Managing Income Over Feed Costs

Introduction

Feed costs have typically represented 40 to 60 percent of the total cost of producing milk. The current volatility of milk and feed prices may increase this to 70 percent. The income left over after accounting for feed costs is what is left to pay other expenses. The same market volatility affecting milk and feed prices is also affecting fertilizer, seed, and fuel costs, to name a few. To remain profitable, producers should be monitoring and making decisions based on their herd's "income over feed costs" (IOFC). This enables producers to make more informed decisions about feed purchases, know when to lock in milk price, or adjust the ration program to accommodate price volatility.

Income over feed costs is a gross margin concept. Simply take the cow, value her daily output, and then subtract off the highest variable cost, which in this case is feed. What is left is gross income, which can be used to pay for interest expenses, labor, and veterinary bills and to provide the owner funds for withdrawals and loan payments.

Income over feed costs is measured in dollars per cow per day. The following equation can be used:

IOFC ($/cow/day) = Pmilk x (DAMP/100) – DFC

Pmilk is the all-milk price ($/cwt), DAMP is "daily average milk production" (lbs/cow/day), and DFC is "daily feed costs" ($/cow/day). DFC is the daily cost of feedstuffs required to produce the amount of milk reflected in DAMP. Essentially, the all-milk price is being converted from dollars per cwt to dollars per pound of milk produced, and then the cost of producing that milk is subtracted. For example:

$19.59/cwt (Pmilk) x 80 lbs/cow/day (DAMP)/100 – $5.90 feed cost/cow/day (DFC) = $9.77 IOFC/cow/day

A simple spreadsheet tool has been developed to help producers measure and monitor IOFC. This fact sheet explains the various components of the tool and two approaches to monitoring IOFC. The first approach is to compare a herd's IOFC to a benchmark based on the value of milk output (milk production and price). The second approach is to calculate the herd's cash flow to determine the breakeven IOFC value. The latter has more meaning as this reflects what the dairy operation needs to make in IOFC to pay bills and remain profitable. The IOFC tool will allow the producer to compare against both market conditions and their cash flow requirements.

Calculating Feed Cost per Lactating Cow per Day

Dairy rations consist of two basic components: homegrown and purchased feeds. These can be further divided into forages (hay, corn silage, and hay-crop forage), concentrates (cereal grains, protein sources, minerals, and vitamins), and by-products (distiller's grains, soy hulls, and bakery products). Many combinations of feedstuffs can be used to develop balanced rations. To simplify the calculation of daily feed costs, batch feed weights, the number of cows fed, and their respective prices can be used to calculate the daily feed cost per cow. Feed refusals are not excluded from the calculation because it costs money to feed the lactating cow whether she consumes the feed or not. Information needed for this section is as follows:

- Batch weight of ingredients fed to the lactating herd or the various milking cow groups if the herd is fed a **total mixed ration (TMR)**
- Individual ingredient amounts per day per cow for **component-fed herds**; break the herd into number of cows representing average milk production and number of cows representing peak milk production (more than 20 pounds over average milk production)
- Feed prices for **all ingredients** (forages, grain mixes, and commodities) fed to lactating cows (Figure 1)

Forages

Many producers raise their own forages. There are times when shortages occur and purchased hay/straw is needed to balance the ration. The most difficult part regarding forages is assessing an accurate price. There are two methods to assign a price to home-raised forages. You can assign the price it costs to raise the forage (seed, fertilizer, fuel, storage, etc.), or you can assign the market price of the forage if you were to sell the feed today. The Department of

Figure 1a. Feed prices for ALL ingredients (forages, grain mixes, and commodities) fed to lactating cows.

Choose Month: November	MARKET $/TON	COST $/TON	BATCH WEIGHTS			
			Group 1	Group 2	Group 3	Group 4
	As fed	As fed	High	Low		
Number of animals			155	55		
Forages (home-raised)						
Corn sil avg analysis	$46.75	$35.00	6,623.2	2,450.3		
Grass hay avg analysis	$170.00	$50.00	310.0			
Sor-Sud sil avg	$58.00	$45.00	3,100.0	880.0		
MML sil avg analysis	$83.13	$60.00	1,860.0	660.0		
	$—					
Forage substitutes (home-raised)						
	$—					
	$—					
Concentrates (home-raised)						
	$—					
	$—					
	$—					
	$—					
Purchased forages, forage substitutes, or concentrates						
Corn meal	$175.00	$175.00	2,325.0	660.0		
Dairy supplement	$425.00	$425.00	1,052.5	330.0		
Soybean meal	$308.00	$308.00	344.1	91.9		
Roasted beans	$353.00	$353.00	279.0	74.3		
Mix-One	$120.00	$120.00	10.9	3.9		
Pro-Mix	$250.00	$250.00	480.5	110.0		
	$—					
	Total		16,385.2	5,260.4	—	—
	Lbs as-fed per cow		106	96	0	0

Dairy and Animal Science at Penn State maintains a monthly feed price list on all ingredients, including forages. The IOFC tool will be linked to the monthly feed price so market prices can be used for the forages. If the producer already has an accurate price for their homegrown forages, then that price can be entered in place of the market price. Otherwise, it is recommended that the current market price be used each month for calculating IOFC. The method used should be consistent each month. If producers have cost information on their home-raised feeds, evaluate IOFC with both the market price and the cost value of the forages.

Concentrates and By-Product Feeds

Numerous scenarios exist on farms as far as what is homegrown and what is purchased. Any feed that is homegrown has a corresponding feed price in the IOFC tool based on the current market conditions. The only price the user needs to enter is the actual purchase price for any grain, by-product, grain mix, and/or mineral vitamin mix. This price should be on a per-ton basis. In the event producers forward contract on a feedstuff, they should use the contracted price in lieu of the actual monthly market price.

Creating a Benchmark for Success

One way to use IOFC is to compare against a benchmark. It is recommended that a benchmark range be created using a high and low benchmark. A high IOFC benchmark means that given the herd's daily average milk production, the feed cost per cow is relatively low and gross earnings are relatively high. A low IOFC benchmark means the feed cost per cow is too high and

Figure 1b. Feed cost per cow per day based on market prices and the farm's cost value.

DAILY TOTALS FOR ALL COWS	MARKET VALUE				COST VALUE			
	$/lb As fed	Total $/day by ingredient	Ingredient type subtotal	Cost/cow/ day	$/lb As fed	Total $/day by ingredient	Ingredient type subtotal	Cost/cow/ day
9,074	$0.023	$212.09			$0.018	$158.79		
310	$0.085	$26.35			$0.025	$7.75		
3,980	$0.029	$115.42			$0.023	$89.55		
2,520	$0.042	$104.74			$0.030	$75.60		
—	$—	$—	$458.61	$2.18	$—	$—	$331.69	$1.58
—	$—	$—			$—	$—		
—	$—	$—	$—	$—	$—	$—	$—	$—
—	$—	$—			$—	$—		
—	$—	$—			$—	$—		
—	$—	$—			$—	$—		
—	$—	$—	$—	$—	$—	$—	$—	$—
2,985	$0.088	$261.19			$0.088	$261.19		
1,383	$0.213	$293.78			$0.213	$293.78		
436	$0.154	$67.14			$0.154	$67.14		
353	$0.177	$62.36			$0.177	$62.36		
15	$0.060	$0.89			$0.060	$0.89		
591	$0.125	$73.81			$0.125	$73.81		
	$—	$—	$759.17	$3.62	$—	$—	$759.17	$3.62
21,646			**$1,217.78**	**$5.80**			**$1,090.86**	**$5.19**

gross earnings are relatively low. Also worth noting is that given the prevalence of component pricing and milk quality premiums, not every farm in a given region will receive the same price of milk. Thus, this could also affect the level of IOFC. The following formulas are used in the Excel spreadsheet tool:

*Low IOFC Benchmark = Pmilk x (DAMP/100) – 0.6 * DAMP * Pmilk/100*

*High IOFC Benchmark = Pmilk x (DAMP/100) – 0.4 * DAMP * Pmilk/100*

These benchmarks use the farm's actual daily average milk production. In addition, feed costs are measured as a percent of daily average milk production. Thus, if feed costs are merely 40 percent of milk revenue (DAMP * Pmilk/100), then IOFC is high. On the other hand, if feed costs are 60 percent of your milk revenue, then IOFC is low. In Figure 2 this example herd is doing a very good job with IOFC based on current milk production and feed costs. The IOFC exceeds the high range of the benchmark, which is good. Many farms will find their IOFC somewhere between the low and high benchmark value. That may represent some opportunities for cost control.

Interpreting Results

The worksheet allows a producer to track IOFC over time and to compare the farm's performance to a benchmark. The user can compare the farm's history to these goals. This information provides a guide of how efficiently the feeding program is working for the amount of milk being produced. Producers can use this information to set goals for IOFC, evaluate seasonality, and develop

quarterly and/or monthly budgets.

Each month after calculating the feed cost per cow per day, the user should enter the gross milk price, the feed cost per cow (market), and the average milk pounds per day. The worksheet will compute and graph the IOFC compared to a benchmark. If IOFC consistently falls below the low range, producers should examine the nutrition and feeding management of the dairy operation. Some areas to investigate are dry matter intake efficiency, use of excessive feed additives, and level of concentrate feeding for production, to name a few. Conversely, if IOFC is consistently at or above the high range, the operation is doing a good job of converting feed to milk (Figure 3).

Comparing IOFC against Market Values and Actual Farm Costs

The lactating cow ration summary (Figure 1a) provides the tools to calculate IOFC using both market value for home-raised grains and forages and the cost value for these products. Both pieces of information are valuable and provide important management information to the dairy producer (Figure 4).

Market Value

The market value of forages is derived from the Penn State Feed Price List and reflects a compilation of current market prices around Pennsylvania. This price includes all the marketing costs and transportation charges associated with the sale of grains and forages and includes the opportunity cost that producers could capture through the sale of grains and forages instead of marketing milk. This value is useful for comparing the farm to benchmarks and determining if feed costs appear high or low relative to other dairy operations. Standardizing the value of farm-raised feeds means benchmarks will be more consistent across dairy operations.

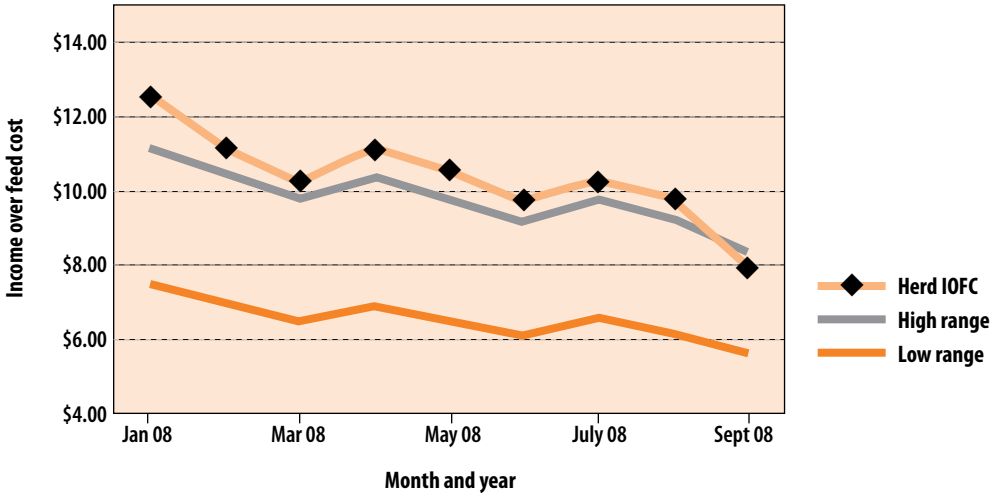
Cash Flow

The IOFC information can be used to assess the viability of future cash flow plans during an upcoming month or year. This information allows the producer to make management adjustments when expected cash flow looks tight and also provides information to evaluate forward-pricing opportunities to determine when pricing milk and feed would be beneficial to farm cash flow (Figure 5). Figure 5 graphically depicts the difference between what the herd requires in breakeven cash flow from IOFC to remain viable. The dark orange bar represents the minimum breakeven cash flow needed to meet the farm's cash inflow requirement. The breakeven

Figure 2. Example calculation of IOFC using daily average prices and production.

					Benchmark range		
Month and year	Gross milk price/ cwt	Milk income/cow	Feed cost/cow	IOFC	Average milk pounds	Low	High
Example	$20.00	$17.00	$6.00	$11.00	85.00	*$6.80*	*$10.20*

Figure 3. Income over feed cost compared to benchmarks.



cash flow worksheet is found in the third section of the tool. The light orange bar shows the current IOFC for the dairy operation based on the cost value of home-raised grains and forages. In the example, the current price and production are providing $0.82 per cow per day above the required breakeven level. If the light orange bar drops below the dark orange breakeven level, the herd is experiencing insufficient cash flow and adjustments are needed.

For this use, the cost value is more appropriate than the market value because it reflects the cash expenditures incurred to produce a grain or forage crop. The cost value should reflect the amount producers actually spend to produce a grain or forage crop on the farm. It may be different from the market value of the forage or grain since marketing and transportation costs are not included. This value may actually exceed the market value of forages or grains where crop production is inefficient with either low yields or high crop production costs, or it may be the competitive advantage that allows producers to operate a highly profitable dairy when crops can be produced well below the market price.

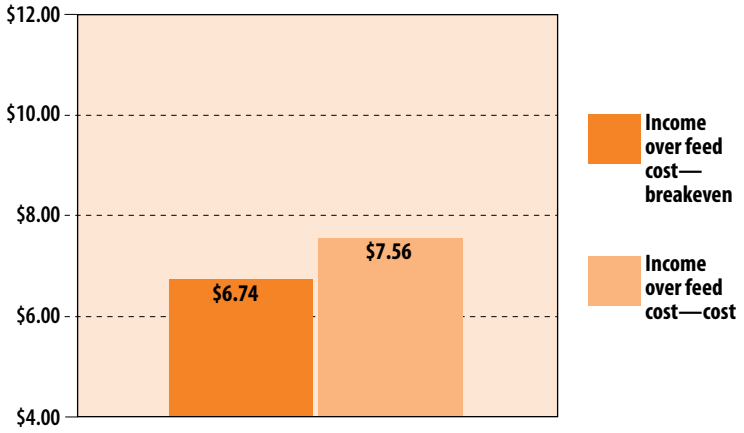
Accurately establishing this cost value requires producers to conduct enterprise budgeting for their dairy operation to separate crop and dairy expenses and allocate direct and overhead costs between enterprises. The farm accounting system should separate expenses such as repairs, custom hire, and fuel and oil between crops and dairy to make the enterprise analysis more accurate.

When using the IOFC tool, producers may select any future time interval for evaluation of the breakeven IOFC. This could be the upcoming month where the amount of milk sold could reflect the expected quantity for the next 30 days, or it could be the 365-day projection for the upcoming year. To be most useful, producers should calculate breakeven IOFC on an annual basis at the start of the year to establish the big-picture view. Producers should then use the tool monthly, using information from their milk checks and comparing it to the cash flow required during the upcoming month. Frequent review of IOFC will alert managers to the need for adjustments as market conditions change throughout the year. When summarized on an annual basis, the IOFC calculation gives the producer a measure of the feasibility of the whole farm cash flow for the coming year and assesses the amount of risk associated with the projected plan.

Figure 4. Comparison of on-farm breakeven income over feed costs (IOFC) compared to current market and cash flow IOFC.

Item	Market	Cost
Feed cost/cow/day	$5.80	$5.19
Milk lbs shipped	5,750,000	5,750,000
Number of days in shipment	365	365
Daily milk sold	15,753	15,753
Lbs milk/cow/day	75.0	75.0
Milk price per cwt	$17.00	$17.00
Milk income per cow/day	$12.75	$12.75
Income over feed cost—current	$6.95	$7.56
Income over feed cost—breakeven	$6.74	$6.74
IOFC current compared to breakeven	$0.21	$0.82

Figure 5. Current income over feed cost compared to breakeven cost.



Determining Breakeven Cash Flow

To calculate the breakeven IOFC based on cash flow, producers need to calculate their cash-flow requirement for a future time period. Figure 6 includes a whole-farm cash flow projected on an annual basis. Table 1 identifies the data required for this section. Cash inflow from sources other than milk is included since cash-flow needs must be met with either milk income or income from crop or livestock sales. Inflow from sources other than milk is calculated and entered. The total amount of outflow planned for all direct and overhead costs is calculated. In Figure 6 the total outflow includes owner withdrawals (family living) and a minimum ending balance. These must be deducted from the

total before they are entered on the sheet. The total amount of all loan payments to be made is entered to finish the calculation of the total outflow required for the farm.

By definition, IOFC includes only the cost of feed used for milking cows. Therefore, the user needs to compute the dollars required for purchased cow feed and enter the cash crop expenses for seed, fertilizer, chemicals, and custom hire. While a portion of labor and repairs are also involved in crop production, only those expenses that can be easily separated as crop production costs for this calculation are selected.

After this data is entered, the worksheet calculates the cash inflow that must be earned to cover all costs other than feed. The IOFC required can be translated into a monitoring tool for the farm cash flow. After entering the number of cows to be milking, the expected milk price, milk production, and the days in the calculation (month or year), the program will calculate the IOFC breakeven per day. Subtracting the daily milk income from the income over feed cost breakeven identifies the maximum amount available to spend on feed cost per cow per day. The feed cost per cow per day maximum can be compared to the current feed cost per cow per day to determine if the current ration and milk production are providing sufficient income to cover the needs of the whole-farm cash flow.

Since both milk yield and price fluctuate over time, Figure 7 provides a visual representation of how these changes influence the breakeven feed cost per lactating cow. In Figure 6 the whole-farm cash flow remains viable at $17 milk with 71 pounds of milk production, but when milk price drops to $15, if costs remain unchanged, 81 pounds of milk production would be needed to make the whole-farm cash flow breakeven. Figure 7 helps a producer establish

Table 1. Projected annual cash flow.

CASH INFLOWS	2009 JAN-DEC	
Beginning cash balance	3,582	
Milk	977,500	
Cull stock	68,000	
Misc. livestock	17,500	
Direct and Counter—Cyclical Program Payments	3,254	
Custom work	8,100	
Patronage dividends	520	
Other farm income	4,890	
TOTAL INFLOW	1,083,346	
CASH OUTFLOWS		
Seed	12,735	
Fertilizer	13,752	
Chemical	15,000	
Crop custom hire	25,900	
Purchased feed	420,116	→ Cows: 334,263 Heifers: 85,853
Breeding	8,750	
Veterinary	31,737	
Supplies	36,485	
DHIA	5,248	
Livestock custom hire	3,998	
Livestock utilities	34,236	
Milk hauling	35,986	
Milk marketing	11,500	
Bedding	17,993	
Fuel and oil	34,000	
Repairs	30,000	
Labor	69,650	
Land rent	11,450	
Real estate taxes	16,282	
Farm insurance	15,496	
Owner withdrawals (family living)	50,000	
Income taxes	1,000	
Minimum end balance	1,000	
Total outflow	902,314	
Operating surplus	***181,031***	
LOAN PAYMENTS		
Bank	94,555	
Total loan payments	94,555	
Surplus or deficit	86,476	

Figure 6. Determining breakeven cash flow, IOFC goal and maximum daily feed cost per cow.

Cash inflows			
Cull cows and calves	$85,500	A	
Other income	$16,764	B	
Non-milk cash inflow	**$102,264**	C =	C = A + B
Total cash outflow (direct and overhead costs)	$851,315	D	
Owner withdrawals (family living)	$50,000	E	
Loan payments (principal and interest)	$94,555	F	
Total outflow required	**$995,870**	G =	G = D + E + F
Purchased cow feed	$334,263	H	
Crop expenses (seed, fert., chemicals, custom hire)	$67,387	I	
Nonmilk cash inflow	$102,264	C	C from above
Purchased feed + crop + nonmilk inflow	**$503,914**	J =	J = H + I + C
IOFC total required	$491,956	K =	K = G - J
Cows milking (average number)	200	L	
Days in calculation	365	M	
IOFC breakeven/day	**$6.74**	N =	N = K ÷ L ÷ M
Expected milk price ($/cwt)	$17.00	O	
Bulk tank average (lbs)	75.00	P	
Daily milk income per cow	$12.75	Q =	Q = (O x P) ÷ 100
IOFC breakeven	$6.74	N	N from above
Feed cost/cow/day maximum	**$6.01**	R	R = Q - N
Current feed cost/cow/day (cost)	$5.19		
Difference in maximum and current feed cost/ cow/day	$0.82		

realistic management goals and targets based on the current cash-flow requirements of the dairy operation. While it won't always be possible to readily change either feed costs or milk production, producers can quickly identify when management interventions are needed using this approach. The information can also be used to proactively look at forward-pricing opportunities based on the IOFC concept.

In summary, IOFC can be a valuable planning tool that can be used to establish benchmarks for profitability of the dairy operation. After planning a cash flow for the year, a producer can determine the breakeven IOFC needed to keep the operation viable. The measure can provide a means to benchmark the operation against other dairy farms and monitor the farm's financial progress against the projected cash-flow plan. IOFC can then be computed on a monthly basis and compared to this benchmark level. The milk check and actual monthly feed expenditures can be used to monitor IOFC. Corrective action can be taken if IOFC suddenly declines. In addition, the monthly calculations can be used in a hedging or forward contacting program in order to lock in an acceptable IOFC level. In this way a producer can be guaranteed a profit margin.

Producers who want assistance calculating the IOFC measure or using this spreadsheet tool should contact their local dairy extension educator for assistance. You can find contact information for educators on the Web at **extension.psu.edu**.

Figure 7. Breakeven feed cost per lactating cow per day with changes in milk price and production.

Milk yield	Milk price ($/cwt) $15.00	$15.25	$15.50	$15.75	$16.00	$16.25	$16.50	$16.75	$17.00	$17.25	$17.50	$17.75
61	$ (2.78)	$ (2.78)	$ (2.63)	$ (2.48)	$ (2.17)	$ (2.02)	$ (1.87)	$ (1.72)	$ (1.56)	$ (1.41)	$ (1.26)	$ (1.11)
63	$ (2.48)	$ (2.33)	$ (2.17)	$ (2.01)	$ (1.85)	$ (1.70)	$ (1.54)	$ (1.38)	$ (1.22)	$ (1.07)	$ (0.91)	$ (0.75)
65	$ (2.18)	$ (2.02)	$ (1.86)	$ (1.70)	$ (1.53)	$ (1.37)	$ (1.21)	$ (1.05)	$ (0.88)	$ (0.72)	$ (0.56)	$ (0.40)
67	$ (1.88)	$ (1.72)	$ (1.55)	$ (1.33)	$ (1.21)	$ (1.05)	$ (0.88)	$ (0.71)	$ (0.54)	$ (0.38)	$ (0.21)	$ (0.04)
69	$ (1.58)	$ (1.41)	$ (1.24)	$ (1.07)	$ (1.88)	$ (0.89)	$ (0.55)	$ (0.38)	$ (0.20)	$ (0.03)	$ 0.14	$ 0.31
71	$ (1.28)	$ (1.11)	$ (0.93)	$ (0.75)	$ (0.57)	$ (0.40)	$ (0.22)	$ (0.04)	$ 0.14	$ 0.31	$ 0.49	$ 0.67
73	$ (0.98)	$ (0.80)	$ (0.62)	$ (0.44)	$ (0.25)	$ (0.07)	$ 0.11	$ 0.29	$ 0.48	$ 0.66	$ 0.84	$ 1.02
75	$ (0.68)	$ (0.50)	$ (0.31)	$ (0.12)	$ 0.07	$ 0.25	$ 0.44	$ 0.63	*$ 0.82*	$ 1.00	$ 1.19	$ 1.38
77	$ (0.38)	$ (0.19)	$ 0.00	$ 0.19	$ 0.39	$ 0.58	$ 0.77	$ 0.96	$ 1.16	$ 1.35	$ 1.54	$ 1.73
79	$ (0.08)	$ 0.11	$ 0.31	$ 0.51	$ 0.71	$ 0.90	$ 1.10	$ 1.30	$ 1.50	$ 1.69	$ 1.89	$ 2.09
81	$ 0.22	$ 0.42	$ 0.62	$ 0.82	$ 1.03	$1.23	$ 1.43	$ 1.63	$ 1.84	$ 2.04	$ 2.24	$ 2.44
83	$ 0.52	$ 0.72	$ 0.93	$ 1.14	$ 1.35	$ 1.55	$1.76	$ 1.97	$ 2.18	$ 2.38	$ 2.59	$ 2.80
85	$ 0.82	$ 1.03	$ 1.24	$ 1.45	$ 1.67	$ 1.88	$ 2.09	$ 2.30	$ 2.52	$ 2.73	$ 2.94	$ 3.15
87	$ 1.12	$ 1.33	$ 1.55	$ 1.77	$ 1.99	$ 2.20	$ 2.42	$ 2.64	$ 2.86	$ 3.07	$ 3.29	$ 3.51
89	$ 1.42	$ 1.64	$ 1.86	$ 2.08	$ 2.31	$ 2.53	$ 2.75	$ 2.97	$ 3.20	$ 3.42	$ 3.64	$ 3.86

Prepared by Ken Bailey, associate professor of agricultural economics; Tim Beck, senior extension educator; Erica Cowan, project associate; and Virginia Ishler, nutrient management specialist

Supported by an informational partnership of Penn State Cooperative Extension, Pennsylvania Department of Agriculture, and USDA's Risk Management Agency.

RMA

Pennsylvania Department of AGRICULTURE

Visit Penn State's College of Agricultural Sciences on the Web: www.agsci.psu.edu

Penn State College of Agricultural Sciences research, extension, and resident education programs are funded in part by Pennsylvania counties, the Commonwealth of Pennsylvania, and the U.S. Department of Agriculture.

This publication is available from the Publications Distribution Center, The Pennsylvania State University, 112 Agricultural Administration Building, University Park, PA 16802. For information telephone 814-865-6713.

This publication is available in alternative media on request.

Produced by Ag Communications and Marketing

CODE # UA458 2M4/09mpc4720