Gardner Farm Income and Policy Simulator

University of Illinois at Urbana-Champaign
Gardner Agricultural Policy Program

Documentation Report on Model and Case Farms

February 2018
Krista Swanson, Patrick Kelly, Gary Schnitkey, Jonathan Coppess, and Nick Paulson

I. INTRODUCTION AND MODEL OVERVIEW

Risk permeates agriculture, impacting decisions on the farm, at the bank and by policymakers. With volatile crop prices, uncertain yields and myriad sunk costs, evaluating farm risk and financial performance in a real-world setting is exceptionally challenging; rare is analysis that compares financial health across actual farms with an eye toward the influence of policy on farm management. As part of its mission, the Gardner Agricultural Policy Program at the University of Illinois has undertaken a comprehensive and complex effort to provide that capability with particular relevance during the current period of relatively low prices, as well as in advance of Congressional efforts to reauthorize federal farm policy.

The Gardner Farm Income and Policy Simulator (GFIPS) is designed to analyze farm financial scenarios for benchmarking, as well as farm-level financial health and risk analysis. It is also designed to measure the impact of policy scenarios on actual Illinois grain farm financial health. As a benchmark, GFIPS can assist farmers with real-world farm financial management. As a policy simulator, GFIPS can assist farmers in better understanding the impacts and value of various farm policies as well as inform policymakers about the potential impacts of the policies they are considering and debating.

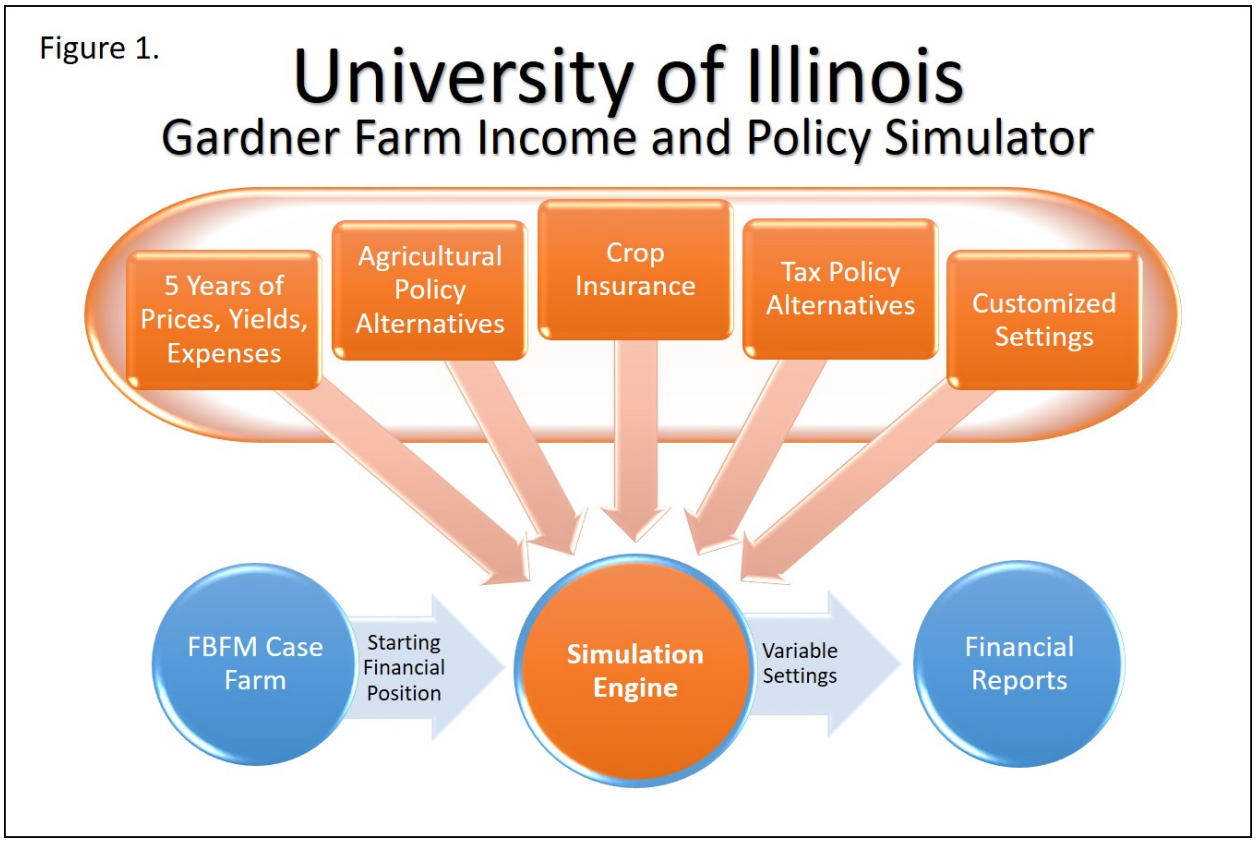
GFIPS works through a detailed model that closely represents grain farms of a specific size in one of four Illinois regional and productivity groups. The model utilizes actual data sourced from the Illinois Farm Business Farm Management Association (FBFM) to create case farms that provide real-world perspective to the analysis. It also uses data from the USDA National Agricultural Statistics Service (NASS), and the *farmdoc* Revenue and Costs publications to develop scenarios for farm financial evaluation.

A key component of GFIPS is that the model generates a set of financial statements over a five-year projection period. The financial statements include a balance sheet, income statement, cash flow, and capital repayment capacities. The financial statements can be used to evaluate financial health, risk and performance over a five-year projection period. It looks to specific measurements of financial health risk, such as income and expenses, cash flows, repayment capacity, balance sheets and financial ratios.

Figure 1 illustrates the three major elements of the GFIPS model: data input for the FBFM Case Farm; data output in the form of financial reports; and the processing module, Simulation

Engine. Figure 1 also provides a visualization of the major components that feed into the Simulation Engine.

Figure 1.



The GFIPS projected financial reports are dependent not only on the starting financial position of the FBFM case farm used as input data, but also the simulation engine settings. When results are evaluated, it is important to consider what simulation engine variables are selected. To maintain consistent presentation of output for a given set of projection period prices, yields and other simulation engine inputs, the financial results for each case farm example has been narrowed to Net Worth and three key ratios that are telling to the financial health of a farm: current ratio, a measure of liquidity; debt to asset ratio, a measure of solvency; and debt coverage ratio, a measure of capacity. A colored scale is used to represent an acceptable range (green), a questionable range (yellow), and the warning zone (red), a range that would be expected to raise concerns with lenders.

The table summarizes the analysis for the three case farm examples discussed in this report. Each is representative of average actual farms in the three different regions of Illinois, *Northern 1*, *Central High 1,* and *Southern 1*. This summary analysis demonstrates the comparative financial health of the case farms, as well as provides indications of financial risk; challenges that progressively increase over the five-year projection period. This analysis can help inform farmers and lenders, as well as policymakers looking to adjust or revise current federal support systems and programs.

University of Illinois
Gardner Farm Income & Policy Simulator

Northern 1	Base Year 2016	2017	2018	2019	2020	2021
Corn Price/Yield (bu/acre)	$3.35 / 223	$3.25 / 215	$3.30 / 202	$3.35 / 201	$3.35 / 203	$3.40 / 204
Soybean Price/Yield (bu/acre)	$9.50 / 69	$9.30 / 65	$9.30 / 64	$9.45 / 60	$9.45 / 60	$9.50 / 61
Net Farm Income	$37,295	-$18,379	-$52,354	-$79,406	-$81,563	-$73,487
Net Worth (Millions)	$4.63	$4.6	$4.47	$4.31	$4.15	$4.
Current Ratio	1.55	1.51	1.37	1.19	1.05	0.94
Debt/Asset Ratio	31.5%	31.7%	34.2%	37.4%	40.7%	43.8%
Debt Coverage Ratio	133.8%	78.2%	47.4%	26.2%	25.2%	31.0%

University of Illinois
Gardner Farm Income & Policy Simulator

Central High 1	Base Year 2016	2017	2018	2019	2020	2021
Corn Price/Yield (bu/acre)	$3.35 / 228	$3.30 / 215	$3.30 / 210	$3.35 / 201	$3.35 / 203	$3.40 / 205
Soybean Price/Yield (bu/acre)	$9.50 / 69	$9.35 / 67	$9.30 / 63	$9.45 / 61	$9.45 / 61	$9.50 / 62
Net Farm Income	$77,892	$57,459	$4,226	-$17,600	-$13,329	-$3,041
Net Worth (Millions)	$3.76	$3.76	$3.71	$3.63	$3.55	$3.47
Current Ratio	1.78	1.76	1.72	1.55	1.35	1.19
Debt/Asset Ratio	26.9%	26.9%	27.6%	29.0%	31.5%	33.8%
Debt Coverage Ratio	151.4%	111.3%	66.2%	46.9%	49.0%	55.1%

University of Illinois
Gardner Farm Income & Policy Simulator

Southern 1	Base Year 2016	2017	2018	2019	2020	2021
Corn Price/Yield (bu/acre)	$3.35 / 163	$3.35 / 160	$3.30 / 165	$3.35 / 161	$3.35 / 162	$3.40 / 164
Soybean Price/Yield (bu/acre)	$9.50 / 56	$9.40 / 54	$9.30 / 50	$9.45 / 52	$9.45 / 52	$9.50 / 53
Net Farm Income	-$80,445	-$127,600	-$141,738	-$140,756	-$144,551	-$141,190
Net Worth (Millions)	$3.74	$3.73	$3.54	$3.34	$3.15	$2.96
Current Ratio	1.20	0.97	0.81	0.69	0.59	0.52
Debt/Asset Ratio	30.1%	30.6%	35.0%	39.3%	43.7%	47.9%
Debt Coverage Ratio	83.5%	-19.2%	-37.4%	-31.3%	-30.7%	-24.7%

II. BACKGROUND ON THE CASE FARM AND SIMULATION ENGINE

The simulation engine of GFIPS is a Microsoft Excel based economic and financial model driven by numerous options and inputs to simulate actual farm financial responses under specific scenarios. It provides five years of financial statements that can be used for financial benchmarking, as well as to evaluate financial performance and risk over the projection period. To simulate actual performance, GFIPS operates through case farms that are designed with actual farm data provided by the Illinois Farm Business Farm Management Association (FBFM). In addition to benchmarking and financial performance, the tool can be used to evaluate the implications of changes to current policies for farm income and financial health.

A. Case Farm Development

FBFM is a cooperative educational-service program that provides services to help farmers maintain farm business records and make management decisions. Farmers work with their local FBFM representative on a regular basis to discuss farm business and for tax services. FBFM data is collected throughout the state and compiled annually. It is made available to the University of Illinois for research purposes. It is a very thorough dataset that has consistently proven to provide an accurate representation of farms in Illinois.

GFIPS creates a case farm using the certified data from grain farms participating in the FBFM program. The case farms are designed to be representative of actual Illinois grain farms of a specific size in a specific location. The FBFM dataset is not extensive enough in all counties to create county-specific case farms, however, case farms are created on a regional basis. The model is designed to represent cash grain farms growing any combination of corn, soybeans and wheat crops.

The raw FBFM data is averaged by region and farm size to create a case farm. The farm size groups range from less than 500 acres, to greater than 2,500 acres, in 500 acre increments. A seventh option for farm size is also available to include all farms in the region regardless of size. The averaged data includes total acres farmed, acres by crop, land ownership and tenure, as well as the farm and non-farm related financial data. The only exception to this is family living expenses, calculated using FBFM data averaged on region and family size, a more accurate indicator for cost of living than farm size. This information is used to create the case farm's balance sheet and income statement for the base year. Users may use the default FBFM data or overwrite as needed for specific analysis or comparison.

Specifically, the farm level data is divided into four regional groups and six farm size groups. The four regional groups are assigned using a combination of county geographical location and Soil Productivity Rating (SPR) to produce North, Central High (Productivity), Central Low (Productivity), and South. SPR is a measure of the inherent productivity of the land. Using the FBFM scale, 100 is the highest rating, representing the most productive farmland. Counties in the central region are divided into a high productivity group (SPR $\geq$ 86) and a low productivity group (SPR $<$ 86); SPR is also used to distinguish some borders between central and southern region following the same methodology of regional assignment FBFM uses in their reporting.

B. The Simulation Engine and Model

The simulation engine is the working element of the model. It simulates financial performance for the select case farm built from actual FBFM farm. The GFIPS simulation engine develops a specific scenario that includes future prices, yields, and expenses, as well as factors that shape the policy and economic environment the case farm will face. These settings dictate how the case farm is expected to operate over the projection period which is reported to the user through a simulated set of financial statements. The set of financial reports includes a statement of income and expenses for the farm, statement of cash flow, projected capital repayment capacity, balance sheet summary, and important ratios for financial analysis. These projections permit detailed evaluation of financial performance, health and risk of the case farm annually throughout the projection period. Financial reports are the critical output of the simulation engine because they provide important indicators of financial health or stress.

5 Years of Prices, Yields, Expenses

GFIPS uses the price, yield, cash rental rate, and expenses (except interest, crop insurance premium, and property taxes) from the *farmdoc* Revenue and Cost projections for the base year. For the projection period the user can select price, yield, and expense settings. The default for expenses is the specified annual percent changes to the prior year value for each expense. Alternatively, the user can select the expenses from the *farmdoc* Revenue and Cost data for any years in which they are available. The default for prices are the projected prices from the Food and Agricultural Policy Research Institute (FAPRI) Baseline Outlook, the Congressional Budget Office, or the USDA Office of the Chief Economist Long-term Projections. Alternatively, the user can select prices from the *farmdoc* Revenue and Cost data for any years in which they are available. The default for yields is a yield estimation as a function of historical values in a formula that considers both NASS and FBFM data by county. Alternatively, the user can select yields from the *farmdoc* Revenue and Cost data for any years in which they are available.

If *farmdoc* Revenue and Cost data has been entered into the model the user may select use of just expenses, just prices and yields, or all pieces of data for any years in which this information is available. If the option to use *farmdoc* Revenue and Cost data is selected, the method for price, yield, and expenses will automatically go back to the default method once a year is reached in which the *farmdoc* Revenue and Cost information is no longer available.

Agriculture Policy Alternatives

The agriculture policy alternatives are those included in the Agricultural Act of 2014 (the 2014 Farm Bill). Farmers elected to enroll decoupled base acres, determined by historic planting records with the United States Department of Agriculture (USDA), in either the Price Loss Coverage (PLC) program or the Agriculture Risk Coverage (ARC) program. PLC uses reference prices fixed in statute to trigger deficiency payments when marketing year average prices are below the reference; ARC uses benchmark revenue calculations (five-year Olympic averages of marketing year average prices and average yields) to trigger payments when actual crop year revenues are below 86% of the benchmark.

In addition to ARC and PLC, farmers have the option to purchase subsidized crop insurance to cover revenue or yield risk within the crop year. Unlike ARC and PLC, crop insurance applies to the actual crop grown and does not protect against multi-year price or yield declines. Crop insurance is purchased by the farmer with the premium discounted by the Federal Crop Insurance Corporation (FCIC) pursuant to a statutory schedule. Farmers generally have the option of purchasing revenue-based crop insurance up to 85% of the historic (Actual Production History, APH) yields and projected or harvest prices determined by futures markets. In addition to individual insurance policies, farmers who are not enrolled in the ARC program may purchase Supplemental Coverage Option (SCO) insurance which provides an area-wide (county) policy that can be stacked on top of the individual policy beginning at the individual buy-up level.

Users select ARC Individual Coverage (ARC-IC), ARC County (ARC-CO), PLC with SCO Option, or PLC without SCO option. The payments for these options are calculated using actual formulas. Besides ARC Individual, which covers the sum of all eligible crop commodities on the farm, the model allows the user to select a different program for each crop, if desired. The model is built upon the assumption that the total acres are part of a single FSA farm, so the model does not offer the ability to change program selections for only a portion of acres for a single crop.

Title 1 government program payments are made on 85% of the certified base acres for the farm. Base acres are a historical record of crop acres on specific parcel of land and remain unchanged over the life of the 2014 Farm Bill, and therefore, do not necessarily align with planted acres in a given year. The user enters base acres as a percent by crop and the acres are split accordingly across the farm. The simulation engine calculates estimated payments throughout the projection period using the actual government calculation and the same projected farm prices and yields as used to calculate projected revenue.

When a payment is triggered for a given year, the payment is made in the following year. The estimated payments are displayed in the year in which they are triggered, rather than the year received. Accounting for receivables is standard practice and aligns with the assumption that yields are for the crop in the year stated and prices are for the marketing year that follows the crop produced. Further, this provides a consistent view of profitability for each individual crop year and adheres to the accrual method in which FBFM financial statements are tabulated. Finally, this component can be modified to analyze proposed agriculture policy alternatives.

Crop Insurance

For crop insurance, the user selects individual or county coverage products, revenue or yield-based products, coverage level, and protection factor or unit type, depending on the type of coverage selected. These selections are used to determine crop insurance premium expenses and predict potential for a crop insurance indemnity payment based on forecasted prices and yields. If indemnities are estimated for a crop year, the magnitude of the payment for each crop will be included in the simulation. When a payment is triggered for a given year, the amount may be paid out during the crop year or in the following year, depending on the policy selection and when a farmer meets with an adjuster. The estimated payments are displayed in the year in which they are triggered, regardless of the year received. As with agricultural payments, this

provides a consistent accrual view for each individual crop year that adheres to the accrual method in which FBFM financial statements are tabulated.

Premium expenses are pulled from the *farmdoc* Crop Insurance Decision Tool. Model indemnity payments are calculated using the actual insurance formulas at the coverage level selected. Expected county yields are based upon NASS data. Base price and harvest price are known values from the USDA Risk Management Agency (RMA) for the base year and year one of the projection period (base only). Future prices are determined by the model user, for the case farm the model is set to carry the last known RMA price, the year one base price, through the rest of the projection period. Projected farm prices and yields used for crop insurance are the same as the projected farm prices and yields used to calculate revenue.

Tax Policy Alternatives

A simplified version of a tax return has been built into the tax policy alternatives component of the simulation engine. A sample Form 1040 U.S. Individual Income Tax Return includes the necessary data for calculating taxable income. Adjusted Gross Income is the calculated sum of wages, taxable interest, business income (loss) from Schedule C, capital gain (loss) from Schedule D, and farm income (loss) from Schedule F, less the deductible portion of self-employment taxes. The standard deduction and exemption values are subtracted from Adjusted Gross Income to arrive at Taxable Income. Filing status and personal exemptions are adjustable settings in the model.

GFIPS calculates Federal income tax using known tax tables for years those are available. Future years are calculated on a specified annual percent change beginning with the most recent known year. All farm income and expense are pulled in to calculate the actual value that would appear on a Schedule F. The non-farm business income from averaged FBFM data is neither wages nor farm income; it is assumed to be a net Business Income value that would be returned by input on a Schedule C. The Schedule SE self-employment tax income includes this amount along with the net income (loss) from Schedule F when calculating total self-employment tax. Self-employment tax is calculated following the same methodology as a Schedule SE. State income tax is calculated using a similar process. The actual flat income tax rate for Illinois is applied to Illinois Taxable Income. This component can be modified to analyze changes to tax policy.

Customized Settings

The default settings for the GFIPS case farm include a bank balance and operating/short term principal balance that changes with the net change in cash balance. If net change in cash is negative, the amount is subtracted from bank balance. If bank balance reaches $0, the amount needed to cover costs is drawn from an operating loan. If bank balance is positive and net change in cash is positive, it is used to pay down the operating/short-term liability balance.

The case farm provides the starting balance for intermediate-term and long-term liabilities. Throughout the projection period, intermediate-term liability is calculated with an annual principal payment as one-seventh of the beginning of the year intermediate term liability balance.

The ending balance is calculated on prior year-end intermediate-term liability balance, less principal payment made during the year, plus the portion of intermediate-term capital purchases financed in the year. For long-term liability, the simulation engine calculates an annual principal payment as one-fifteenth of the beginning of the year long term liability balance. Long-term liability ending balance is calculated on prior year-end long-term liability balance, less principal payment made during the year, plus the portion of long-term capital purchases finances in the year.

The default setting uses the straight line depreciation method for calculating depreciation. The salvage value is assumed to be 5% of the prior year end balance for the asset category. The useful life for machinery and equipment assets is set at ten years and the useful life for buildings and improvements is set at twenty years. Machinery depreciation is computed by dividing 95% of the prior year-end asset value for machinery and equipment by ten. Building depreciation is computed by dividing 95% of the prior year-end asset value for buildings and improvements by twenty. The user has the ability to override default settings as needed for targeted analysis.

GFIPS permits users to further customize settings for simulation and analysis. For example, a user may adjust the acres for each crop or total acres to account for variation in acres by crop or fluctuation in total acres farmed. Non-farm income and expense factors like family living and off-farm income may be adjusted; this includes individual selections for wages, taxable interest, and non-farm business income. The customized settings will alter how the case farm will operate and change over the five-year projection period. For all customized settings with potential for annual changes, such changes may be applied as a flat rate across all line items in a group or each individual line item; and changes may be applied across all years, only specific years, or different amounts by year. The following is a list of additional customized settings:

- maintain total size and crop allocation over the projection period or revise total acres and acres in each crop by year;

- alter cash rental rates and apply percent changes by year to expense costs and interest rates;

- adjust share lease agreements for owner's share of revenue, government payments, and individual expenses;

- select the rate at which capital purchases change from year to year, the portion of capital purchases paid with cash versus the percent financed and how new capital purchases are allocated between machinery, building/improvements, and land;

- revise property tax by applying an annual percent change, if desired, over the projection period.

III. GFIPS SIMULATION USING EXAMPLE CASE FARM

To demonstrate the capabilities of GFIPS, the following is an example analysis on case farms selected from the Northern, Central High, and Southern regions. The case farms created for this analysis are referred to by the following names, respectively: *Northern 1*, *Central High 1*, and *Southern 1*. *Northern 1* is located in DeKalb County, *Central High 1* in McLean County and *Southern 1* in Effingham County. The case farms were created using the most recent FBFM data available, as of 2016 year-end. The base year for the case farm is 2016 and the five-year projection period spans from 2017 through 2021.

The base year information is compiled using averaged FBFM data of certified grain farms located in the respective region and farming between 1,501-2,000 acres, resulting in a representative example of the actual farms in the region and farm size group. The 1,501-2,000-acre farm size group was selected for all three case farms and, specifically, all are simulated at 1,700 acres, rounded from FBFM data averages (1,724.24 for *Northern 1*; 1,714.76 for *Central High 1*; 1718.62 for *Southern 1*) for the selected regional and farm size group. The user has the ability to overwrite the acres for the base year in the simulation with a manual selection.

All of the farms are simulated growing corn and soybean on an annual rotation with fifty percent of acres planted to each crop, each year. In addition to providing basic farm information, the averaged FBFM dataset includes all of the components that would appear on a balance sheet and income statement. The FBFM data for the three case farms was retrieved at 2016 year-end; each averaged dataset serves as the respective financial position as of 2016 year-end and also the starting point for the projection period, beginning in 2017.

The next step is setting simulation engine inputs. The customized settings within the simulation engine impact how the three case farms will operate and change over the five-year projection period. Specifically, *Northern 1, Central High 1, and Southern 1* remain at 1,700 acres over the five-year projection period and will maintain an even (50-50) crop rotation between corn and soybeans; no changes are applied to total acres or number of acres in each year.

Land tenure type is allocated on the same ratio as the FBFM averages for the region and farm size group selected in each case. The following table shows the divide of acres between applicable tenure types for each case farm. A portion of the land on each case farm is on a share lease agreement in which the owner of the land receives 50% of total revenue, pays 50% of direct expenses, and pays 100% of property taxes. Each case farm tenant received 50% of total revenue and is responsible for all other expenses.

Case Farm Land Tenure Allocation

	Northern 1	Central High 1	Southern 1
Owned	18.4%	11.4%	20.2%
Cash Rent Lease	66.1%	44.7%	41.7%
Share Rent Lease	15.4%	44.0%	38.1%

All three case farms are simulated with capital purchases increasing from the base year amount by 1% annually over the projection period. Capital purchases made during the projection period

are paid 20% with cash and the remaining 80% financed; none of the case farms make any new land purchases during the projection period. New capital purchases are allocated to machinery/equipment (intermediate-term asset) and to building/improvements (long-term asset), maintaining the same ratio of the two asset types as on the base year balance sheet. The following chart shows the percent allocation for each case farm.

Case Farm Allocation of Capital Purchases

	Northern 1	Central High 1	Southern 1
Machinery/Equipment	80.2%	90.8%	80.1%
Building/Improvements	19.8%	9.2%	19.9%

Interest for the case farms is calculated at 5% on current liabilities in the base year and throughout the projection period. Intermediate liabilities are charged a 4% interest rate in the base year and throughout the projection period. The case farms owe 4.5% interest on long-term liabilities in the base year and 5% annually over the projection period. These interest values are estimated using information in the Chicago Federal Reserve Ag Letter, any known values are rounded to the nearest fifty basis points.

Property taxes for all three case farms are calculated with a 1% annual increase from the base year amount.

Non-farm income for the three case farms is calculated assuming an annual 1% increase from the base year for each of the three components: wages, taxable interest, and non-farm business income. Non-farm expenses grouped as family living also experience a 1% annual increase from the base year.

For the simulation, prices, yields, cash rental rate, and expenses (except interest, property taxes, depreciation, and crop insurance premium) for the case farm examples were retrieved from the *farmdoc* Revenue and Cost projections for all years available, specifically the 2016 base year, and 2017 and 2018, the first two years of the projection period. Beginning with 2019, year three of the projection period, all farm expenses are carried from the prior year with a specified change applied. For the three case farm examples, a 0% change is expected, and therefore, the 2018 expense levels remain flat over the remainder of the projection period.

Prices and yields continue to change throughout the projection period. For the last three years of the projection period, prices for the three case farms are expected to align with the USDA Office of the Chief Economist Long-Term Outlook. Projected yields in years three through five are estimated using the default yield estimation function. Acreage, yields, prices and net revenue for each of the case farms are included in the following set of tables.

Northern 1	Base Year 2016	Year 1 2017	Year 2 2018	Year 3 2019	Year 4 2020	Year 5 2021
Corn Acres	850	850	850	850	850	850
Yield/Acre	223	215	202	201	203	204
Cash Price ($/bu.)	$3.35	$3.25	$3.30	$3.35	$3.35	$3.40
Soybean Acres	850	850	850	850	850	850
Yield/Acre	69	65	64	60	60	61
Cash Price ($/bu.)	$9.50	$9.30	$9.30	$9.45	$9.45	$9.50
Net Revenue ($/acre)	$22	-$11	-$31	-$47	-$48	-$43

Central High 1	Base Year 2016	Year 1 2017	Year 2 2018	Year 3 2019	Year 4 2020	Year 5 2021
Corn Acres	850	850	850	850	850	850
Yield/Acre	228	215	210	201	203	205
Cash Price ($/bu.)	$3.35	$3.30	$3.30	$3.35	$3.35	$3.40
Soybean Acres	850	850	850	850	850	850
Yield/Acre	69	67	63	61	61	62
Cash Price ($/bu.)	$9.50	$9.35	$9.30	$9.45	$9.45	$9.50
Net Revenue ($/acre)	$46	$34	$2	-$10	-$8	-$2

Southern 1	Base Year 2016	Year 1 2017	Year 2 2018	Year 3 2019	Year 4 2020	Year 5 2021
Corn Acres	850	850	850	850	850	850
Yield/Acre	163	160	165	161	162	164
Cash Price ($/bu.)	$3.35	$3.35	$3.30	$3.35	$3.35	$3.40
Soybean Acres	850	850	850	850	850	850
Yield/Acre	56	54	50	52	52	53
Cash Price ($/bu.)	$9.50	$9.40	$9.30	$9.45	$9.45	$9.50
Net Revenue ($/acre)	-$47	-$75	-$83	-$83	-$85	-$83

All three case farms are enrolled in ARC-CO for both corn and soybeans. Base corn acres are 850 and base soybean acres are 850.

All three case farms purchase an individual revenue protection crop insurance policy at the 80% coverage level, with enterprise units on both corn and soybeans. With individual coverage, protection factor is not used. Using these selections and county farm location, the crop insurance premium was pulled from the *farmdoc* Crop Insurance Decision Tool for base year 2016 and projection year one, 2017. The tool is not available for later years in the projection period. The annual change for crop insurance premium is set at 0% for *Central High 1*, so the premium amount will remain unchanged for years two through five of the projection period.

The income and social security taxes for all three case farms are calculated following the same methodology as a standard tax return. The taxpayer for all three case farms is married filing jointly and claims four exemptions. The actual federal tax tables are used for 2016, 2017, and 2018; years three through five are calculated assuming the tax rates stay the same as 2018, but the income cut-off value for each tax bracket increases by 1% annually. Beginning in 2018, federal income tax is calculated with anticipated changes as a result of the tax legislation signed into law in December of 2017. At the state level the actual flat income tax rate of 3.75% is applied to Illinois Taxable Income for the 2016 base year. The flat tax rate for Illinois changed from 3.75% to 4.95% midyear in 2017, so half of Illinois Taxable Income is calculated at each rate in 2017, year one of the projection period. The tax rate is assumed to remain flat at 4.95% over the remainder of the projection period.

Financial Reports & Analysis

Given projected prices, yields, and expenses, paired with the selected set of simulation engine settings, GFIPS simulates five years of financial statements for *Northern 1*, *Central High 1*, and *Southern 1*. The financial statements can be used to analyze the future financial position of each of the three case farms under the specified set of conditions.

The complete set of financial statements is summarized in a review of measures of financial performance. The first step in the analysis identifies measures of income. Net farm income represents gross farm income less total farm expenses, including land costs. The *farmdoc* Revenue and Costs publication assumes all land costs at a cash rented level, which is generally costlier for the farmer than a share lease arrangement or ownership. Operator and land return is another measure of net income, representing the result of gross farm income less and total farm expense, except land costs. Operator and land return is valuable in providing a more uniform comparison that is not skewed by tenure type. Both measures of income consider the case farm's income and expenses associated with growing a crop in a given year, but not additional financial demands. All three of the case farm examples have loan payments for farm related capital purchases in years past, family living, and self-employment taxes and income taxes. In addition to farm income, all three case farm examples have supplemental income from multiple sources, including off-the-farm wages and non-farm business.

The next step in the analysis is to evaluate measures of liquidity. Liquidity is a point in time measurement evaluating current, or liquid assets, with short-term debt and payments due within one year. One method of measuring liquidity is the current ratio, current assets divided by current liabilities. There are other measures of liquidity that may be used, such as evaluating working capital (current assets minus current liabilities) as a percent of either farm expenses or gross farm income.

Solvency represents the financial stability of the farm over the long-run; gauging the ability of the farm to meet total debt obligations relative to total assets. Solvency can be measured by a ratio of debt to assets. Although the ratio value rises as debt levels increase relative to asset levels, solvency of the farm declines. Solvency is strongest at the lowest debt to asset ratios. Another measure of solvency is the equity to assets ratio. Equity, the numerator in the equity to

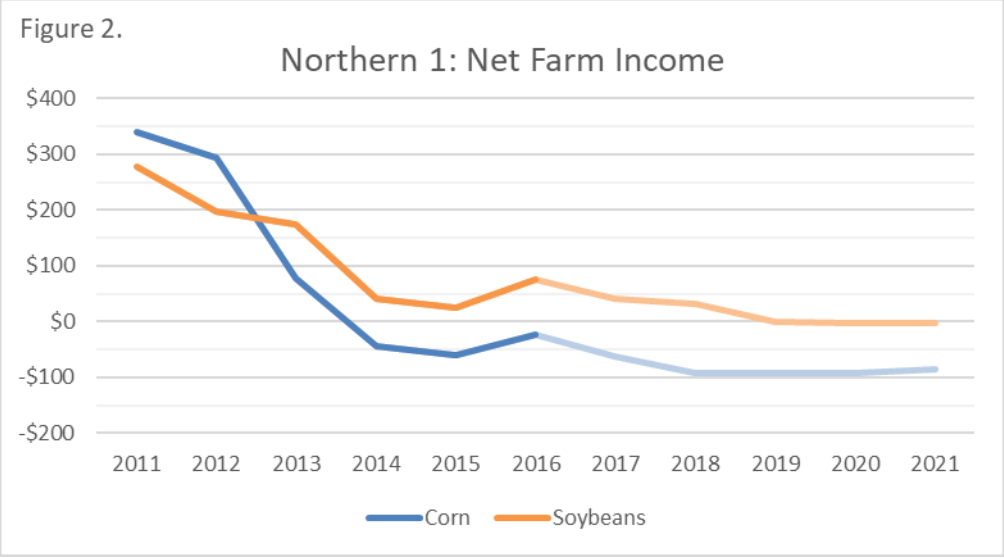
assets ratio, is commonly referred to as "net worth." Net worth is calculated as total assets minus total liabilities, essentially the value of everything owned, less debt owed.

Another financial measure, repayment capacity, is a dollar figure representing the sum of dollars available (to make loan payments) after covering all other expenses and obligations. Repayment capacity is used to evaluate the level of additional debt a farmer can assume. Repayment capacity is calculated as the sum of net farm income, non-farm income, depreciation, and interest on term debt, less taxes owed and family living. To calculate the debt coverage ratio, total repayment capacity is divided by the sum of annual principal and interest payments on term debt (plus annual lease payments, if applicable). A debt coverage ratio of 100% indicates that total capacity available for loan repayment, after covering living expenses and taxes, is equal to existing term debt obligations. The debt to income ratio, another measure of capacity, is a straightforward representation of total annual debt obligations compared to total income, including both farm income and non-farm income. Although the ratio value rises as debt levels increase relative to income, repayment capacity of the farm declines. Repayment capacity is the strongest when debt relative to income is at the lowest level. Although the ratio value rises as debt levels increase relative to asset levels, solvency of the farm declines. Solvency is strongest at the lowest debt to asset ratios.

Northern 1 Results

In 2017, *Northern 1* has a loss of -$62/acre on corn and profits of $40/acre on soybeans. The outlook for 2018 results in a -$93/acre loss for corn and $32/acre profit on soybeans. From 2019 through 2021, the outlook for *Northern 1* remains very poor, with losses of -$84/acre to -$93/acre corn and soybeans losses ranging from -$1/acre to $-3/acre, as shown in Figure 2. Despite positive margins on soybeans in the first two years of the projection period, overall *Northern 1* experiences a net loss on the farm all five years. The historic values for 2011-2016, are from the *farmdoc* Revenue and Costs for Northern Illinois for relative comparison.

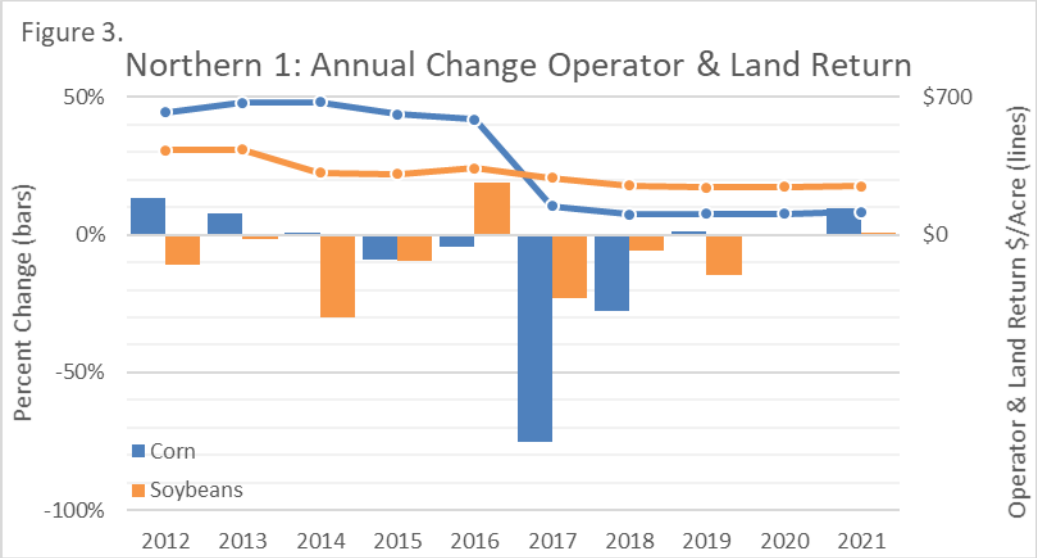
Figure 2.



Operator and land return provides a more uniform comparison between historical values and projected values to evaluate annual change in income. As shown in Figure 3, the magnitude of

the 2017 decline for corn is much larger than prior years and the drop in 2017 marks the third straight year of downward movement for corn and the fourth decline in six years for soybeans. Land costs must remain below $250 for profitability in soybeans and below $150 for profitability in corn from 2018 through 2021.

Figure 3.

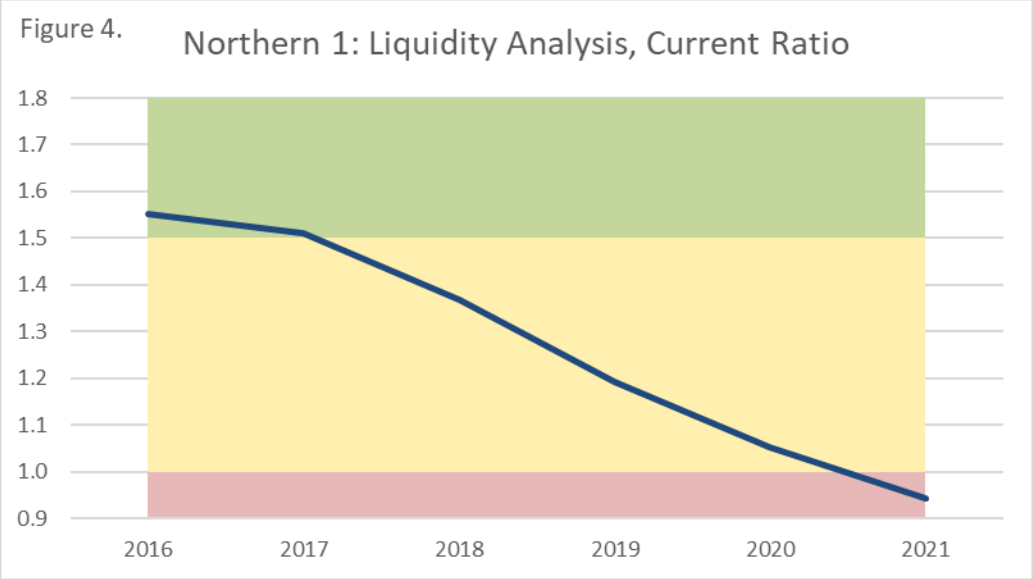


The decline in net farm returns for 2017 is due to a combination of lower prices and a drop in revenue from government payments. Although there is a 2017 ARC-County payment for *Northern 1*, it is lower than the 2016 payment. A large drop in prices pushes grain income down 7.1%. The further decline in farm revenues in 2018 is due to lack of expected payments from crop insurance or ARC-County, as well as continued low prices and trendline yields, as opposed to above trendline yields *Northern* 1 experienced in recent years. Expenses are expected to decline from 2017 to 2018, but not enough to counter the large decline in farm revenue.

With continued pressure on commodity prices, *Northern 1* has a net loss throughout the projection period. Even when paired with off-the-farm earnings, income from all sources is not adequate to meet all necessary uses of funds over the projection period. The balance of *Northern 1*'s operating loan increases annually over the projection period as additional funds are borrowed to cover uses of funds.

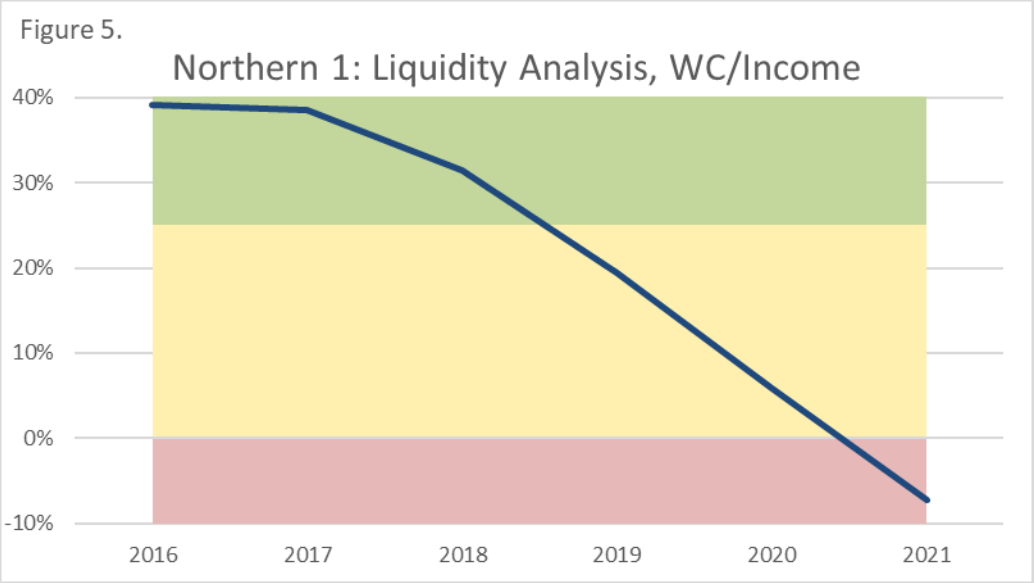
Northern 1 is already showing stress in liquidity at year-end 2016, the starting position for the projection period, with measures of liquidity falling near the weaker end of the level lenders may find acceptable. Weaknesses are apparent beginning in 2018, depending on the measure of liquidity used. As shown in Figure 4, the current ratio drops to 1.37 in 2018, below the 1.50 threshold that lenders may consider as a turning point in quality, and reaches the warning zone in 2021.

Figure 4.

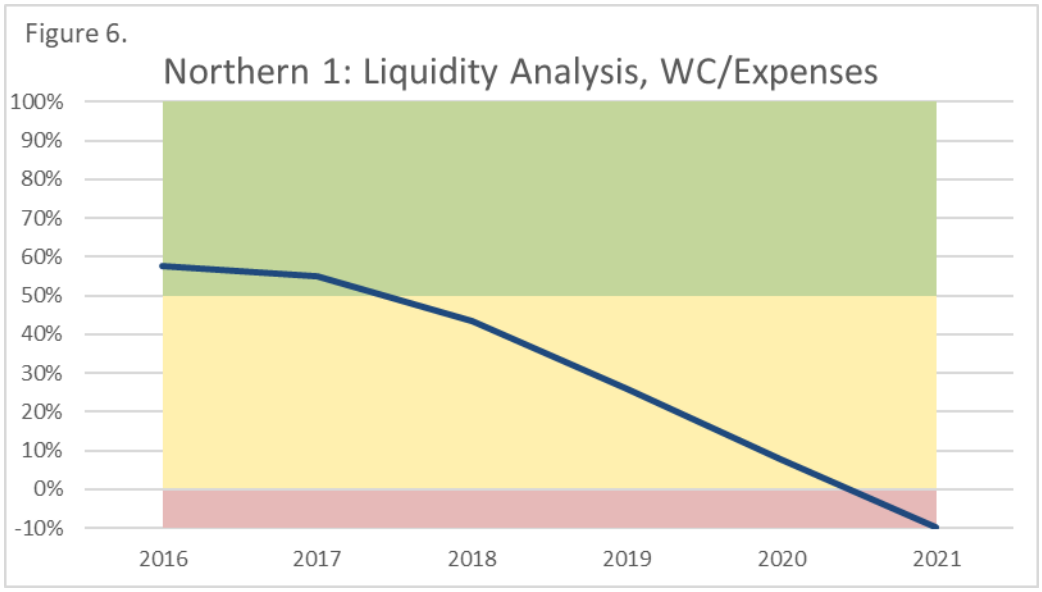


The ratio of working capital to gross farm income for *Northern 1* begins around 39% in 2016, and then drops annually. The ratio falls into the range that lenders may view as questionable beginning in 2019 and into the warning zone by 2020, as shown in Figure 5.

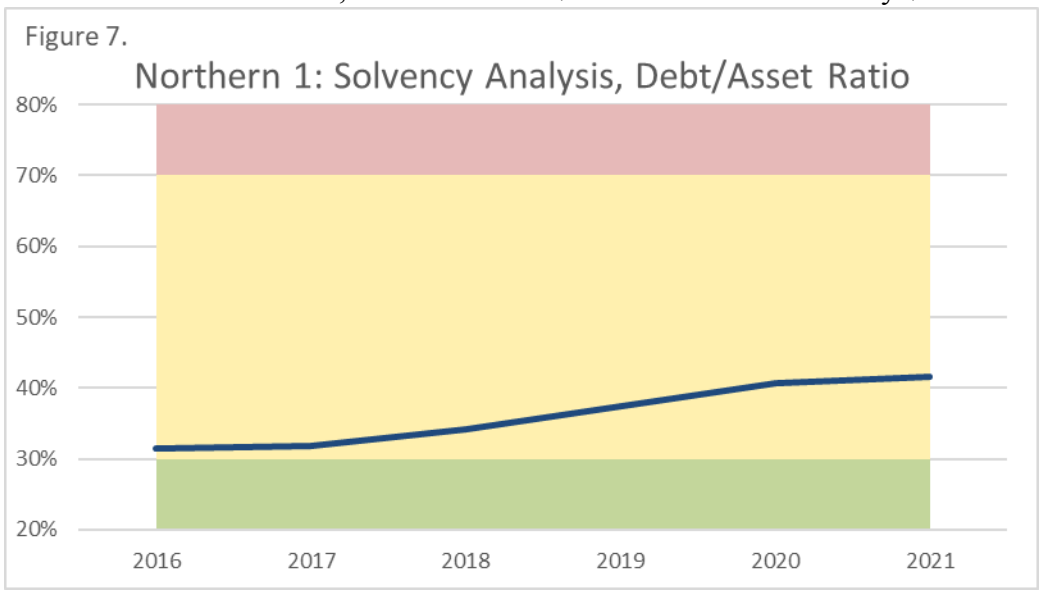
Figure 5.



For *Northern 1*, the ratio of working capital as a percent of farm expenses falls throughout the projection period, starting near the border of the acceptable range in 2016, and falling into the warning zone by 2020, as shown in Figure 6.

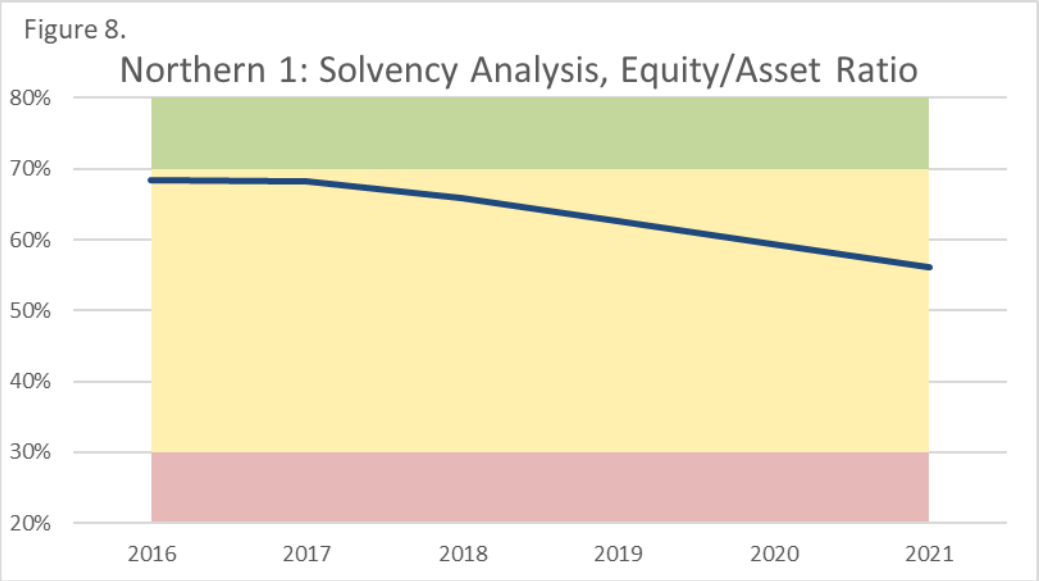


Solvency weaknesses that may be of concern to a lender are apparent throughout the projection period. As shown in Figure 7, *Northern 1*'s debt to asset ratio was in the questionable range at year-end 2016 and stays in the questionable range throughout the projection period. Ending with a 43.8% debt to asset ratio in 2021, *Northern 1* has $43.83 borrowed for every $100 of assets.



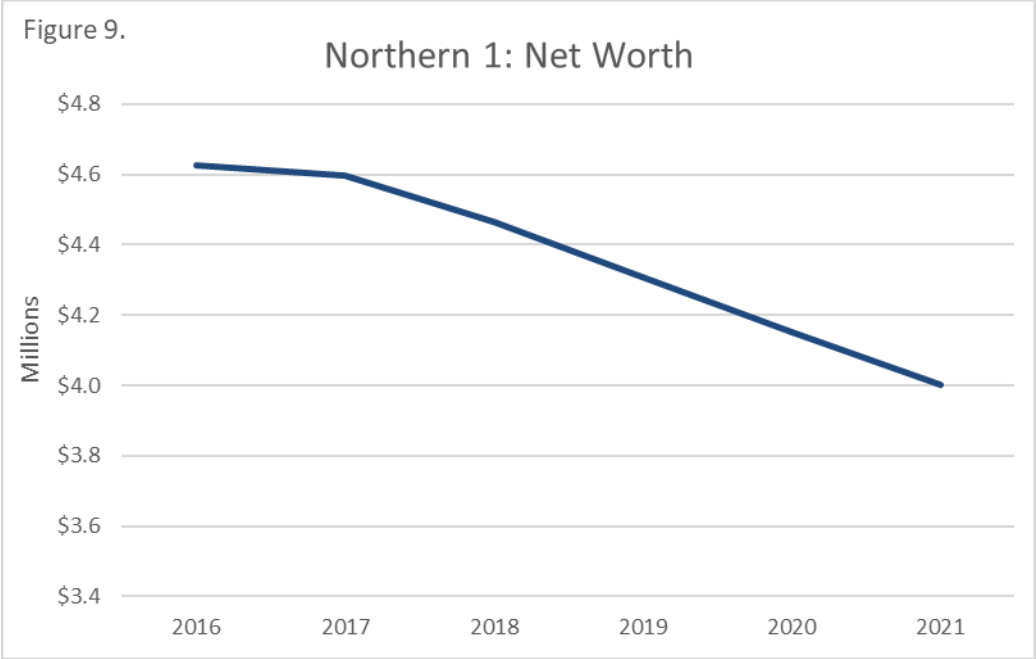
As with the debt to asset ratio, the equity to asset ratio for *Northern 1* is already in the questionable range at year-end 2016 and stays throughout the projection period. The change in the equity to asset ratio over the projection period is shown in Figure 8.

Figure 8.



Net worth declines steadily over the five-year projection period, as shown in Figure 9. The 13.5% total decline from 2016 to 2021 is a result of increasing total liabilities. Total assets remain mostly steady over the projection period, as new machinery and building purchases offset depreciation and declining cash and liquid assets over the projection period. The overall increase in liabilities is due to financed capital purchases as well as increasing draws on a short-term line of credit to provide needed operating funds.

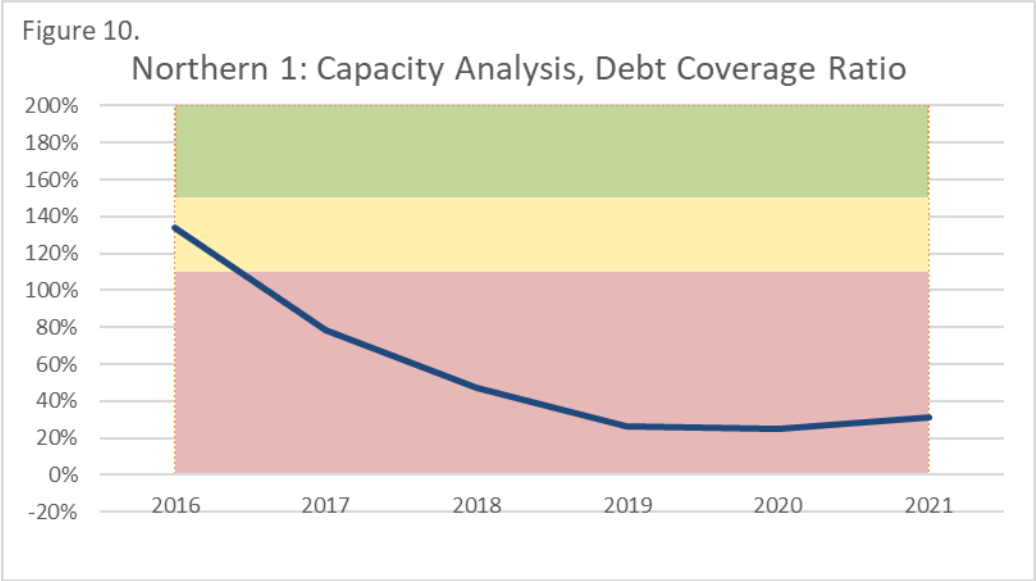
Figure 9.



From a financial perspective, repayment capacity is the major weakness for *Northern 1* over the entire projection period. The debt coverage ratio for *Northern 1* drops as low as 25.2% in 2020, meaning *Northern 1* has only $25.15 to cover every $100 of term debt obligations. *Northern 1*'s

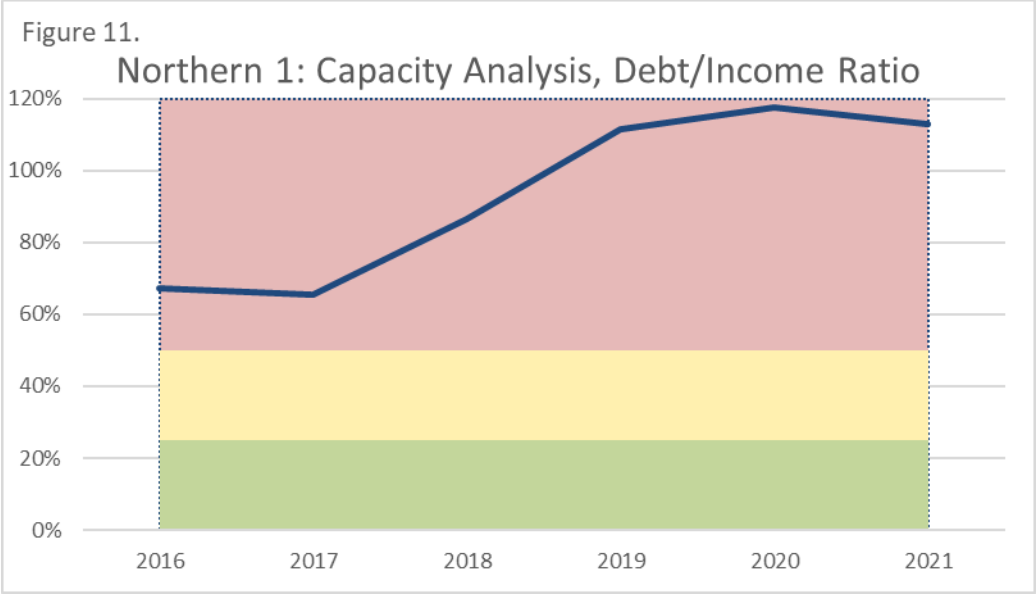
debt coverage ratio is in the questionable range at year-end 2016 and is in the warning zone in all five years of the projection period, as shown in Figure 10.

Figure 10.



For *Northern 1*, the debt to income ratio fluctuates between 65-118% over the projection period, falling into the warning zone throughout the projection period, as shown in Figure 11. A desirable rating is under 25% and the warning zone is upwards from 50%.

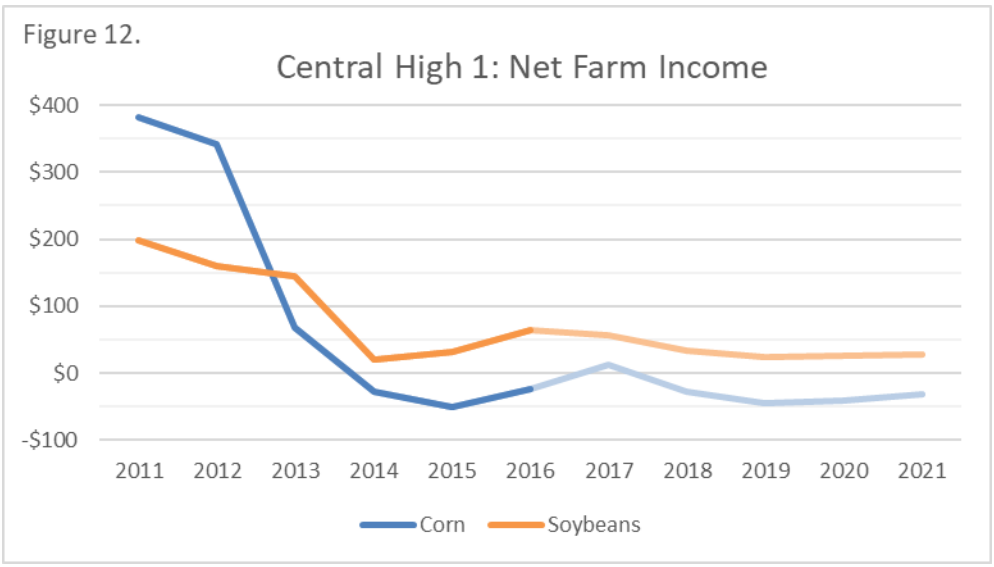
Figure 11.



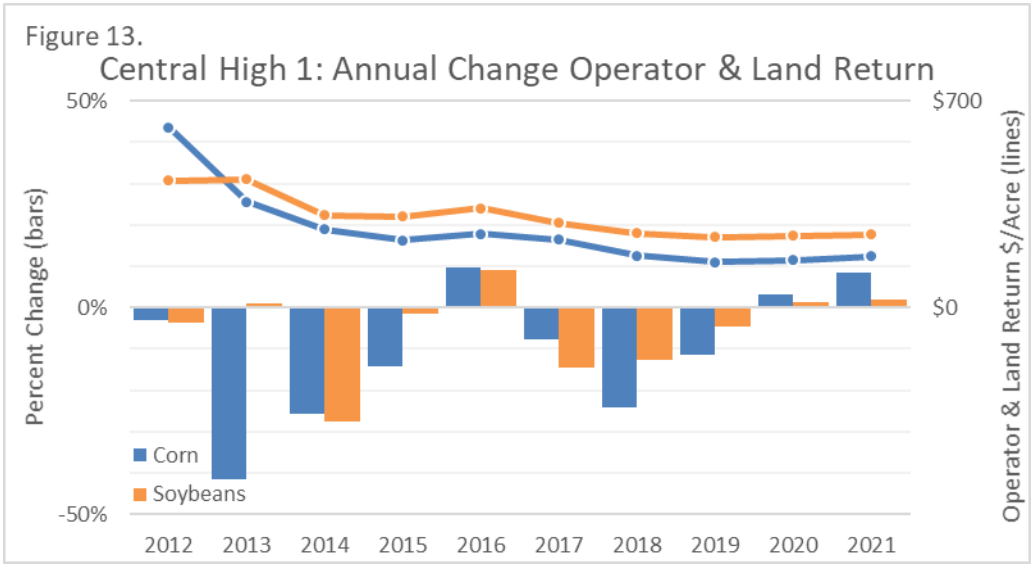
Central High 1 Results

In 2017, *Central High 1* profits $12/acre on corn and $56/acre on soybeans. The outlook for 2018 results in a -$28/acre loss for corn and $33/acre profit on soybeans. From 2019 through 2021, the outlook for *Central High 1* remains poor, with corn losing -$31/acre to -$44/acre and

soybeans ranging in profits from $23/acre to $28/acre as shown in Figure 12. Overall net farm income is positive in 2017 and 2018, although margins are very low compared to recent historic levels. *Central High 1* experiences net farm losses the remainder of the projection period. The historic values for 2011-2016, are from the *farmdoc* Revenue and Costs for Central Illinois High Productivity for relative comparison.



Operator and land return provides a more uniform comparison between historical values and projected values to evaluate annual change in income. As shown in Figure 13, the magnitude of the declines in 2017 and 2018, are smaller than experienced in 2013 and 2014. The decline in 2017, however, marks the fifth year of downward movement for corn in a six-year period and fourth decline in six years for soybeans, so overall operator and land return is relatively low.



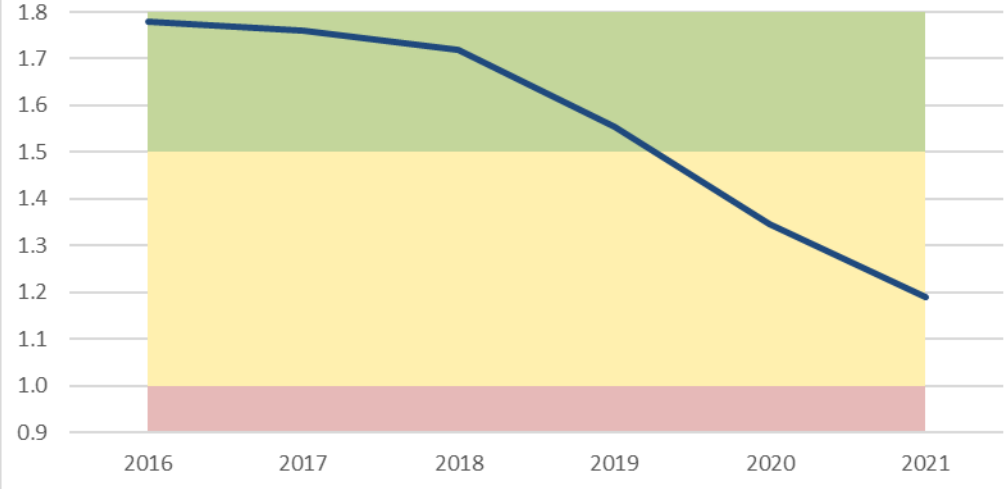
The decline in net farm returns for 2017 is due to lower prices offsetting an increase in income from government payments. Despite the gain in farm revenue from the sum of these sources, overall farm revenue drops -3.9% from 2016 to 2017, driven by a -5.9% in grain sales revenue.

The further decline in farm revenues projected in 2018 is due to expectations that neither crop insurance nor ARC-County will issue payments despite continued low prices and trendline yields. The forecast for trendline yields is counter to the above trendline yields *Central High 1* experienced in recent years. Expenses are expected to decline from 2017 to 2018 but not enough to offset the large decline in farm revenue.

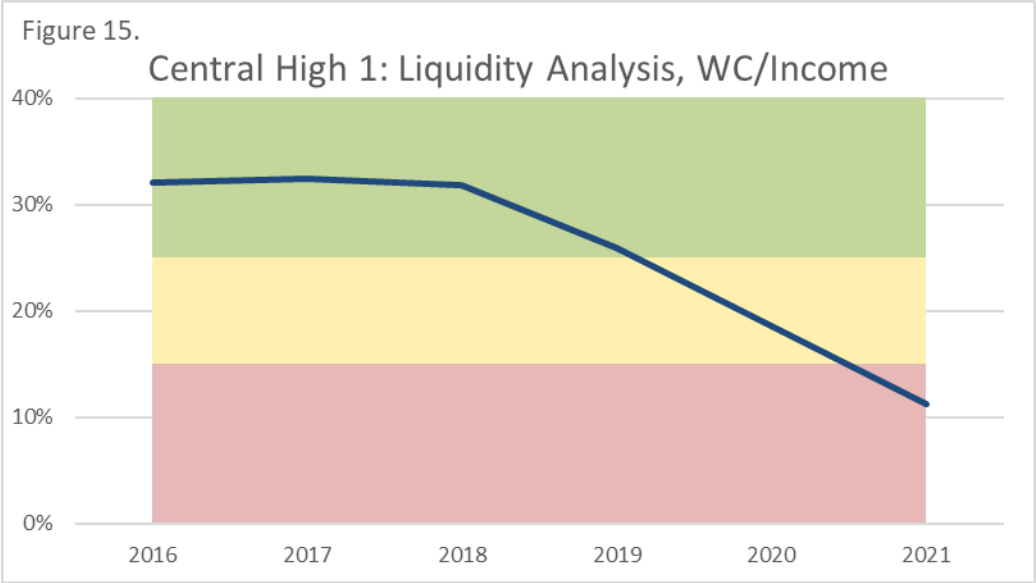
With continued pressure on commodity prices, *Central High 1* has a net loss from 2019 through 2021, with a narrow positive margin in earnings in the first two years of the projection period. Even when paired with off-the-farm earnings, income from all sources is not adequate to meet all necessary demands for funds over the projection period. *Central High 1* is able to cover costs in Year 1 and Year 2 with a steady level of funds borrowed on operating. In Year 3, the line of credit rises as additional funds are borrowed to cover needs.

Central High 1 begins strong enough at year-end 2016 to weather the first part of the projection period maintaining a range of liquidity that would be generally be acceptable to lenders. Depending on the measure of liquidity used, however, weaknesses are apparent beginning in 2018. As shown in Figure 14, the current ratio drops to 1.35 in 2020; notably below the 1.50 threshold that lenders may consider a turning point in quality.

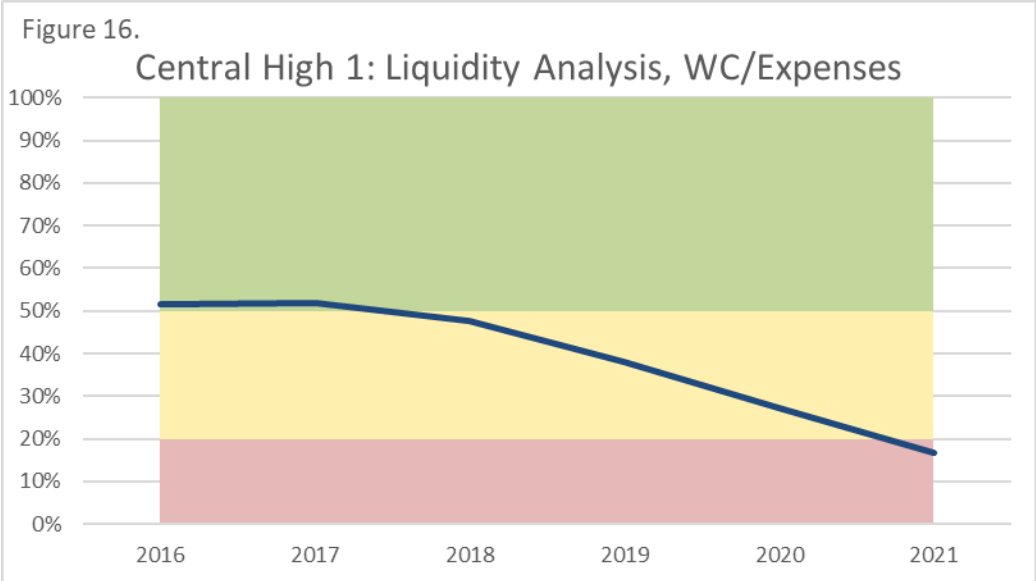
Figure 14. Central High 1: Liquidity Analysis, Current Ratio



The ratio of working capital-to-gross-farm-income for *Central High 1* begins around 32% in 2016, and then drops annually. Figure 15 illustrates this decline, with the ratio falling nearly into the range that lenders may view as questionable beginning in 2020, and further into the warning zone in 2021.

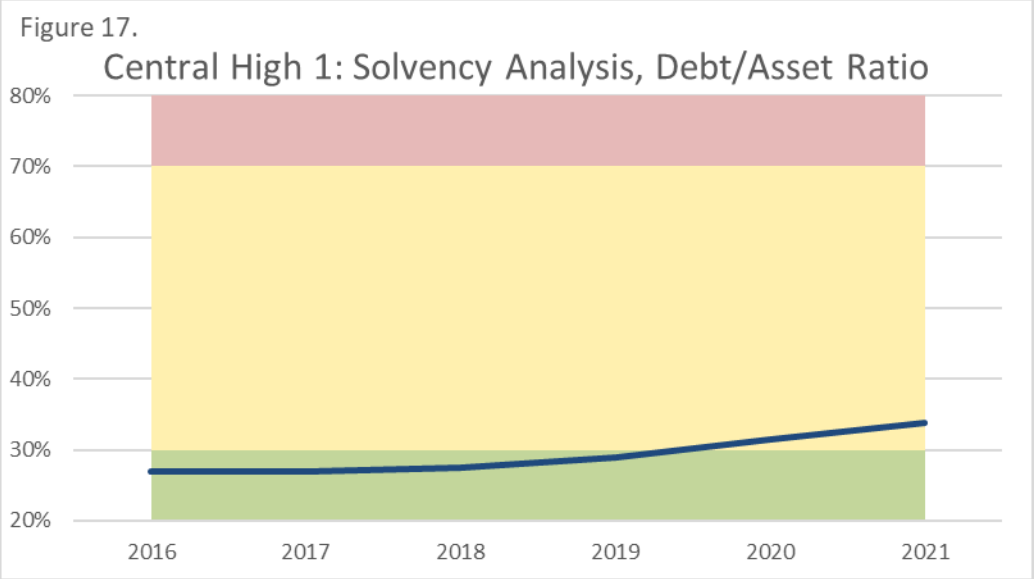


For *Central High 1*, the ratio of working capital as a percent of farm expenses stays in or near the questionable range all five years of the projection period. This measure begins at the lower edge of the acceptable range in 2016 and declines throughout the projection period, as shown in Figure 16.



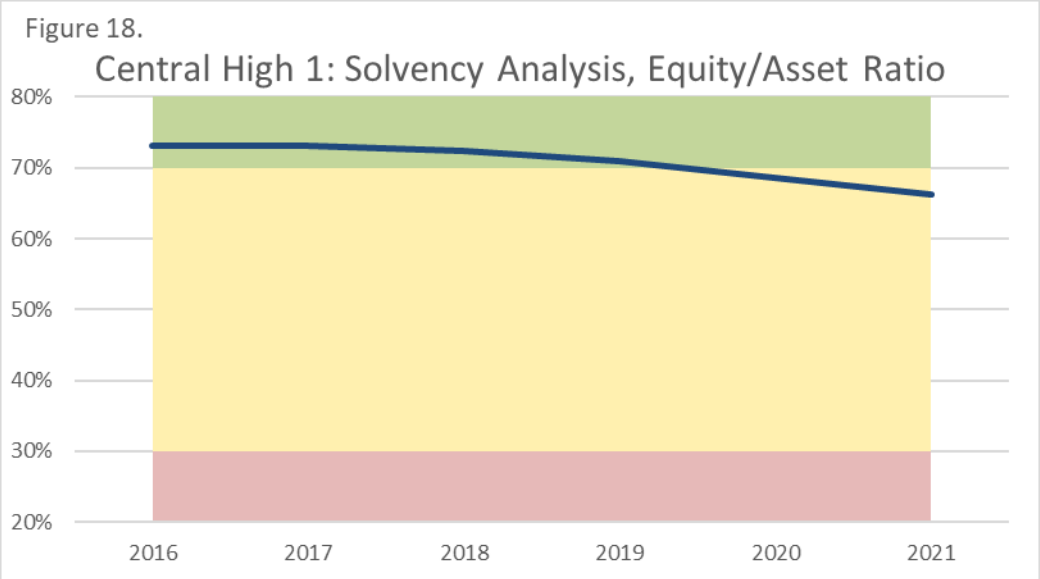
Solvency weaknesses that may be of concern to a lender are apparent beginning in 2020. As illustrated in Figure 17, *Central High 1*'s debt to asset ratio does not rise to the questionable range until 2020, barely increasing above the 30% threshold. By 2021, *Central High 1* has $33.77 borrowed for every $100 of assets.

Figure 17.



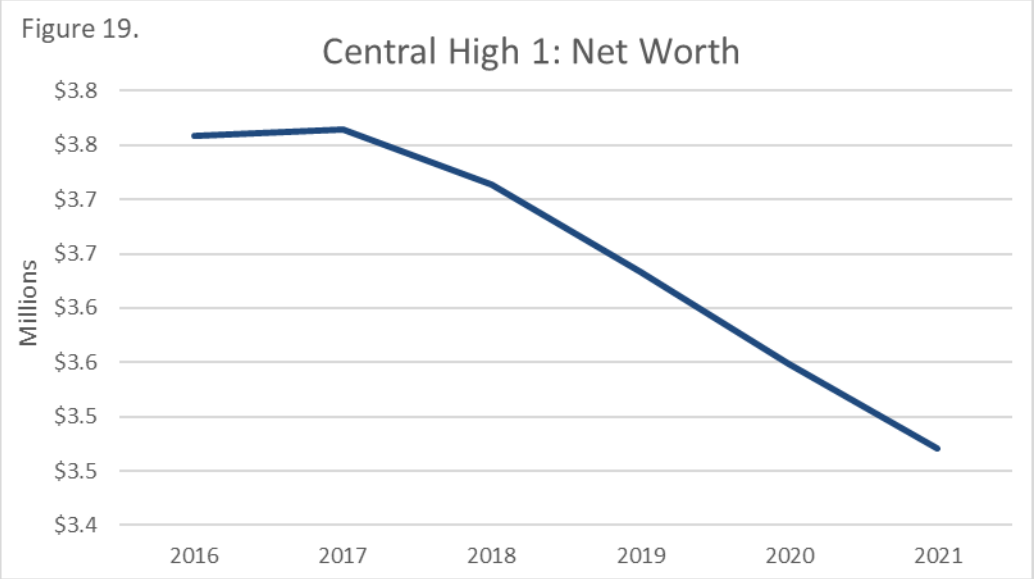
As with the debt-to-asset ratio, the equity-to-asset ratio for *Central High 1* declines to reach the questionable range in 2020, the fourth year of the projection period. The change in the equity to asset ratio over the projection period is shown in Figure 18.

Figure 18.



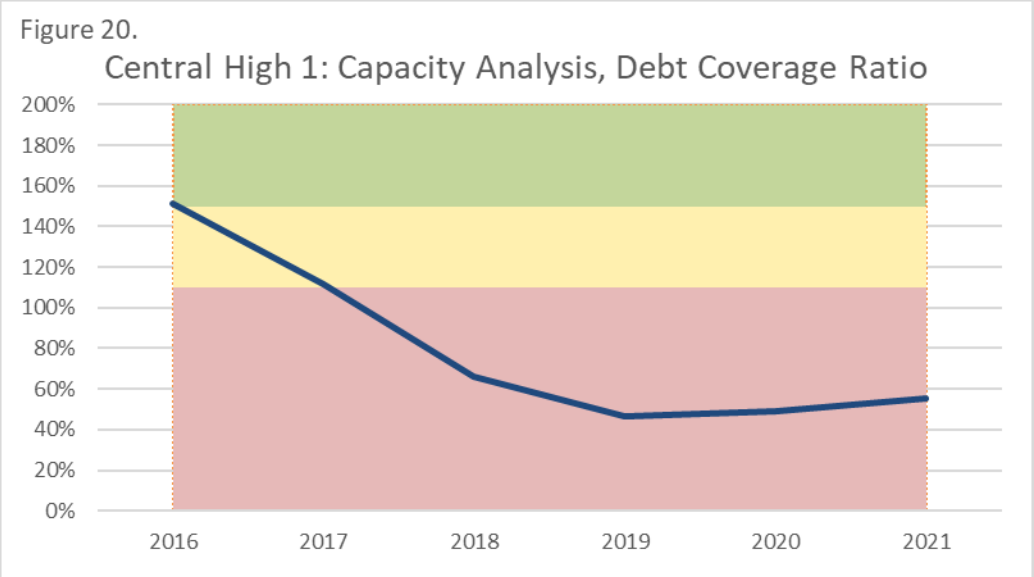
Net worth declines steadily over the five-year projection period. Figure 19 illustrates the 7.7% total decline from 2016 to 2021, which is a result of increasing total liabilities as well as a drop in total assets. Although depreciation is a contributing factor in lower asset values, the overall decrease in assets is largely due to declining cash and liquid assets over the projection period offsetting new equipment and building purchases. The overall increase in liabilities is due to financed capital purchases as well as increasing draws on a short-term line of credit to provide needed operating funds.

Figure 19.

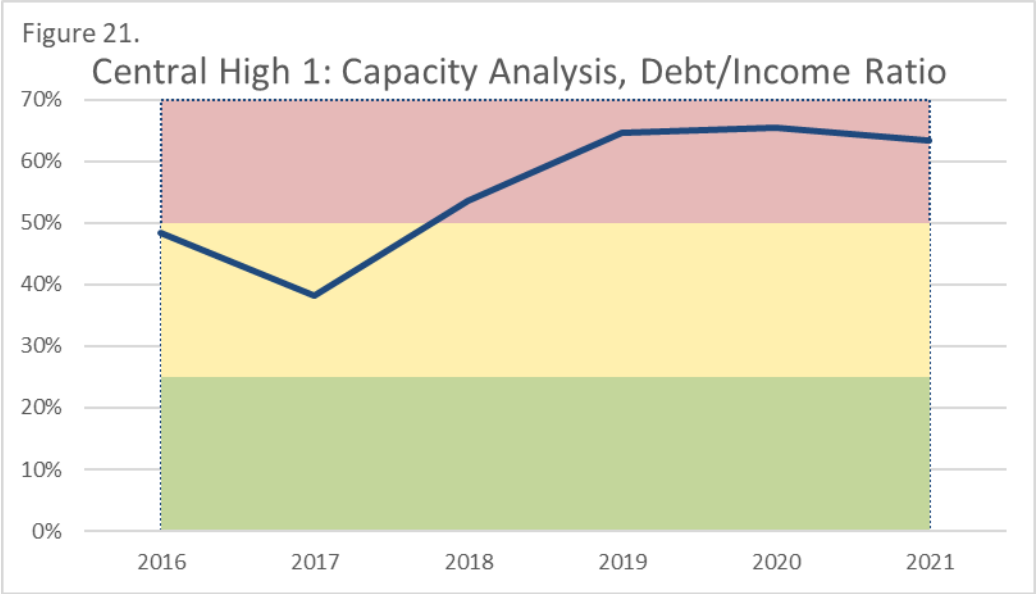


From a financial perspective, repayment capacity is the major weakness for *Central High 1* over the entire projection period. The debt coverage ratio for *Central High 1* drops as low as 46.9% in 2019, meaning the farm only has $46.86 available to cover every $100 of term debt obligations. *Central High 1*'s debt coverage ratio is acceptable at year-end 2016 but falls in the warning zone for four of the five years of the projection period, as shown in Figure 20.

Figure 20.

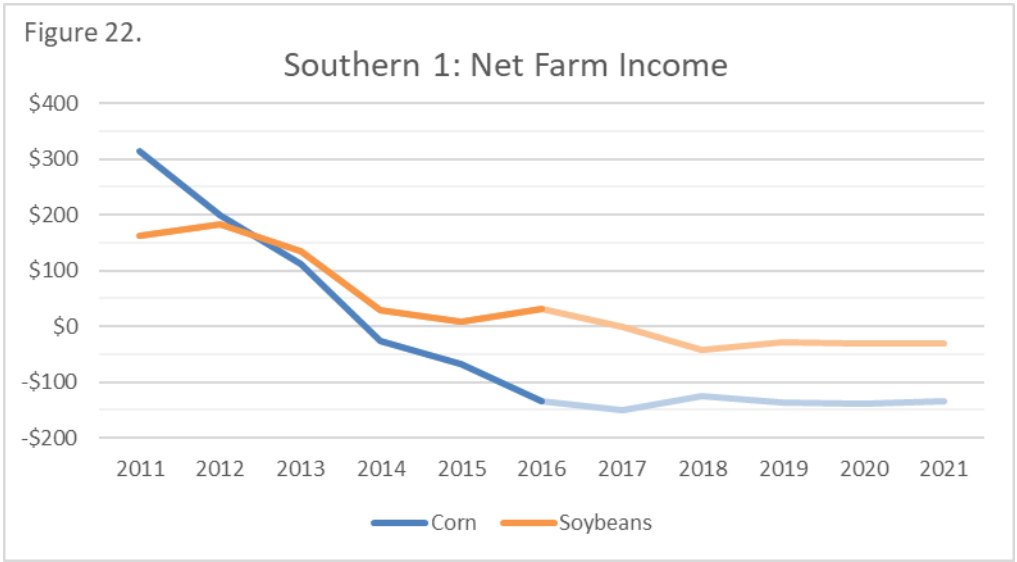


For *Central High 1*, the debt-to-income ratio fluctuates between 38-66% over the projection period. Figure 21 illustrates the ratio remains in a range that would raise questions with lenders, between a desirable rating under 25% and a warning zone beginning at 50%.



Southern 1 Results

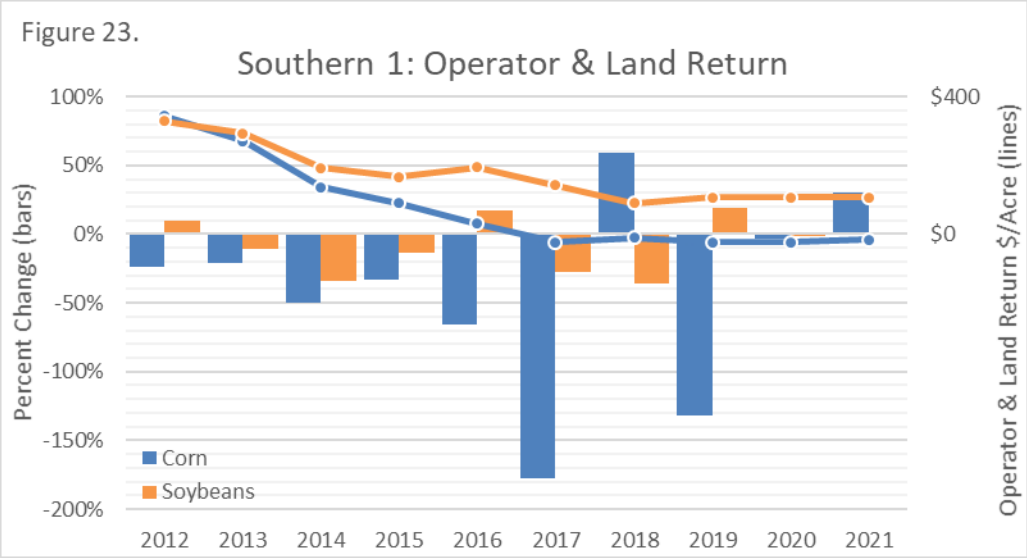
In 2017, *Southern 1* has a loss of -$149/acre on corn and -$1/acre loss on soybeans. The outlook for 2018 results in a -$125/acre loss for corn and -$41/acre loss on soybeans. From 2019 through 2021, the outlook for *Southern 1* remains very poor, with losses ranging from -$135/acre to -$139/acre corn and losses of -$28/acre down to -$31/acre for soybeans. Figure 22 illustrates the forecasted decreases in net farm income. *Southern 1* experiences a net loss on the farm in every year of the projection period. The historic values for 2011-2016 are taken from the *farmdoc* Revenue and Costs for Southern Illinois for relative comparison.



Operator and land return provides a more uniform comparison between historical values and projected values to evaluate annual change in income. As shown in Figure 23, the magnitude of the 2017 decline is significantly larger than previous years and it marks the sixth straight year of

downward movement for corn. Despite an increase from 2017 to 2018, the operator and land return on corn acres is still negative. Soybeans allow a margin for returns through the remainder of the projection period if land costs stay below $100/acre.

Figure 23.

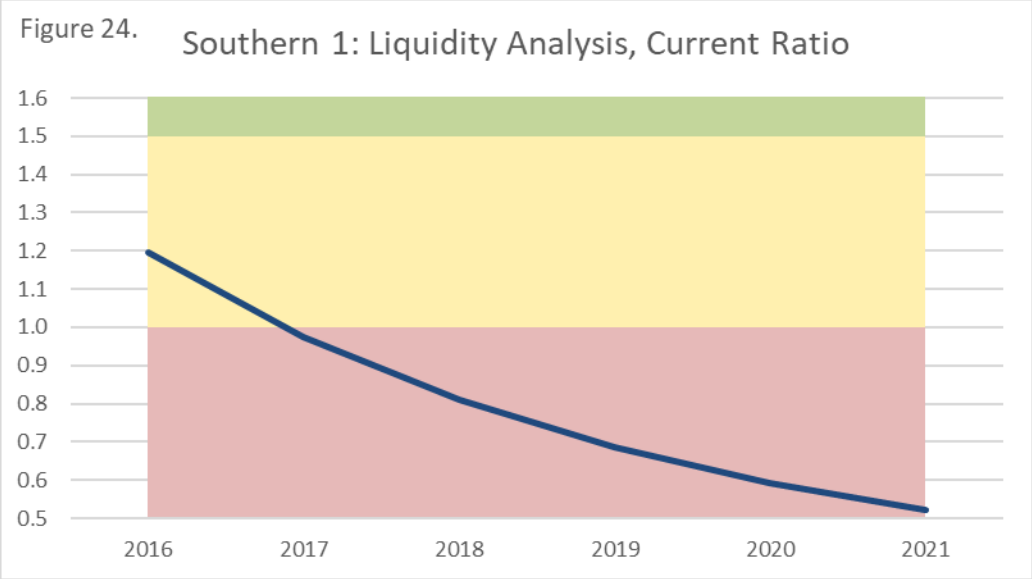


The decline in net farm returns for 2017 is due to a combination of lower prices and reduction in expected government payments. Although there is a 2017 ARC-County payment for *Southern 1*, it is lower than the 2016 payment pair with a large drop in prices pushing grain income down 3.2%. The further decline in farm revenues in 2018 is due to a combination of no payments from crop insurance or ARC-County expected, as well as continued low prices combined with trendline yields. This forecast is opposite of the above-trendline yields *Southern* 1 experienced in recent years. Expenses are expected to decline from 2017 to 2018, but not enough to counter the large decline in farm revenue.

With continued pressure on commodity prices, *Southern 1* experiences a net loss throughout the projection period. Even when paired with off-the-farm earnings, income from all sources is not adequate to meet all necessary needs for funds over the projection period. As such, the balance of *Southern 1's* operating loan increases annually over the projection period because additional funds are borrowed to cover uses of funds.

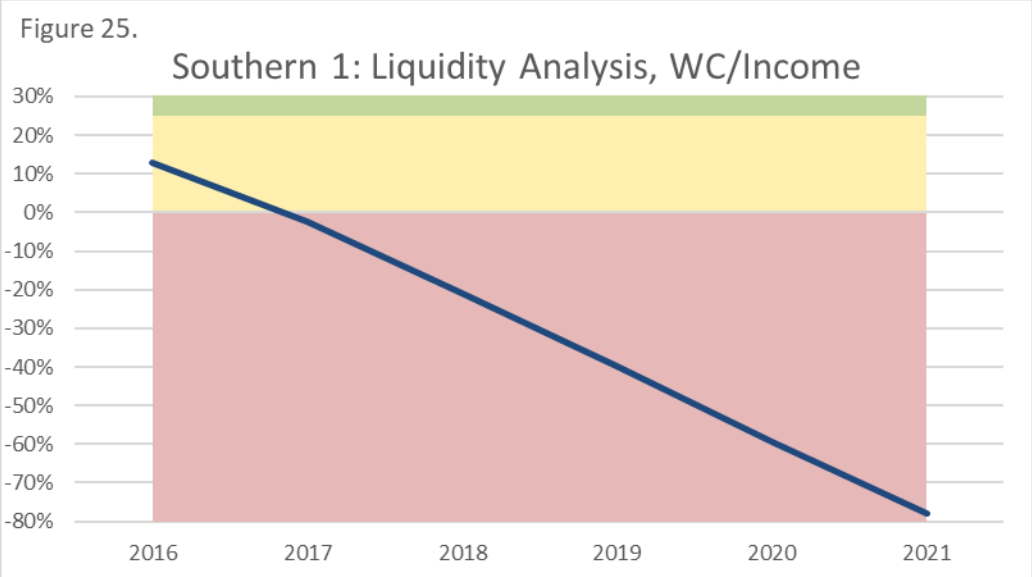
Figure 24 shows that *Southern 1* is already exhibiting stress in liquidity at the beginning of this analysis, year-end 2016. The case farm's measures of liquidity begin in the range that lenders may view as questionable and continue to fall further into the warning zone; weaknesses are apparent throughout the projection period. The current ratio of 1.20 in 2016 is below the 1.50 threshold that lenders may consider as a turning point in quality. In 2017, the ratio drops further falling into the warning zone for the remainder of the projection period.

Figure 24.



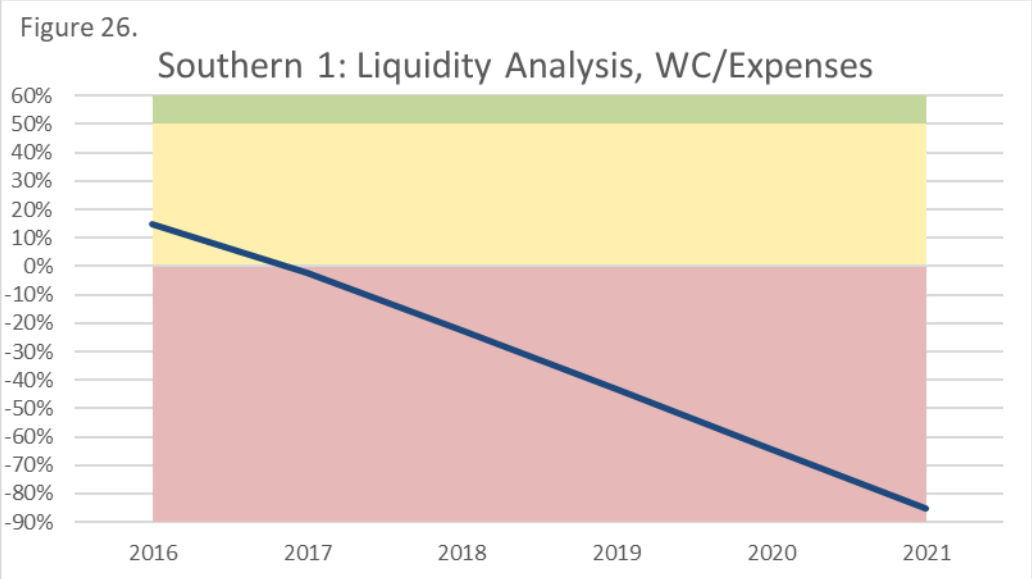
The ratio of working capital-to-gross-farm-income for *Southern 1* begins around 13% in 2016, and then drops annually. The ratio remains in the warning zone throughout the projection period. Figure 25 illustrates the decline in liquidity as measured by working capital to gross farm income.

Figure 25.



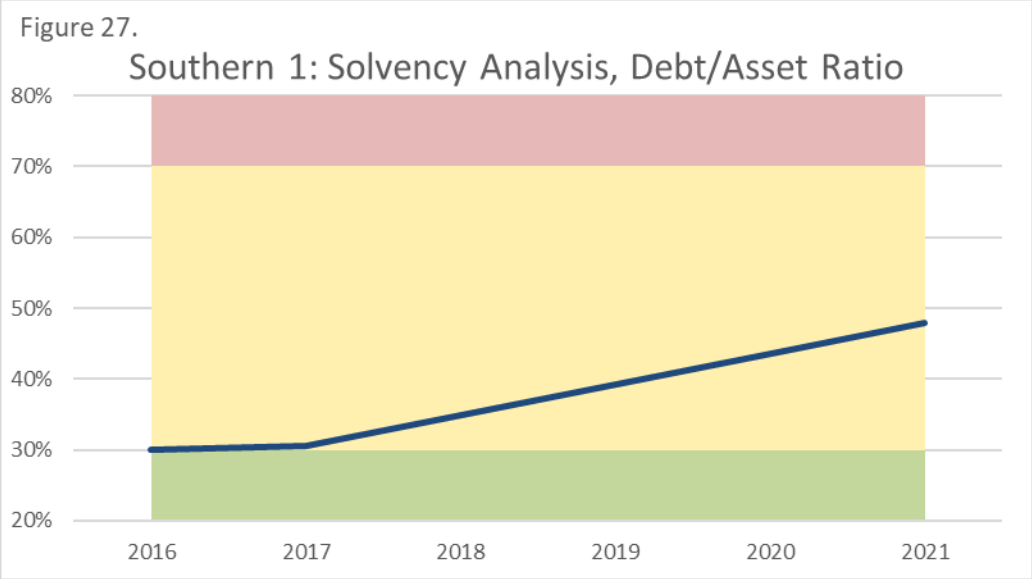
For *Southern 1*, the ratio of working capital as a percent of farm expenses is in the questionable range at year-end 2016 and declines annually over the projection period as shown in Figure 26.

Figure 26.



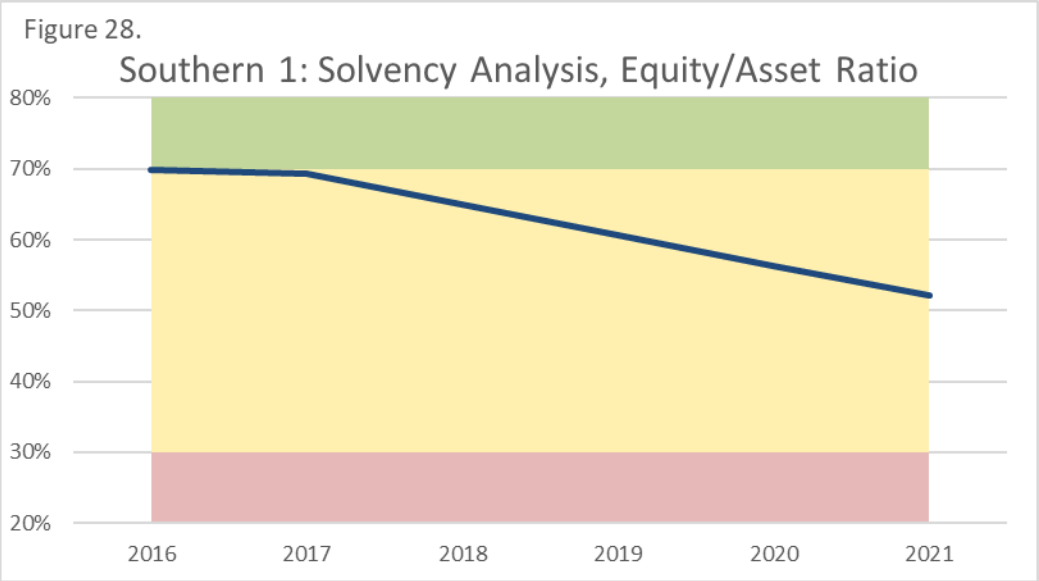
Solvency weaknesses that may be of concern to a lender are apparent through the entire projection period. As shown in Figure 27, *Southern 1*'s debt to asset ratio begins at the edge of the acceptable range at year-end 2016, and falls further into the questionable range, as the ratio rises in value throughout the projection period. Ending with a 47.9% debt to asset ratio in 2021, *Southern 1* has $47.93 borrowed for every $100 of assets.

Figure 27.



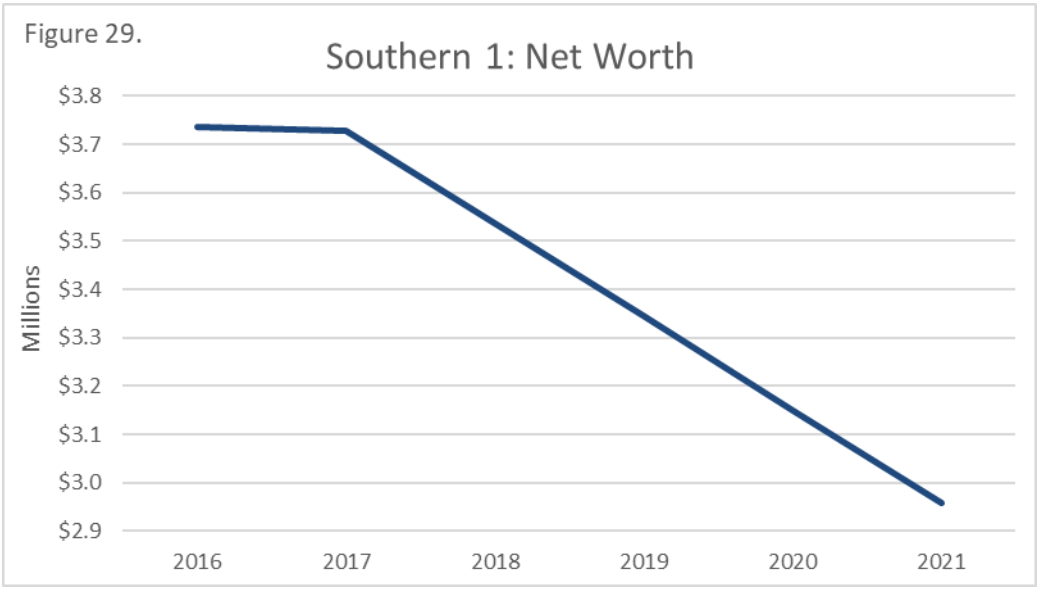
As with the debt-to-asset ratio, the equity-to-asset ratio for *Southern 1* begins at the border of the questionable range in 2016 and declines throughout the projection period. The change in the equity-to-asset ratio over the projection period is shown in Figure 28.

Figure 28.



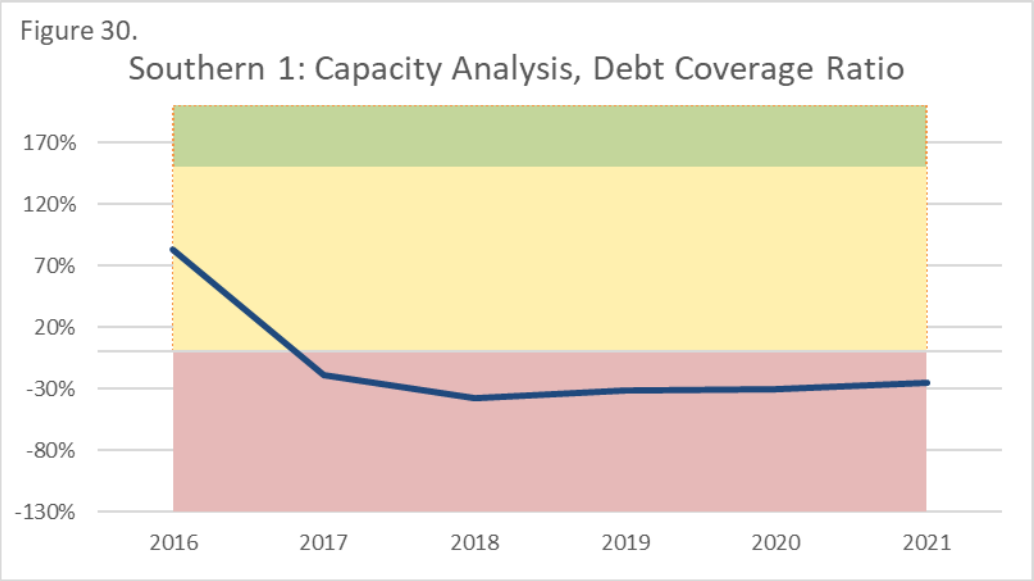
Net worth declines steadily over the five-year projection period, as shown in Figure 29. The 20.8% total decline from 2016 to 2021 is a result of increasing total liabilities. Total assets remain mostly steady over the projection period, as new machinery and building purchases offset depreciation and declining cash and liquid assets. The overall increase in liabilities is due to financed capital purchases, as well as increasing draws on a short-term line of credit to provide needed operating funds.

Figure 29.



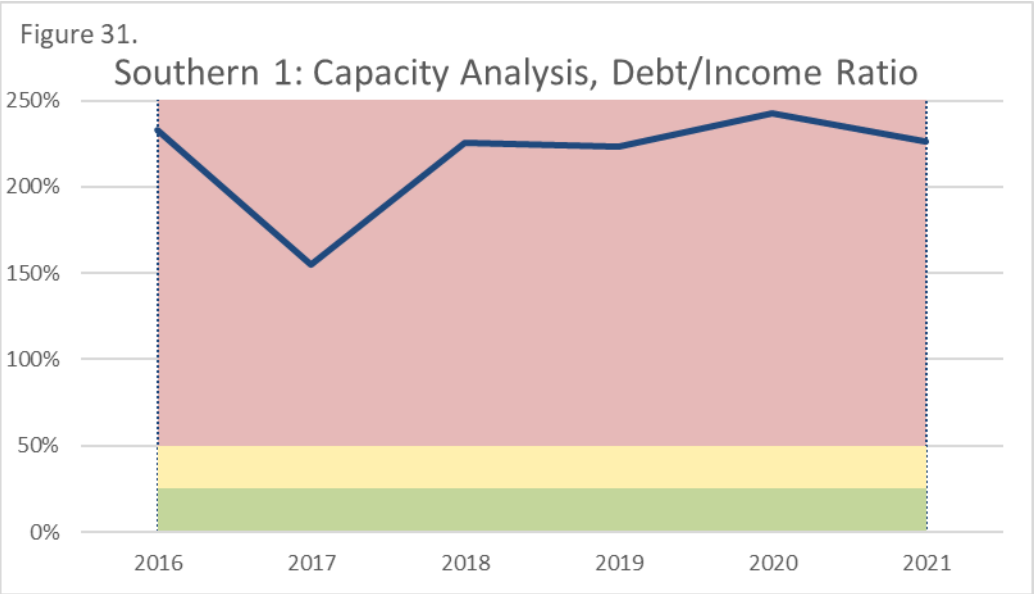
From a financial perspective, repayment capacity is the major weakness for *Southern 1* over the entire projection period. The debt coverage ratio for *Southern 1* drops as low as -37.4% in 2018, meaning the farm is $137.36 short of covering every $100 of term debt obligations. *Southern 1*'s debt coverage ratio is already in the warning zone at year-end 2016 and stays in that range all five years of the projection period, as shown in Figure 30.

Figure 30.



For *Southern 1*, the debt-to-income ratio fluctuates between 154% and 243%. Even at the strongest point, the ratio is well into the warning zone, as shown in Figure 31. This is very concerning, indicating that annual debt payments range from one-and-a-half to two-and-a-half times the total income from all sources.

Figure 31.



IV. CONCLUSION

Using certified FBFM data averaged by farm size on a regional basis, GFIPS is capable of generating detailed financial statements for a five-year projection period for representative Illinois grain farms. The projections facilitate comprehensive analysis of farm financial health for benchmarking purposes and for risk analysis, as well as evaluating federal policies. The simulation engine applies a set of prices, yields, expenses, and policy settings to the case farm to estimate future financial performance under the specified set of conditions.

To demonstrate the simulation capability and the level of analysis possible, this study discussed three case farm examples, *Northern 1*, *Central High 1*, and *Southern 1*; each representative of an average 1,500-2,000 acre grain farm in their respective counties and regions.

Comparative Analysis of Results

The tight margin environment and equivalent set of variables applied to the three case farm examples results in three very different ending financial situations. *Central High 1* fares better than *Northern 1* and *Southern 1* throughout the projection period. Although the case farm examples are based on average data for actual sizes in each particular region and farm size, an actual farm in any region could perform better than the case farm for that region or one of the other regions. Evaluating the characteristics that lead to better performance can be valuable in making farm financial decisions, regardless of region.

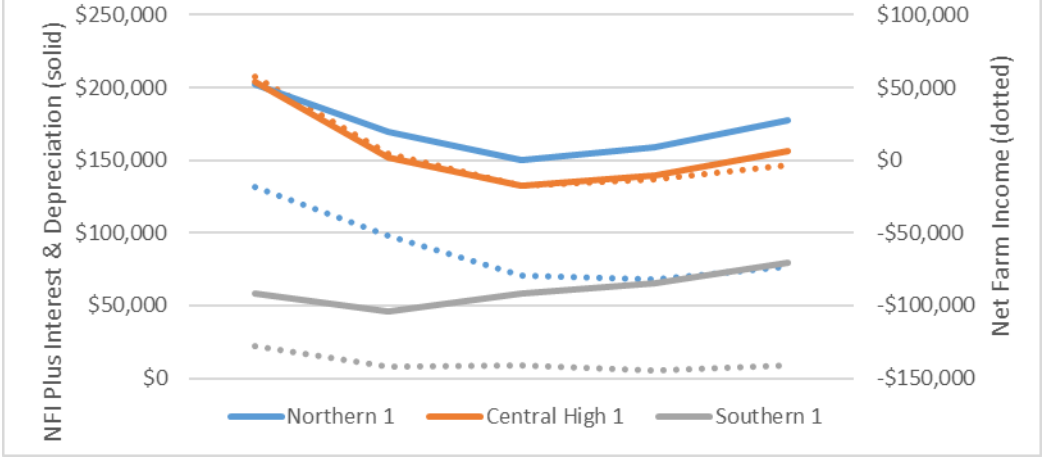
One reason for the stark difference in the three sets of results, is the starting financial position of each case farm. At the beginning of the projection period, *Central High 1* has an acceptable level of liquidity, solvency, and capacity. Although *Northern 1* has an acceptable level of liquidity, solvency and capacity are showing weaknesses at the onset of the projection period. *Southern 1* is showing weaknesses in liquidity and solvency, and has a level of capacity that indicates it does not have funds to meet existing debt obligations. All other things aside, starting position alone indicates *Northern 1*, and especially *Southern 1*, will be more susceptible to financial deterioration in the simulation's tight margin environment during 2017 and 2018.

Southern 1's crop revenue is driven lower than the other regions, due to lower yields. Although there is some variation in expenses across the regions, expenses are relatively the same, with some lower and some higher. The biggest challenge for *Southern 1* on expenses is crop insurance premium. In effort to keep variable settings constant, an individual crop insurance revenue policy at the 80% coverage level was selected for all three regions, but the premium cost for that level of coverage is significantly higher for *Southern 1* than the other two case farm examples. The 2017 premium cost per corn acre in Effingham County nearly double the DeKalb County premium and more than double the McLean County premium.

Although some financial ratios consider only the farm business, non-farm income is an important part of calculating capacity. All three case farm examples have income from both off-farm wages, and non-farm businesses. The combination of all net non-farm income ranges between \$16-\$18,000 for *Northern 1*, \$41-\$43,000 for *Central High 1*, and \$36-\$38,000 for *Southern 1*. Both *Central High 1* and *Southern 1*, have an advantage in this respect.

Although the variable settings are consistently applied to all three case farm examples, the magnitude of same variables is dependent upon starting financial position. For example, the interest rates for each liability type are the same, but each case farm example enters the projection period with a different level of debt. Therefore, the magnitude of interest each farm will owe annually throughout the projection period is different. The same methodology is applied to depreciation. The variable setting for calculating economic depreciation is the same in all three case farm examples, but results in a different magnitude for each case farm due to differing levels of machinery and buildings at the onset of the projection period. The subtotal of farm income, after all expenses have been deducted except interest and depreciation, shows *Northern 1* has the highest net farm returns in four of the five years. However, the larger interest and depreciation expenses are causing actual net farm income to fall below *Central High 1* in all five years. The scale on the graph in Figure 32 is set so Net Farm Income and Net Farm Income plus Interest and Depreciation align for *Central High 1*. This creates a visual comparison of the differing impact interest and depreciation expenses are having on income for the three case farm examples.

Figure 32. Comparison of Net Farm Income versus Net Farm Income Before Interest & Depreciation Expenses



Capital purchases are another figure dependent on the FBFM case farm starting set of financial data. Capital purchases during the projection period are based on the amount spent on capital purchases in the case farm's base year. *Northern 1*'s base capital purchase amount is $96.61/acre, *Central High 1* is $65.98/acre, and *Southern 1* is $77.82/acre. For these three case farm examples, capital purchases are set to increase by 1% annually throughout the projection period and another variable setting finances 80% of new capital purchases. Not only does *Central High 1* have less cash going out, it's also increasing debt on new capital purchases at a lower rate.

Future Study

GFIPS will be used in future study to analyze farm financial scenarios for benchmarking and on-farm risk analysis. GFIPS can be used to generate variations on the initial three case farm examples, as well as new case farm examples, to evaluate estimated future financial performance of farms in other size groups, other regional groups, or different combinations of simulation engine settings. GFIPS will also be used to estimate the impact of policy scenarios on actual Illinois grain farm financial health. Farmers can use the published results of such studies to manage farm financial decisions and obtain a stronger understanding of the impact and value of existing or potential farm policies. The vast array of simulation engine input settings provides many options of future study of how changes to agricultural or tax policy could impact the financial performance of Illinois grain farms.

References:

Kelly, P.J., Schnitkey, G. D., Paulson, N., & Coppess, J. (2014). "Developing a Farm Income Projection Model for Illinois Farms to Determine Advantages of the Agricultural Act of 2014's Farm Safety Net Options". Department of Agricultural Economics, University of Illinois at Urbana-Champaign.

Food & Agricultural Policy Research Institute, University of Missouri. U.S. Baseline Briefing Book, FAPRI - MU Report #01 - 17. March 2017. https://www.fapri.missouri.edu/wp-content/uploads/2017/03/FAPRI-MU-Report-01_17.pdf

United States Department of Agriculture, Office of the Chief Economist. Long-term Projections Report, OCE-2017-1. February 2017. https://www.usda.gov/oce/commodity/projections/USDA_Agricultural_Projections_to_2026.pdf

United States Department of Agriculture, Office of the Chief Economist. Early-Release Tables from USDA Agricultural Projections to 2027. November 2017. https://www.usda.gov/oce/commodity/projections/index.htm

Schnitkey, G. "Revenue and Costs for Corn, Soybeans, Wheat, and Double-Crop Soybeans, Actual for 2010 through 2015, Projected 2016 and 2017." Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, released February 2017, updated July 24, 2017.

Department of the Treasury, Internal Revenue Service. "2016 Federal Tax Rates, Personal Exemptions, and Standard Deductions, IRS Tax Brackets & Deduction Amounts for Tax Year 2016." https://www.irs.com/articles/2016-federal-tax-rates-personal-exemptions-and-standard-deductions

Department of the Treasury, Internal Revenue Service. "Revenue Procedure 2017-58." https://www.irs.gov/pub/irs-drop/rp-17-58.pdf

Department of the Treasury, Internal Revenue Service. "Revenue Procedure 2016-55." https://www.irs.gov/pub/irs-drop/rp-16-55.pdf

Kohl, D. (2009). "Farm Financial Ratios and Benchmarks, Calculations & Implications". Department of Agricultural and Applied Economics, Virginia Polytechnic Institute and State University.

2016 FBFM Data

NASS Quick Stats Database

Crop Insurance Decision Tool

Appendix A. Case Farm Assumptions

- McLean County (Central High Region)
- 1,700 Acres
    - FBFM data average for Central High Region farms in the 1,501-2,000-acre size group is 1714.76
- 2016 Base Year - 850 Acres Corn & 850 Acres Soybeans
    - FBFM data average for region is 53.62% Corn / 46.38% Soybeans
- Assumed 50% corn / 50% soybean crop rotation over projection period
- 11.38% Owned / 44.67% Cash Rent / 43.96% Share Lease
    - Values align with FBFM data averages for region and farm size group
- 2016 base year inputs for balance sheet information are averages for the region and farm size group using certified FBFM data
- 2016 base year inputs for direct, power, and overhead expenses (except interest, property tax, crop insurance premium) come from *farmdoc* budget projections
- Year 1 (2017) and Year 2 (2018) of the projection period use *farmdoc* budget amounts for direct, power, and overhead expenses (except interest, property tax, crop insurance premium) and remain constant over the remainder of the projection period
- Interest expense for all years is calculated at the specified interest rate on prior year-end balance:
    - Current Liabilities – 5% for 2016 Base Year and 2017-21 Projection Period
    - Intermediate Liabilities- 4% for 2016 Base Year and 2017-21 Projection Period
    - Long Term Liabilities – 4.5% for 2016 Base Year, 5% for 2017-21 Projection Period
        - Values estimated using information in Chicago Federal Reserve Ag Letter, known values rounded to nearest 50 basis points
- Cash rent rate for 2016 base year and Year 1 (2017) and Year 2 (2018) of the projection period use *farmdoc* budget projections and remains constant over the remainder of the projection period
- Share rent rate is calculated on the assumption the landowner receives 50% of all income while paying 50% direct expenses, 0% power expenses, 0% overhead expenses, and 100% of property taxes.
- Property tax is the average amount for the region and farm size group using certified FBFM data and increases 1% annually over the five-year projection period
- Crop insurance premium is from the *farmdoc* Crop Insurance Decision Tool, using selected county and policy and coverage level
- 2016 base year, Year 1 (2017) and Year 2 (2018) of the projection period use *farmdoc* budget amount for price and yield.
    - Price for the remaining projection period are USDA projections
    - Yields for the remaining projection period are calculated using a slope/intercept formula on historical NASS yields for Illinois with an adjustment made for the average difference between FBFM farm-level yields and NASS Illinois yields
- Non-Farm Income (includes wages, interest, and non-farm business) and Family Living Costs increase 1% annually over the five-year projection period
- Social Employment and Income Taxes are calculated on actual income for the year using a simplified version of actual IRS tax return

    - Using Married Filing Jointly with four exemptions
- Capital Purchases increase 1% annually over the five-year projection period and are added to asset value in each year allocated at the same ratio of assets on the base year balance sheet (FBFM data average for region and farm size) excluding farmland, as no new land purchases occur over the projection period
        - 91% Machinery (Intermediate Assets)
        - 9% Building/Improvements (Long-Term Assets)
- All capital purchases are paid 20% with cash and 80% financed, financed amounts are allocated to the same liability category the asset is in
- Value of all assets not impacted by cash balance (bank balance) or capital purchases (machinery and building/improvements) remain constant over the projection period
- Bank balance and operating/short term principal balance changes based on net change in cash balance:
    - If net change in cash is negative the amount is subtracted from bank balance until balance reaches $0, then amount needed to pay interest is drawn from operating
    - If net change in cash is positive, it is used to pay down operating/short term liability
- Intermediate term liability balance is calculated on prior year-end balance less principal payment made plus portion of intermediate term capital purchases financed in year
    - Annual principal payment on intermediate term liabilities is 1/7 of the beginning of the year intermediate term liability balance
- Long term liability balance is calculated on prior year-end balance less principal payment made plus portion of long-term capital purchases financed in year
    - Annual principal on long term liabilities is 1/15 of the beginning of the year long term liability balance
- The case farm is assumed to be one FSA farm, base acres are entered as a percent for simplicity, entered as 50% corn and 50% soybeans
- Case farm is enrolled in ARC County Revenue program for both corn and soybeans
- Crop Insurance selected is individual Revenue Protection at the 80% coverage level
    - Premium amount is pulled from the *farmdoc* Crop Insurance Decision Tool using the county and policy selections in the model