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# Evaluating the effect of ration composition on income over feed cost and milk yield

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## ABSTRACT

Feed is generally the greatest expense for milk production. With volatility in feed and milk markets, income over feed cost (IOFC) is a more advantageous measure of profit than simply feed cost per cow. The objective of this study was to evaluate the effects of ration cost and ingredient composition on IOFC and milk yield. The Pennsylvania State Extension Dairy Team IOFC tool (http://extension.psu.edu/animals/dairy/business-management/financial-tools/income-over-feed-cost/introduction-to-iofc) was used to collect data from 95 Pennsylvania lactating dairy cow herds from 2009 to 2012 and to determine the IOFC per cow per day. The data collected included average milk yield, milk income, purchased feed cost, ration ingredients, ingredient cost per ton, and amount of each ingredient fed. Feed costs for home-raised feeds for each ration were based on market values rather than on-farm cost. Actual costs were used for purchased feed for each ration. Mean lactating herd size was 170 ± 10.5 and daily milk yield per cow was 31.7 ± 0.19 kg. The mean IOFC was $7.71 ± $1.01 cost per cow, ranging from −$0.33 in March 2009 to $16.60 in September 2011. Data were analyzed using a one-way ANOVA in SPSS (IBM Corp., Armonk, NY). Values were grouped by quartiles and analyzed with all years combined as well as by individual year. Purchased feed cost per cow per day averaged $3.16 ± $1.07 for 2009 to 2012. For 2009 to 2012 combined, milk yield and IOFC did not differ with purchased feed cost. Intermediate levels (quartiles 2 and 3) of forage cost per cow per day between $1.45 and $1.97 per cow per day resulted in the greatest average IOFC of $8.19 and the greatest average milk yield of 32.3 kg. Total feed costs in the fourth quartile ($6.27 or more per cow per day) resulted in the highest IOFC. Thus, minimizing feed cost per cow per day did not maximize IOFC. In 2010, the IOFC was highest at $8.09 for dairies that fed 1 or more commodity by-products. Results of the study indicated that intermediate levels of forage cost and higher levels of total feed cost per cow per day resulted in both higher milk yield and higher IOFC. This suggests that optimal ration formulation rather than least cost strategies may be key to increasing milk yield and IOFC, and that profit margin may be affected more by quality of the feed rather than the cost.
**Key words:** income over feed cost, profitability, dairy management

## INTRODUCTION

Income for a dairy producer can be difficult to predict because milk and feed markets are continuously changing and this is exacerbated with the ever-changing prices of fuel, fertilizers, and crop seeds (CME Group Inc., 2013). Thus, producers should monitor profit margins rather than milk income or feed costs to predict profitability. Milk production is often monitored because higher milk production equates to higher milk income. However, monitoring gross milk income per cow alone does not provide a good estimate of cash flow or profitability, especially when feed costs are high. Wolf (2010) showed that income over feed cost (**IOFC**) could be used to monitor profit by including gross milk income and feed cost. Using IOFC accounts for the volatility in milk and feed markets, giving the producer a better metric for evaluating profit margin.

Income over feed cost is the measure of what remains of the milk income after subtracting the feed cost of the lactating cows on a per-cow-per-day basis or on a per-hundredweight basis. Income over feed cost can be used to evaluate nutrition and pasture management as well. Profit margin risk management, in part, can be done by monitoring IOFC (Bozic et al., 2012). Using the Penn State IOFC tool (Ishler et al., 2013), the amount spent on purchased feeds or the cost of home-raised feeds can be evaluated against the current milk production. In grazing herds, the IOFC can be used as a measure on how well feeding strategies are being implemented (Vibart et al., 2012). Monitoring IOFC monthly can determine if feed costs are in line for the current milk production or if ration and feed management strategies are currently successful (Maulfair et al., 2011).

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With volatility in milk prices, producers examine ways to stabilize their incomes. The livestock gross margin (**LGM**) for the dairy cattle insurance program was developed to help protect producers from large losses in a volatile market (CME Group Inc., 2013). Research has been conducted to find the optimal LGM coverage and the best incorporation into farm management decisions (Valvekar et al., 2010, 2011; Bozic et al., 2012). Farms can improve risk management by using LGM insurance program and monitoring the IOFC.

The research objective of this study was to evaluate the effect of ration composition and ration cost on both the IOFC and milk yield. By evaluating ration characteristics and feed costs for herds with the highest IOFC and milk yield, the best management practices could be identified. The use of IOFC can lead to finding the best cost ration for the lactating herd. Continuous monitoring of IOFC should be coupled with a cash flow plan to determine the particular farm's breakeven IOFC. Only then will constant monitoring of IOFC be ideally meaningful to a producer and the impact on profitability.

## MATERIALS AND METHODS

### *IOFC Tool*

The IOFC tool was developed by Pennsylvania State University faculty, Extension educators, and staff. Information about the tool can be found on the Pennsylvania State University Dairy Extension Team website (http://extension.psu.edu/animals/dairy/business-management/financial-tools/income-over-feed-cost/introduction-to-iofc). The tool is an Excel spreadsheet (Microsoft Corp., Redmond, WA) that is user friendly. In this tool, IOFC is calculated by the following formula:

$$[\text{daily average milk production (lbs)/cow} \times \text{milk price per hundredweight}/100] - \text{total feed cost/cow}.$$

Because feed costs are constantly changing, monitoring the IOFC can help dairy producers monitor margins versus just milk income or feed cost. The IOFC tool divides feed into purchased and home raised categories. The IOFC can be calculated using the market values for a feed type or the actual cost. To best compare across all the farms, market prices for home-raised feeds were used (Bailey et al., 2009; Ishler, 2012). This allows the use of market prices to be compared with the true cost of home-raised feeds. Often true costs for each individual home-raised feed are unknown by the producer, also leading to the use of market values for home-raised feeds. For the current study, all feed prices were calculated using market values from the Pennsylvania State University Extension website (http://extension.psu.edu/animals/dairy/business-management/feed-price-list). These prices were calculated including transportation charges and profit that could be captured selling the crops rather than using them to produce milk. This website is linked to the IOFC tool and updates the monthly market prices to each IOFC worksheet. The prices for home-raised feeds reflect the value out of the structure, but do not reflect adjustments based on DM, forage, or feed quality (Ishler, 2012). These were updated with the tool and the website on a monthly basis.

### *Data Collected*

All farms in this study were located in Pennsylvania. These farms were self-selected from the farms that chose to use the IOFC tool and completed training with the tool as part of an Extension education program. The IOFC data forms were completed by the producer and were submitted to a dairy Extension team member. The IOFC spreadsheet data includes gross milk price, average milk yield, average milk shipped, home-raised, and purchased feed amount, cost per ton of feed, batch weights of feed, number of lactating cows, and number of lactating nutritional cow groups. Data from the forms were used to calculate IOFC with the IOFC tool monthly on a cost-per-cow-per-day basis.

On the IOFC data form, producers reported total milk weights shipped for the month, the average pick-up weight, or the average per-cow-per-day milk weight. If the average bulk tank weight was given, the weight was divided by the number of lactating cows and the number of days in the shipment. The major variables analyzed were milk income, feed cost, milk yield (kg), IOFC, purchased feed cost, number of lactating animals, purchased feed amount (kg), total feed amount (kg), and number of lactating cow groups. All feed variables were expressed on an as-fed and per-cow-per-day basis. Each ingredient was also classified as forage, concentrate grain, concentrate mix, by-product or mineral, and additive. The kilograms fed on an as-fed basis and price per ton was recorded for each feed. Only those by-products used as a commodity were included in the by-product calculations. By-products existing in premixed purchased feeds were not analyzed. The analysis for by-products was divided into 2 groups. These groups were farms that did not use by-product commodity feeds in the lactating cow ration and farms that did use by-product commodity feeds in the lactating cow ration. Feeds that fit into more than one type of analysis were analyzed for all of the analyses they were applicable for. Because by-products can often be