Staff Paper

Dairy Farm Business Analysis Workbook

by

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Gerald Schwab, and Sherrill Nott

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Date:				Herd Number:	
Farm/owner:				Phone:	
Address:					
City:		State:		Zip:	

INSTRUCTIONS

The Dairy Farm Analysis Workbook is divided into sections of the dairy farm that can be analyzed including financial, labor, crops and the dairy herd. The dairy herd is further divided into 3 replacement age groups, lactating cows and transition cows. The information in this section of the Dairy Analysis Workbook is for financial analysis of the farm business.

Goal: For a one-year period, develop an accrual adjusted income statement. This means preparing the following financial reports:

1. Balance Sheet statement at beginning of year, with both cost and market valuations.
2. Balance Sheet statement at end of year, with both cost and market valuations.
3. Income statement, showing inventory adjustments and depreciation.
4. Summary of cash flows including principal borrowings and repayments.

From the accrual income statement and other documents, various profit and financial ratios indicating strengths and weaknesses of the farm business can be calculated. This financial analysis should be performed every year to monitor the business.

Choices: You have three ways to accomplish this.

1. Fill in the worksheets in the following pages to perform a manual "paper" business analysis. Once this workbook is completed it can easily be used for FINPACK computerized business analysis input. Your Extension Agent can help you with the FINPACK program.

or

2. Run Finpack software, using the Year End Analysis (FINAN) option.
   a. Contact your county Michigan State University Extension office and ask to be put in contact with your District Extension Farm Management Agent or with your Local Agent. They have the software on their computers and will arrange to do the analysis.
   b. Buy the FINPACK software from the Center for Farm Financial Management at the University of Minnesota, 249 Classroom Office Building, 1994 Buford Avenue, St. Paul, Minnesota 55108 or phone 800-234-1111. To preview what FINPACK does, visit their web site at: http://www.cffm.umn.edu/finpack.htm

or

3. Your consultant or accountant may already have prepared statements that meet the above for completeness. Have these available. From these consultant prepared statements, calculate the ratios on page 27 of this document. Work with your consultant, District Farm Management Agent, and/or Local Agent to identify strengths and areas of potential improvement. With their help, establish a strategic plan to implement improvements within your business.

Balance Sheet Instructions and Explanations

The balance sheet or net worth statement is a snapshot of the financial position of the farm business at a given point in time. Everything the business owns and owes is listed on the balance sheet. It provides a summary of how funds have been invested in the business (assets) and the financing methods (liabilities) used at a given point in time. Accurate and detailed balance sheets are needed to accomplish the following:

- Analyze the financial performance of the business.
- Secure credit and financing from lenders
- Monitor financial progress over time
- Make financial projections
- Understand the financial risk position
- Provide information for Estate Planning

The first step in building an accurate balance sheet is to select the date that the balance sheet represents. It needs to be consistent from year to year. December 31st is the preferred date as this corresponds to the end of the previous cash accounting year and the beginning of the next. Accurate balance sheets for the beginning and end of the cash accounting period enables adjustment of cash accounting for inventory changes that occurred during the year. This is essential to understanding the farm's financial performance.

The next step is to decide what business entity the balance sheet represents (partnership, individual or the whole farm). Clearly identify the person(s) or entity being described at the top of the balance sheet and be consistent each year. Within the balance sheet, it is important to keep separate farm from non-farm assets and liabilities.

ASSETS
Assets are all the things owned or coming to the business as of the date of the statement. There may be a liability against the asset. This will be accounted for in the liability part of the Balance Sheet

Current Farm Assets
Current assets are cash or other assets that are expected to be realized in cash or consumed (feed, etc.) in production during a business year.

All supplies on hand should be priced at their cost. Growing crops such as wheat or alfalfa, should be listed at the actual cash costs invested to date.

See appendix 1 for information on calculating the quantity of crops in storage and pricing corn silage and haylage.

Government payments should reflect payments yet to come as a result of past activities, not future activities. A crop under loan can be valued and listed with crops held for sale only if offset later by a loan against it in the liability section.

The Market Value and Cost Value values are the same for current assets.

Valuation Methods for Intermediate and Long-term Assets

Values for intermediate and long-term assets should be determined using both their Cost Value and their Market Value. The Cost Value is the purchase price minus the depreciation taken to date. This should be consistent with income tax records. The Market Value is the amount that would be received if the asset were sold on the open market. It is important to use consistent values from year to year.

This formula may be helpful to help be consistent from year to year on Market Value:
"beginning value" PLUS "purchases made during the year" MINUS "cash sales" TIMES "90%"
(The 90% can be changed to reflect the years of the asset. 90% would be a 10% or 10 year life. 85.71% would be 7year life and 95% would be 20 year life.)

Lenders want to see the Market Value of term assets so they can determine ability to repay the loan if they had to foreclose. The accrual income statements (over several years) should be used to determine ability to repay without foreclosure.

There is significant value in both Market Value and Cost Value balance sheets. Market Value only can be very misleading in determining profitability and monitoring financial progress over time. Net worth calculated from a Market Value balance sheet is affected by inflation or deflation as well as actual earned income. The Cost Value balance sheet is not affected by inflation or deflation and is more useful in monitoring the businesses financial profitability and progress since only the changes in net worth resulting from earnings are included. There is space to enter both the Cost Value and the Market Value of term assets in the worksheet.

Intermediate Farm Assets
Intermediate-term assets are those resources that support production. They are not intended for immediate sale. Such assets are expected to have a useful line of 1 to 7 years. They include machinery and equipment (marketable value and un-depreciated value; be consistent year to year), breeding livestock, and securities not readily marketable.

Long-Term Farm Assets
Long-term assets include items of a more permanent nature, such as farmland, buildings and improvements, and non-farm real estate. Land should be listed separately from farm buildings and improvements.

Non-Farm Assets
Non-farm Assets are those assets not used in the farm business. These could be profits taken from the business for personal use. Personal residence, house hold items, retirement funds and cash value of life insurance typically are non-farm assets.

LIABILITIES
Liabilities are all obligations that are owed as of the statement date. Do not change the classification of a liability as it matures. Make sure principal and unpaid accrued interest are separated. The principal balances should not include unpaid interest. Accrued unpaid interest is listed separately. Statements from lending institutions should be used to verify balances.

Current Farm Liabilities
Current liabilities are those due and payable on demand or within the operating year. Commodity credit loans should be added to this section. If a CCC loan is entered, make sure the product is listed on the asset side of the balance sheet as well.

It is important to separate and understand the difference between borrowed money and unpaid bills. In cash accounting, unpaid bills have not yet been claimed as a tax-deductible expense.

Intermediate Farm Liabilities-
Intermediate liabilities and debts are against intermediate assets. These typically are due within 7 or 10 years. Loans for machinery and equipment purchases and breeding livestock tend to fall into this category. Leases, such as on silos and machinery, should be added here.

Long-term Farm Liabilities
Long-term liabilities are against long term Assets. Typically these are land contracts and mortgages on land and buildings. These typically were set up originally with 10 or more year to repay.

Non-Farm Liabilities
Non-Farm Liabilities are those liabilities against non-farm Assets.

B=Beginning, E=Ending, C=Cost Value, M=Market Value

Balance Sheet: ASSETS

CURRENT ASSETS		**Beginning of year Date: 1/1/____**		**End of Year Date: 12/31/____**
1. Farm Checkbook and Cash	1B	$	1E	$

Prepaid Expenses and Supplies on Hand

	Quantity X Value/Unit		**Dollars**	**Quantity X Value/Unit**		**Dollars**
Seed						
Fertilizer						
Crop chemicals						
Drying Fuel						
Crop supplies						
Protein Feeds						
Minerals						
Breeding & Semen						
Vet & Drugs & BST						
Livestock Supplies						
Fuel and Oil						
Parts & Misc Supplies						
Dues						
Miscellaneous						
Other						
2. **Total Prepaid Expenses and Supplies**		2B	$		2E	$

Growing Crops			**Beginning of year**			**End of year**
CROP	**Acres**	**X $ Value**	**Dollars**	**Acres**	**X $ Value**	**Dollars**
Wheat						
New seeding Alfalfa						
Mature Stands						
3. **Total Growing Crops**		3B	$		3E	$

Accounts Receivable			**Beginning of Yr Date 1/1/____**			**End of Year** Date 12/31/____
Dec. Milk (15 or 30days)						
Government Program Payments						
Hedging Accounts						
Other Current Assets						
4. **Total Accounts Receivable**		4B	$		4E	$

Crops In Inventory	**Quantity X Price**		**Dollars**	**Quantity X Price**		**Dollars**
Corn Bu						
Soybeans Bu						
Wheat Bu						
Hay Tons						
Haylage Tons ___%Moisture						
Corn Silage Tons						
Other						
5. **Total Crops In Inventory**		5B	$		5E	$

Market Livestock	**Number X Value/Head**		**Dollars**	**Number X Value/Head**		**Dollars**
Bull Calves						
6. **Total Market Livestock**		6B	$		6E	$
7. **Total Current Farm Assets** **(Add lines 1 thru 6)**		7B	$		7E	$

INTERMEDIATE FARM ASSETS

Breeding Livestock	**Beginning of Yr Date: 1/1/____** Number	X Value/Head	**Dollars**	**End of Yr Date: 12/31/___** Number	X Value/Head	**Dollars**
Milking Cows						
Dry Cows						
Bred Heifers13 to 23						
Open Heifers 3 to 12						
Heifer Calves 0 to 2						
Bulls						
8. **Total Breeding Livestock**		8B	$		8E	$

Machinery & Equipment **(Cost value is the remaining un-depreciated tax basis)**	**Cost Value**	**Market Value**	**Cost Value**	**Market Value**
Machinery				
Other				
Other				
9. **Total Machinery & Equipment**	$	$	$	$
	9BC	**9BM**	**9EC**	**9EM**

Other Intermediate Assets				
Co-op Stock				
Other				
Other				
Other				
10. **Total Other Intermediate Assets**	$	$	$	$
	10BC	**10BM**	**10EC**	**10EM**
11. **Total Intermediate Assets** **(add lines 8, 9, 10)**	$	$	$	$
	11BC	**11BM**	**11EC**	**11EM**

LONG TERM FARM ASSETS			**Beginning of Year Date: 1/1/____**		**End of Year Date: 12/31/___**	
Farm Land Cost value is the remaining un-depreciated tax basis (what you paid for it minus tax depreciation claimed)						
	Acres X Value Equals Market		**Cost Value**	**Market Value**	**Cost Value**	**Market Value**
Home Farm						
12. **Total Land**			$	$	$	$
			12BC	**12BM**	**12EC**	**12EM**

Farm Buildings & Improvements Cost Value is the remaining un-depreciated tax basis				
Farm Buildings				
Improvements including Tile				
13. **Total Farm Buildings & Improvements**	$	$	$	$
	13BC	**13BM**	**13EC**	**13EM**

Other Long-Term Assets				
Co-op Long Term Stock				
Other				
Other				
14. **Total Other Long-Term Assets**	$	$	$	$
	14BC	**14BM**	**14EC**	**14EM**

TOTAL LONG-TERM FARM ASSETS	**Cost Value**	**Market Value**	**Cost Value**	**Market Value**
15. **Tot. L. Term Farm Assets (Add lines 12,13,14)**	$	$	$	$
	15BC	**15BM**	**15EC**	**15EM**

NON-FARM ASSETS	**Beginning of Year Date: 1/1/____**		**End of Year Date: 12/31/____**	
	Cost Value	**Market Value**	**Cost Value**	**Market Value**
16. **Savings and Checking**	$	$	$	$
	16BC	**16BM**	**16EC**	**16EM**
Stocks and Bonds				
Other Current Assets				
Household Furnishings & Appliances				
Non-farm Vehicles				
Cash Value of Life Insurance				
Retirement Accounts and IRA's				
Other Intermediate Assets				
Non-Farm Real Estate Your House				
Other Long Term Assets				
17. **Total Non-Farm Assets (Include line 16)**	$	$	$	$
	17BC	**17BM**	**17EC**	**17EM**

TOTAL COMBINED FARM AND NON-FARM ASSETS				
18. **(add lines 7*, 11, 15 and 17 for each column)**	$	$	$	$
	18BC	**18BM**	**18EC**	**18EM**

*** NOTE: Line 7 (Current Farm Assets) - Use cell 7B for both the Cost Value and Market Value columns for the Beginning of the Year, and cell 7E for both the Cost Value and Market Value columns for the End of the Year figures.**

Balance Sheet: LIABILITIES

CURRENT FARM LIABILITIES	**Beginning of Year Date: 1/1/____**			**End of Year Date: 12/31/____**		
Farm accounts payable (unpaid bills & credit cards if not shown as principal debt)						
	Quantity X Value/Unit		**Dollars**	**Quantity X Value/Unit**		**Dollars**
Seed						
Fertilizer						
Crop chemicals						
Drying Fuel						
Misc. Crop Expenses						
Purch. Corn / BU						
Purch. Hay / Tons						
Purch. Silage / Tons						
Other Purch. Feed						
Breeding Fees and Semen						
Veterinary & Drugs						
Livestock Supplies						
Fuel & Oil						
Repairs						
Custom Hire						
Labor Related Items						
Land Rents						
Machinery Unpaid Leases						
Real Estate Taxes						
Insurance or Other						
Unpaid Utilities						
Unpaid Dues						
Misc. Unpaid						
19. **Total Unpaid Bills**			$			$
			19B			**19E**

Debt and Structure- BEGINNING OF YEAR - Date: 1/1/_____

SHORT-TERM FARM (Debts on Operating Loans)

CREDITOR	Interest Rate	Tot. Principal Balance	Unpaid Accrued Interest	Year P & I Payment	Month Due		Tot. Principal Balance (same)
20. Total Accrued Interest **(Add Acc. Int. Column)**			$				000,000
21. Current Principal Due on Inter.& L. Term Debt **(Add Princ. Due columns lines 25 & 27)**						21B	$
22. Accrued Interest on Short, Inter.& Long Term Debts **(Add acc. int. columns lines 20,25 & 27)**						22B	$
23. Total Oper. Loans, Current principal and Accrued Interest **(Add all of this column to this cell)**						23B	$
24. **Total Current Farm Liabilities** **(Add Lines 19B and 23B - Beginning of year)**						24B	$

INTERMEDIATE-TERM FARM (Debts on Machinery, Breeding Livestock & perhaps Bldgs.)

CREDITOR	Interest Rate	Tot. Principal Balance	Unpaid Accrued Interest	Year P & I Payments	Month Due	Final Year	Principal Due in next 12 Months	Intermediate Balance
25. **(Add bolded columns)**			**$**	$			**$**	000,000
26. **Total Intermediate Farm Liabilities**							26B	**$**

LONG-TERM FARM (Debts on Land and Buildings)

CREDITOR	Interest Rate	Tot. Principal Balance	Unpaid Accrued Interest	Year P & I Payment	Month Due	Final Year	Principal Due in next 12 Months	Long Term Balance
27. (Add Acc. Int. and Princ. Due 12 month)			$	$			$	000,000
28. **Total Long Term Farm Liabilities** **(Add this column)**							28B	$

TOTAL FARM LIABILITIES - BEGINNING OF YEAR

29. **Total Farm Liabilities**- Beginning of Year **(Add lines 24B, 26B, and 28B)**	29B	**$**

NON FARM LIABILITIES - BEGINNING OF YEAR

Accounts payable and other accrued expenses	
Credit Cards	
30. **Total Non Farm accounts payable, accrued expenses, Credit Cards and other**	**$**

CREDITOR	Interest Rate	Tot. Principal Balance	Unpaid Accrued Interest	Year P & I Payments	Month Due	Final Year	Principal Due 12mnth	Term Balance
Current						Curr	All	$0,000
						Curr.	All	$0,000
						Curr	All	$0,000
Intermediate								
Long Term								
31. Totals of Principal & Accrued Interest		**$**	**$**					

32. **Total Non Farm Liabilities** **(add the three bolded cells with $ signs in line 30 and line 31)** 32B $

TOTAL COMBINED FARM AND NON-FARM LIABILITIES- BEGINNING OF YEAR

33. **Total Combined Farm and Non Farm Liabilities** **(Add Lines 29B & 32B)** 33B $

Debt and Structure - END OF YEAR - Date: 12/31/_____

SHORT-TERM FARM (Debts on Operating Loans)

CREDITOR	Interest Rate	Tot. Principal Balance	Unpaid Accrued Interest	Year P & I Payment	Month Due		Total Principal Balance (same) (same)
34. Total Accrued Interest **(Add Acc. Int. Column)**			$				000,000
35. Current Principal Due on Inter.& L. Term Debts **(Add Princ. Due columns lines 39 & 41)**						35E	$
36. Accrued Interest on Short, Inter.& Long Term Debts **(Add acc. int. columns lines 34,39 &41)**						36E	$
37. Total Oper. Loans, Current principal and Accrued Interest **(Add all of this column to this cell)**						37E	$
38. **Total Current Farm Liabilities** **(Add Lines 19E and 37E - End of Year)**						38E	$

INTERMEDIATE-TERM FARM (Debts on Machinery, Breeding Livestock & perhaps Bldgs.)

CREDITOR	Interest Rate	Tot. Principal Balance	Unpaid Accrued Interest	Year P & I Payment	Month Due	Final Year	Principal Due in next 12 Months	Intermediate Balance
39. **(Add bolded columns)**			$	$			$	000,000
40. **Total Intermediate Farm Liabilities**							40E	$

LONG-TERM FARM (Debts on Land and Buildings)

CREDITOR	Interest Rate	Tot. Principal Balance	Unpaid Accrued Interest	Year P & I Payment	Month Due	Final Year	Principal Due in next 12 Months	Long Term Balance
41. (Add Acc. Int. and Princ. Due 12 month)			$	$			$	000,000
42. **Total Long Term Farm Liabilities**							42E	$

TOTAL FARM LIABILITIES - END OF YEAR

43. **Total Farm Liabilities** – End of Year **(add lines 38E, 40E, and 42E)**	43E	$

NON FARM LIABILITIES - END OF YEAR

Accounts payable and other accrued expenses	
Credit Cards	
44. **Total Non Farm accounts payable, accrued expenses, Credit Cards and other**	$

CREDITOR	Interest Rate	Tot. Principal Balance	Unpaid Accrued Interest	Year P & I Payment	Month Due	Final Year	Principal Due 12mnth	Term Balance
Current						Curr.	All	000,000
						Curr.	All	000,000
						Curr.	All	000,000
Intermediate								
Long Term								
45. Totals of Principal & Int.		$	$					

46. **Total Non Farm Liabilities** **(add the three bolded cells with $ signs in line 44 and line 45)** 46E $

TOTAL COMBINED FARM AND NON-FARM LIABILITIES - END OF YEAR

47. **Tot. Comb. Farm and Non Farm Liab. End of Year** **(Add Lines 43E & 46E)** 47E $

Note 2

Cost Value versus Market Value Balance Sheets - A positive Cost Value farm net worth indicates that the business has had greater profits and/or contributed capital than what it has pulled out of the business. A business with negative Cost Value net worth indicates that the business has had losses and/or has pulled more money out of the business than profits generated. The term Retained Earnings is sometimes used which basically equals the Cost Value net worth.

The difference between Cost Value net worth and Market Value net worth is called market valuation equity. This is commonly from land inflation and from machinery being valued greater than the remaining tax cost basis. Having both cost and market valuation balance sheets allows the manager to see where equity is coming from; retained profits or from inflation.

Summary and Comparison Sheet for Assets and Liabilities

ASSETS	**Beginning of Year Date: 1/1/____**		**End of Year Date: 12/31/____**	
NOTE: For Total Farm Current Assets use cell 7B for both Cost Value & Market Value for Beginning Year; use cell 7E for both Cost Value & Market Value for End of Year	**Cost Value**	**Market Value**	**Cost Value**	**Market Value**
48. Total Farm Current Assets **(line 7)**				
49. Total Farm Intermediate **(line 11)**				
50. Total Farm Long-Term Farm **(line 15)**				
51. Total Farm Assets **(add lines 48, 49, 50)**	$	$	$	$
52. Non Farm Assets **(line 17)**				
53. Total Combined Farm & Non-Farm Assets **(add lines 51 and 52)**	$	$	$	$
LIABILITIES (Cost and Market Values will be the same)				
NOTE: Cost Value and Market Values are the same for the Beginning of Year and Cost Value and Market Values are the same for the End of the Year columns for Liabilities	**Cost Value**	**Market Value**	**Cost Value**	**Market Value**
Beg. of Yr. End of Yr.				
54. Total Farm Current Liabilities **(24B) (38E)**				
55. Total Farm Interm. Liabilities **(26B) (40E)**				
56. Total Farm L. T. Liabilities **(28B) (42E)**				
57. Total Farm Liabilities **(add lines 54, 55 & 56)**	$	$	$	$
58. Non Farm Liabilities **(32B) (46E)**				
59. Total Combined Farm & Non-Farm Liabilities **(add lines 57 & 58)**	$	$	$	$
BALANCE SHEET OR NET WORTH COMPARISON				
	Cost Value	**Market Value**	**Cost Value**	**Market Value**
60. Farm Net Worth **(line 51 minus line 57)**	$	$	$	$
61. Farm Contingent Tax Liability **(optional)**				
62. Farm Net Worth after Contingent Tax Liability **(line 60 minus 61)**	$	$	$	$
63. Non Farm Net Worth **(line 52 minus line 58)**	$	$	$	$
64. Non Farm Contingent Tax Liability **(optional)**				
65. Non Farm Net Worth after Contingent Tax Liability **(line 63 minus line 64)**	$	$	$	$
66. Tot. Combined Farm & Non Farm Net Worth **(add lines 62 and 65)**	$	$	$	$
67. Farm Market Valuation Equity (See note 2) **(line 51 Market Value minus line 51 Cost Value for each year)**	XXXXXXXX	$	XXXXXXXX	$
68. Change in Combined Net Worth for the year **(use line 66 for both CV and MV, Ending minus Beginning)**	XXXXXXXX	XXXXXXXX	$	$

INCOME STATEMENT - Explanations

The profit and loss statement or NET FARM INCOME presents a summary of income, related expenses and the resultant profit or loss from operations for a given period, normally one year. The income statement starts with the NET CASH FARM INCOME and then makes inventory adjustments to determine NET OPERATING PROFIT. Depreciation and other capital adjustments are made next to determine NET FARM INCOME.

By comparing profit and loss statements for several years, you can see trends in your business. If you use a profit and loss statement along with a balance sheet, you can calculate your return on investment.

An income statement must include adjustments for inventories, and depreciation.

NET CASH FARM INCOME is simply the difference between total cash income and total cash expenses. This value minus tax depreciation is what are subject to cash basis income taxes.

NET OPERATING PROFIT takes into account inventory changes of current assets and unpaid bills. These changes are often huge and make significant differences to the income statement. A feed shortage due to drought often will not show in cash flow until next year.

NET FARM INCOME takes into account depreciation and other capital activities. This is where the cost of machinery, buildings and other assets with a life of more than one year gets accounted for. The change in inventory of Breeding Livestock is accounted for in this section. The Net Farm Income is the return to unpaid labor and management and the farm equity used in the business.

B=Beginning, E=Ending, C=Cost Value, M=Market Value

Income Statement: CASH FARM REVENUE for the Year

CASH FARM INCOME		
	Quantity	**Dollars**
Corn	bu.	$
Soybeans	bu.	
Sugar beets	Ton	
Dry beans	cwt.	
Wheat	bu.	
Other grains (oats, etc.)	bu.	
Hay	Ton	
Calves	Hd	
Milk	Lbs	
Cull Dairy cattle sold	Hd	
Misc. Livestock sold (beef, swine...) [cwt or hd.]	Hd	
Deficiency Payments		
CRP payments		
Other Government Programs		
Custom Income		
Contract Livestock Income		
Patronage Dividends, Cash		
Insurance Income		
Cash from Hedging		
Other Farm Incomes		
PA 116 and Homestead Credit		
69. **Gross Cash Farm Income**		$

Income Statement: CASH FARM EXPENSES for the Year

CASH FARM EXPENSES (expenses paid)	**Quantity & Unit**		**Dollars**
Seed		**Units**	
Fertilizer			
Crop Chemicals			
Crop Insurance			
Drying Fuel			
Irrigation Energy			
Packaging and Supplies			
Utilities Crops			
Hauling and Trucking Crops			
Marketing Crops			
Feeder Livestock Purchased Head & lbs		Head	
Purchased Protein Feeds			$
Corn Purchased Dry Shelled Corn Equivalent		Bu	$
Corn Silage Purchased		Tons	$
Haylage & Dry Hay Purchased Dry Hay Equivalent		Tons	$
Breeding Fees			
Veterinary, Medicine, BST			
Livestock Supplies			
DHIA			
Livestock Leases			
Utilities Livestock			
Hauling and Trucking Livestock & Milk			
Marketing Livestock			
Miscellaneous Livestock			
70. Interest			$
Fuel and Oil			
Repairs			
Custom Hire			
Hired Labor			
Land Rent			
Machinery and Building Leases			
Real Estate Taxes			
Farm Insurance			
Utilities			
Dues and Professional Fees			
Miscellaneous Expenses			
71. **Total Cash Farm Expenses**			$

72. NET CASH FARM INCOME (Line 69 minus Line 71) $

INVENTORY CHANGES

*Note: The numbers below the cell or box is where you find your value.

	Crop & Feed	Market Livestock	Receivables & other income items	Prepaid Expenses	Payables & Accrued Expenses
73. Ending Inventory					
	(line 5E)	**(line 6E)**	**(line 4E+3E)**	**(line 2E)**	**(line 19B+22B)**
					(Beginning)
74. Beginning Inventory					
	(line 5B)	**(line 6B)**	**(line 4B+3B)**	**(line 2B**	**(line 19E+36E)**
					(Ending)
75. Inventory Change **(line 73 minus line 74)**	$	$	$	$	$

76. Total Inventory Change $

(Combine all cells in line 75. Make sure to add or subtract depending on the cell's individual value.)

77. NET OPERATING PROFIT (Line 72 combined with line 76) $

DEPRECIATION AND OTHER CAPITAL ADJUSTMENTS

	Breeding Livestock	Machinery & Equipment	Building & Improvements	Other Assets
78. Ending Inventory				
	(line 8E)	**(line 9EC)**	**(line 13EC)**	**(line 10EC+14EC)**
79. Capital Sales **(+)**				
(Separate out sales by categories)	**(line 85)**	**(line 85)**	**(line 85)**	**(line 85)**
80. Beginning Inventory **(-)**				
	(line8B)	**(line 9BC)**	**(line 13BC)**	**(line 10BC+14BC)**
81. Capital Purchases **(-)**				
(Separate out purchases by categories)	**(line 90)**	**(line 90)**	**(line 90)**	**(line 90)**
82. Depreciation/Capital Adjust. **(=)** **(Line 78 plus L. 79 minus L. 80 minus L. 81)**	$	$	$	$

83. Total Depreciation/Capital Adjustment $

(Combine all cells in line 82. Make sure to add or subtract depending on your cell's individual value.)

84. NET FARM INCOME (Cost Value) **(line 77 combined with line 83)** **$**

Statement Of Cash Flows and Cash Reconciliation

SOURCE OF FUNDS		USE OF FUNDS	
Beginning Cash Balance **(line 1B)**		Ending Cash Balance **(line 1E)**	
Gross Cash Farm Income **(line 69)**		Total Cash Farm Expense **(line 71)**	
85. Farm Capital Sales **(sum of line 79 blocks)**		90. Farm Capital Purchases **(sum of line 81 blocks)**	
86. Net Non-Farm Income		91. Income Tax and S.S. Paid	
87. Money Borrowed		92. Principal Payments	
88. Gifts and Inheritances		93. Cash Gifts Given	
Beg. Non-Farm Savings **(line 16BC)**		End. Non-Farm Savings **(line 16EC)**	
89. Total Cash Inflows	$	94. Subtotal Cash Outflows	$

95. Apparent family living expense	**(line 89 minus line 94)**	$
96. Family living expense reported		$
97. Discrepancy (Unaccounted Cash)	**(line 95 minus line 96)**	$

This section is used to help determine the accuracy of the information. With large unaccounted cash, one should question the accuracy of the financial information. Your accounting system should be able to account for these activities. For assistance contact your local extension agent to learn about the MSU Extension Telfarm farm record keeping system.

B=Beginning, E=Ending, C=Cost Value, M=Market Value

FINANCIAL MEASUREMENTS - Explanations

Having an understanding of the financial ratios and measurements for specific farms can give significant guidance of where to investigate for opportunities and improvements in the business. Expansion feasibility can be more realistically evaluated with good financial information. High profitability and adequate cash flow is the result of many factors. Information from the beginning and ending balance sheets and the income statement can be used to calculate these financial measurements. The indicators should be calculated each year to document and monitor financial progress.

Side-by-side comparisons of the efficiency ratios to other Michigan farms will help the manager identify where improvements may be made. The financial measures allow the farm manager to identify where strengths and weaknesses of the business are. Are they having a profitability problem, a cash-flow problem, or a debt structure problem? Are the efficiencies within reason, or should management energies by focused to enhance the strengths and minimize the weaknesses? A low asset turnover rate may indicate the necessity to liquidate unproductive assets, including machinery, unproductive land, or high valued land.

The National Standards Task Force on farm accounting has sixteen ratios divided into five major groupings. We will utilize eleven of these ratios. The five main sections are: Liquidity, Solvency, Profitability, Repayment Capacity and Efficiency.

Liquidity

The **Current Ratio** is the total current farm assets divided by total current farm liabilities. The current ratio tells us if we have enough current assets to cover our current liabilities, and the current portions of intermediate and long-term debts are included in this ratio. The current ratio is static in nature in that no timing of cash flows are involved and it ignores lines of credit that may be available. Current is defined as a 12-month planning horizon. Desired level varies by type of farm, with dairy able to have a lower value compared to fruit or cash crop operations. A ratio less than (<) 1 is considered "weak", with the ratio greater than (>) 2 considered to be "strong". A business with weak current ratio and cash flow problems should evaluate stretching principal payments over more years. It is also valuable to look at how this ratio has changed over recent years and relate to production and/or investment occurrences.

Solvency

The farm **Debt to Asset Ratio** tells us what percentage of business assets are owed to creditors. This is calculated by taking total farm liabilities divided by total farm assets. The debt to asset ratio measures the financial position of the business. It gives us a measure of risk exposure and the ability of the business to take hits. The debt to asset ratio is not a measurement of profitability. Ratios > than 65% are considered to be "weak", with ratios < than 35% considered to be "strong". The equity to asset ratio is simply the reverse of the debt to asset ratio, and the debt to equity ratio is computed using the same values. It is also called the **leverage ratio** and lenders tend to use it. This is an important value to monitor over time and as major investments are considered or made. A goal may be a Debt to Asset ratio below 60% even during a major expansion.

Profitability

The **Rate of Return on Farm Assets** is a good overall measure of profitability. It is calculated by taking the net farm income plus interest expense minus the value of unpaid operators, labor and management; and this all is divided by the average total farm assets. Including the value of unpaid labor and management is important, and significantly influences this ratio. The ratio tells us how our business compares from prior years and to outside investments. The ratio tells us what the return on the business is if there were no debts and after the value of unpaid labor and management is paid. This ratio can be greatly influenced depending on whether you're using cost value or market value. We've chosen to calculate on market value. Non-farm income items should not be included. Comparisons across farms are more meaningful using market values, while comparisons from year-to-year of an individual farm is more meaningful using cost values. For rate of return on farm assets, ratios <4% are considered "weak", while >10% are considered to be "strong".

The **Rate of Return on Farm Equity** measures how well your equity capital is being employed by the business. It is calculated by taking the net farm income, minus the value of operator's unpaid labor and management, divided by the average total farm equity. Highly leveraged and under capitalized farms can get wild results. If your debt is working for you, the return on equity will be higher than the return on assets. If the farm has no debt, the return on equity will be the same as the return on assets. Rate of return on farm equity should be higher than rate of return on assets, but ratios <6% are considered "weak", while ratios >12% are considered "strong".

The **Operating Profit Margin** ratio measures the efficiency in terms of the return per dollar of sales. The operating profit is before interest expense, but after taking a charge for the value of unpaid labor and management. A low operating profit margin can be caused by low production, low prices, or high input costs. These input costs include all the expenses included under cash farm expenses, but not including interest. Interest expense does not affect the operating profit margin. A high value of unpaid labor management will reduce the operating profit margin. Depreciation is also not part of the ratio. Big-ticket items on dairy operations are: crop expenses, purchased feed, labor, veterinary costs, livestock supplies and repairs. Operating profit margin ratios <10% are considered "weak", while ratios >20% are considered "strong". The operating profit margin ratio calculates the profit of the business without taking into consideration interest, but after taking into account the value of unpaid labor and management.

A farm heavily leveraged must have a strong rate of return on farm assets, while a business that has relatively low debt, or no debt, can be quite profitable from an income tax standpoint, and provide significant family living and some increase in net worth. A low operating profit margin can be caused by low milk production, low crop yields and/or low milk prices. It can also be caused by high input cost, including: fertilizer expense where manure is not utilized, high chemical expenses from poor weed control, high cost of purchased feed, including corn and hay, and purchased protein feeds. Poor quality forages may necessitate high purchase feed, while in other circumstances, balancing rations for unrealistic milk production levels can cause high feed expenses. Veterinary and medicines, livestock supplies and hired labor are other areas often identified on dairy operations as needing attention. High labor is sometimes identified with inefficient facilities.

Repayment Capacity

The **Term Debt Coverage Ratio** measures the ability of businesses to cover all intermediate and long-term debt payments. It is calculated by taking net earnings, which includes farm and non-farm earnings plus depreciation, plus interest on the intermediate and long-term debts divided by the annual scheduled principle and interest on the intermediate and long-term debts. Notice that the amount of money available for debt servicing of the intermediate and long-term debts does not include the interest that is paid on short-term one year and operating loans. The ratio of 1 or 100% means that there is just enough money to service the debt. Ratios less than 115% are considered "weak", while ratios greater than 140% are considered "strong". The farm with a weak repayment capacity may or may not have a profitability problem. Repayment capacity is a measurement of the ability of the business to pay interest and principal in relationship to how debt is structured. A fast debt repayment structure will generate a lower repayment capacity. The farm may be experiencing cash flow problems, creating a weak current ratio, because of the fast repayment schedule. A farm with a relatively good rate of return on assets and net farm income ratio, but a weak repayment capacity can restructure its debt to spread out payments and improve cash flow.

Efficiency Measures

The **Asset Turnover Rate** measures how efficiently assets are being utilized in the business to generating revenue. A low asset turnover ratio indicates that the business has a lot of assets not efficiently being utilized. However, a business can have a low asset turnover ratio if it has a high profit margin ratio. The asset turnover ratio times the profit margin ratio gives you the rate of return on farm assets; in other words, how much profit is being generated in relationship to the amount of assets employed by the business. A farm business that owns most of its assets, including land and facilities will have a relatively low asset turnover rate, compared to a business that rents most of its land and facilities, which should have a high asset turnover rate, but may have a low operating profit margin. It's the combination of these two that is important to determine overall profitability in the business.

The **Operating Expense Ratio** is used to compare the individual farm to industry averages or standards. It is used to measure expense control. It is calculated by taking total operating expenses divided by total revenue. The operating expenses are the items listed in the cash farm expense section, but do not include interest. It is similar to the profit margin, except it looks at the expenses versus the income, and the operating expenses ratio does not include a value for unpaid labor and management, where the operating profit margin does include a value for unpaid labor and management. The operating expense ratio is commodity specific, but ratios >80% are considered "weak", while values <70% are considered "strong".

The same items that affect the operating profit margin also directly inversely affect the operating expense ratio, with the exception of the value of unpaid labor and management. So to some degree, the same items that affect the operating profit margin also affect the operating expense ratio.

The **Depreciation Expense Ratio** is used to look at the amount of income being used for capital items. A ratio >10% is considered "weak", while a ratio <5% is considered "strong".

The depreciation expense ratio should not include the depreciation on purchased cows, nor should it include the appreciation or depreciation on raised cows. The only way to decrease the depreciation ratio, without a major change in the business, is to decrease the amount of capital purchases each year. It will take a few years to work out of a high ratio. A farm that has new facilities will also experience a high depreciation ratio, but highly utilized facilities, especially the milking parlor, can keep the depreciation ratio <10%.

The **Interest Expense Ratio** is used to measure the interest expense compared to gross income from the operation. The high interest expense ratio indicates that the business is not generating much income in relationship to the amount of interest being paid. A high or weak interest expense ratio indicates that the business needs to reduce debt or increase the output with the investment that it has. High depreciation/high interest ratios often go together. If these two items are high, the operating expense ratio needs to be relatively low in order to have a satisfactory net farm income ratio

The **Net Farm Income Ratio** is the amount of money left over after operating, depreciation and interest expenses. It is different than the operating profit margin because interest and depreciation is included, while the value of unpaid family labor and management is not included in NFIR. A net farm income ratio <7% is considered "weak", while >15% is considered "strong". A low net farm income ratio indicates the farm is not generating much profit for the unpaid labor or for net worth gain. Businesses that do not have any unpaid labor, i.e.: a corporate structure where the owners are paid through salaries, will tend to have a lower farm income ratio because the value of unpaid labor is included in the cash expenses.

Year _____

FINANCIAL MEASUREMENTS		**Beginning of Year**	**End of Year**
LIQUIDITY			
98. Current Farm Assets	**(line 7B)** and **(line 7E)**	$	$
99. Current Farm Liabilities	**(line 24B)** and **(line 38E)**	**$**	$
100. **Farm Current Ratio**	**(line 98 divided by line 99)**		
SOLVENCY			
101. Total Farm Debt	**(line 29 B)** and **(line 43 E)**	**$**	$
102. Total Farm Assets	**(line 51 BM)** and **(Line 51 EM)**	**$**	$
103. **Debt to Asset Ratio** (Farm,Market)	**(line 101 divided by line 102) X 100**	%	%
PROFITABILITY			
104. **Net Farm Income** (Market Value)	**(Line 84 plus line 67EM minus line 67BM)**		$
105. Farm Total Accrual Interest	**(line 70 plus line 36E minus line 22B)**		$
106. Value of **Unpaid** Family labor and Management	**(what is yours and others time worth)**		$
107. Average Farm Assets (Market Value)	**((line 102B plus line 102E) divided by 2)**		$
108. **Rate of Ret. on Farm Assets**	**((line104 plus line105 minus line106) divided by line107) X 100**		%
109. Average Total Farm Equity	**((line 60BM plus line 60EM) divided by 2)**		$
110. **Rate of Return on Farm Equity**	**((line 104 minus line 106) divided by line 109) X 100**		%
111. **Operating Profit Margin**	**(line104 plus line105 minus line106) divided by line116) X 100**		%
REPAYMENT CAPACITY – Accrual			
112. Cash Available for Principal and Interest **(line 77 plus line 105 minus interest expense only on operating and short term debts plus line 86 minus line 95 minus line 91)**			
113. **(sum of scheduled yearly P & I payments on Interm. And Long Term Debts from lines 25 and 27)**			
114. **Term Debt Coverage Ratio - Accrual**	**(line 112 divided by line 113) X 100**		%
EFFICIENCY			
115. Gross Farm Income **(line 69 plus line 3E plus line 4E plus line 5E plus line 6E minus line 3B minus line 4B minus line 5B minus line 6B)**			$
116. Value of Farm Production **(line 115 minus purchased livestock and purchased feed from line 71)**			$
117. **Asset Turnover Ratio** (Market Value)	**(line 116 divided by line 107) X 100**		%
118. **Operating Expense Ratio** (Cost Value) **((line71 minus line105 plus line19E minus line19B minus line2E plus line2B) divided by line115) X 100**			%
119. **Depreciation Expense Ratio** (Cost Value)	**(line 83 divided by line 115) X 100**		%
120. **Interest Expense Ratio** (Cost Value)	**(line 105 divided by line 115) X 100**		%
121. **Net Farm Income Ratio** (Cost Value)	**(line 84 divided by line 115) X 100**		%

Break Even Milk Prices Worksheet
Prices Needed for Whole Farm Financial Indicators to Equal Zero

122. **Average Number of cows (milking and dry)**	**hd**	
123. **Total cwt of Milk Shipped (not DHIA)** **(pounds from line 69 divided by 100)**	**cwt**	
124. **Total Milk Income** **(only milk sold from line 69)**	**$**	
125**. Average Price Received per Cwt** **(line 124 divided by line 123)**	**$ /cwt**	
126. **Pounds Milk shipped per Cow** **(line 123 divided by line 122 X 100)**	**lbs**	

Whole Farm Financial Indicators	**Whole Farm**	**Per Cow**	**Per Cwt**
127. **Net Farm Income** **(line 84)**	**$**	**$**	**$**
128. **Change in Net Worth Cost Value** **(line 68 Cost Value)**	**$**	**$**	**$**
129. **Capital Replacement Margin** **(line112 minus line113)**	**$**	**$**	**$**

For lines 127, 128, and 129; Use the whole farm value from each line divided by line 122 for the Per Cow value and divide by line 123 for the Per Cwt value.

Break Even Milk Price for Whole Farm Indicator to Equal Zero

130. **Net Farm Income**	**(line 125 minus line 127 per cwt value)**	**$ /cwt**
131. **Change in Net Worth – Cost Value**	**(line 125 minus line 128 per cwt value)**	**$ /cwt**
132. **Capital Replacement Margin – Cash Flow**	**(line 125 minus line 129 Per Cwt value)**	**$ /cwt**

These "Break Even Milk Prices" give the manager an indication of what milk price was needed for the whole farm "Financial Indicators" to be zero for the time period being analyzed. The "Change in Net Worth" would be zero at the indicated price and there would be just enough money to meet "Cash Flow" needs, assuming that only borrowed money was used to make capital purchases. Assuming everything stays the same, these values can give an indication of the ability of the business to withstand low milk prices.

This worksheet should not be used to determine "Cost of Production" for producing milk because the financial indicators are whole farm values and do not break out individual profit centers such as cropping activities or other enterprises included in the "whole farm". If profit were generated in non-dairy enterprises then the break evens would be higher for milk. Conversely if losses were occurring in non-dairy business activities (included in the whole farm) the "break even" would be lower for milk.

The values in this Break Even Milk Prices Worksheet can and should be compared to milk prices and industry averages for the year being analyzed. This information can be obtained from the Dept. of Agricultural Economics, Michigan State University "Business Analysis Summaries" for various farm types. The information can be downloaded from the Website http://www.msu.edu/user/nott It can also be obtained from your local Extension office.

Farm Name _____
Business Year _____

FINANCIAL RATIOS GENERAL GUIDELINES

		Weak		Caution		Strong
Liquidity						
Current Ratio	**(line 100)**	_____	<1	_____	>2	_____
Solvency						
Farm Debt to Asset Ratio	**(line 103)**	_____	>65%	_____	<35%	_____
Profitability						
Rate of Return on Farm Assets	**(108)**	_____	<4%	_____	>10%	_____
Rate of Return on Farm Equity	**(110)**	_____	<6%	_____	>12%	_____
Operating Profit Margin	**(line 111)**	_____	<10%	_____	>20%	_____
Repayment Capacity						
Term Debt Coverage Ratio	**(line 114)**	_____	<115%	_____	>140%	_____
Efficiency						
(Commodity Specific)						
Asset Turnover Rate (Mkt)	**(line117)**	_____	<40%	_____	>50%	_____
Operating Expense Ratio	**(line118)**	_____	>80%	_____	<70%	_____
Depreciation Expense Ratio	**(line119)**	_____	>10%	_____	<5%	_____
Interest Expense Ratio	**(line 120)**	_____	>10%	_____	<5%	_____
Net Farm Income Ratio	**(line 121)**	_____	<7%	_____	>15%	_____

Business Strengths:

1._____
2._____
3._____
4._____
5._____
6._____

Opportunities:

1._____
2._____
3._____

FEED DISSAPEARANCE CALCULATION TABLE

	A	B	C	D	E	F	G	H	I	J
Roughage	**Beginning Inventory**	**+ Plus Purchases**	**+ Plus Production**	**- Minus Sales**	**- Minus Ending Inventory**	**= Equals FeedDisappearance**	**Per Cow (Milking and Dry)**	**Weigh Back**	**Consumption**	**Storage Loss**
Hay, Tons DM										
Haylage, Tons DM										
Corn Silage Tons DM										
Other										
Other										
Total Roughage										
Corn, Bu										
Other Grains										
Protein Feeds Tons										
Supplements										
Salt										
Mineral										
Other										

Feed disappearance is calculated by adding columns A, B, C and then taking away columns D and E to equal Column F (Feed Disappearance). Column F is divided by average number of cows to determine Feed Disappearance per cow (milking and dry) Column F can be separated in columns H, I and J to determine where feed is disappearing to.

COMPARE NEEDS WITH SUPPLY

	Requirements Needed	Supplies Available	Difference
Hay, tons DM			
Haylage, tons DM			
Corn silage, tons DM			
Total roughage			
Total grain, tons			
Corn, tons			
Protein supplement, tons			
Other cereal grains			
Other			
Other			
Supplements			
TM salt (+/- .004 DM intake)			
Mineral (+/- .005 DM intake)			
Other			

ESTIMATED FEED NEEDS OF DAIRY COWS - 365 days*

Milk production per cow			DM consumed	FORAGE QUALITY					
				LOW		MEDIUM		HIGH	
				Forage**	Grain***	Forage**	Grain***	Forage**	Grain***
lb/yr	lb/day		lb/cow/day	ton DM	lb DM	ton DM	lb DM	ton DM	lb DM
20,000	66		47	4.7	7,300	5.1	6,600	5.3	6,200
18,000	60		45	4.7	6,800	4.9	6,500	5.1	6,000
16,000	52		43	4.7	6,200	4.9	5,700	5.1	5,400
14,000	46		41	4.6	5,700	4.9	5,200	5.2	4,600
Heifers, 1-2 yr	-----		+/-20	3.9	200	3.8	100	3.6	100
Heifers, 1 yr	-----		-----	1.4	1,300	1.5	1,050	1.6	900

* Values given are for DM needed/animal/365 days. This includes a dry period of 60 days for milking cows fed about 28 lb DM hay/day. A reasonable estimate of DM consumed can be obtained from the equation DM intake = (2 + [.02 x milk lb/day]) x cwt body wt. This does not include feeding and storage losses, which are included in the above table. The value from that equation can be used for any given period. That value can then be multiplied by the percent concentrate and forage in the ration (DM basis) to give lb DM of each needed for that period.

**Forage values are in tons of dry matter. To convert to as-fed basis, divide lb or ton hay DM by .87; to convert DM to lb or ton of 55% DM haylage, divide lb DM by .55; to convert DM to ton or lb of 35% DM silage, divide by .35.

***Grain values are total DM for 1 yr. A 12% grain mix requires 90% corn and 10% soybean meal (44% protein SBM) or equivalent; a 14% mix requires 15% SBM; 16% requires 20% SBM; and 18% requires 26% SBM or equivalent.

To convert lb corn DM to lb of HM corn as fed, divide lb DM obtained from table and footnote *** by percent DM in the HM corn; ex., the cow needs 4,000 lb dry corn plus 2,000 lb SBM. Amount of HM corn is 4,000 divided by .70 (70% DM in HMSC) = 5,714 lb of HMSC.

SILO CAPACITIES OF CORNAGE PER FOOT OF HEIGHT

APPROXIMATE BUSHELS OF DRY GRAIN (15.5%)												
Kernel moisture content	Conversion factor	*Inside silo diameter (feet)*										
		8	10	12	14	16	18	20	22	24	26	30
SHELLED CORN (1.25 cubic feet per bushel at 15.5 percent moisture)												
15.5(*)	1.0	40	63	90	123	160	204	251	304	362	424	640
24	.93	37	58	84	114	148	188	233	281	334	392	592
28	.89	35	56	80	109	142	180	224	270	320	376	568
32	.85	34	53	77	105	136	173	214	258	307	360	543
GROUND EAR CORN (1.94 cubic feet per bushel at 15/5 percent kernel moisture)												
15.5	1.0	26	41	59	80	103	131	162	196	233	274	413
24	.90	23	37	53	72	94	119	148	176	213	250	375
28	.86	22	35	50	69	90	114	141	169	203	238	358
32	.83	21	34	48	66	86	109	134	162	193	227	342

(*) This first line is for dry grain and can be used to measure capacity of round bins for all small grains.

Conversion factor - For any size not listed, multiply the dry grain capacity of the storage by this factor as listed moisture content to determine equivalent in dry grain.

Density increases with depth but no allowance was made for compaction in this table. Silos 40 feet or higher may have 10 percent greater capacity than shown in table.

CAPACITIES OF BINS AND CRIBS IN DRY GRAIN

To find the capacities in bushels, first find the volume in cubic feet;
For a crib or cube, multiply the length x width x height (all in feet).

For round bins, cribs, or silo, multiply the radius (1/2 diameter) x radius x 3.1416 x height.
Then, to convert cubic feet to bushels:
Multiply by .8 for small grain or shelled corn.
Multiply by .4 if ear corn.
Multiply by .515 if ground ear corn.

For round bins, you may use the top line in table and multiply by height in feet.

Crib capacities in bushels for ear corn per foot of length:					
Width	*Height (in feet)*				
(in feet)	**8'**	**10'**	**12'**	**14'**	**16'**
5	16	20	24	28	32
6	19.2	24	28.8	33.6	38.4

STANDARD WEIGHTS OF FARM PRODUCTS PER BUSHEL

Product	***lb***
Alfalfa	60
Apples (average)	42
Barley (common)	48
Beans	60
Bluegrass (Kentucky)	14-28
Bromegrass, orchardgrass	14
Buckwheat	50
Clover	60
Corn (dry ear)	70
Corn and cob meal	45

Product	***lb***
Corn (shelled)	56
Corn kernel meal	50
Corn (sweet)	50
Cowpeas	60
Flax	56
Millet (grain)	50
Oats	32
Onions	52
Peas	60
Potatoes	60

Product	***lb***
Ryegrass	24
Ryegrass	56
Soybeans	60
Spelt	30-40
Sorghum	56
Sudangrass	40
Sunflower	24
Timothy	45
Wheat	60
Milk, per gallon	8.6

RULE OF THUMB ON SILO CAPACITIES

20' X 60' = 500 tons
20' x 50' = 390 tons
20' x 40' = 280 tons
20' x 70' = 575 tons

For any other size silo, the radius squared expressed as a decimal (divided by 100) times the tonnage of a 20-foot silo will give the capacity in tons

Examples:
30' x 60' - 15 x 15 = 2.25 x 500, or 1,145 tons
16' x 50' - 8 x 8 = .64 x 390, or 250 tons
12' x 40' - 6 x 6 = .36 x 280, or 101 tons

TO CONVERT HIGH MOISTURE FORAGE TO DRY HAY EQUIVALENT

Method A:
Read the tonnage from the silo capacity table. Then divide this figure by 3 to convert to dry hay equivalent. This will be a close estimate, regardless of the moisture content of the grass or haylage.

Method B:
Multiply the tonnage of green or wet material by the dry hay per ton equivalent in the following table:

Hay or forage	***% moisture***	***Dry hay per ton***
Green chop	88	.25 ton
Grass silage	70	.34
Grass silage	65	.40
Haylage	60	.45
Haylage	50	.57
Haylage	40	.68

MEASUREMENT STANDARDS, HAY AND STRAW

	Avg. cu. Ft/ton	***Range cu. Ft/ton***
Hay, baled	275	250-300
Hay, chopped - field cured	425	400-450
Hay, chopped - mow cured	325	300-350
Hay, long	500	475-525
Straw, baled	450	400-500
Straw, chopped	600	575-625
Hay, loose	480	370-390
Straw, loose	800	750-850

BUNKER SILO CAPACITY FOR CORN SILAGE, 70 PERCENT MOISTURE

Formula:
Average length x width x settled depth (all in feet) x 40 lb = T
2,000 lb.

Weight per cubic ft will vary by amount of packing, fineness cut, moisture content and depth of material. Use the followin table to estimate pounds per cubic ft according to depth of pi

Depth of silage (ft)	***Pounds per cubic ft***
6	32
8	36
12	40
20	45

SILO CAPACITY:
TONS OF CORN OR GRASS SILAGE (68% MOISTURE) IN SETTLED UNOPENED SILOS

Depth of silage (in feet)	Inside diameter of silo in feet							
	12'	14'	16'	18'	20'	24'	26'	30'
8	11	15	20	25	31	45	52	70
12	19	25	33	42	52	75	88	117
16	28	38	49	62	77	111	130	173
20	38	51	67	85	105	151	177	236
24	49	66	87	110	135	194	228	304
28	61	83	108	137	169	243	286	380
32	74	100	131	166	205	295	346	461
36	87	118	155	196	242	348	409	545
40	101	138	180	229	280	403	473	630
44	117	159	207	261	320	461	541	720
50	137	186	248	310	389	560	673	875
55	---	212	283	365	444	639	750	999
60	---	---	319	415	500	720	845	1,125
70	---	---	---	---	574	827	970	1,290
80	---	---	---	---	650	1,100	1,330	1,880
90	---	---	---	---	---	---	---	2,470

NOTE: When a silo is partially unloaded from the top, the remaining silage is more tightly packed and heavier than the same volume in an unopened silo. Therefore, compute the weight remaining as follows:
1. Use the table to find the original contents before the silo was opened. (Example: 50' of settled silage in a 20' silo = 389 tons).
2. Estimate depth of silage removed and determine its weight from table (Example: Weight removed in 32' = 205 tons).
3. Subtract tonnage removed from original contents to find tonnage remaining.
(Example: 389 tons (original contents) - 205 tons (removed in 32') = 184 tons (remaining in 18').

CONVERSION TABLES FOR COMMON WEIGHTS AND MEASURES

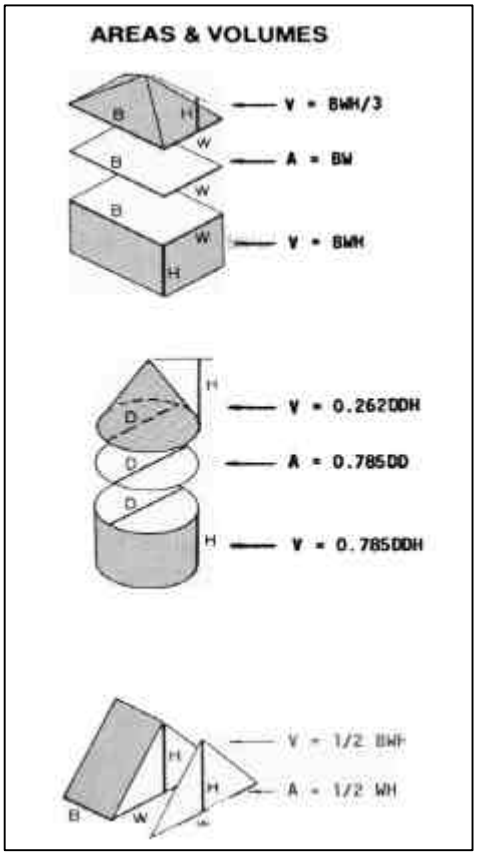
Metric conversions:
1 pound = 454 grams
2.2 pounds = 1 kilogram
1 quart = 0.946 liter
1 gram = 15.43 grains
1 metric ton - 2.205 bands
1 inch = 2.54 centimeters
1 centimeter - 10 millimeters = .39 inches
1 meter = 39.37 inches
1 acre = .406 hectare

Weight conversions:
8 tablespoons = 1/4 lb.
3 teaspoons = 1 tablespoon
1 pint = 1 pound
2 pints = 1 quart
4 quarts = 1 gallon = 8 lbs.
2,000 lbs. = 1 ton
16 ounces = 1 pound
27 cubic feet = 1 cubic yard
1 peck = 8 quarts
1 bushel = 4 pecks

Other conversions:
1% = .01
1% = 10,000 parts per million (ppm)
1 Megacalorie (M-cal) = 1,000 calories
1 calorie (big calorie) = 1,000 calories (small calorie)
1 M-cal = 1 therm

Bushel weights and volumes:

	lb/cubic ft	*cubic ft/ton*
Oats = 32 lb/bu	26	77
Barley = 48 lb/bu	38.4	53
Shelled corn = 56 lb/bu	44.8	45
Wheat = 60 lb/bu	48	42
Corn & cob meal = 70 lb/bu	28	72
Soybeans = 60 lb/bu	48	42
Rye - 56 lb/bu	44.8	45
Soybean oil meal = 54 lb		37
Dairy feed = 35 lb		57



Storage and Feeding Dry Matter Losses of Alfalfa

Storage method	*Storage loss*	*Feeding loss*
Small bales, stored inside	04	.05
Round bales, stored inside	.04	.14
Hay stacks, stored inside	.04	.16
Round bales, stored outside	.12	.14
Hay stacks, stored outside	.16	.16
Haylage, vertical silo	.07	.11
Haylage, bunk silo	.13	.11