Dairy Price Risk Management
Livestock Gross Margin for Dairy (LGM-Dairy)

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Introduction to LGM-Dairy

- General structure of the LGM-Dairy program

- Derivation of gross margin guarantee

- How is an indemnity (premium) determined

- Examples for Wisconsin

- Comparison with bundled option

LGM-Dairy: An Overview

- Livestock Gross Margin Insurance for Dairy (*LGM-Dairy*)
  - ➢ Available starting in August 2008
  - ➢ Protects against unanticipated declines in *Gross Margins* where
    - ✓ Gross Margin = Milk Revenue – Feed Costs

- Purchased from crop insurance agents selling Federal crop insurance products
  - ➢ Need to be certified to sell LGM-Dairy products

LGM-Dairy: An Overview

- LGM-Dairy a natural extension of Feeder Cattle and Swine LGM products
  - Uses adjusted Class III, corn, and soybean meal futures prices to determine target expected and actual gross margins
    - Futures prices are adjusted via state and month specific All-Milk and corn basis.
  - 11-month insurance period (10 covered months)
  - Local market price received by producer not used

LGM-Dairy: An Overview

- Who is eligible to purchase LGM-Dairy?
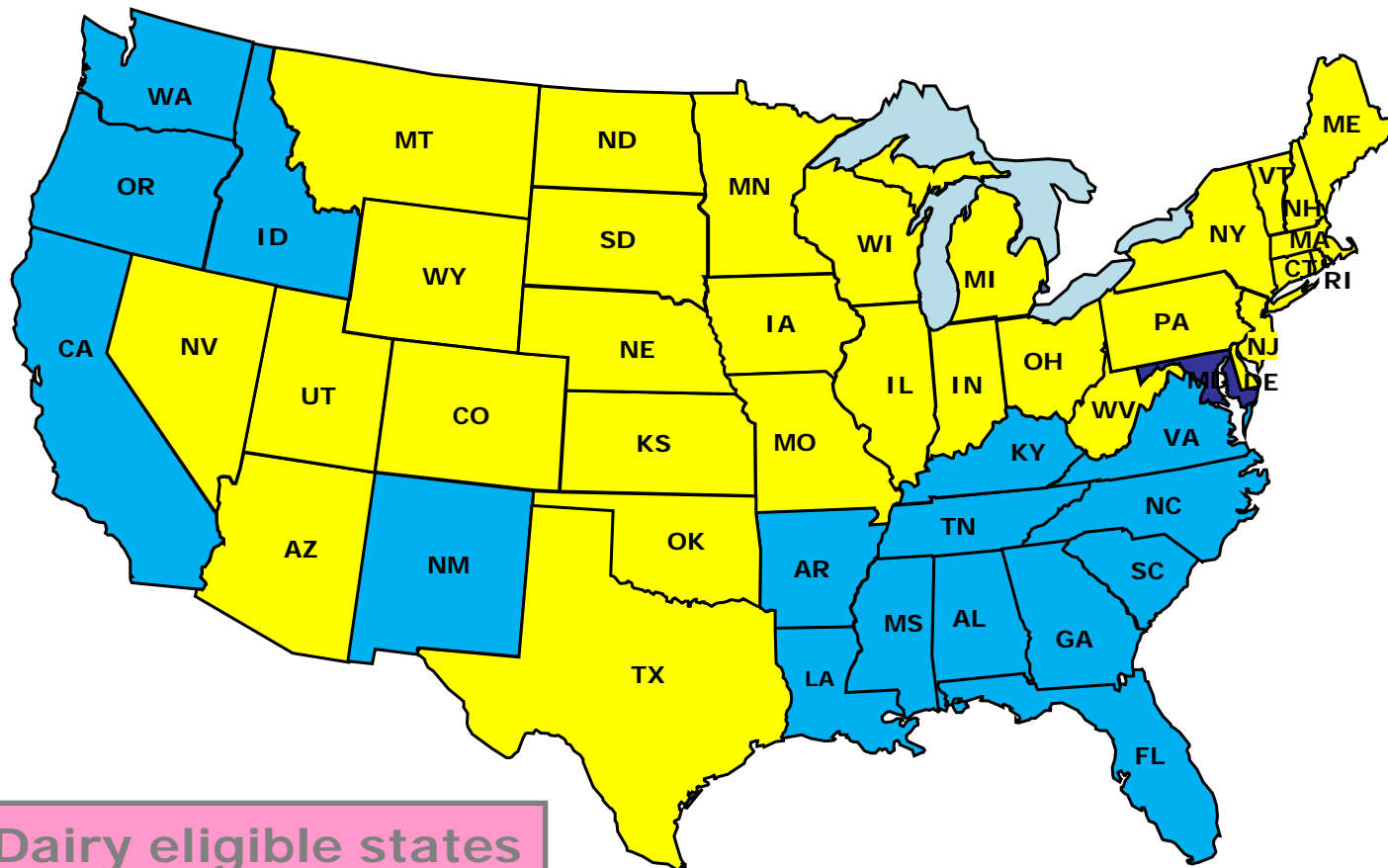
LGM-Dairy eligible states shown in yellow

LGM-Dairy: An Overview

➢ LGM-Dairy is customizable as to milk covered
  ✓ Upper limit of 240,000 cwt over 10 months
  ✓ Production of approximately 1,500 head
    with average Wisconsin cow productivity

➢ Can use LGM-Dairy to insure any month
➢ Under 1 Contract can insure from 1 to 10
  months
➢ Can stack multiple LGM-Dairy Contracts
  ✓ Cannot exceed certified production capacity
➢ Can range from 0-100% of expected
  production

LGM-Dairy: What is the insurance Period?

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		1	2	3	4	5	6	7	8	9	10
LGM-Dairy	**No Coverage**	**Insurance Coverage**									
Selected Covered Months		100%	0%	50%	50%	0%	0%	75%	100%	0%	50%

From 4 pm on 3rd to last business day to to 9 am following day (17-hour period)

LGM-Dairy: How it works?
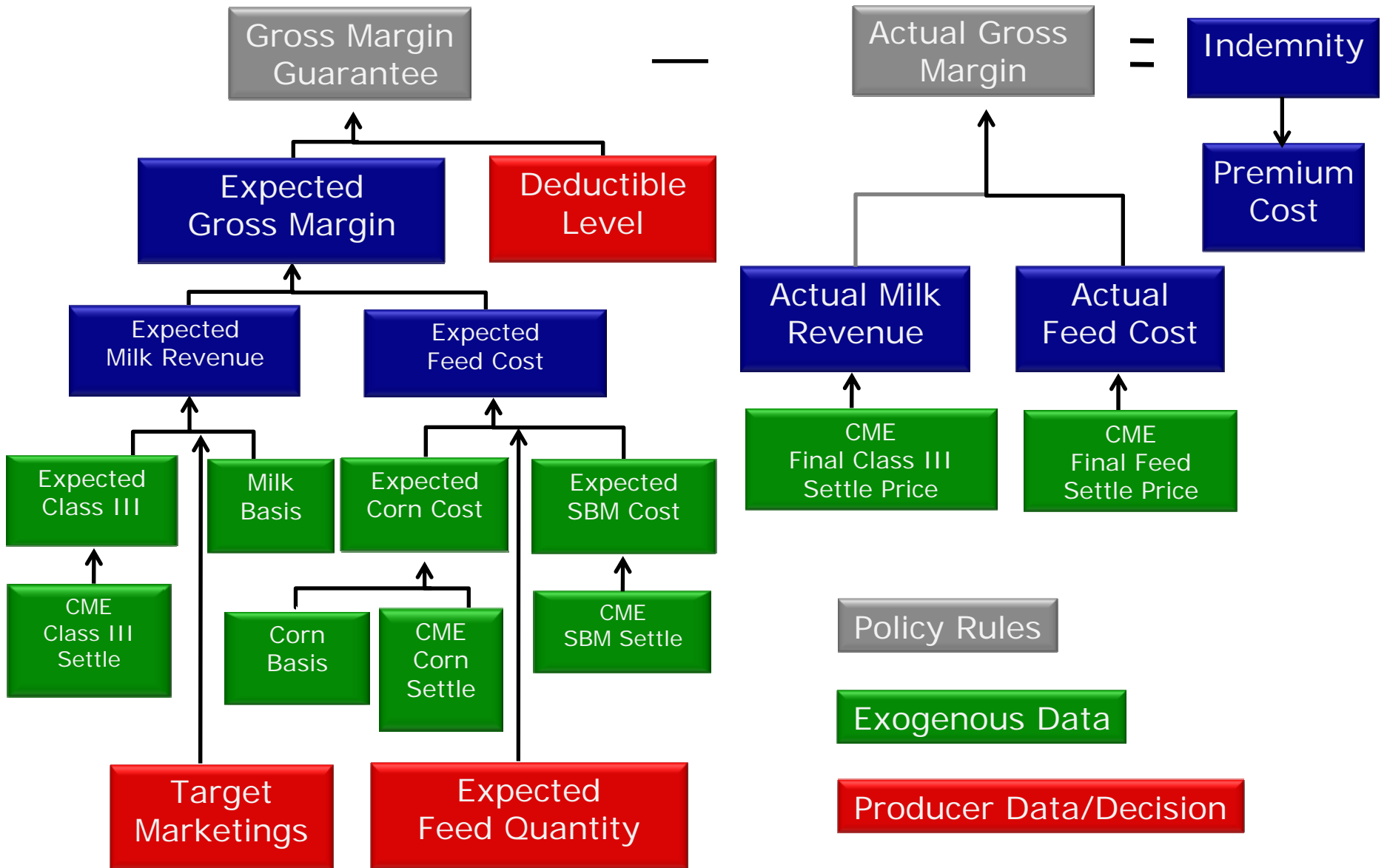
LGM-Dairy: Definition of Gross Margin

- **Definition of Gross Margin**
  - Gross Margin = Total Value of Covered Milk – Total *Purchased* Feed Costs
    - ✓ Feed does not actually need to be purchased but valued as if purchased
    - ✓ Does not include cost of growing home-grown feed (e.g. labor cost, energy cost, pesticides)
  - Both milk value and feed cost *NOT* based on actual farm prices
    - ✓ Milk price used: State All-Milk Price
    - ✓ Feed prices used: State Corn Price
                                             U.S. Soybean Meal Price

LGM-Dairy: Expected Price Calculation

January 2009

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1-New Year's Day	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19-Martin Luther King Jr. Day	20			23	24
25	26	27	28 Purchase Day	29	30 Last Business Day	31

Average Settle Prices Over These Days for Expected Prices

LGM-Dairy: Expected Gross Margin

- Expected Gross Margin for entire contract period determined at sign-up
  - Expected Gross Margin
    - Sum over all contract months of *Expected* Value of Milk – *Expected* Feed Costs
  - *Expected* Value of Milk in a particular month
    - That month's *Expected* Milk Price x *Expected* Monthly Production
  - *Expected* Feed Costs in a Particular Month
    - That month's *Expected* Feed Price x *Expected* Amount of Feed Used

LGM-Dairy: Expected Gross Margin

- Expected Gross Margin
  - As long as actual production ends up within 75% of expected production (EP_i) no adjustments
  - Should be able to justify TM_i

- Expected Feed Use for each month specified by producer at contract sign-up
  - Feed Use adjusted by the % of each month's production covered by contract, $Cover_i$

LGM-Dairy: Expected Price Calculation

- Above calculations done automatically when accessing RMA Premium Calculator website: *www.rma.usda.gov/tools/premcalc.html*
  - Purchase data only available at the end of EPM
  - Stays There Until Next Month

- University of Wisconsin LGM-Dairy Premium Calculator updated the day after purchase date *http://future.aae.wisc.edu/lgm_dairy.html#2*
  - More flexible than RMA site to undertake "what-if" type of analyses
  - Historical database of simulated prices

LGM-Dairy: Expected Price Calculation

- Calculation of Expected Prices for Jan. 09 contract
  - 10 Values
  - No problem for Class III with futures contract for every calendar month
  - A problem for Corn and SBM as for some months there are no futures contracts
    - For missing months average of surrounding months used in *Expected Price* calculation

LGM-Dairy: Expected Price Calculation

- January purchase month example
  - What contracts used in *Expected Price* calculation?

	Contract Month									
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Class III	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Corn	Mar	Mar, May	May	May, Jul	Jul	Jul, Sep	Sep	Sep, Dec	Sep, Dec	Dec
SBM	Mar	Mar, May	May	May, Jul	Jul	Aug	Sep	Oct	Oct, Dec	Dec

LGM-Dairy: Expected Feed Costs

- We need to convert *Expected* feed use to Corn and SBM equivalents
  - ➢ Corn used to account for energy
    SBM used to account for protein
  - ➢ Program rules specify feed equivalents need to be in very broad ranges:
    - ✓ Corn: 0.00364–0.02912 tons/cwt
      - • 0.13 – 1.04 bu/cwt
    - ✓ SBM: 0.000805–0.006425 ton/cwt
      - • 1.61 – 12.85 lb/cwt
  - ➢ *Each Month's* feeding rates must be between limits

LGM-Dairy: Expected Feed Costs

- Expected feed use converted to Corn and SBM equivalents
  - As noted above, any reasonable conversion system acceptable to RMA
  - UW *Understanding Dairy Markets* Website has conversion software available with an extensive database of forages and concentrates:

  future.aae.wisc.edu/lgm-dairy/excel_files/feed_conversions_2.xls
  - Based on 1995 Dairy Reference Manual Data (NRAES Publication #NRAES-63)

LGM-Dairy: Insurance Deductible

- Producer chooses amount of gross margin (Milk Value – Feed Costs) per cwt not covered by contract
  - Referred to as insurance deductible
  - Similar to your auto insurance deductible
  - Allowed to exclude from $0 - $1.50/cwt gross margin from insurance coverage
  - The greater the deductible:
    - ✓ The lower the premium
    - ✓ You are assuming more risk as deductible portion of your gross margin not guaranteed

LGM-Dairy: Indemnity Determination

- LGM-Dairy defines indemnity as:
  - Indemnity = Max[0, *Total* GMG – *Total* AGM]
    - ✓ *Total* refers to sum over all contract months
  - → If *Total* GMG > *Total* AGM → An indemnity is paid
  - Evaluate indemnity after last covered month's actual prices are available

LGM-Dairy: A Wisconsin Example (Nov 08)

Contract

- Purchased Nov 26th 08
- Coverage period: Jan-Oct 09
- Feed expected to be used:
  - 39.2 lb corn/cwt milk (68% max allowable)
  - 5.05 lb of SBM/cwt milk (39% max allowable)
- Similar Example in Policy Briefing Paper of Gould, Mitchell and Cabrera Using May 2008 Data (Aug, 2008)

LGM-Dairy: A Wisconsin Example (Nov 08)

Deductible ($/cwt)	GMG Total ($)	Premium ($/cwt)	Premium % of GMG
0.0	13.13	0.855	6.51
0.1	13.03	0.803	6.16
0.2	12.93	0.752	5.82
0.3	12.83	0.703	5.48
0.4	12.73	0.656	5.16
0.5	12.63	0.612	4.84
0.6	12.53	0.569	4.54
0.7	12.43	0.529	4.26
0.8	12.33	0.491	3.98
0.9	12.23	0.454	3.71
1.0	12.13	0.420	3.46
1.1	12.03	0.387	3.22
1.2	11.93	0.356	2.98
1.3	11.83	0.327	2.76
1.4	11.73	0.299	2.55
1.5	11.63	0.273	2.35

LGM-Dairy: A Wisconsin Example (Dec 08)

Deductible ($/cwt)	GMG Total ($)	Premium ($/cwt)	Premium % of GMG
0	11.88	0.761	6.41%
0.1	11.78	0.708	6.01%
0.2	11.68	0.658	5.63%
0.3	11.58	0.610	5.27%
0.4	11.48	0.564	4.91%
0.5	11.38	0.520	4.57%
0.6	11.28	0.479	4.25%
0.7	11.18	0.440	3.94%
0.8	11.08	0.403	3.64%
0.9	10.98	0.369	3.36%
1	10.88	0.337	3.10%
1.1	10.78	0.306	2.84%
1.2	10.68	0.278	2.60%
1.3	10.58	0.251	2.37%
1.4	10.48	0.226	2.16%
1.5	10.38	0.203	1.95%

Simulated Indemnities (Nov 08)
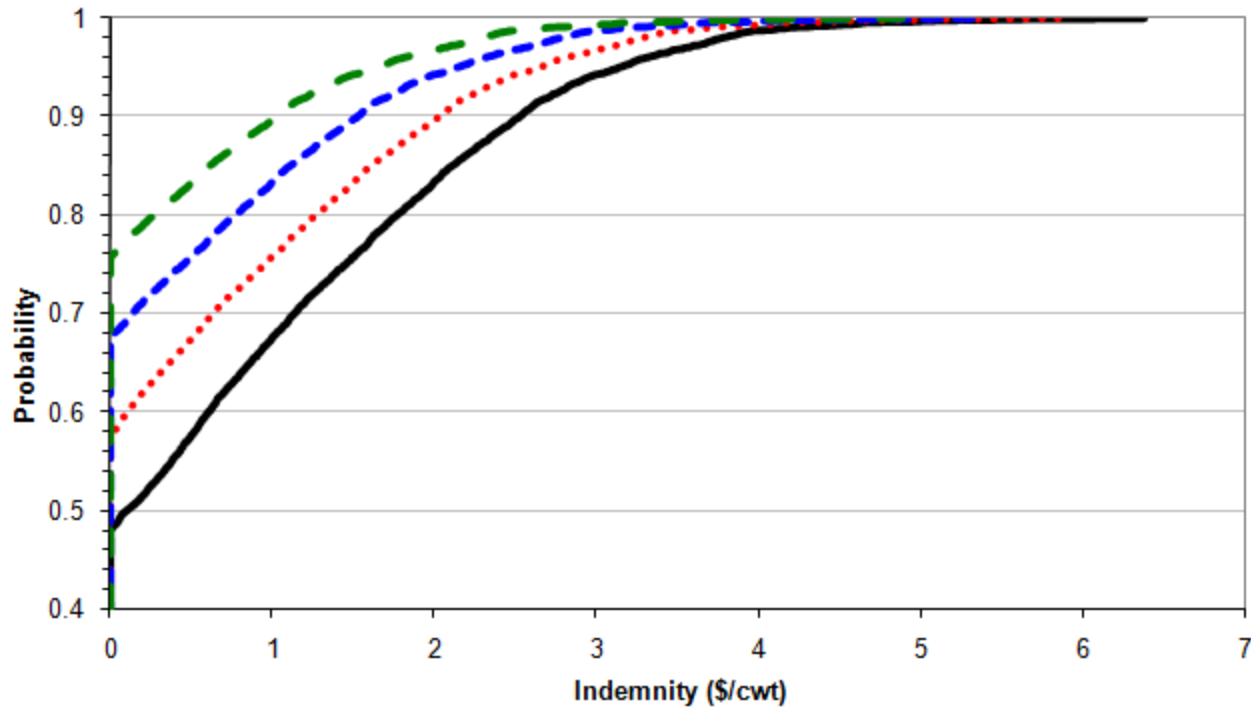
Wisconsin Expected and Actual (Jan 2008)

Gross Margin
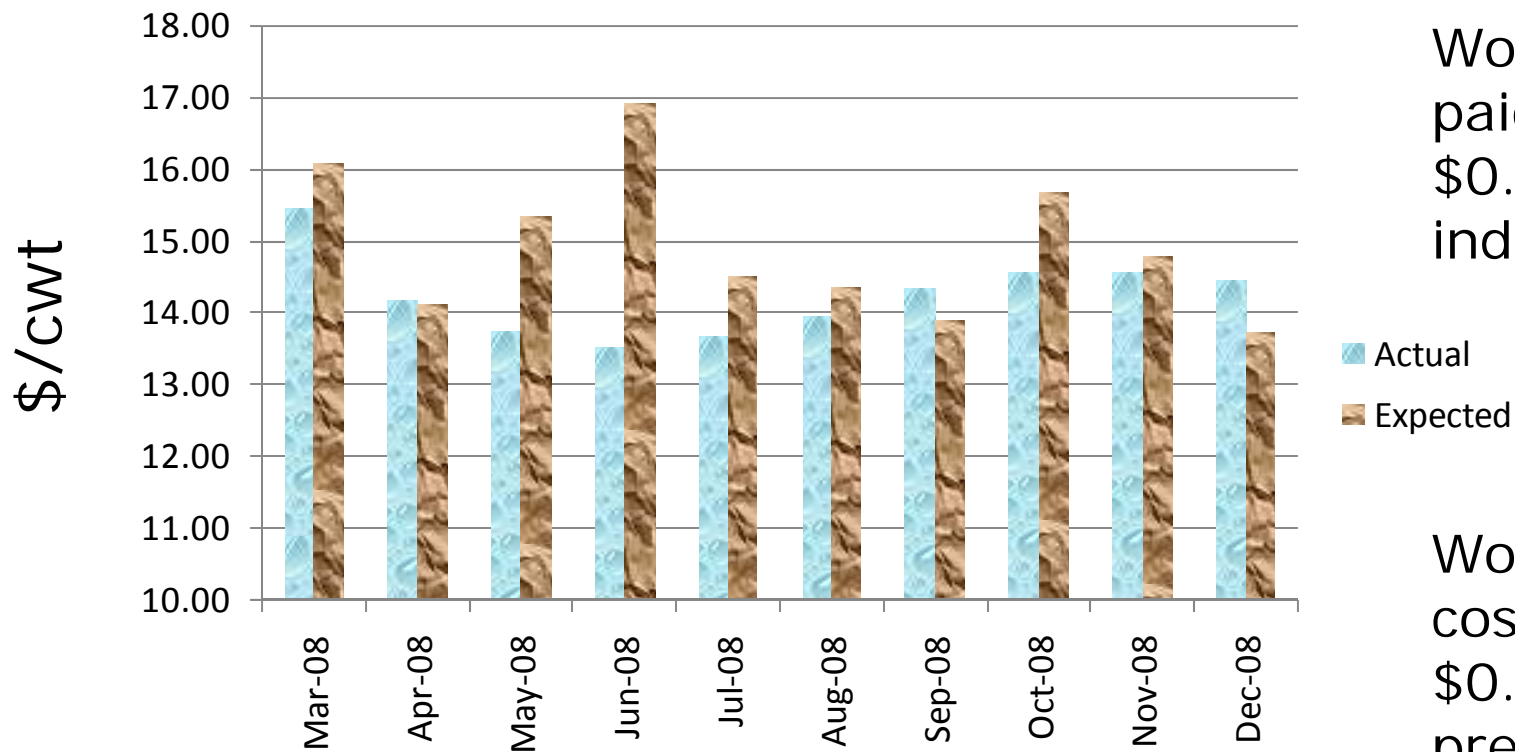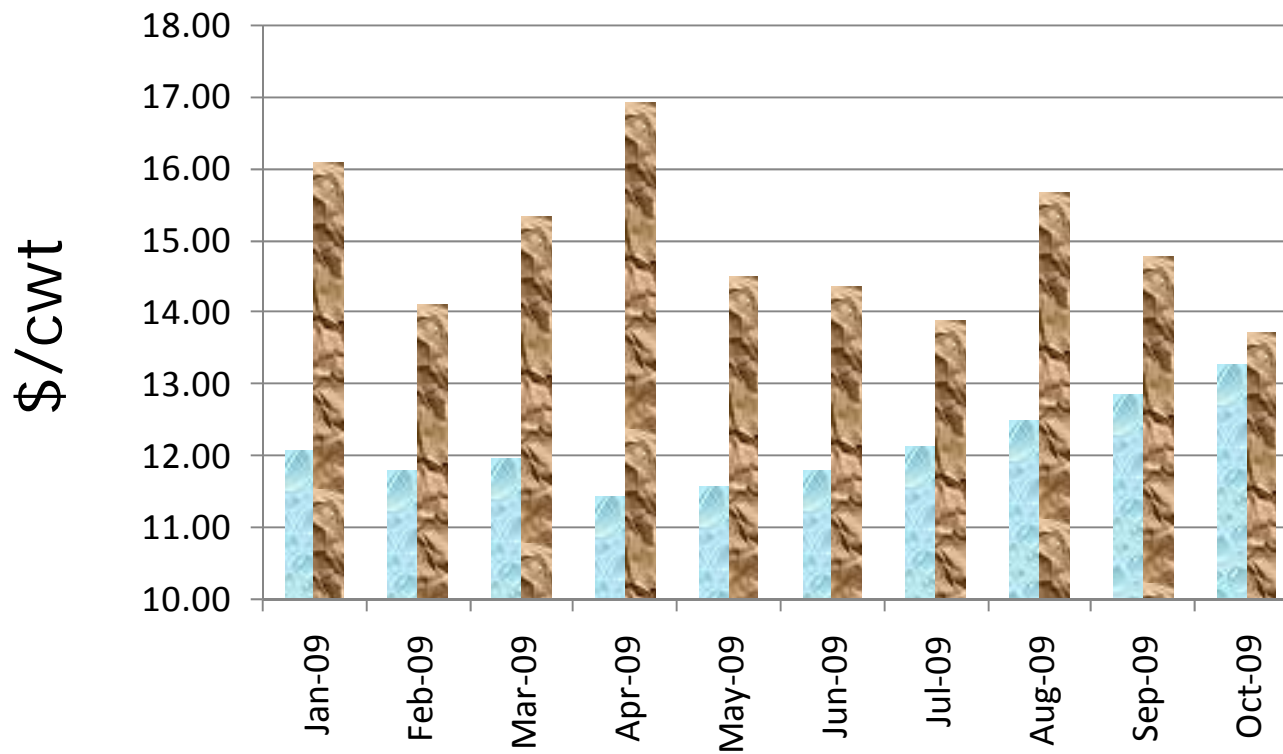
Deductible: $0/cwt

Would have paid: $0.00/cwt in indemnities

Would have cost: $0.82/cwt in premium

A Cost Comparison of LGM-Dairy With Options-Based Revenue Management

- As noted above, LGM-Dairy similar to a bundled option

- How do LGM-Dairy costs compare to the costs of setting a similar revenue *floor* via use of Class III puts and Corn/SBM calls?

- Difficult to compare given lumpiness of options
  - Assume options perfectly divisible
  - Compare costs under alternative deductible levels
  - Use data for January 2008 LGM-Dairy contract given availability of actual price data

A Cost Comparison of LGM-Dairy With Options-Based Revenue Management

- Farm Characteristics
  - 250 Milk Cows
  - Average Cow Productivity: 19,815 lbs
    - 2007 WI 200-499+ Herd Size Category Average
  - 41,481 cwt produced over 10 months
- Insurance Contract Purchased on January 29th
  - 10-Month Insurance Period: Mar `08 – Dec `08
  - Amount of Feed Expected to be Used
    - 966 Tons Corn Equivalent
    - 213 Tons Soybean Meal Equivalent
  - Insure 100% of Production

A Cost Comparison of LGM-Dairy With Options-Based Revenue Management

- Procedure for determining option premium costs
  - Use expected prices observed on January 29th to determine nearby option
  - To determine ending option value we use final settle price of futures contract
    - For missing months, we use the futures contract on last business day prior to the 15th of the missing month(s)

A Cost Comparison of LGM-Dairy With Options-Based Revenue Management

- Expected Prices for Jan. 2008 LGM-Dairy purchase

Month	Expected Prices		
	Class III ($/cwt)	Corn ($/bu)	SBM ($/Ton)
Mar `08	17.08	5.01	337.07
Apr `08	16.40	5.07	340.09
May `08	16.17	5.13	343.10
Jun `08	16.11	5.17	345.45
Jul `08	16.28	5.21	347.80
Aug `08	16.46	5.18	344.57
Sep `08	16.62	5.15	339.37
Oct `08	16.38	5.13	325.10
Nov `08	16.21	5.12	324.80
Dec `08	16.20	5.10	324.50

A Cost Comparison of LGM-Dairy With Options-Based Revenue Management

■ Puts and Calls on January 29, 2008

Month	Class III Put ($/cwt)	Class III Premium ($/cwt)	Corn Call ($/bu)	Corn Call Premium ($/bu)	SBM Call ($/Ton)	SBM Call Premium ($/Ton)
Mar `08	17.00	0.65	5.00	0.1775	340	11.60
Apr `08	16.50	0.84	5.10	0.3275	340	23.10
May `08	16.25	0.92	5.10	0.3275	340	23.10
Jun `08	16.00	0.90	5.20	0.4137	350	25.25
Jul `08	16.25	1.00	5.20	0.4137	350	25.25
Aug `08	16.50	1.14	5.20	0.4912	340	27.25
Sep `08	16.50	1.14	5.20	0.4912	340	27.25
Oct `08	16.25	1.18	5.10	0.5537	330	26.75
Nov `08	16.25	1.30	5.10	0.5537	320	30.40
Dec `08	16.25	1.35	5.10	0.5537	320	30.40

Note: The values in green correspond to the following months options given that options are not available for these months

A Cost Comparison of LGM-Dairy With Options-Based Revenue Management

- We can compare the *net costs* of the two programs

Month	Class III Put ($/cwt)			Corn Call ($/bu)			SBM Call ($/Ton)		
	Put	Actual Class III	Put Value	Corn Call	Actual Corn	Corn Call Value	SBM Call	Actual SBM	SBM Call Value
Mar `08	17.00	18.00	0	5.00	5.4550	0.4550	340	336.50	0
Apr `08	16.50	16.76	0	5.10	6.0025	0.9025	340	336.60	0
May `08	16.25	18.18	0	5.10	5.8975	0.7975	340	348.00	8.00
Jun `08	16.00	20.25	0	5.20	7.2460	2.0460	350	434.00	84.00
Jul `08	16.25	18.24	0	5.20	6.5700	1.3700	350	452.00	102.00
Aug `08	16.50	17.32	0	5.20	5.6820	0.4820	340	350.00	10.00
Sep `08	16.50	16.28	0.22	5.20	5.4740	0.2740	340	359.00	19.00
Oct `08	16.25	17.06	0	5.10	4.1125	0	330	254.50	0
Nov `08	16.25	15.51	0.74	5.10	3.8025	0	320	265.50	0
Dec `08	16.25	15.28	0.97	5.10	3.5950	0	320	258.50	0

A Cost Comparison of LGM-Dairy With Options-Based Revenue Management

- We can compare the *net costs* of the two programs

	Gross Cost	Gross Cost/Cwt	Net Cost	Net Cost/Cwt
Put/Call Options				
$0 Deductible	$63,216	$1.524	$28,461	$0.686
$0.80 Deductible	$58,993	$1.422	$26,560	$0.640
$1.50 Deductible	$55,301	$1.333	$24,898	$0.600
LGM-Dairy				
$0 Deductible	$36,107	$0.870	$36,107	$0.870
$0.80 Deductible	$21,147	$0.510	$21,147	$0.510
$1.50 Deductible	$12,144	$0.293	$12,144	$0.293

Note: Under the options based strategy we reduce the options costs by the % reduction in GMG observed under the LGM-Dairy scenarios.

LGM-Dairy: Summary

- LGM-Dairy a flexible insurance program
  - ➤ Need not insure all months or all production
    - ✓ Could make sense to overlap contracts

- Can be thought of as a combination of use of Class III Put and feed price Calls
  - ➤ Premium may be considered reasonable
  - ➤ Premiums are sensitive to deductible chosen

- LGM-Dairy Drawbacks
  - ➤ Short sign-up window at the end of each month
  - ➤ Total contract premium due at sign-up

LGM-Dairy: More Information

http://www.uwex.edu/ces/dairymgt/

http://future.aae.wisc.edu/

http://www.rma.usda.gov/livestock/