Farm Income Statement Analysis

AAE 320

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Agricultural & Applied Economics

Learning Goals

- How to read an accounting Income Statement as it pertains to agricultural operations
- How to calculate several key measures of income and rates of return
- Typical income and rates of return in agriculture
- Common accounting software packages used by Wisconsin farms

Income Statement

- Income Statement: Record of revenues and expenses over a period of time
  - Remember: Balance Sheet is statement of assets, liabilities and equity at a point in time
- Other names for an income statement
  - Operating Statement
  - Profit and Loss Statement (P & L)
- Income = Revenue minus Costs
- Question it answers: Did you make money last year?

Income Statement

- Income = Revenue minus Costs
- Account for all business revenue earned and costs during the period, both cash and non-cash
- Revenue consists of Cash Revenue and Non-Cash Revenue
- Costs consist of Cash Expenses and Non-Cash Expenses

Cash Revenue

- Crop sales
- Feeder livestock sales
- Crop and Livestock product sales
- Government program payments, including crop insurance and disaster payments
- Basically anything you sell!
- Will generally have a record for checks received

Non-Cash Revenue

- Will not always have records for these revenues
- Inventory Changes for commodities ready for sale
  - Grain, feeder livestock
  - Value of ending inventory minus value of beginning inventory
- Accounts Receivable: ending balance minus beginning balance
- Miscellaneous:
  - Non-cash payments in kind, trades, custom harvest arrangements

Revenue: Special Agricultural Cases

- Gain/Loss from sale of culled breeding livestock or milk cows
  - Treat as Cash Revenue, a normal part of production process
  - Typically do not treat it as gain/loss from sale of a capital asset
- Change in value of raised breeding livestock or milk cows (a calf that becomes a heifer, a heifer that becomes a cow)
  - Treat the increase in value of raised livestock as an increase in Non-Cash revenue
  - Practical way: Treat it like an inventory change for the herd
    - Use a book value for each animal type, then calculate the ending value minus the beginning value for the herd

Revenue: Special Cases: Sale of Capital Assets

- Treat gains or losses on the Sale of Capital Assets as Cash Revenue
- Land: Selling Price minus Selling Costs
  - Revenue changes only due to price changes
  - Selling costs: often there are deferred taxes due
- Depreciable Assets: Selling Price minus “Book” Value” (the value according to your depreciation schedule)
  - Revenue changes due to price changes and errors in estimating depreciation
  - This adjusts revenue for “errors” in depreciation, which are very common

Cash Expenses

- Purchased inputs: fertilizer, seed, fuel, chemicals, feeder livestock, feed, etc.
- Labor and services
- Repairs and maintenance
- Property taxes, insurance, etc.
- Everything you buy for the farm!!!
- Will generally have records for checks written

Non-Cash Expenses

- Will not always have records for these expenses
- Depreciation
  - All capital assets (buildings, tractors, etc.)
  - Breeding livestock, milk cows, perennial crops
  - A cost of production to account for, even if you don’t pay cash
- Accounts Payable
  - Ending accounts payable balance minus beginning accounts payable balance

Prepaid Expenses

- Expenses paid in previous tax period for production during the current tax period
- Common examples: fertilizer, seed, feed etc. bought in previous tax year for this crop year
- Goal: to put expenses into the year they were used to produce crops/livestock
- Expenses for This Year = Prepaid Expense Last Year – Prepaid Expense This Year
- Same thing for large feed, fuel and other infrequent purchases
- Main idea: put expenses into the year the inputs are used for

Accrued Expenses

- Cash interest paid
  - Add accrued interest owed
  - Subtract interest prepaid
- Property taxes paid
  - Add accrued taxes owed
  - Subtract taxes prepaid
- Income taxes owed
  - Should estimate, but that very difficult
  - Do Income Statement as pre-tax income
  - Do after-tax Income Statement later after pay taxes

Income Statement

- Main Idea: Income = Revenue - Costs
  - Revenue – Expenses = Net Farm Income from Operations
  - Include Unpaid Labor & Management & Net Gains from Sale of Capital Assets = Net Farm Income
- Trying to separate income from production activities versus income from investment activities
- This is the general idea, many variations due to differences in the non-cash costs and non-cash revenues included

Cash Accounting and Accrual Adjustments

- Most farms use cash accounting, especially for taxes
- Common problems cash accounting creates
    1. Prepaid expenses: Buy inputs (seed, fertilizer, chemicals, feed, fuel) in one year, but use them the next year
    2. Output sales in year different than production year: Harvest crops and livestock born/raised in one year, but sell in next year
    3. Buy inputs and make sales to reduce taxable income
- Often cannot use costs and revenue from taxes to calculate profits by enterprise, only profits by year
- Accrual Adjustments: Put costs and revenues into the right year to determine profits by enterprise

Accrual Adjustment of Cash Income Statement

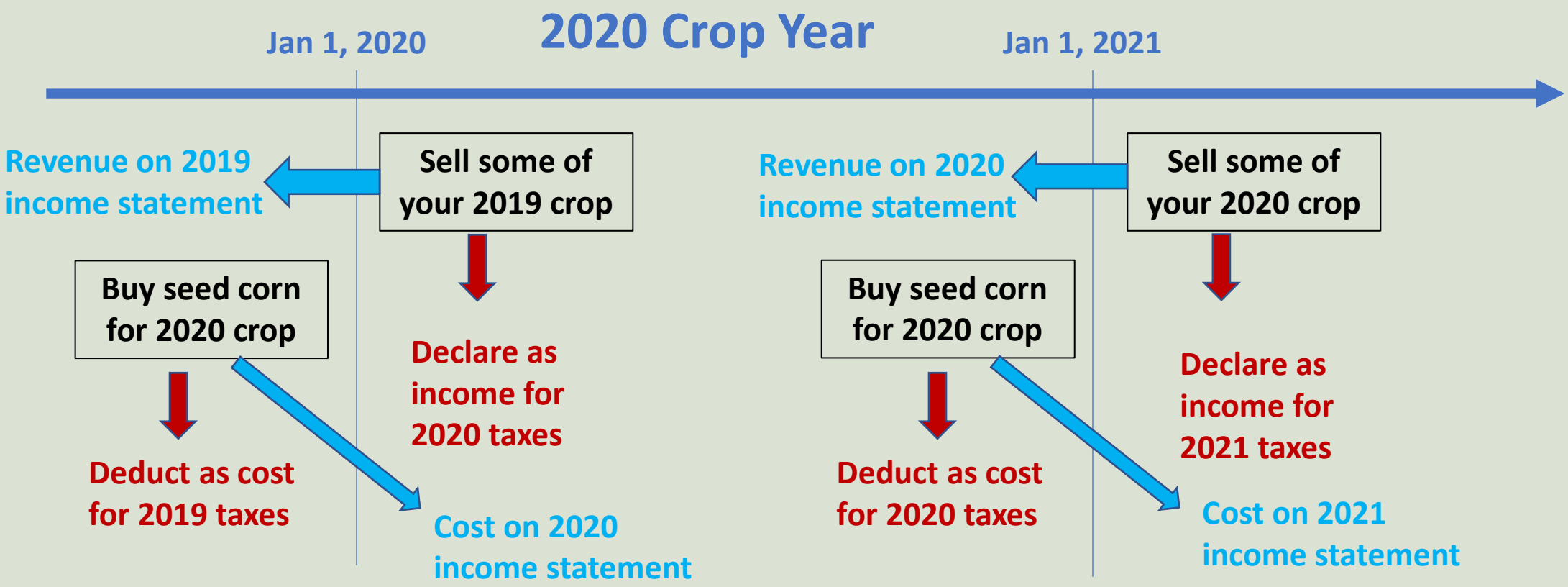
- Accrual accounting: the business standard: GAAP
  - Accrual accounting: more accurate and useful for decision making: puts costs and revenue in the right years
  - Cash accounting simple and has tax advantages
- Farms end up with two sets of accounting records if do it “right”: cash accounting for taxes and accrual accounting for decisions
- Farms create cash accounting records for tax purposes, then do an accrual adjusted cash basis income statement from them
  - What was my income in 2019? Cash accounting for taxes
  - What was my 2019 income from growing corn? Accrual adjusted
- Farm accountants work out the details

Simple Example to Illustrate Cash versus Accrual Accounting

- If 2020 is a high revenue year, to lower 2020 taxes, farmers often
  - Increase prepaid expenses: Buy more than usual inputs in 2020 for the 2021 crop or herd use (feed, fertilizer, seed, fuel)
  - Sell 2020 grain after Dec 31, 2020 so less 2020 income
  - Just “kicks the can down the road” but eventually a low-income year happens and you can “catch up”
- To calculate profits from growing corn in 2020
- Do not include revenue from corn grown in 2019 and sold in 2020, but do include revenue from corn sold in 2021 that was grown in 2020
- Include costs paid in 2019 for inputs used in 2020, but not costs paid in 2020 for inputs used in 2021

Illustration of Accrual Adjustment

What was my profit from growing corn in 2020?



Uses for Income Statement

- See if business had a profit or a loss, but really want to know profitability
- Profitability: normalize for size to see if there is efficient use of resources to produce income
- Five Measures commonly used
  - Net Farm Income from Operations
  - Net Farm Income
  - Rate of Return on Assets
  - Rate of Return on Equity
  - Operating Profit Ratio

Should be Accrual Adjusted

Calculating Farm Income: Revenue

- You decide which non-cash sources to include and whether it is accrual adjusted or not
- Selling Things: self explanatory
- Capital Gains: Selling of capital (non-current) assets for prices different than their basis
  - Sell land for different price than original cost
  - Depreciable assets: selling for price different than remaining basis
- Are you going to do accrual adjustments?

Calculating Farm Income: Cost

- Operating Costs: You decide what non-cash costs to include and whether to use accrual adjustments
- Interest: separate it out as an operating expense
  - Need to account for interest in some measures
- Unpaid Labor and Management: How much you “pay yourself” for labor and management: you decide
  - Need to account for it in some measures
- Are you going to do accrual adjustments?

Net Farm Income from Operations (NFIfO)

- **NFIfO = Revenue – Operating Costs – Interest**
- NFIfO = Income made by the farm operation
- Does not include investment income from sale of capital asset sales: depreciation should already be included as a non-cash expense
- Does not include paying the operator/manager for time and labor

Net Farm Income (NFI)

- **NFI = Revenue – Operating Costs – Interest – Unpaid Labor & Management + Capital Gains**
- Income generated by all farm business activities after paying all expenses (operation & investment activities)
- Includes net gain from sale of capital assets (investment activities)
- Includes paying for owner/operator's time and management (as though busines hired you as the manager)
- **NFI = NFIfO – Unpaid Labor & Management + Capital Gains**

NFIfO vs NFI

- A farm is a mix of different activities: labor, management, investment, financing, etc.
- NFIfO: trying to get at the crop growing and livestock part of the operation, not investment or management
- NFI: tries to get at all the farm business earning (including investment activities) and after paying for the manager

Return on Assets (ROA)

- **ROA = Revenue – Operating Costs – Unpaid Labor & Mgmt + Capital Gains**
- **ROA = NFI + Interest**
- Income generated by all Farm Assets, including investment income
- Do not Subtract Interest
  - Interest = cost of using someone else's money so your farm can have more assets than just what you can own with your equity
  - ROA wants to calculate income generated by all assets, yours and other people's
- Other terms: Return to Capital

Return on Assets (ROA)

- Estimate cost of Unpaid Labor and Management
  - What would it cost to hire someone to do all the currently unpaid labor and management?
  - What would you/your family make at your next best alternatives (opportunity costs)?
- Removing Unpaid Labor and Management arbitrary, but important
  - Whatever value you choose changes estimated ROA
- If ignore unpaid labor and management (which many do), will get higher ROA
- Know these issues before you compare with other businesses and with market returns

Rate of Return on Assets (ROROA)

- ROA compared to size of business
  - How much income is the farm generating relative to the amount of assets used?
- **ROROA = (ROA/Average Assets) x 100**
- Average Assets = average of assets over the time period of the Income Statement
  - Go to Balance sheet and use average of total assets (current and non-current) at start and end of period
  - Rates of return are why Balance Sheet and Income Statement go together

Rate of Return on Assets (ROROA)

- **ROROA = (ROA/Average Assets) x 100**
- Average Assets = “size” of business during the accounting period
- Which basis for asset valuation: Cost or Market?
  - Use Market Basis to compare farms and to compare to liquidating and getting market rates of return on financial investments
  - Use Cost Basis to look at your trend over years
- Compare ROROA only if done in same way, especially asset valuation
- Do not include non-farm assets and income

Return on Equity (ROE)

- **ROE = Revenue – Operating Costs – Interest – Unpaid Labor and Management + Capital Gains**
  - **ROE = ROA – Interest**
  - **ROE = NFI**
- Of all the income generated by the Farm Assets, ROE is the part that goes to you as holder of equity in the business
  - Return on your equity invested in the farm

Rate of Return on Equity (ROROE)

- **ROROE = (ROE/Average Equity) x 100**
- Average Equity = average of equity at the beginning and end of the period
  - Obtain from Balance Sheet
- Like ROROA, except use ROE, not ROA
- ROE removes Interest from ROA
  - Interest is farm income to pay for debt equity
  - Interest is the “ROE” for the bank, and the Interest Rate is roughly the bank’s “ROROE”

ROROA, ROROE and Interest Rate

- Interest the only difference between ROE and ROA
- If Rate of Return on Assets > Interest Rate,

  Rate of Return on Equity > Rate of Return on Assets
- If Rate of Return on Assets < Interest Rate,

  Rate of Return on Equity < Rate of Return on Assets
- If ROROA > Interest Rate, then extra generated from use of external funds goes to increase ROROE

Operating Profit Margin Ratio ("Profit Margin")

- Operating profit as percent of Revenue
- **Operating Profit = Return on Assets**
- **Operating Profit Margin Ratio = ROA/Total Revenue**
- Of all revenue generated by the business, how much does the business keep?
- Low Profit Margin: improve ratio first (by lowering costs) before expansion
- High Profit Margin: expansion may make sense

Summary of Farm Income Definitions

- Net Farm Income from Operations (NFIfO) = Revenue – Operating Costs – Interest
- Net Farm Income (NFI) = Revenue – OperatingCosts – Interest – UnpaidLabrMngmt + CapGains
  - NFI = NFIfO – UnpaidLabrMngmt + CapGains
- Return on Assets (ROA) = Revenue – OperatingCosts – UnpaidLabrMngmt + CapGains
  - ROA = NFIfO + Interest – UnpaidLabrMngmt + CapGains
  - ROA = NFI + Interest
- Return on Equity (ROE) = Revenue – OperatingCosts – Interest – UnpaidLabrMngmt + CapGains
  - ROE = ROA – Interest = NFI
- Profit Margin = ROA/Total Revenue

Farm Income: Final Comment

- When a small business or farm does their accounting (or pays some one to do it) and they calculate farm income
  - They decide how they want to deal with non-cash costs, non-cash revenues, depreciation, inventory changes, accrued expenses, prepaid expenses, accrual adjustments and unpaid labor and management costs for themselves and their family
- When comparing farms to one another, for an accurate comparison, must use the same assumptions for non-cash costs, non-cash revenues, depreciation, inventory changes, accrued expenses, prepaid expenses, accrual adjustments and unpaid labor and management

Summary

- How to develop an Income Statement
  - Accrual Accounting vs Cash Accounting
  - Accrual Adjusted Cash Accounting
- How to calculate and interpret measures from Income Statement
  - Net Farm Income
  - Net Farm Income from Operations
  - Return on Assets and Rate of Return on Assets
  - Return on Equity and Rate of Return on Equity
  - Profit Margin
- Look at example rates and margins
- Look at example income statement

Rates of Return in Dairy

- UW Center for Dairy Profitability

  http://cdp.wisc.edu/pdf/02bench.pdf
  http://cdp.wisc.edu/Financial%20Benchmarks.htm
- Two methods
  - Assets at Cost Basis with Tax Depreciation
  - Assets at Market Basis with Economic Depreciation
- **Does NOT include cost of unpaid labor and management or opportunity cost of owner equity**

Average Profitability in WI Dairy

Cost Basis and Tax Depreciation

	2002	2001	2000
ROROA	4.00%	10.01%	7.91%
ROROE	-1.69%	16.15%	9.07%
Profit Margin	4.99%	12.38%	10.25%

Market Value and Economic Depreciation

	2002	2001	2000
ROROA	2.17%	5.65%	4.24%
ROROE	0.05%	4.82%	2.34%
Profit Margin	5.79%	13.31%	10.52%

ROROA in WI Dairy: AgFA Farms

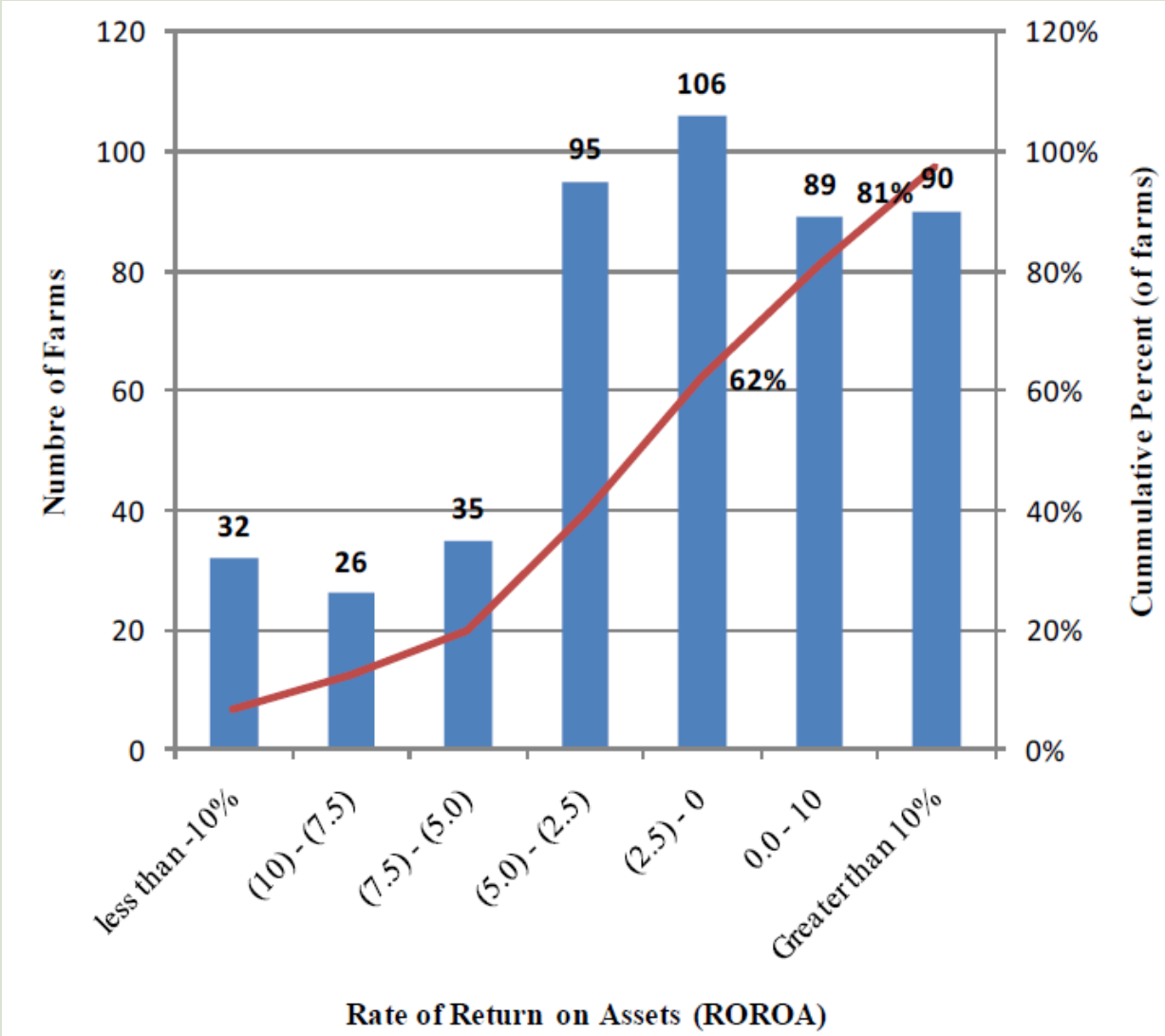
Year	ROROA	Year	ROROA
1995	5.57%	2005	6.77%
1996	5.36%	2006	3.25%
1997	5.42%	2007	8.39%
1998	9.20%	2008	6.49%
1999	7.56%	2009	-1.65%
2000	4.24%		
2001	5.65%		
2002	2.17%		

2002 Range of ROROA

Range	% Farms
< 0%	35.5%
0% - 2.5%	20.1%
2.5% - 5%	16.3%
5% - 7.5%	14.0%
7.5% - 10%	7.1%
> 10%	7.1%

* Assets at Market Value and Economic Depreciation

2009: A Bad Year for Dairy



	NFI	ROROA	ROROE
Top 40%	$77,098	3.32%	2.63%
The Rest	-$23,794	-7.84%	-2.83%
473 Farms in AgFA database for 2009			

Even in bad years, some farms make money

More Recent WI Dairy Data

250 famers for 2014-2016

- Larger farms have higher ROA, but more leveraged, so they don't keep as much of the ROA as ROE
- Write-up does not explain asset valuation method, non-cash costs used and unpaid labor and management assumptions

Herd Size	ROA	Profit Margin	Debt to Asset Ratio
<50	0.5%	3.5%	15.6%
50-99	1.6%	8.9%	25.5%
100-199	2.4%	8.7%	45.6%
200-499	4.0%	10.6%	59.1%
500-999	4.9%	12.4%	62.0%
>1,000	6.8%	13.3%	62.2%
All	2.2%	9.0%	

Source: https://cdp.wisc.edu/wp-content/uploads/Profitability-14_15_16-C-1.pdf

More Recent WI Dairy Data
Distribution of ROA by Herd Size
250 famers for 2014-2016

- Even in good years, some farms lose money
- Even in bad years, some farms make money

Herd Size	Top 10%	Top 25%	Median	Bottom 25%	Bottom 10%
<50	4.6%	1.9%	0.5%	-1.5%	-3.8%
50-99	9.1%	4.2%	1.6%	-0.6%	-3.2%
100-199	9.6%	5.7%	2.4%	0.1%	-2.5%
200-499	12.3%	8.1%	4.0%	1.2%	-2.0%
500-999	14.1%	9.6%	4.9%	2.0%	-0.9%
>1,000	15.4%	9.0%	6.8%	2.4%	0.4%

Source: https://cdp.wisc.edu/wp-content/uploads/Profitability-14_15_16-C-1.pdf

IA 1990-1998 by Type and 2000-2006

IA 1990-1998	ROROA	ROROE	Profit Margin
Grain	7.3%	6.0%	22.3%
Hog	7.4%	6.3%	20.9%
Fed Beef	6.0%	4.6%	23.1%
Cow-Calf	4.5%	2.6%	16.0%
Dairy	7.6%	7.5%	21.1%

IA 2000-2006	ROROA	ROROE	Profit Margin	Current Ratio	Debt to Asset
Top 20%	12.8%	15.1%	22.9%	3.45	0.41
Upper 20-40%	11.4%	12.7%	20.1%	3.44	0.37
Middle 20%	7.9%	8.1%	17.0%	2.50	0.37
Lower 20-40%	9.2%	11.5%	16.7%	1.87	0.36
Lowest 20%	4.4%	2.9%	9.0%	1.62	0.44

Source: http://www.extension.iastate.edu/Publications/FM1883.pdf

IL and MN 2004

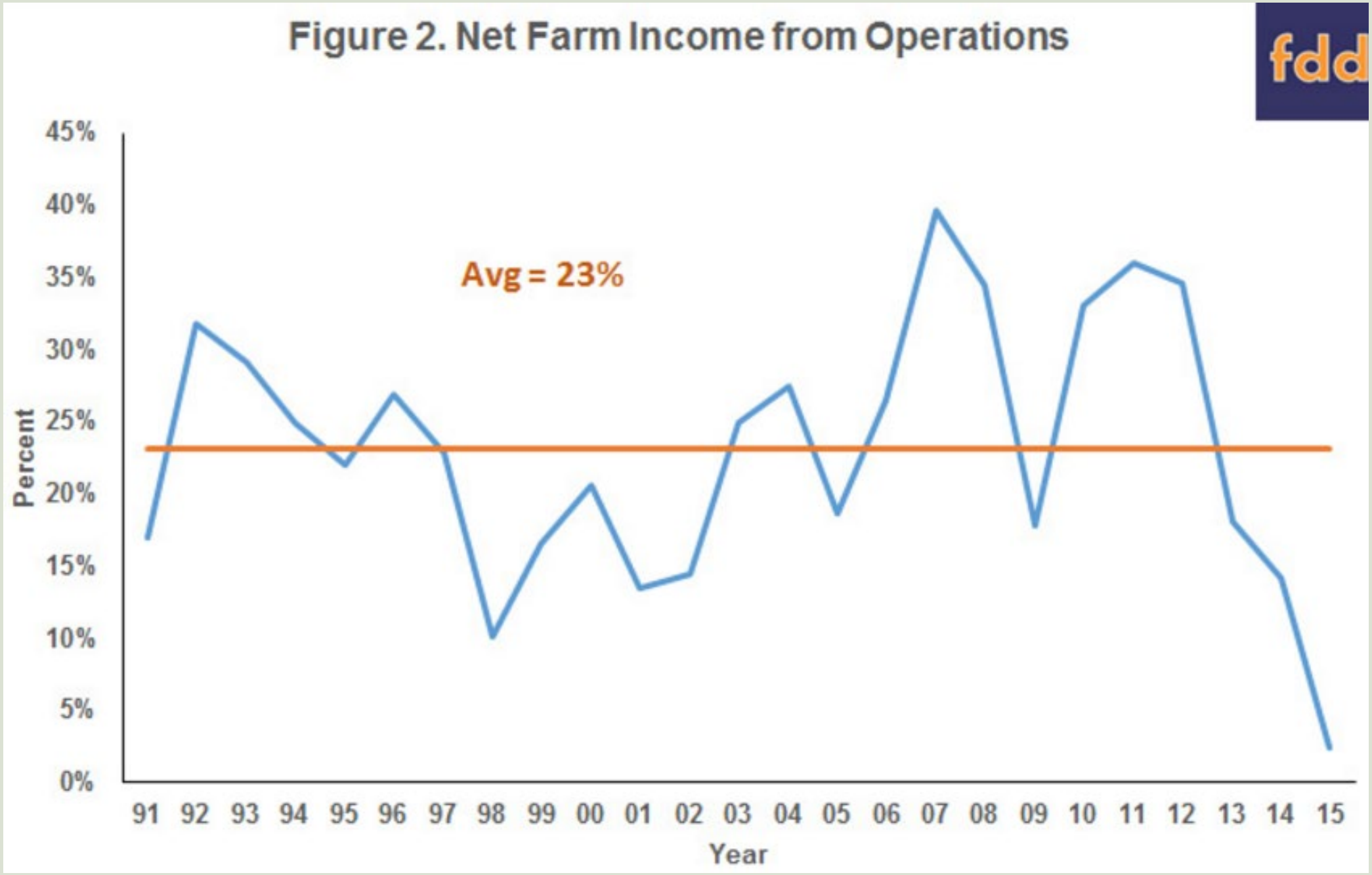
IL 2004	ROROA	ROROE
Grain	6.2%	7.1%
Hog	13.4%	19.2%
Beef	2.9%	2.6%
Dairy	9.6%	11.2%

MN 2004	ROROA	ROROE	Profit Margin
Average	8.0%	10.9%	17.6%
Top 20%	13.4%	20.8%	26.0%
Btm 20%	-2.7%	-18.0%	-8.0%

Table 1. Financial Performance of Grain Farms Enrolled in Illinois Farm Business Farm Management

	Year						
	2009	2010	2011	2012	2013	2014	2015
Efficiency							
Operating expense ratio	71%	57%	55%	55%	69%	72%	81%
Depreciation expense ratio	7%	7%	7%	7%	10%	11%	13%
Interest expense ratio	3%	3%	2%	2%	2%	2%	3%
Profitability							
Net income from operations	18%	33%	36%	35%	18%	14%	3%
Return on farm assets	3.4%	8.4%	9.6%	3.8%	2.6%	1.6%	-0.6%
Repayment Capacity							
Term debt and capital lease ratio	1.64	3.67	4.67	4.57	1.57	1.38	0.44
Liquidity							
Current ratio	2.31	2.56	2.73	3.08	2.59	2.32	2.05
Solvency							
Debt-to-asset ratio	0.22	0.21	0.20	0.18	0.18	0.18	0.20

Source: Illinois Farm Business Farm Management as reported in Financial Benchmarks tool on farmdoc, http://www.farmdoc.illinois.edu/finance/benchmarks.asp.



Source: http://farmdocdaily.illinois.edu/2016/10/financial-performance-of-illinois-grain-farms.html

Farm Accounting Programs (from Jenny Vanderlin, UW CDP)

- AAIMS: Agricultural Accounting & Management Information System
  - CDP developed and supports, cheap ($150) for dairy only
- AgManager by AgriSolutions
  - General farm accounting, Farm Credit Services use
- Redwing sells CenterPoint and Perception
  - More expensive, used by ag accounting firms
  - CenterPoint is newer, more for farmers
- Others: Farm Fund$, PeachTree, QuickBooks, Quicken, MoneyWorks

- CDP & UWEX presentations & workshops for farmers to learn more
  - Heart of the Farm, Annie's Project, plus as requested

WI Farm Management Associations

- Fox Valley Farm Management
  - http://fvfma.com/ in Appleton, WI with about 700 members
- Lakeshore Farm Management
  - http://www.lakeshorefarmmanagement.com/ in Valders, WI with about 1,000 members
- Services provided to members
  1. Tax preparation, management and planning
  2. Computerized and hand record-keeping systems
  3. Scheduled "on the farm" consultations
  4. Yearly farm business summary and analysis
- Ag Lenders, UW Extension and CDP

More Information

- UWEX Center for Dairy Profitability (CDP)
- FarmDOC IL Extension
- Center for Farm Financial Management MN Extension
- AgDecision Maker IA Extension
- Farm Financial Standards Council
- UW CDP soon to release FARMBENCH to replace Agriculture Financial Advisor (AgFA)

Learning Goals

- How to prepare and read an accounting Income Statement as it pertains to agricultural operations
  - How and why to do accrual adjustments to income statement
- How to calculate key measures of income and rates of return
  - NFIfO, NFI, ROA, ROROA, ROE, ROROE, Profit Margin
- Typical income and rates of return in agriculture
- Common accounting software used by WI farms