# ANALYSIS OF A GROWTH MANAGEMENT PROGRAM TO MITIGATE PRICE VOLATILITY

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*Supply Management & Plant Capacity*
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CPDMP
Cornell Program on Dairy Markets & Policy

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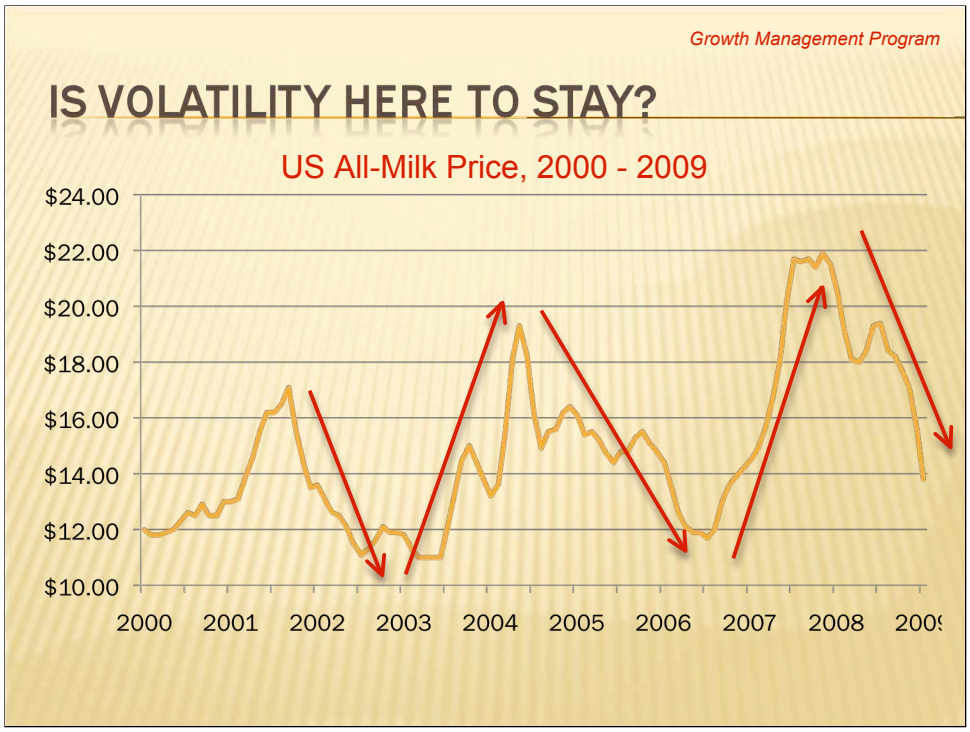
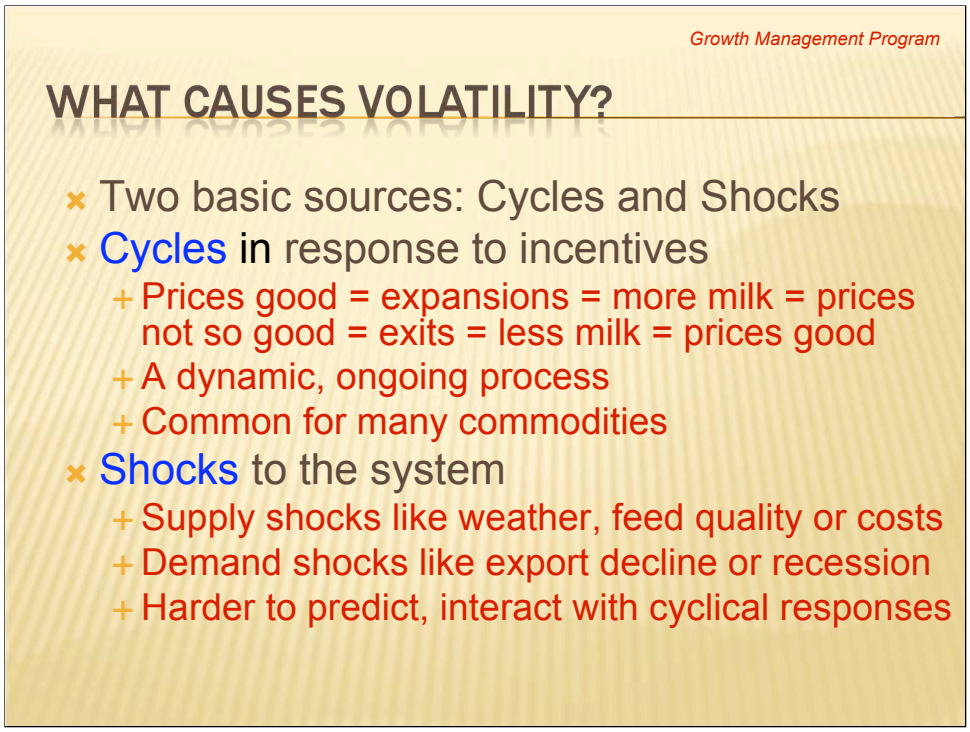
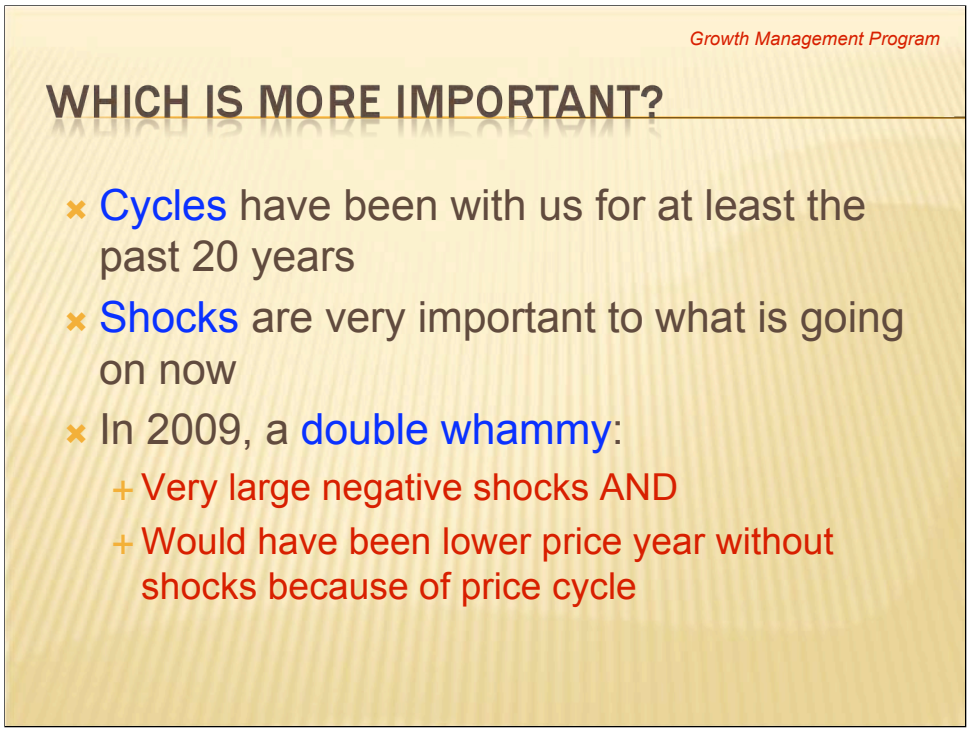



Price volatility is endemic to the dairy industry. It was largely suppressed for 40 years under the Dairy Price Support Program but, when support prices were lowered to levels well below market prices in 1989, volatility again became an issue.




Work at Cornell has shown that there are multiple cycles with different periods and amplitudes at work in the dairy industry. An annual cycle, or "seasonality" certainly exists, but so too do cycles with a length of 9 months, 26 months and 36 months. The collective impact of these cycles gives us price volatility that may look chaotic over time but in fact has order lying beneath it.

Unlike cycles, price shocks, by their very definition, cannot be anticipated. High oil prices in 2007 & 2008 provided the incentive for biofuel production which in turn dramatically increased the price of corn and other dairy feeds. This was a supply shock which would tend to reduce milk production and yield higher milk prices. In 2007 & 2008 we also experienced a demand shock as personal wealth in other countries, drought in a few exporting countries, and a weak U.S. dollar thrust our dairy industry into world markets. This also tightened the supply of dairy products in domestic markets and pushed prices higher. At the end of 2008 and in 2009, domestic and global economies have collapsed into recession and we are currently experiencing a demand shock in the other direction.



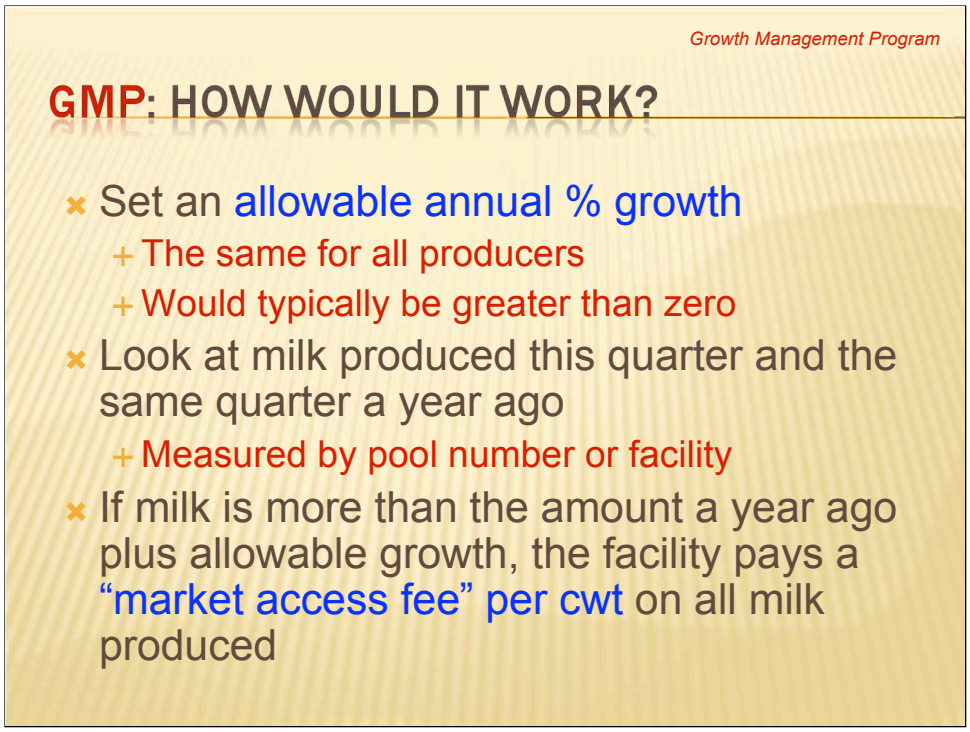

Two years ago our projection of milk prices, just based on the endemic cycles, pointed to a substantial decline in 2009. The shock that we couldn't anticipate was the significant loss of export opportunities which would also occur at that same time and plunge us into a deep milk price trough.


At the request of dairy producer groups, we have previously looked at two other programs to address volatility. One of these was a refundable assessment program and another was a mandatory assessment to fund a voluntary herd retirement and export subsidy program like CWT (Cooperatives Working Together). The idea for this Growth Management Program was also conceived by dairy producers and we were asked to evaluate the effectiveness of such a program.

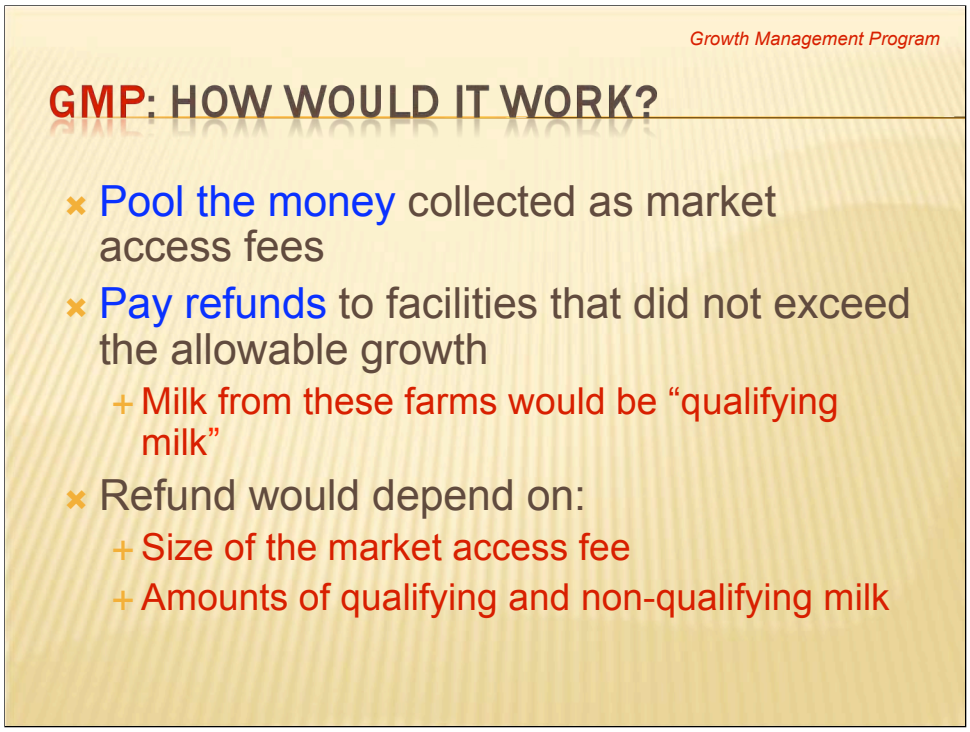
# GROWTH MANAGEMENT PROGRAM

Objective: Manage milk supply growth for more stable prices

- All producers must participate
- But individual facilities can still grow milk production




The Growth Management Program would be mandatory but producers can choose to produce any amount of milk for the market. An allowable growth rate would be announced perhaps quarterly, possibly yearly, or maybe just set and not changed very often—we examine each of those scenarios. An individual farm (facility identified by pool number or bulk tank unit) would compare their quarterly milk production against their production in the same period the prior year. If that production exceeded the allowable annual growth rate, that facility would be assessed a "market access fee" per cwt on all milk produced at that facility. The allowable growth rate would be selected to minimize milk price volatility. Under most circumstances, the growth rate would be positive and accommodate the growth in demand for dairy products. Under an extreme circumstances, it could be negative to recover from a price shock.




The money collected from producers who exceeded the allowed growth rate would be pooled into a national fund. Those producers who did not exceed the allowed growth rate would receive a payment per cwt on their milk production equal to the pool value divided by the cwt of qualified milk (milk produced below the allowed growth rate). The size of the incentive to stay below the allowed growth rate would thus depend on the size of the market access fee for unqualified milk and the amounts of both qualified and non-qualifying milk.

# KEY DECISIONS FOR GMP

- What is the size of the Market Access Fee?
- What % production increases are allowed?
  - Each year
  - Before facilities have to pay the MAF
- Do these need to change over time to make prices more stable?

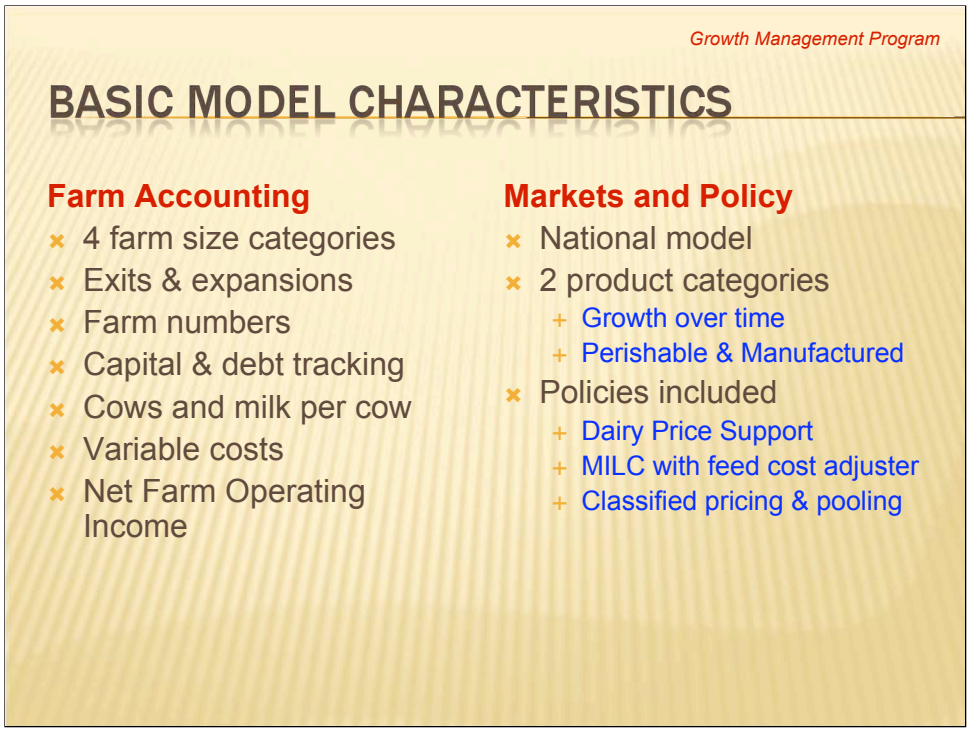
# CPDMP EXAMINED THE GMP CONCEPT

Three basic questions:

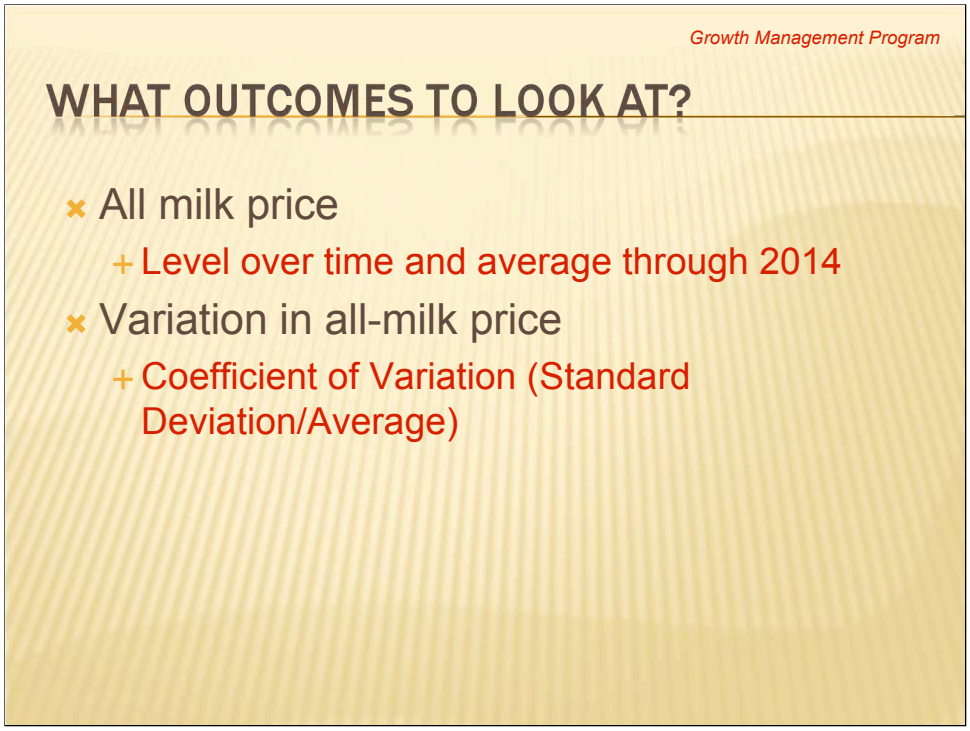
- Can it make milk prices more stable for regular variation due to cycles?
- Can it make milk prices more stable in the face of shocks?
- What are the levels of MAF and % growth that achieve more stable prices?
  - How often might need to change them?

# HOW DID WE ANALYZE THE PROGRAMS?

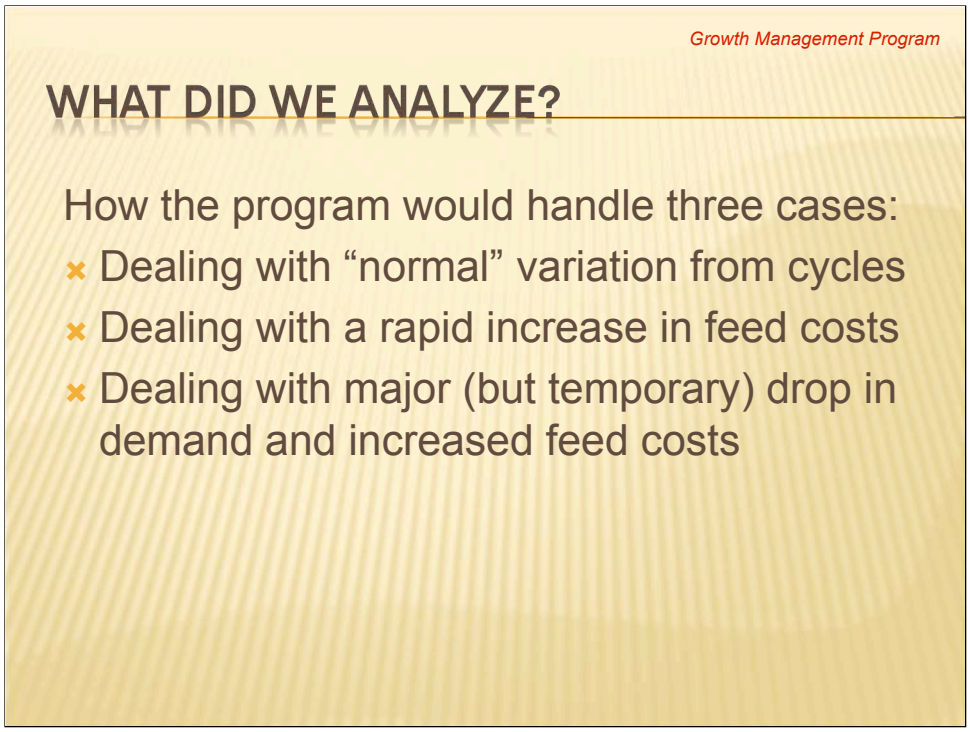
- Cornell Dynamic Dairy Sector Model
- Captures effects of both cycles and shocks
- Links detailed farm-level accounting with market prices and policies



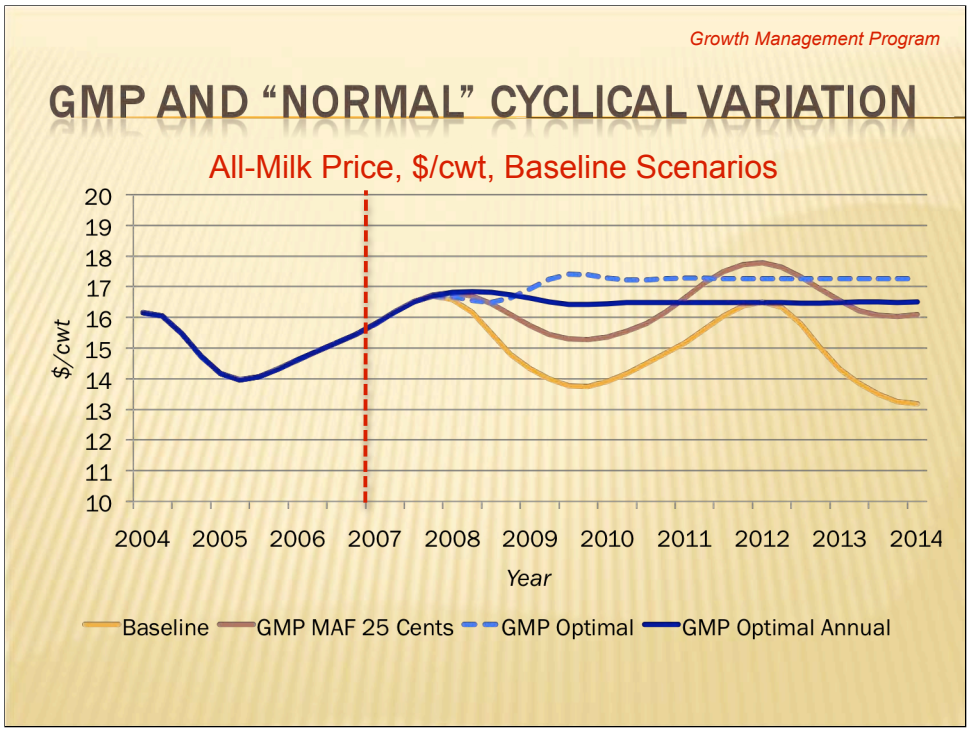

The model is highly detailed and includes many components contributing to net farm operating income (NFOI). Of course, NFOI is dependent on milk and input prices, but it is also dependent on policy instruments such as MILC (Milk Income Loss Contracts), market influences such as the Dairy Support Price Program, and State or federal order pricing. NFOI is also influenced by management decisions like expansion, culling or farm exit, productivity, etc. Finally, we consider income or expenses, depending on whether or not milk is qualified, from the proposed (GMP) Growth Management Program.




The scorecard for the GMP's success is the all milk price average over time and the degree of volatility as measured by the coefficient of variation in the prices. The model generates and uses the U.S. all milk price to reflect the impact across the country. Regional price levels will be different than the U.S. average but would be expected to follow the movements in lockstep.




We examined how the program would handle both the endemic cyclical milk price movements and economic shocks. Two real-world shocks were used: the feed price shocks and the demand shocks that we have experienced.




Under the cyclical price variation that we have been experiencing, the GMP works quite well. Three scenarios are examined: a fixed market access fee of $0.25 per cwt with an allowed growth rate of 3 percent; an optimally (minimizes variation) fixed market access fee of $0.55 and allowed growth rate of 2.9 percent; and a optimally variable fee (determined annually) which averaged $0.35 and variable allowed growth rate which averaged 1.9 percent. All three scenarios reduce price volatility but the two optimal versions do a much better job than the fixed $0.25 version.

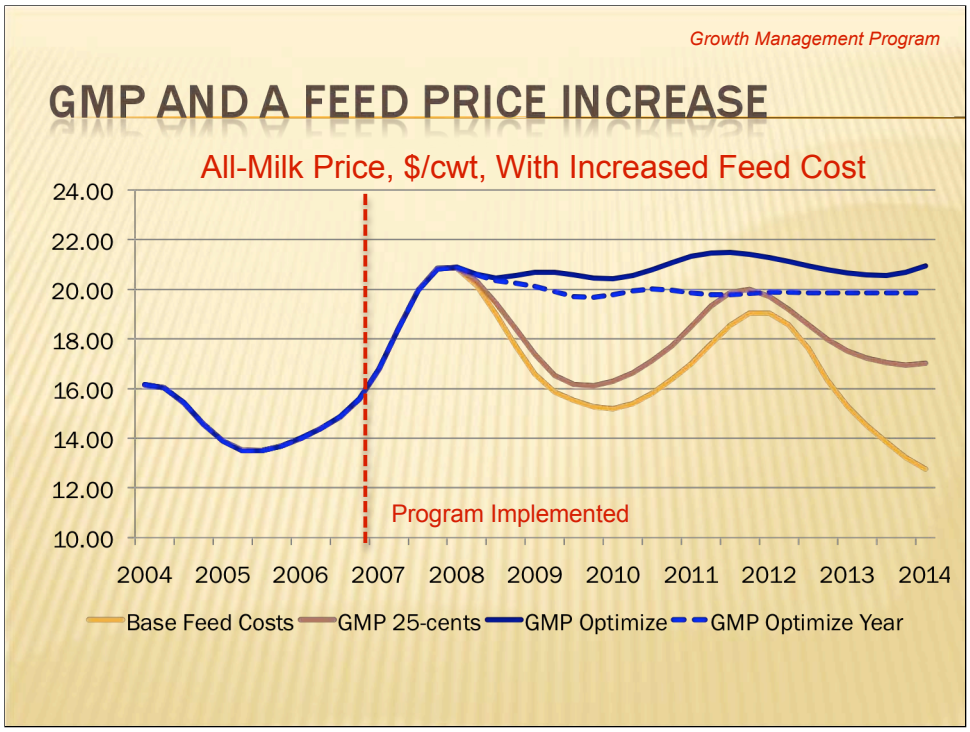
*Growth Management Program*

## BASELINE INDICATORS 2007-2014

| | Baseline | Baseline with 25-cent Market Access Fee | Baseline Minimize Variation | Baseline Minimize Variation with Annual Changes |
|---|---|---|---|---|
| Market Access Fee, $/cwt | -- | 0.25 | 0.55 | 0.35* |
| Allowable Growth, %/year | -- | 3.0% | 2.9% | 1.4%* |
| Refund, Qualifying Milk, $/cwt | -- | 0.19 | 0.32 | 0.39 |
| Average all milk price, $/cwt | 15.04 | 16.39 | 17.02 | 16.49 |
| Coefficient of variation, % | 7.6% | 4.5% | 0.5% | 0.2% |

* Indicates varies over time

This table provides some additional detail of the baseline and three scenarios. Clearly, the optimal variable market access fee and growth rate provide the lowest volatility measure but the fixed optimal does nearly as good a job with a somewhat higher average milk price.




This set of scenarios differs from the previous graph in that the feed price shock of 2006-2007 was included. You can see the impact with a 2008 price peak that is much higher than baseline scenarios without the feed price shock. Again, the GMP significantly reduces the price volatility in all cases but the ability to alter the market access fee and allowable growth provides the most stability and rapid recovery from this magnitude of shock.

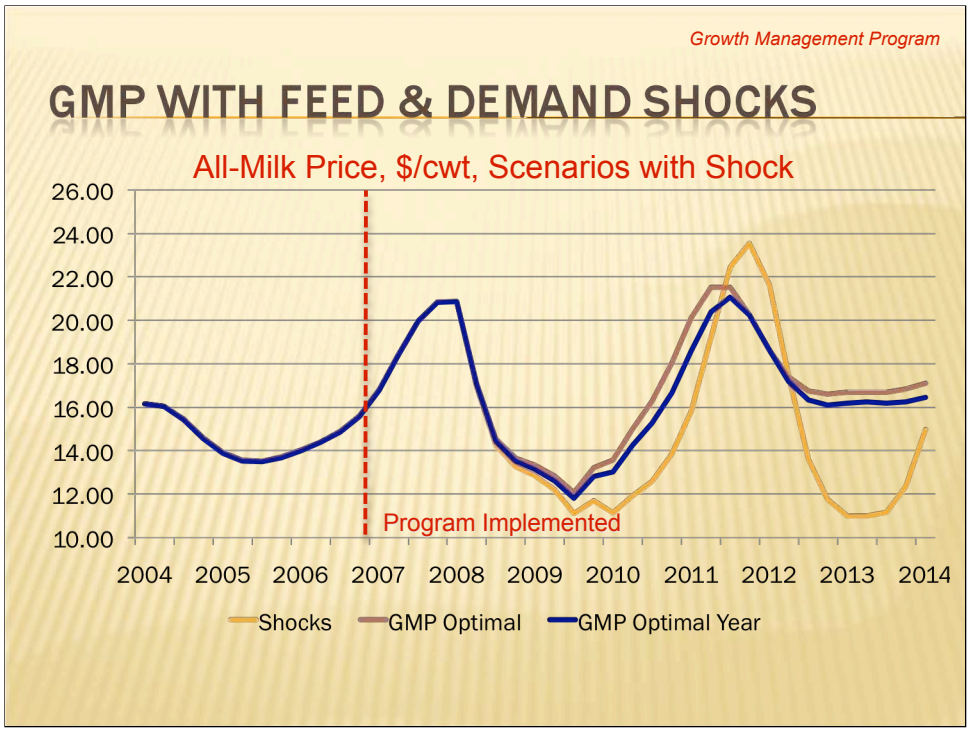
# GMP AND FEED COST INCREASES

| | Baseline with Feed Cost Increase | Baseline with Feed Cost Increase 25-cent MAF | Baseline with Feed Cost Increase Minimize Variation | Baseline with Feed Cost Increase Minimize Variation with Annual Changes |
|---|---|---|---|---|
| Market Access Fee, $/cwt | -- | 0.25 | 1.50 | 0.74* |
| Allowable Growth, %/year | -- | 2.5% | 3.0% | 2.7%* |
| Refund, Qualifying Milk, $/cwt | -- | 0.59 | 0.51 | 0.61 |
| Average all milk price, $/cwt | 17.02 | 18.21 | 20.59 | 19.84 |
| Coefficient of variation, % | 12.9% | 8.1% | 4.5% | 3.6% |

* Indicates varies over time

# GMP AND THE "DOUBLE WHAMMY"

- Increase in Feed Costs as before
- Demand growth shock for 2 years 2008-2009
  - Growth in Manufactured product demand is negative during 2008-09

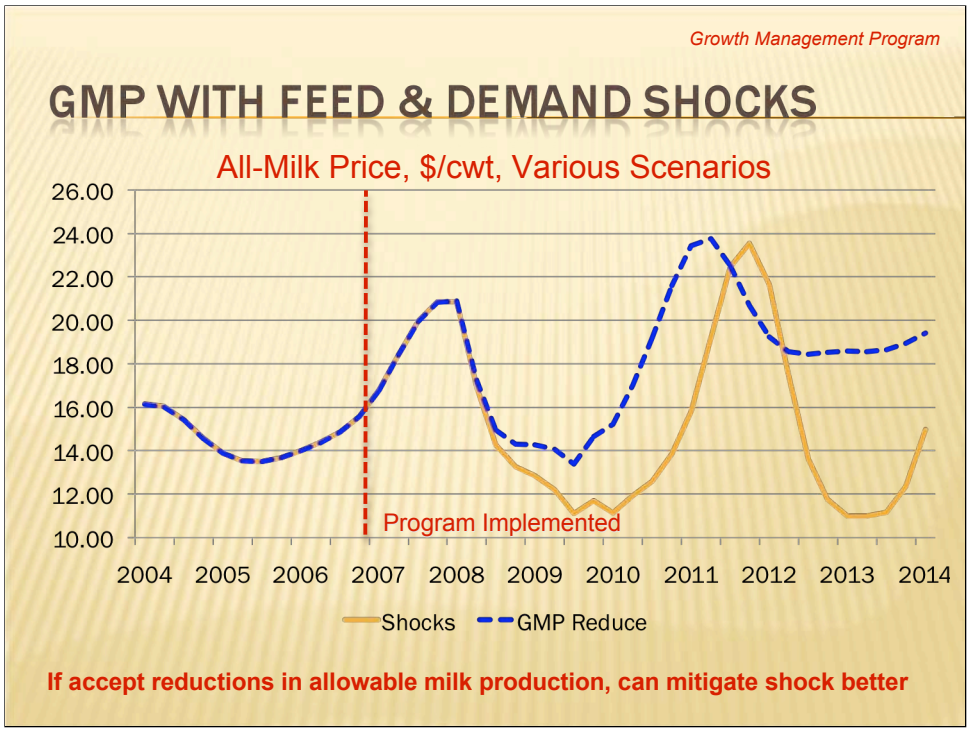



Lastly, we combine the underlying price cycles and the feed shock with the demand shock of 2008-2009 (global recession). You can see that the impact of the demand shock causes the price drop to be nearly $4.00 lower than before—it is a severe shock. It is also the case that while the GMP elevates the trough somewhat, it cannot provide complete protection from such an unanticipated event. Although it may be somewhat difficult to detect from the graph, a shock of this magnitude partially "resets" the underlying cycles which begin again at a slightly different time period. The GMP does substantially aide in the recovery after the shock (years 2013-2014) by again smoothing the price variation from underlying volatility.

# GMP WITH FEED AND DEMAND SHOCKS

| | Demand and Feed Costs Shocks, No GMP | Demand and Feed Costs Shocks, Minimize Variation | Demand and Feed Costs Shocks, Minimize Variation with Annual Changes |
|---|---|---|---|
| Market Access Fee, $/cwt | -- | 0.10 | 0.32* |
| Allowable Growth, %/year | -- | 3.0% | 1.5%* |
| Refund, Qualifying Milk, $/cwt | -- | 0.23 | 0.46 |
| Average all milk price, $/cwt | 15.34 | 16.61 | 16.44 |
| Coefficient of variation, % | 26.0% | 16.3% | 16.5% |

* Indicates varies over time




Initially, the Growth Management Plan was conceived with the idea that allowable growth in production would be positive for qualifying milk. Because the program did not provide much initial relief in the face of a severe demand shock, we decided to impose a negative growth limit on production. In other words, because demand had collapsed, this would provide a stronger incentive to bring production back into alignment with supply. The graph above imposes a $1.00 market access fee and restricts allowed growth to a negative 5 percent. The GMP is still not able to flatten out price immediately, but using the policy tool in this manner does improve the bottom of the price trough by nearly $3.00 per cwt and the market price does return to much less volatile levels by 2012.

# GMP WITH FEED AND DEMAND SHOCKS

| | Demand and Feed Costs Shocks, No GMP | Demand and Feed Costs Shocks, Minimize Variation | Demand and Feed Costs Shocks, Minimize Variation with Annual Changes |
|---|---|---|---|
| Market Access Fee, $/cwt | -- | 0.10 | 1.00* |
| Allowable Growth, %/year | -- | 3.0% | 0.1%* |
| Refund, Qualifying Milk, $/cwt | -- | 0.23 | 2.64 |
| Average all milk price, $/cwt | 15.34 | 16.61 | 18.52 |
| Coefficient of variation, % | 26.0% | 16.3% | 16.0% |

* Indicates varies over time

# GMP: BOTTOM LINE ON IMPACTS

- Program passes initial exploratory test
  - Appears that it could work to reduce volatility
- More effective at reducing cyclical variability
  - Does promote faster recovery of prices
- If the GMP allowed growth can be negative when demand falls, could improve prices with major demand shock