54 percent of its receipts from corn, 11 percent from grain sorghum, 21 percent from cotton, and 14 percent from wheat.

The large-sized Texas feed grain and oilseed farm (TXNP10000) plants 8,000 acres of irrigated crops (80%), 1,200 acres of non-irrigated crops (12%), and leaves the remaining 800 acres fallow (8%) each year. The irrigated crops consist of 3,200 acres of corn, 3,200 acres of cotton, 800 acres of wheat, and 800 acres of sorghum while the non-irrigated crops consist of 800 acres of cotton, 200 acres of wheat, and 200 acres of sorghum. AFPC simulation results for this farm suggest that it earned 50 percent of its receipts from corn, 13 percent from grain sorghum, 32 percent from cotton, and 5 percent from wheat.

The region of Texas in which these representative farms are found relies on irrigation to produce a crop. If water is available, this area is very productive. However, if water is not available and non-irrigated crops are planted, the likelihood of enough rainfall to produce a crop is rather low. The panel members indicated that rainfall in the area of the two most recent years totaled 5” in 2011 and 9” in 2012. Budgeted yields for irrigated corn are 220 bu/acre for both farms. Irrigated versus non-irrigated budgeted yields for cotton, wheat, and sorghum are very different. Non-irrigated cotton budgeted yields are half or less of irrigated budgeted yields while non-irrigated wheat and sorghum budgeted yields are less than one third of irrigated budgeted yields.

Tillage practices vary across the region by crop and whether it is irrigated or not. Irrigated crops are strip till except for wheat which uses conventional tillage while non-irrigated crops are no-till. Cropland of the region consists of predominantly clay-loam and silty-clay-loam soils. According to the Moore County soil survey, the Sherm Series makes up over 45 percent of all land area in the county. Table 1 identifies median 2012 planting and harvest dates, 2012 yields, common tillage practices, and other farm-specific attributes of the Texas representative farms.

Table 1. Attributes of Texas Representative Feedgrain and Oilseed Farms.

Crop	**Corn**	**Sorghum (for Seed)**	**Wheat**	**Cotton**
Median Planting Date	April 20	May 12	November 1	May 1
Median Harvest Date	October 15	October 1	June 15	October 25
Typical Yield (units/Acre)	220 bu.	*	63 bu.	1000 lbs.
Major Pests	Mites	Head Worms	-	-
Irrigated	Yes	Yes	Yes	Yes
Irrigation Water	28"	24"	13.5"	12"
Tillage Practice	Strip Till	Strip Till	Conventional	Strip Till
Soil Texture	Clay Loam	Clay Loam	Clay Loam	Clay Loam
Crop	**Sorghum (for Grain)**	**Sorghum (for Grain)**	**Wheat**	**Cotton**
Median Planting Date	June 25	June 25	November 1	May 1
Median Harvest Date	December 1	October 1	June 15	December 1
Typical Yield (units/Acre)	107 bu.	30.3 bu.	20 bu.	500 lbs.
Major Pests	Head Worms	-	-	-
Irrigated	Yes	No	No	No
Irrigation Water	12"	-	-	-
Tillage Practice	Strip Till**	Strip Till**	No Till**	No Till**
Soil Texture	Clay Loam	Clay Loam	Clay Loam	Clay Loam

* Harvested for commercial hybrid seed production, so conventional yield not available

** For a description of tillage practices, refer to: http://www.extension.iastate.edu/publications/pm1901c.pdf

Financial Summary

A baseline financial outlook for each of the two Texas feedgrain farms was established using FLIPSIM assuming commodity prices and rates of change for input prices reported in the December 2013 FAPRI Baseline. The farms were simulated 500 iterations using a distribution of possible price and yield combinations, allowing the model to incorporate price and production risk into the analysis. Table 2 includes 2012 asset values for the two farms along with mean projected outcomes for selected financial measures over the 2013-2018 study period. Additionally, Figures 2 and 3 illustrate the historical Net Cash Farm Income (NCFI) for each of the two farms along with a range of projected NCFI outcomes for 2013-2018. Ninety percent of the projected NCFI results fall within the outer two red lines, 50 percent of the results fall between the inner two blue lines, and the mean NCFI is depicted by the black line in the center. The bar graph at the bottom indicates the annual probability of the farm experiencing a cash flow deficit at the end of each projected year.

In addition to detailed financial measures, the Agricultural and Food Policy Center evaluates and scores the overall financial condition of each of its representative farms. Overall financial condition is a composite ranking based on the probability of a farm facing cash flow stress and the probability of a farm's real net worth declining over the course of the study period. Farms are classified as good, marginal, or poor based on these criteria.

TXNP3000 experiences essentially no chance of cash flow stress throughout the projection period. With the chance of negative ending cash ranging from one to three percent throughout the projection period, the farm receives a "good" score with respect to its liquidity measure. Similarly, increasing land values and cash built earlier in the study period when commodity prices are most favorable allow the farm to build wealth throughout the period, thus it receives a "good" ranking with respect to its equity. Taking both measures into account, the farm receives a "good" overall financial ranking.

TXNP10000 is projected to have very low chances of facing cash flow problems throughout the projection period, with a virtually nonexistent chance of a negative ending cash balance by the end of the study period. Much like TXNP3000, the larger farm also is expected to have a minimal chance of losing real net worth by 2018, resulting in a "good" overall financial condition ranking.

Table 2. Financial Characteristics of Texas Representative Feedgrain and Oilseed Farms.

	TXNP3000 --$1,000--	TXNP10000 --$1,000--
Assets, 2012	2,355.0	17,987.0
Receipts, 2013-2018	1,762.2	6,029.5
Payments, 2013-2018	62.2	58.2
NCFI, 2013-2018	247.0	1,891.1
Cash Reserves, 2018	1,004.7	10,765.2
Nominal Net Worth, 2018	3,029.5	25,709.2

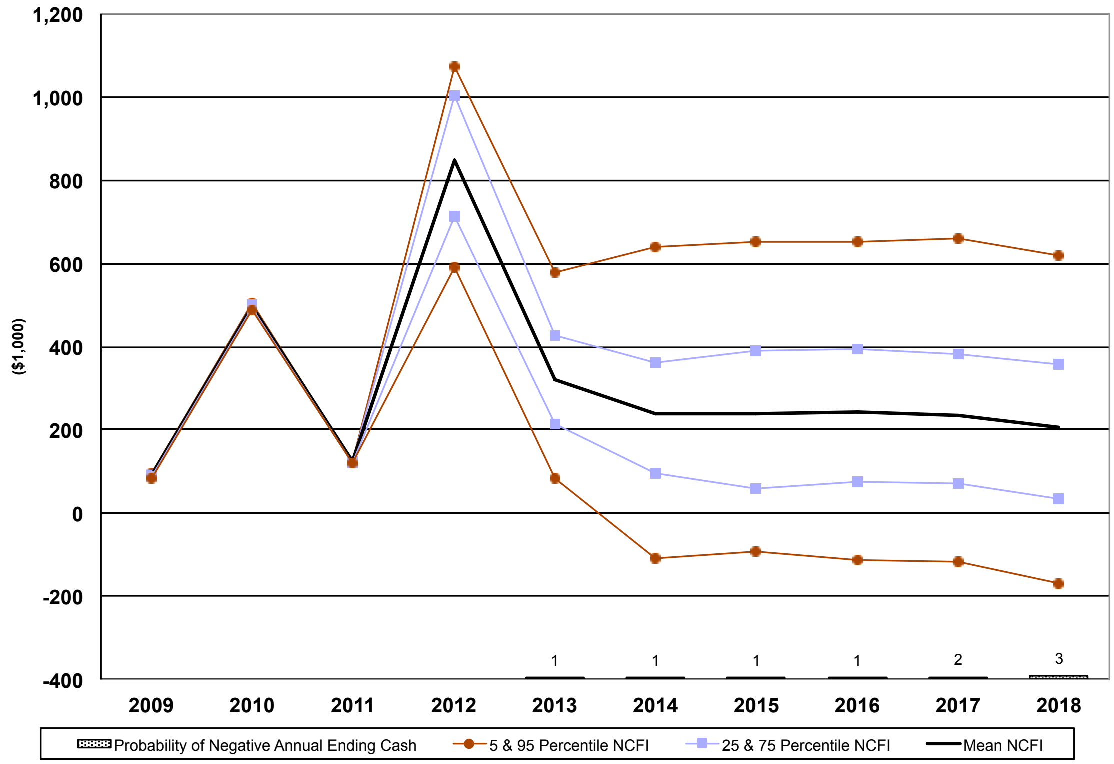

Figure 2. Net Cash Farm Income and Probabilities of Negative Ending Cash for TXNP3000, 2009-2018.

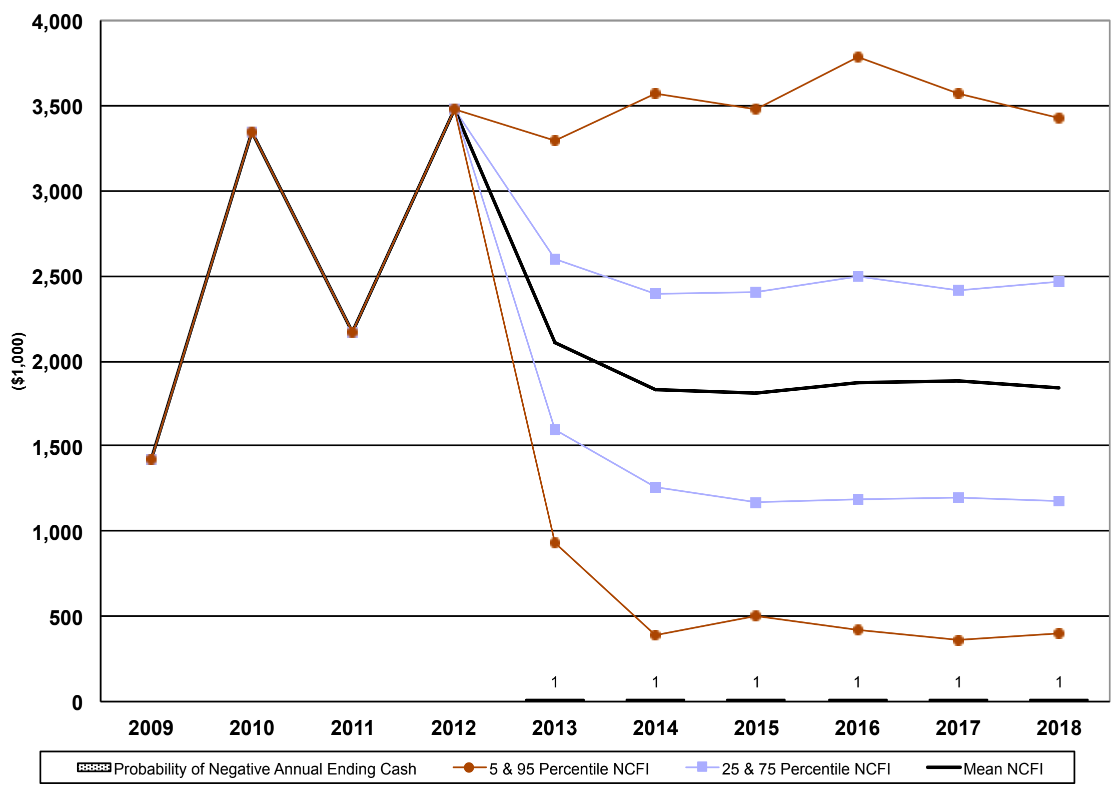

Figure 3. Net Cash Farm Income and Probabilities of Negative Ending Cash for TXNP10000, 2009-2018.

Attitudes toward Climate Change

One of the objectives of this project is to discuss climate change and how it may be impacting their operation now and into the future. In general, the panel members agreed the climate is changing. With that being said, they do not believe man is causing it, that it is caused by natural things such as volcanoes.

While they agreed the climate was changing, they were not spending time thinking about it or worrying about it. Since they deal with it yearly, they do not plan for it longer term. Instead, they deal with it and prepare for it as best than can on a year to year basis.

These two groups have faced severe drought of the last two years (2011 & 2012). In a normal year, the area receives approximately 17" of rainfall while they received approximately 5" in 2011 and 9" in 2012. In some cases, a large percentage of their rainfall comes in one or two events. Other issues these producers have to deal with are excessive heat and wind. It was mentioned that they could deal with the excessive heat if they did not have the wind to deal with. In 2011, they had excessive heat, wind and lack of rainfall all in one growing season and this was devastating to their operations.

Climate Change Adaptation

These two groups, like the groups in Nebraska that we met with in 2013 for this project, have experienced severe drought in the last several years. The panel members noted that they have been adapting to changes in weather as it happens to them in recent years. This lack of rainfall has resulted in the panel members looking for ways to adapt their operations to the current climate. Through advances in technology, the producers have been successful during these difficult times. They have changed tillage practices, implementing no-till and reduced tillage practices. They have also increased the use of irrigation, working with extension personal to decrease the amount of evaporation by placing the sprinkler heads closer to the ground as well as using different sprinkler heads. They have also started to use variable rate application technology to reduce waste in applying fertilizer and chemicals.

Conclusions and future areas of the study

The first phase of the project focused on producers' attitudes and opinions on climate change. In general, the Texas group's thoughts on climate change are evolving as pointed out earlier in the paper. Additionally, vital production information was gathered. This information will be used to feed climate and economic models to forecast specific regional climate change impacts and to simulate agricultural commodity market impacts.

Future project work

The information obtained at this initial meeting will be transferred into climate models which will produce regional climate impacts. These impacts will be translated into crop yield and price ranges. Results will be of particular interest as farmers who have not had climate change impacts communicated to them in terms of yield and price impacts that speak directly to their bottom lines. Our project team will disseminate these findings at the next representative farm update in Texas planned for 2015.

A Final Note

Results of our study will help farmers understand what climate change means for them. In the areas with Representative Farms, project reports will disseminate specific estimates and list adaptation strategies real farmers have identified. For farmers in other regions, the scale of impacts and the nature of adaptation options will inform decision making by alerting them to the ranges of possible outcomes, including the impacts on risk, and help them to assess the priority of developing adaptation strategies.

Our project, the first to exploit climate research findings and link them through yield and market effects to an existing extension network to deliver climate impacts to farmers, will be a step towards identifying and moving toward a sustainable adaptation to climate change. Moreover, by delivering results to farmers and policy makers, as well as academic audiences, investment and policy decisions will be better informed, helping the US agriculture and food sector to be sustainable in the context of new climate conditions.

References

FAPRI-MU. *U.S. Baseline Briefing Book*. Columbia, MO: Food and Agricultural Policy Research Institute, University of Missouri-Columbia, FAPRI-MU Report #01-13, March 8, 2013.

Resources Conservation Practices: Consider the Strip-Tillage Alternative. Ames, IA: Iowa State University Extension, PM 1901c, May 2008.

Richardson, James W. and Clair J. Nixon. *Description of FLIPSIM V: A General Firm Level Policy Simulation Model*. College Station, TX: Texas Agricultural Experiment Station, Bulletin B-1528, July 1986.

Richardson, James W., Joe L. Outlaw, George M. Knapek, J. Marc Raulston, Brian K. Herbst, David P. Anderson, Henry L. Bryant, Steven L. Klose, and Peter Zimmel. *Representative Farms Economic Outlook for the December 2013 FAPRI/AFPC Baseline*. College Station, TX: Agricultural and Food Policy Center, Department of Agricultural Economics, AFPC Working Paper 13-4, December 2013.