Comparing Debt, Investment, and Equity of Grazing, Organic, and Confinement Dairy Farms with the Federal Government Debt as a Percent of Income from 1995 to 2013

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Abstract
The three goals of any business are profitability, solvency, and liquidity. Reports about dairy farm financial performance typically focus on measures of profitability and/or cost of production because of the importance of these measures.

Grazing advocates typically claim that being low input contributes substantially to the financial success of grazing systems. Many reports (mine included) about grazier's financial performance versus other systems do not focus as much on measures of solvency, liquidity or input intensity. Measures of investment, debt and equity (investment minus debt) are measures of solvency and provide more sense about input intensity than profitability measures alone.

The experience of 2009 in the U.S. dairy industry dramatically demonstrated that the levels of investment, debt, and equity were the measures that most accurately predicted the economic resiliency of dairy farm systems and operations when profit margins were small to negative.

The public attention on and misunderstanding of the federal debt, a period of rapidly increasing farmland prices since 2005, and now some weakening of farmland prices further reminds us that levels of investment, debt and equity are important measures.

This report uses both conventional and non-conventional measures of investment, debt and equity to compare Wisconsin grazing, organic and confinement dairy systems with each other, with themselves, and with the federal debt over a 19 year period.

Source of Data
The farm data came from a farm financial analysis computer program called Agricultural Financial Advisor (AgFA©) developed at and used by the Center for Dairy Profitability at the University of Wisconsin. AgFA© can be accessed at the following link: https://cdp.wisc.edu/AgFAnew3.htm. However, since it is a dynamic data set, it might be difficult for casual users to exactly duplicate the results reported in this article. AgFA has a sample of Wisconsin dairy farms from which financial and production data are collected annually. Data were originally collected by a number of providers: Lakeshore and Fox Valley Management Association, Wisconsin Farm and Business Management Inc., other independent consultants, UW-Extension agricultural agents, Wisconsin Technical College System instructors and Center for Dairy Profitability staff. Personnel affiliated with these associations helped individual farm managers reconcile their financial data.

The grazing data included 7 to 41 observations per year (total of 357 farm years of data) from 1995 to 2014. Until 2006, a few organic graziers were included in the grazing group, but they represented 25% of the grazing herds in 2004 and 2005, and less than 14% in any previous year. The annual average grazing herd size ranged from 50 to 90 cows. The organic herd summaries ranged from 6 to 17 herds with an annual average herd size of 48 to 80 cows (total of 174 farm years of data). Not all organic herds were intensive graziers. The first organic summary was produced in 1999. The average confinement herd summaries ranged from 304 to 928 farms per year, with annual average herd size ranging from 76 to 204 cows from 1995 to 2014. AgFA© contains over 10,000 years of whole farm financial data from dairy farms spanning the years from 1995 through 2014.

Federal government debt data was obtained from the Congressional Budget Office (CBO).

Defining debt, equity and investment and why debt numbers are more trustworthy for comparing solvency and liquidity among five Wisconsin dairy systems from 1999 to 2013.

Data is available for two of the dairy systems beginning in 1995 and two beginning in 1996. However, 1999 is the beginning year of the dairy system comparisons in Tables 1-5 because that is the year of the first organic summary. Dairy data from 1995 to 2013 was used in Table 6.

The balance sheet is a common name for the financial document that helps measure **investment or assets (what you own), debt or liabilities (what you owe) and equity (investment or assets minus debt or liabilities).**

For reasons that will be explained next, this report will focus more on debt than on equity or investment.

When analyzing dairy farm financial performance, debt is typically examined as dollars of debt per cow or as a percent of assets.

Analyzing dairy farm debt as a percent of annual total farm income should also be useful for the following reasons. First, income is an important indicator of ability to pay debt. Secondly, debt and income can usually be measured more accurately than asset values. Thirdly, when comparing a dairy system (confinement) that focuses on maximized production and income with dairy systems (graziers and organic) that focuses less on maximized production and income, debt as a percent of income will provide a different perspective. This report compares debt of Wisconsin dairy farms each of these ways.

Two track balance sheets are recommended for use by all businesses. One track uses the historic cost (HC) value of assets—often called adjusted tax basis (calculated by subtracting depreciation from the acquisition cost of the asset). The other track uses current market value (CMV) which is one's best guess of current value (ideally based on some evidence). Too often, farm balance sheets use CMV because it is easier to guess than to keep good records. Each method has positives and negatives. A big advantage of the HC method is that measures of operating profit are not distorted by changes in asset unit values. Therefore, the HC track is better for measuring operating profitability. **The HC basis is the default value used by accountants because it encourages numerical consistency from one accounting period to another.**

The CMV method is more useful for such tasks as making decisions about insurance coverage and for estimating the size of your estate. The CMV will often enable you to persuade your lender to loan more money. Both methods (CMV and HC) are needed for estate planning, planning a farm business transfer or arrangement, and estimating the tax consequences of many major business decisions. Unfortunately, relying too heavily on CMV balance sheets convinced many farm families and their lenders into overestimating the financial health of many family farms in the 1960s, '70s and '80s which lead to many farm failures in the 1980s farm crisis.

Because HC asset values are generally lower than CMV values, the rate of return on assets (ROROA) calculated with HC values will often be higher than the ROROA calculated with CMV values. In addition, the HC based NFIFO values are often lower than the NFIFO values based on CMV.

Any number on a balance sheet can be wrong. However, debt is the number trusted most on a balance sheet by the author because most debts on farm balance sheets are the unpaid principle balances on loans to a conventional lender in a legal contract.

So, barring an error in writing a number (intentional or not), or overlooking a loan from a friend, family or unrecorded growing accounts payable to a merchant, debt numbers are the most trust worthy numbers on a balance sheet.

Less worthy of trust is the asset side of the balance sheet. This is because too many farm balance sheets contain only current market values (CMV). CMV are guesses (ideally the guesses are educated and realistic). CMVs are often overestimated and few balance sheets calculate contingent liabilities (cost of liquidating assets).

In addition, CMVs can drop as quickly as they can increase and from a variety of causes. Debts decrease by being paid off or forgiven. Equity is also less trustworthy than debt because it is the amount left when the more trustworthy amount of debt is subtracted from the less trustworthy asset values. Equity can also decrease as CMV decreases.

Comparing Debt Per Cow Among Five Wisconsin Dairy Systems From 1999 To 2013

Line graphs for all of the comparisons tend to be cluttered. Therefore, tables are provided to help compare the debt burden for five Wisconsin dairy systems. The ranges provided in Tables 2, 3, and 4 somewhat illustrate the volatility of some debt measures. The 1999 and 2013 columns in Table 1 come close to showing the range of debt per cow for all groups. Acronyms are used to identify groups in the narrative.

Table 1

Debt per Cow 1999-2013

Dairy System	Range of Herd Sizes	1999	2013	Average (1999-2013)	Increase (1999-2013)
Large Confinement (LC)	441 to 644	$2,510	$5,004	$3,799	$2,494
Average Confinement (AC)	96 to 204	$2,353	$4,591	$3,466	$2,242
Small Confinement (SC)	62 to 63	$2,214	$3,611	$2,920	$1,397
Organic (O)	48 to 80	$2,183	$4,662	$3,279	$2,481
Non-Organic Graziers (NOG)	61 to 90	$1,538	$3,173	$2,391	$1,635

Debt per cow increased for all groups and was highest for the LC group most years, followed by the AC, O, SC, and NOG groups. The NOG group had the lowest debt per cow in 3 columns in table 1. The NOG group also had the lowest investment per cow in both the CMV and HC tracks which somewhat supports the perception that NOG is a lower input system, which might make the NOG system more attractive to new farmers.

The debt per cow for the O group had the most erratic pattern of any group from 1999 to 2013.

The range in debt per cow between groups was $972 ($2,510-$1,538) in 1999 and gradually widened to $1,831 ($5,004-$3,173) in 2013. The LC, O, and AC groups experienced the largest increases in debt per cow. At first glance, this might suggest trouble for these three dairy systems. Before reaching that conclusion, it is best to examine other measures.

Comparing Debt as a Percent of CMV Basis Assets Among Five Wisconsin Dairy Systems From 1999 To 2013

As previously stated, **all balance sheets should value assets two ways in separate tracks.** The two ways to value assets are the historic cost (HC) basis (initial cost minus depreciation) and current market value basis (CMV). CMV is one's best guess, ideally based on some evidence. CMV tends to be higher and more volatile with "paper gains and losses" than the HC basis. HC basis is the default value used by accountants because it encourages numerical consistency from one accounting period to another.

The CMV basis typically presents debt as less burdensome than most other measures. **However, since the CMV basis is too commonly used exclusively on farm balance sheets, debt as a percent of CMV basis assets** is presented first in table two and **debt as a percent of HC basis assets** appears in table three.

Table 2

Debt as a Percent of Assets (CMV Basis)

Dairy System	1999	2013	Range (1999-2013)	Average (1999-2013)
Large Confinement (LC)	46.66%	50.37%	44.96 to 58.89%	51.94%
Average Confinement (AC)	32.95%	38.03%	31.46 to 41.24%	35.95%
Small Confinement (SC)	24.93%	20.20%	16.66 to 24.93%	21.34%
Organic (O)	23.80%	34.16%	23.33 to 40.07%	29.05%
Non-Organic Graziers (NOG)	32.21%	32.73%	16.11 to 32.21%	27.15%

The ranking of systems using **debt as a percent of CMV basis assets** was nearly the same as when using debt per cow (Table 1) and **debt as a percent of HC basis assets (Table 3)**.

Debt as a percent of CMV basis assets increased for three groups from 1999 to 2013, and was highest for the LC group most years, followed by the AC, and O, groups. The NOG group was barely different and the SC group decreased.

However, because the CMV of assets increased much more than the HC value, the increase in debt burden seemed much less using CMV instead of HC or debt per cow measures.

The O group's position was more volatile again, being close to average several years but also near the low end of the range some years. The volatility could result partly from the fact that the organic dataset had more turnover than any other group

Farmers are often advised not to exceed 50% debt as a percent of assets. Four groups stayed below the 50% debt level as a percent of assets guideline during the whole period. Since LC is the only group that exceeded 50% debt using HC basis or CMV of assets, does this mean trouble for LC? See Tables 3, 4, and 5.

Comparing Debt as a Percent of HC Basis Assets Among Five Wisconsin Dairy Systems From 1999 To 2013

Table 3

Debt as a Percent of Assets (Cost Basis)				
Dairy System	1999	2013	Range (1999-2013)	Average (1999-2013)
Large Confinement (LC)	52.05%	65.17%	52.05 to 77.61%	64.80%
Average Confinement (AC)	40.93%	55.02%	40.93 to 62.62%	52.13%
Small Confinement (SC)	33.00%	33.45%	29.50 to 44.85%	36.55%
Organic (O)	42.72%	55.15%	34.50 to 63.26%	46.66%
Non-Organic Graziers (NOG)	32.08%	52.06%	31.20 to 52.06%	45.13%

The ranking of systems using **debt as a percent of HC basis assets** was nearly the same as when using debt per cow (Table 1) and debt as a percent of CMV basis assets (Table 2). Debt as a percent of HC basis assets increased (not by much for SC) for all groups and was highest for the LC group most years, followed by the AC, O, NOG, and SC groups.

The O group's position was more volatile again, being close to average several years but also near the low end of the range some years.

The NOG group increased the most in debt as a percent of assets from 1999-2013. Does this mean trouble for NOG? See Tables 4 and 5.

Farmers are advised not to exceed 50% debt as a percent of assets. Since LC is the only group that exceeded 50% debt using HC basis or CMV of assets, does this mean trouble for LC? See Tables 4 and 5.

Comparing Debt as a Percent of Annual Total Farm Income Among Five Wisconsin Dairy Systems from 1999 To 2013

As indicated before, the traditional measures may not be adequate to properly understand the debt burden among these various dairy systems. Consequently, it is useful to look at a measure that is not often used for dairy farms, but is more common to the rest of the business world. It is also the best way to measure federal government debt. **That measure is debt as a percent of annual total farm income.** All of the farms in the data set meet the Wisconsin definition of specialized dairy farms. A specialized dairy farm in Wisconsin raises its own replacements and much of the feed consumed by the herd. Consequently, it is routine for a specialized Wisconsin dairy farm to have income from the sale of cull cows and calves, some breeding stock, occasional crop sales, government program payments, etc. However, these specialized dairy farms will still have **at least** 70% of their total farm income from milk sales and 85-90% of their total farm

income from dairy sources. In making decisions, these farmers rarely differentiate between the categories of farm income. Consequently, measuring debt as a percent of total income is more useful than as a percent of milk income.

Don't confuse debt as a percent of assets (Tables 2 and 3) **with debt as a percent of income** (Table 4)**.** Debt numbers as a percent of income are usually higher than debt as a percent of assets, because **asset values tend to be higher than annual income values.**

Table 4

Debt as a Percent of Annual Total Farm Income (1999-2013)				
Dairy System	1999	2013	Range (1999-2013)	Average (1999-2013)
Large Confinement (LC)	67.92%	80.99%	67.92 to 105.61%	85.60%
Average Confinement (AC)	65.26%	76.07%	64.87 to 97.74%	79.77%
Small Confinement (SC)	62.45%	62.67%	52.84 to 85.49%	68.67%
Organic (O)	67.70%	85.58%	67.49 to 93.02%	80.69%
Non-Organic Graziers (NOG)	53.73%	80.12%	53.73 to 92.36%	74.75%

Debt as a percent of annual total farm income increased (not by much for SC) for all groups and was highest for the LC group on average and in most years, followed by the AC, O, NOG, and SC groups.

The highest debt as a percent of income for the organic herds occurred in 2006 and in 2009 for all the other groups. It is not surprising that 2009 was the peak year for most groups because a severe decline in milk prices between 2008 and 2009 greatly increased the debt as a percent of total income even on farms that did not increase their debt in 2009. The Wisconsin organic group was fortunate to have a much more stable milk price in 2009.

The ranking of systems using debt as a percent of income is nearly the same as in Tables 1, 2, and 3.

However, the difference between the dairy systems doesn't look as large when measuring debt as a percent of income versus the more traditional measures in Tables 1, 2, and 3. That's because income increased along with debt, assets, equity, and expenses for all Wisconsin dairy systems from 1999-2013. This is also because income and debt increased at about the same speed, but CMV and HC asset increased faster. This is partially illustrated in Table 5.

Table 5

Increase in Income per Cow and Debt per Cow 1999-2013		
Dairy System	Income	Debt
Large Confinement (LC)	$2,482	$2,493
Average Confinement (AC)	$2,429	$2,237
Small Confinement (SC)	$2,215	$1,396
Organic (O)	$2,223	$2,481
Non-Organic Graziers (NOG)	$1,098	$1,635

Table 5 shows that the LC, AC, and O groups increased their income per cow nearly dollar for dollar with their debt per cow.

The SC system actually increased their income about 58% more than their debt per cow. SC is still the most common dairy system in Wisconsin but may have the highest percent of owners that are nearing retirement age with less motivation to increase debt to expand or prolong their milking career, unlike the other four system owners.

In the first four tables, the NOG group had the lowest debt burden while the LC group had the highest debt burden in 1999.

The NOG group increased their debt per cow 50% more than their income per cow from 1999 to 2013. However, Table 4 shows that their debt as a percent of income was much lower than any other group in 1999 and still was not the highest group in 2013. Consequently, the NOG group went from using less of their debt repayment ability in 1999 to no more of their debt repayment ability than two other systems in 2013. In addition, the NOG group tends to focus their investment and debt more on assets like cows and land than on depreciable assets. Depreciating assets are often considered more risky than non-depreciating assets.

All groups increased their debt burden from 1999 to 2013, likely in response to increasing income coming from increasing milk prices and in response to increasing asset values coming from increasing land prices. The SC, NOG, and O groups have had more acres and crop acres per cow than the LC and AC groups.

The SC group increased their debt burden the least, while the NOG group increased their debt burden the most. The LC and O groups also increased their debt burdens more than the AC and SC groups.

The data tends to support the perception that the NOG group has been lower input than other dairy systems in regard to investment and debt. However, the NOG and O groups became more like the confinement groups in terms of debt and investment from 1999 to 2013.

The LC group had the highest debt burden by all measures most years.

Increasing debt, dollar for dollar, with either assets or income is not sustainable forever, but increasing debt up to about 50 cents for every dollar of HC basis assets or up to about 80 cents for every dollar of income could be sustainable for businesses whose debt is already less than 50% of HC basis of assets or less than 80% of income. Because all five dairy systems were below those benchmarks in 1999, they were able to increase their debt burdens from 1999 to 2013, as they did, without serious problems.

Debt of the Federal Government as a Percent of National Income

Concern is often expressed about the debt of the federal government by people who talk about it in absolute amounts. Just as it makes sense to measure dairy farm debt as a percent of annual income, it is even more appropriate to measure federal debt as a percent gross domestic product (GDP), a measure of national income.

Table 6 compares the debt as a percent of total annual farm income from five Wisconsin dairy systems from 1995 to 2013 with the debt of the federal government as a percent of GDP from 1790 to 2014 using official data from the Congressional Budget Office (CBO). The dairy farm data appears like a blob near the upper right-hand corner of table 6.

The dairy farm data in table 6 shows that debt as a percent of income can change dramatically from year to year. It also shows that from 1999 to 2013, the federal debt as a percent of income has been less than Wisconsin dairy farm debt except for one system one year.

Not only has the federal government debt been less of a burden than dairy farm debt, the U.S. government is capable of handling a larger debt burden than is possible for an individual or even a business. The reasons why include the fact that, unlike individuals, the federal government can tax, doesn't get sick, die, or lose its job. There are also other reasons beyond the scope of this article that provide the U.S. federal government a much larger debt service capacity than most, if not all other entities.

As already stated, the dairy farm debt levels have been manageable during the illustrated periods and so has the federal government debt. **An examination of the federal government debt as a percent of national income with itself over time demonstrates even more clearly that the current level of U.S. federal government debt is not a serious economic problem.**

Official data from the CBO in Table 6 shows that the US federal government debt as a percent of GDP was very low, (under 20%) from 1926 to 1929, before the Great Depression (GD). The debt grew during the GD and was very high (about 112%) after WW II in 1946. It was 35.12% in 2008 when Wall Street was bailed out (shifting some private debt to government debt) in response to the Great Recession (GR). The CBO projects the debt to peak at 74% in 2014 before leveling under current economic policies.

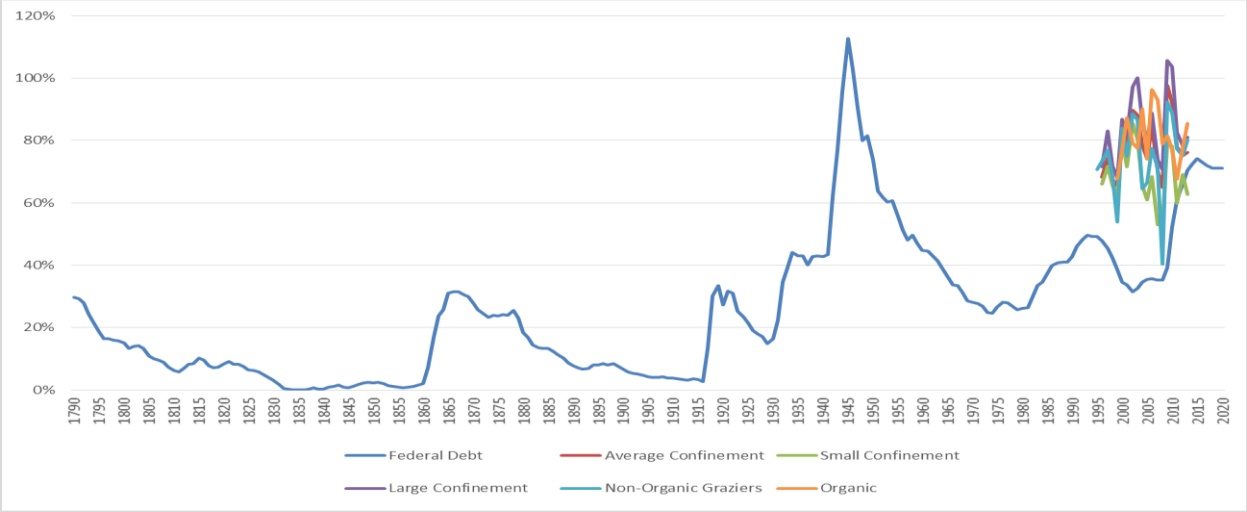
Excessive unproductive private debt created mainly by large financial institution's speculations (including derivatives) played a much larger role leading to the GD and GR. Reducing government debt doesn't automatically reduce private sector debt.

If the U.S. federal government debt was the primary cause of the GD, the economy would not have recovered from the GD because since 1929, the federal government debt has always been higher than in the years before the GD.

If the US federal government debt was the primary factor limiting the recovery from the GD or GR, then the record level of 112% in 1946 would have started a depression even larger than the GD, instead of being followed by the most prosperous 35 year period in history from 1946 to 1980.

We should always spend money wisely and manage debt carefully but the official data indicates that increases in federal government debt since 2008 is a result of instead of the cause of the Great Recession (GR).

Table 6: The U.S. Government Debt held by the public as a percent of national income or Gross Domestic Product (GDP) from 1790 to 2014 actual (2020 projected) with the Wisconsin dairy farm debt as a percent of annual total farm income from 1995 to 2013.



Summary:

1. Levels of investment, debt, equity, income, and expenses per cow have increased for all Wisconsin dairy systems (probably more than people realize).
2. Debt per cow increased at about the same speed as income, but slower than HC and CMV investment for most WI dairy systems.
3. Debt actually increased more than income and HC value of assets for non-organic graziers in part because debt per cow was very low in 1999.
4. Debt per cow has increased in a manageable proportion to income per cow for most dairy systems.
5. Especially given the annual variability of the various debt measures, the debt burden of each dairy system appears manageable and no alarming trends have appeared for any dairy system.
6. Agriculture should measure debt as a percent of income, plus other ways.
7. Different measures provide different perceptions about how low input any system is.
8. Collectively, the debt measures somewhat support the perception that non-organic grazing systems have been lower input systems, but more so earlier than currently. Still, that can make the NOG system attractive to new farmers.
9. Each year since 1995, the federal debt as a percent of income was consistently lower than for any Wisconsin dairy systems. This was also likely the case since 1947 and possibly in earlier periods too.
10. The GD and GR were the cause of increasing federal debt instead of being the result of increasing federal debt.
11. While debt should always be managed carefully, the U.S. federal government debt is not the serious economic problem that too many people believe it to be.