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Goldilocks and the 3 Cows

Marcos Zenobi, Charlie Staples, and Jose Santos

All dairy cows mobilize stored fat for at least 3 weeks after calving to help support milk production. Metabolic problems such as ketosis and fatty liver are common if cows struggle to use the mobilized fat efficiently, reducing farm profits. Different management strategies during the dry period have been proposed to help minimize inefficient fat utilization around calving. Controlling body condition at calving to be between 3.00 and 3.50 is one such strategy because fat cows perform poorly. However, cows may store fat in their viscera (kidney and intestines) which is invisible to those who are body scoring cows. Just as belly fat ("pot belly") in people has been linked to diabetes and heart disease, so cows that accumulate belly fat during the dry period may make them more prone to metabolic problems after calving. For many years pregnant dry cows have been fed diets above their energy requirements, especially during the close-up period, in order to prepare the ruminal microbes for high energy diets after calving and to compensate for decreasing feed intake during the last 1 to 2 weeks of gestation. These diets are often heavy in corn silage or in grain if dry cows are fed weigh-backs from the lactating herd. Sometimes dry cows are ignored and do not receive enough groceries resulting in under-condition at calving and lack the energy reserves to support milk in the early weeks. Alternatively, feeding diets that include less corn silage and more low energy forages such as wheat straw may be "just right." These "just right" diets (a.k.a. Goldilocks diets) allow cows to eat as much as they want without gaining weight.

At the University of Florida, 93 multiparous Holstein cows were divided into 2 groups and fed one of two TMRs from dry-off to calving, approximately 7 weeks. One diet was 58% corn silage and 8% wheat straw (excess energy) whereas the second diet was 37.5% wheat straw, 23% corn silage, and 6% triticale silage (maintenance energy). Wet brew, citrus pulp, canola meal, and minerals/vitamins were the other feed ingredients in both diets. At 2 weeks before calving, cows offered the high corn silage diet ate more TMR dry matter (27.3 vs. 24.7 lb) and so more energy (140 vs. 109% of their energy requirement) compared to the high wheat straw "Goldilocks" group. Interestingly, during the last 2 weeks of gestation cows fed the high corn silage diet dropped in feed intake twice as fast compared to the cows receiving the high straw diet. This rapid drop likely predisposes cows to metabolic problems upon calving. Cows were fed the same TMR postpartum (45% corn silage, 14% ground corn, 15% soybean meal, 8% soybean hulls, 8% whole cottonseeds, 6% citrus pulp, and 4% minerals/vitamins). Cows were monitored closely for the first 15 weeks after calving. Cows fed the "Goldilocks" diet prepartum ate on average 2.6 more pounds of TMR dry matter daily throughout the first 15 weeks after calving (53.1 vs. 50.5 lb/day). The "Goldilocks" cows eating more feed produced 3.1 lb/day more milk (95.0 vs. 91.9 lb/day) but this increase was not statistically greater. Thus, cows eating the lower energy diet prepartum relied less on body energy reserves postpartum to sustain milk production. During the first weeks postpartum, these cows were in less negative energy balance, had 10% less fat in their blood, had less ketosis, and had 20% less fat in their liver as determined from liver biopsies. Overall, multiparous Holstein cows can be fed a single diet throughout the dry period that is matched to their nutrient requirements that will result in a healthier and potentially more productive performance after calving. For more information, contact Charles Staples at chasstap@ufl.edu

Comparing and Forecasting of Florida Federal Order and UF Dairy Unit Mailbox Prices

Albert De Vries and Ashenafi Beyi

We have forecasted (predicted) Florida Federal Order mailbox prices quarterly for 6 years now. The motivation is that milk price forecasts might help dairy farmers with investment and payment decision.

Several readers called after the Spring 2016 forecast, saying that the forecasts of the Florida Mailbox price seemed too optimistic compared to the milk prices they received on their Florida farms. So we decided to look into mailbox prices some more and find out how the Florida mailbox price compares to the mailbox price we receive at the UF Dairy Unit located near Alachua. The UF Dairy Units milks 500 cows and is a member of Southeast Milk Inc (SMI).

Mailbox prices reflect the actual price dairy farms receive for their milk, and include all premiums, as well as marketing costs, including hauling. The mailbox price is printed at the bottom of the SMI settlement sheet. For June 2016, the mailbox price received at the UF Dairy Unit was $15.47/cwt milk. This is calculated as $16.52 gross pay - $0.15 promotion - $0.13 dues – $0.77 hauling = $15.47. The promotion and dues data are found on the settlement sheet, the hauling cost are the sum of the hauling costs on the advance, second advance and settlement sheets.

The Federal Market Administrators collects the mailbox prices from regulated handler payroll data for their reporting areas and submit the data to the Market Information Branch (MIB) of the Agricultural Marketing Service (AMS) of USDA. USDA-AMS-MIB then calculates a weighted average for each federal order. Hence the Florida (Federal Order) mailbox price is calculated. Typically, the federal mailbox prices are released 3.5 months following the month for which the prices apply.

Figure 1 is a graph of the mailbox prices received at the UF Dairy Unit and the Florida mailbox price for January 2014 to April 2016, the most recent month for which the Florida mailbox price is available. The graph shows that both mailbox prices are close, but in 26 of the 28 months the UF Dairy Unit's mailbox price is lower than the Florida mailbox price. The UF Dairy Unit's mailbox price is on average $0.43/cwt lower in these 28 months. In November 2014, the UF Dairy Unit's mailbox price was a record $1.22/cwt lower than the Florida mailbox price. The difference between both mailbox prices does not depend on whether prices are generally good or bad (correlation of 0.02), but the butterfat content plays a role. Also in figure 1 is the average butterfat content at the UF Dairy Unit. The correlation of butterfat percent with the difference is -0.70, which means that the lower the butter fat on the UF Dairy Unit, the greater the difference with the Florida mailbox price. Changes in the UF Dairy Unit's butterfat explain about half of the difference. Figure 1 shows the drop in butterfat in the fall of 2014 and the greater difference between both mailbox prices.

The median difference between both mailbox prices is $0.37, which means that in 50% of the 28 months in figure 1, the UF Dairy Unit's mailbox price is more than $0.37/cwt lower than the Florida mailbox price and in 50% of the case it is less than $0.37 lower than the Florida mailbox price.

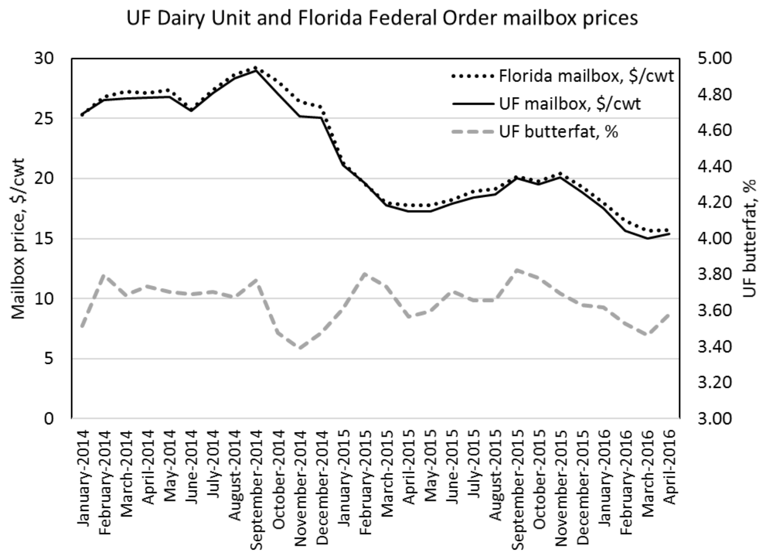

***Figure 1**. UF Dairy Unit and Florida Federal Order mailbox prices for January 2014 to April 2016. Also in the figure is the butterfat content at the UF Dairy Unit which explains 50% of the difference between both mailbox prices.*

When it comes to forecasting the UF Dairy Units mailbox price, a reasonable way is to take the Florida mailbox price forecast minus $0.37/cwt. This forecast ignores changes in butterfat. Every dairy farm in Florida will have its own adjustment depending on the average difference between the Florida mailbox prices and that dairy farm's mailbox prices collected over some time.

The forecasts of the Florida mailbox prices we publish are taken from a regression equation developed and continuously updated by the University of Wisconsin. This regression equation predicts the actual mailbox price from the announced Class III and IV milk prices. Figure 2 shows the actual and predicted Florida mailbox prices for January 2001 to April 2016. The predictions follow the actuals fairly closely.

It makes sense to predict mailbox prices from the Class III and IV prices because the futures markets provide settle prices for monthly contracts up to 24 months into the future. Economic theory holds that these settle prices are the unbiased predictors of what the market believes will be the announced Class III and Class IV prices for that month in the future. These contracts are traded almost every day, so these settle prices change often. Individual forecasters cannot consistently better forecast the announced Class III and IV prices than the futures market, although they can do so occasionally.

To forecast the Florida mailbox price, we simply put the Class III and IV futures prices in the regression equation instead of the announced Class III and IV prices. The forecast is limited to 12 months given the thinness of the futures markets further than 12 months into the future.

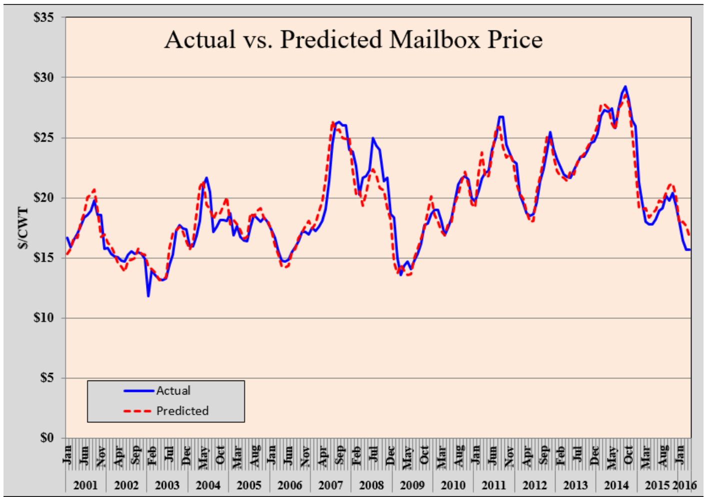

Figure 2*. Actual and predicted Florida Federal Order mailbox prices from June 2001 to April 2016. The predictions are based on a regression equation developed by the University of Wisconsin that uses the announced Class III and IV prices. The regression equation was fitted on all data on August 10, 2016. Graph prepared with the Mailbox Forecast Tool, available at http://dairy.ifas.ufl.edu/tools*

Table 1 and figure 3 show the forecast Florida mailbox prices for August 2016 through July 2017 based on the Class III and IV settlement prices of August 10, 2016. Figure 3 also shows a high and a low forecast price. The range between the high and low price is a 50% confidence interval, which means that there is only a 50% probability that the actual mailbox price will fall within this range once it gets announced. The range is wide because the Class III and IV futures prices vary daily based on new information.

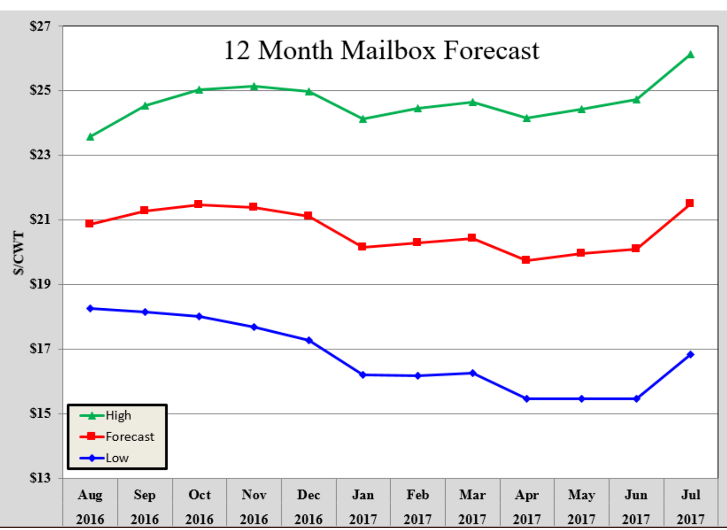

Figure 3*. Forecast of the Florida mailbox price based the settle prices of the Class III and IV futures markets of August 10, 2016. Graph prepared with the Mailbox Forecast Tool, available at http://dairy.ifas.ufl.edu/tools*

One way to forecast mailbox prices for the individual Florida dairy farm is to use the Florida Federal Order mailbox price forecast and adjust that with the long term average difference between the actual Florida and actual farm's mail box price. Another option is to use the farm's own actual mailbox prices with the regression equations. The University of Wisconsin developed a spreadsheet, the Mailbox Forecast Tool, that allows one to do this. The tool is posted at the website http://dairy.ifas.ufl.edu/tools and was populated with Florida Federal Order mailbox prices from January 2001 to April 2016. The user can also enter their own historic actual farm mailbox prices. In addition, one can enter protein and butterfat prices which will help the accuracy of the regression equations and thus the forecasts a little bit. The manual for the tool is also posted on our website.

Table 1. Forecast of the future Florida Mailbox Price and Future All Milk and Feed Prices: August 2016 - July 2017

Month	Forecast FL mailbox price ($/cwt milk)	2014 Farm bill formulas: Forecast All-Milk price ($/cwt milk)	2014 Farm bill formulas: Forecast feed cost ($/cwt milk)
Aug-16	20.87	17.38	7.90
Sep-16	21.28	17.75	7.63
Oct-16	21.48	18.26	7.63
Nov-16	21.39	18.13	7.64
Dec-16	21.11	17.85	7.65
Jan-17	20.15	17.56	7.65
Feb-17	20.29	17.67	7.65
Mar-17	20.42	17.79	7.65
Apr-17	19.74	17.39	7.67
May-17	19.96	17.60	7.70
Jun-17	20.11	17.76	7.73
Jul-17	21.49	17.84	7.77

Based on futures prices of August 10, 2016.

The forecast All-Milk price and the forecast feed cost have been added to the table since the Fall 2014 issue of Dairy Update (see http//dairy.ifas.ufl.edu/dairyupdate). These forecast are based on the formulas in the 2014 Farm Bill. Daily updated Florida mailbox price forecasts are found at http://future.aae.wisc.edu/predicted_mailbox/?state=Florida Feed costs are found at http://future.aae.wisc.edu/tab/costs.html#94.

For more information, contact Albert de Vries at devries@ufl.edu or (352) 392 5594 ext. 227. We appreciated the help of Shana Wooten, Katie Dorta, Jeff Blesy and others at SMI for their help retrieving the UF Dairy Unit's milk price data and the example of the mailbox price calculation. We also thank Randal Stoker, dairy marketing specialist with USDA-AMS, for the information on the mailbox price calculations.

Cooling Your Dry Cows When it is Hot: Major Paybacks Almost Everywhere in the US

Fernanda Ferreira, Rodrigo Gennari, Geoff Dahl, and Albert De Vries

The effects of heat stress on lactating cows are well studied and it is well known that it negatively affects milk production, reproduction and the health of that group of cows. However, only recently have the effects of heat stress on dry cows started to receive more attention. Research has shown that a cow that experienced heat stress every day of her dry period will produce on average 11 lbs/day less milk in her next lactation compared to a cow that did not experience heat stress during her dry period. Heat stressed dry cows also have impaired immune function and poorer health which may lead to increased culling and poorer reproductive performance. In addition, calves born out of heat-stressed dams during their dry period are also negatively affected for much of the rest of their lives. Cooling strategies can help to alleviate heat stress in dry cows. These factors motivated us to do a study to 1) quantify the potential economic losses in the US due to heat stress during the dry period, and to 2) evaluate the economic feasibility of cooling dry cows.

We worked with weather data from the National Oceanic and Atmospheric Administration and the number of dairy cows per state from USDA-NASS. We defined a heat stress day when the average temperature humidity index (THI) was equal or higher 68. We did not consider seasonality in calving, and therefore 15% of the cows were dry at any time of the year. Other assumptions were that only cows in their second or greater lactation benefitted from cooling during their dry periods in the previous lactation. Cooling did not affect milk production in the cooler times of the year when the THI < 68. We also assumed that lactating cows did not experience heat stress, for example because they were already cooled. We assumed at first a milk price of $20.00/cwt, which is the 5-years average milk price in the US. The income over feed cost was $10.8/lb of milk. Cows that produced more milk ate more feed.

Figure 1 summarizes the milk losses in the next lactation if dry cows are not cooled for the 25 states with the greatest number of dairy cows in the US. A cow in the US loses $0.91 per heat stress day per year if dry cows are not cooled. For example, if heat stress happens during 100 days in the year and dry cows are not cooled, then losses are $91 per cow per year. As expected, Florida has the greatest number of heat stress days per year (257, or 70% of the year) and the largest losses, $233 per cow per year, if dry cows are not cooled. California, the state with the most dairy cows and also the largest milk producer, has 112 heat stress days per year, which represents losses of $102 per cow per year if dry cows are not cooled. Even Wisconsin has 75 heat stress days per year, which result in losses of $68 per cow per year if dry cows are not cooled during heat stress. The average cow in the US lives in a location with 96 heat stress days per year. This would result in losses of $87 per cow per year if dry cows in this location are not cooled. If we put all these numbers together, the total losses in the US sum up to $810 million dollars per year if dry cows are not being cooled.

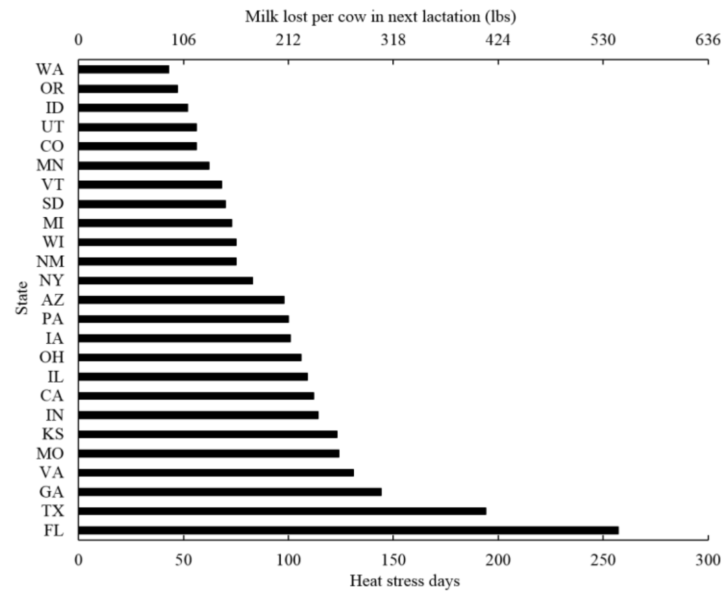

Figure 1. Heat stress days and milk losses in the next lactation for the 25 states with the most dairy cows, and Florida

It is clear that that cooling dry cows during periods of heat stress reduces or eliminates these losses. However, cooling dry cows requires an investment in fans and soakers, as well as a new barn for the dry cows, in some cases. We attempted to answer the question “is it financially worth cooling dry cows?” We worked with two scenarios: one considering that a new barn for the dry cows had to be built including fans and soakers, and one assuming that a barn is available and a farmer only needs to invest in soakers and fans. Water, electricity and maintenance costs were also included. We used the net present value (NPV) to evaluate the feasibility of the investment. The NPV is the value of the investment in cooling dry cows in today’s dollars, compared to the next best alternative for this money which we assumed would generate 5% interest per year. We also did a sensitivity analysis by changing the barn cost, the milk price and the losses in milk production in the next lactation if dry cows are under heat stress.

The NPV results when a new barn for the dry cows needs to be built are shown in Figure 2. Each line represents a different scenario where either milk price, milk loss due to heat stress during the dry period or barn cost per stall was changed. The moment each of these lines crosses the NPV = $0 line represents the break-even point in number of heat stress days from which it is feasible to invest in cooling dry cows even if a new barn needs to be built. For example, in the default scenario where milk price is $20.00/cwt, a decrease in milk production due to heat stress of 11 lbs in the next lactation and a cost to build a new barn for the dry cows of $2,500/stall, the break-even point is 56 heat stress days. It means that any farm located in a region with more than 56 heat stress days per year would profit from cooling its dry cows including building of a new dry cow barn with fans and soakers. For these default assumptions this is the case for 89% of all dairy cows in the US. Only dairy farms in North Dakota, Idaho, Wyoming, Oregon, Maine, Montana, Washington and Alaska would not financially benefit from cooling. With 257 days of heat stress per year in Florida, an investment in a cooling barn for dry cows would result in a profit of $111 per cow per year. In California and Wisconsin (112 and 75 heat stress days per year), the profits would be $31 and $11 per cow per year, respectively. Greater milk price and lower barn cost resulted in fewer heat stress days needed to pay for the cost of cooling. The only scenario in figure 2 where it was not feasible to cool dry cows was when the milk loss is only 2.2 lbs/day in the next lactation. Research has shown much greater losses, however.

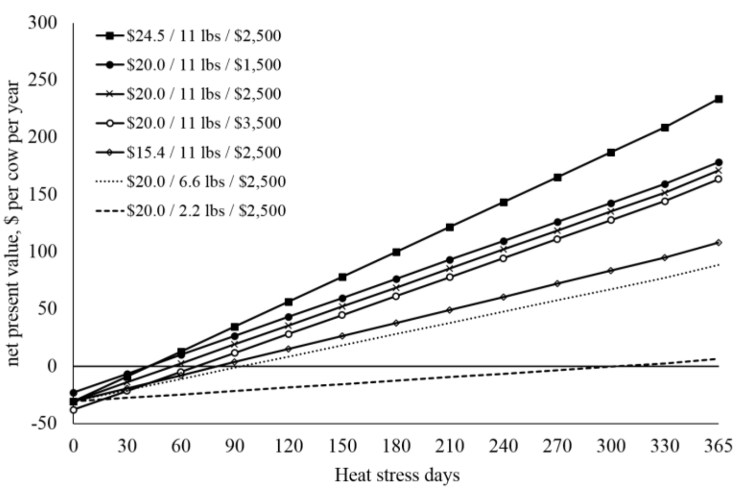

Figure 2*. Net present value (NPV) per cow per year, including the cost of building a new barn, for different scenarios of milk price, milk loss in the next lactation and cost of the dry cow barn per stall. A NPV > $0 means the investment in fans and soakers is profitable.*

If a barn does not need to be built (Figure 3), it is feasible to cool dry cows in all states within the US, except in Alaska. In Florida, California and Wisconsin, adding sufficient fans and soakers to an existing dry cow barn to cool cows would result in a profit of $137, $59 and $38 per cow per year, respectively.

In these economic calculations we only considered the reduction in milk production in next lactation. Although there are negative effects on the calves born from heat-stressed dry cows, the research publications are only few, and we did not quantify and include these additional losses, although they may be large. We also do not have information about seasonality of calving throughout the US. In Florida, more cows are dry during the hot season of the year, which means that the annual losses can be even greater. We also do not know if cows need to be cooled during their entire dry period, but this is currently being investigated.

For more information about the physiology or economics of cooling dry cows, contact Geoff Dahl, gdahl@ufl.edu, or Albert De Vries, devries@ufl.edu

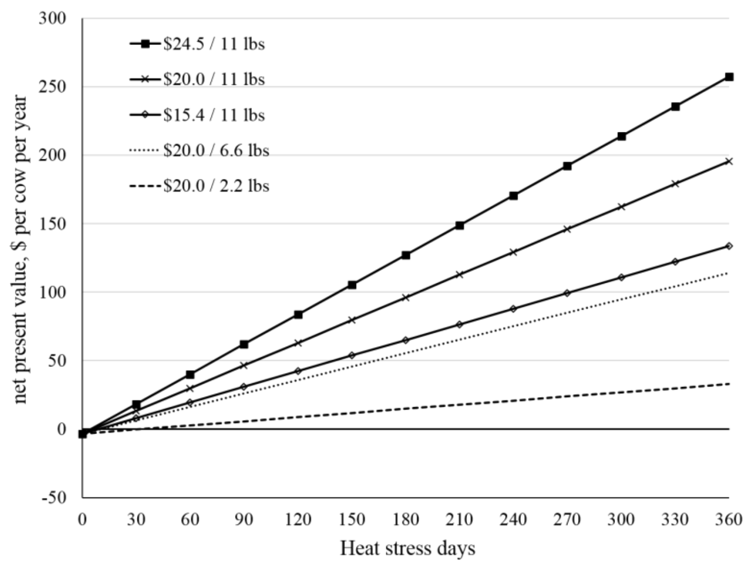

Figure 3*. Net present value (NPV) per cow per year, without the cost of building a new barn, for different scenarios of milk price and milk loss in the next lactation. A NPV > $0 means the investment in fans and soakers is profitable.*

Overstock or Build New?

Albert De Vries

Overstocking dairy facilities has advantages and disadvantages. An increase in stall stocking density (SSD), as measured by the number of lactating cows per stall in a freestall barn, reduces cow performance such as milk yield and fertility, but may increase farm profitability because the fixed costs of the facilities are spread across more cows. We conducted a study to calculate effects of varying SSD on profit per stall for a range of effects on cow performances and external farm factors. The study was financially supported by the Southeast Milk Dairy Checkoff, Belleview, Florida.

A brief summary of the main results of that study is as follows. We assumed effects of SSD on milk yield, probability of conception, and probability of culling assed on a review of the literature. We also build a spreadsheet model to calculate the profit per stall per year. Notice that stall, or barn size, is the correct profit denominator for overstocking because it is the most limiting factor in this case. Profit per cow is not correct here. The SSD was varied from 100% (no overstocking) to 150% (severe overstocking). We varied many of the inputs and assumptions, called sensitivity analysis. Average optimal SSD of all 2,187 combinations of inputs was at 120% SSD and average maximum increase in profit was $99/stall per year compared to no overstocking (100% SSD). However, the results were very sensitive to moderate changes in milk price and feed cost. When income over feed cost was high, it paid to overstock a lot. When income over feed cost was low, the best strategy was not to overstock. We captured the relationships between profit, SSD, and prices in regression equations and published them in a spreadsheet so users can do their own analysis. The full results of this study were recently published in the Journal of Dairy Science and earlier in various proceedings and magazine articles. You can read these at the Florida dairy extension website at http://dairy.ifas.ufl.edu/tools (stocking density). You'll also find the spreadsheet with regression equations.

Then somebody suggested that it might be better to build new facilities for extra cows than to overstock existing facilities with these extra cows. In other words, the reduction in profit experienced by all cows as a result of overstocking might be greater than the cost to build a new stall for each overstocked cow. Figure 1 shows the reduction in profit per additional cow if that cow is added to the current facility. This reduction is based on the regression equations above with reasonable assumptions about loss of milk, fertility and increased culling as a result of overstocking, and average prices. The figure also shows the cost per cow when a new stall is built for each additional cow above 100% SSD (our inputs: annually $201 depreciation + $90 stall maintenance cost). The cost per new stall for otherwise overstocked cows is much lower than the cost of the reduced performance experienced by all cows if the facilities would be overstocked.

Figure 2 shows that the optimum SSD is approximately 120% when only overstocking the current facilities is considered. The 120% SSD increases profit per cow by $27 compared to a 100% SSD with fewer cows (slightly different assumptions that earlier). If new stalls were built for these 20% extra cows, profit per cow would increase by $163, however. These 20% additional cows are profitable by themselves while paying for their new stalls, and they would not reduce performance of the now not overstocked cows in the current facilities. Of course, it might be profitable to overstock these new stalls and even more profitable to build new again when there are no other liming factors …

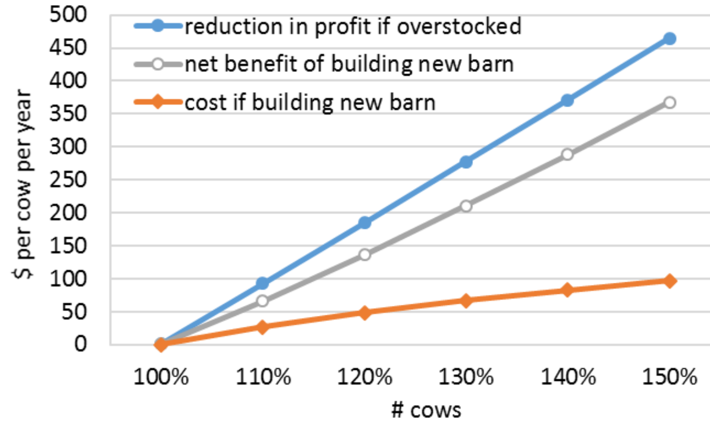

***Figure 1**. Reduction in profit from overstocking, cost of building a new barn and the net benefit from building new compared to reduction from overstocking. These data are inputs for figure 2.*

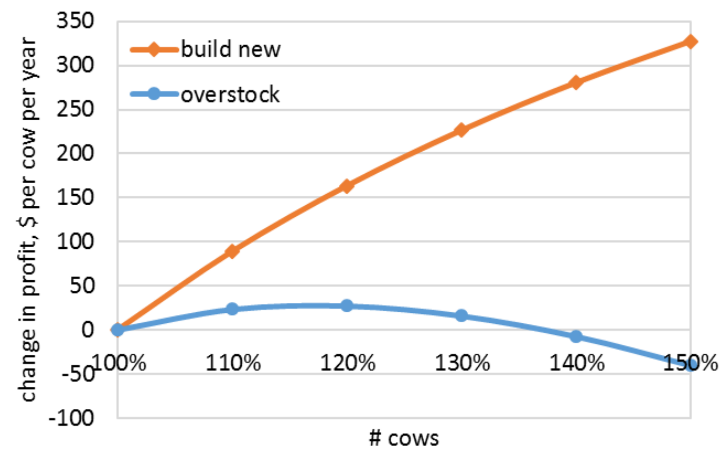

***Figure 2.** Comparison of overstocking vs. building new without overstocking. Building new is more profitable than overstocking in this example.*

A spreadsheet to evaluate overstocking vs. building new is available at http://dairy.ifas.ufl.edu/tools (stocking density). For questions, comments, and improvements, contact Albert De Vries, devries@ufl.edu

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