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USDA's Livestock Gross Margin Insurance for Dairy: What is it and How Can it be Used for Risk Management

By

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USDA's Livestock Gross Margin Insurance for Dairy:
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Brian W. Gould and Victor Cabrera

I. Introduction

Dairy farmers are faced with tremendous and increasing volatility, both in terms of milk prices, and the costs of purchased feed. There is a new weapon in the risk management arsenal of U.S. dairy producers: the Livestock Gross Margin for Dairy (LGM-Dairy) insurance program controls for lower gross revenue, defined as the value of milk produced minus feed costs. This program is administered by USDA's Risk Management Agency, and made available via authorized crop insurance agents to dairy farm operators in the lower 48 states.

This program is quite flexible and useful for farms with a variety of herd sizes, productivity, feeding practices, desired month(s) of coverage and deductible level. Expected gross returns are based on Class III, corn grain and soybean meal futures prices at the time of contract initiation. Indemnities are determined by the difference in expected and actual gross revenues, where the actual gross revenues are based on futures market milk and grain settle prices at contract expiration.

This document provides a brief overview of the Livestock Gross Margin for Dairy insurance program for revenue risk management by U.S. dairy producers. We first provide a summary of the volatility of dairy markets and a brief history of LGM-Dairy. Section II provides a broad overview of this program. In this overview we skip many of the details of how premiums are determined and how some of the program parameters are established. This second section will be useful for those who would like to obtain a working knowledge of LGM-Dairy and not be concerned with program details.

In Section III we present an overview of how insurance premiums are determined. Section IV illustrates program fundamentals via the use of data for July 2011 in a case study of a

hypothetical 350 head dairy operation.[1] The University of Wisconsin *LGM-Analyzer* system is used to undertake all simulations. For additional background information, the University of Wisconsin *Understanding Dairy Markets* website has a section devoted to LGM-Dairy. This website can be found at the following URL: http://future.aae.wisc.edu/lgm_dairy.html.

In Section V we provide more detail as to how program parameters are established. We present detailed explanations of how: (i) premiums are determined; (ii) expected and actual prices are estimated; (iii) gross margins are calculated and (iv) the timing of certain events once an LGM-Dairy contract is purchased. In Section VI, we provide a detailed description of indemnity determination.

In Section VII we undertake a second case study, but this time using data from March 2009. Using this historical data, we use official premium data obtained from the RMA. We also use actual Class III and feed prices to determine indemnity payments.

Throughout this discussion, we make considerable use of abbreviations when describing program characteristics to make the discussion as concise as possible. In Appendix A, we provide a listing of these abbreviations along with its associated longer descriptor. In Appendix B the definitions of key concepts are presented as a second resource to assist in your understanding of LGM-Dairy. Appendices C through E include an application form and other forms related to the program.

I.1. Price Volatility in the U.S. Dairy Industry

There is no doubt that we have witnessed a tremendous increase in farm-level milk price volatility over the last two decades. There are a number of reasons for this trend some of which are: (i) changes in U.S. dairy policies that are more market oriented; (ii) the evolution of the Federal Milk Marketing Orders (FMMO) milk pricing system from one based on surveys of dairy plants' competitive pay prices to a system where minimum milk prices are based via formula to wholesale dairy product prices; (iii) U.S. milk production growth rates exceeding the

[1] The Risk Management Agency (RMA) maintains an on-line premium calculator for LGM-Dairy located at: http://www3.rma.usda.gov/apps/premcalc/index.cfm. The user must first establish a username and password account to use the calculator. Once logged in, premium calculation requires supplying the expected target marketings, corn equivalents and soybean equivalents to be fed for the desired months.

growth in domestic production and (iv) an increased reliance on international markets as the destination of storable dairy products.

To illustrate this increase in price volatility, Figure 1 shows the minimum price of milk used for cheese manufacturing under the FMMO's over the 1970-2011 period. Prior to the early 1980's there was little volatility in manufacturing milk price although there was a steady increase. Starting with the passage of the 1985 Farm Bill and associated reorientation of U.S. dairy policy, milk price volatility has become a common occurrence.

In 1995, the FMMO's adopted their first milk pricing system that was partially based on wholesale commodity prices via the use of the *Basic Formula Price* system for milk valuation.[2] In 2000, under Federal Order reform initiatives the minimum value of milk marketed within the FMMO's is now determined by the U.S. average wholesale prices of four commodities: cheddar cheese, butter, nonfat dry milk and dried whey. These average values are derived from weekly plant sales of cash sales of these commodities.

Under Federal Order reform, the minimum value of milk is determined by: (i) the value of protein, fat, non-fat/non-protein solids and other solids; (ii) wholesale prices of products manufactured from these components; (iii) non-milk commodity costs of production; (iv) assumed product yields and (v) the component composition of raw milk.

As shown in Figure 1, with Federal Order reform came an associated dramatic increase in milk volatility. Not surprisingly this increased price volatility has caused the establishment of a series of dairy commodity based futures and options contracts being traded at the Chicago Mercantile Exchange (CME).

The increased reliance on dairy exports as a market for U.S. manufactured dairy products can be obtained from Figure 2. In this figure, the percent of the annual total solids associated with the U.S. milk supply that is exported is displayed. Concurrent with the 3-fold increase in dairy exports, there has also been a decrease in the level of U.S. dairy imports. The impacts of the volatility of these export markets can be obtained from examining the drop in dairy exports in

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[2] Economic Research Service, 1996. What is the Basic Formula Price, *Dairy Outlook*, USDA, Washington D.C., June. This article can be obtained from the following URL: http://future.aae.wisc.edu/pubs/pubs/show/208 .

2009 and the concurrent dramatic drop in milk prices. In December 2008 the Announced Class III price was $15.28/cwt. By May 2009 this price had dropped to $9.84, a 35.6% decline.

Figure 1 Volatility in Manufacturing Milk Price

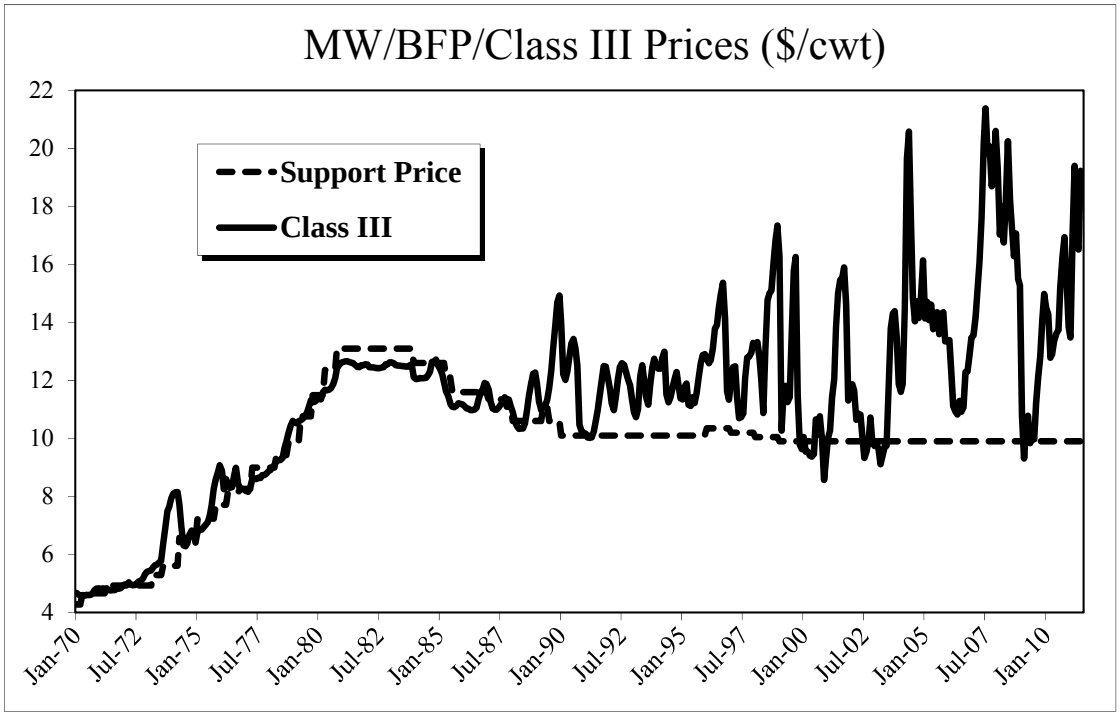
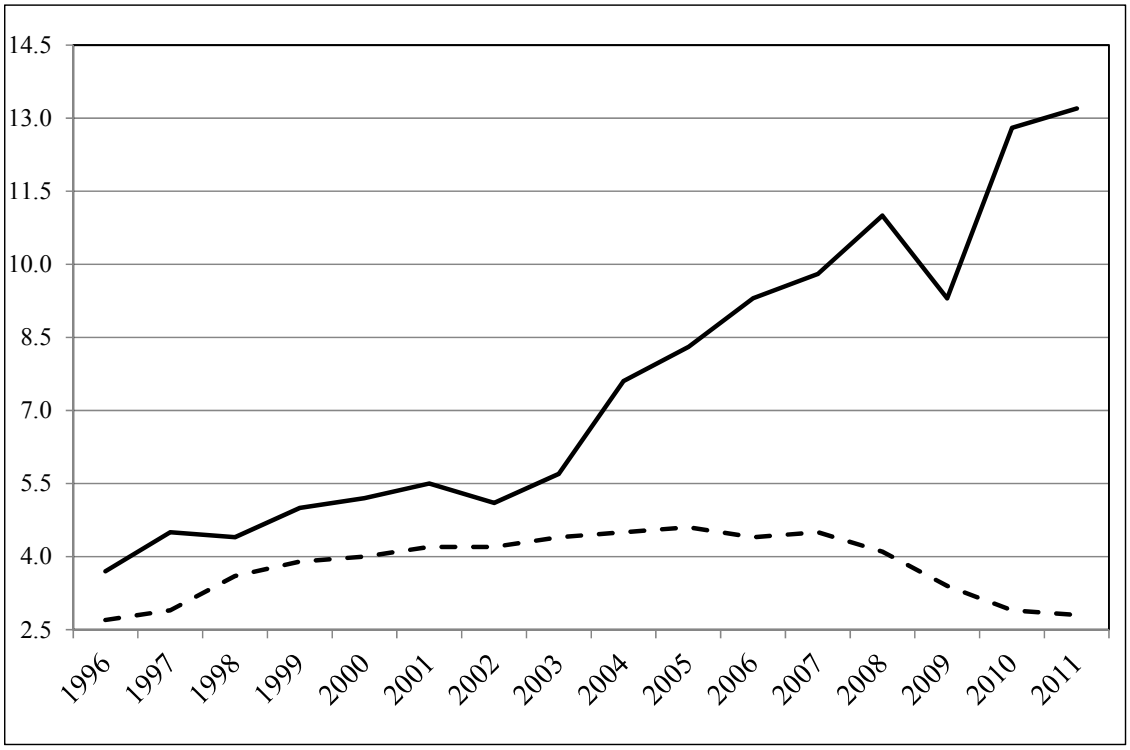
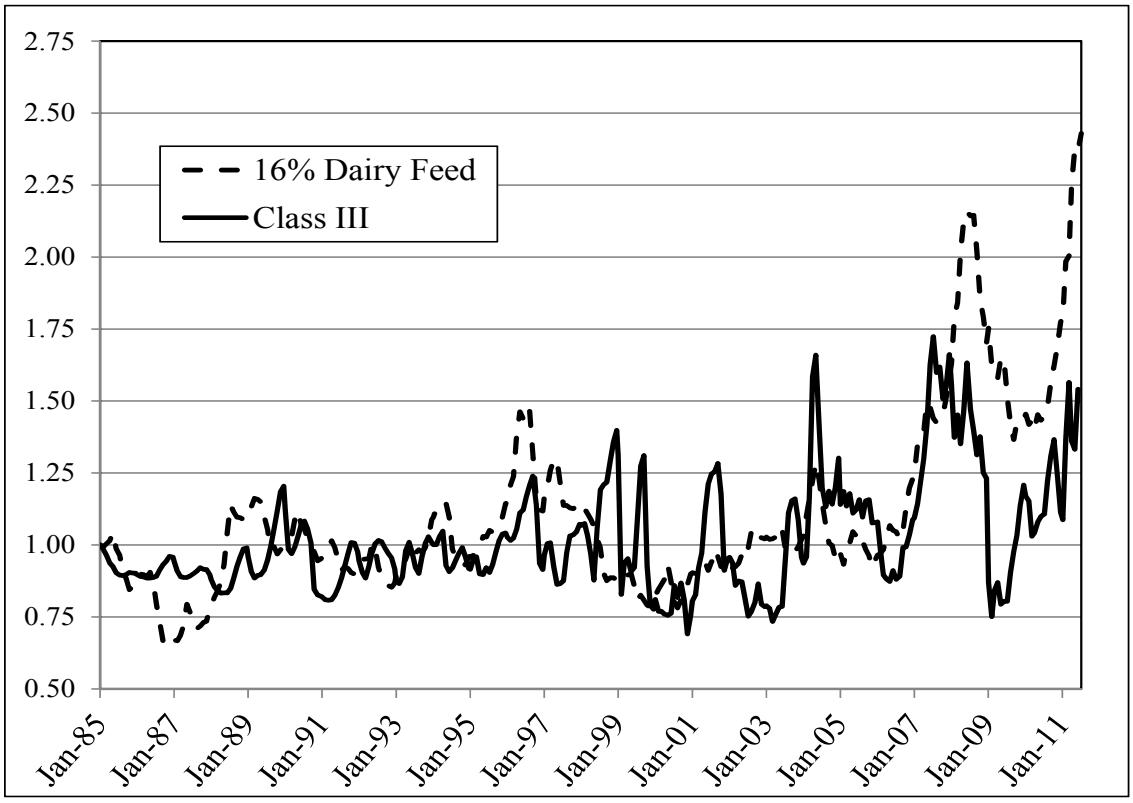


Figure 2 % of Total U.S. Dairy Solids Imported and Exported



Traditionally, with stable feed prices, examining dairy farm revenue volatility could be addressed by focusing on the volatility of farm-milk prices. Unfortunately with recent increases in the level and volatility in feed grain prices the focus of attention has turned from trying to manage milk price volatility to one of managing dairy gross revenue volatility. Specifically, over the last few years the grain markets have been just as volatile, if not more volatile, than the dairy markets. Figure 3 is used to show the volatility in feed and manufacturing milk prices. For this comparison, we standardize both milk and 16% dairy ration feed prices to 1 for Jan. 1985.[3] From this figure, since 2006, the U.S. average cost of a 16% dairy ration has experienced just as much if not more volatility than observed for farm milk.

Figure 3 Relative Value of Dairy Feed and Manufacturing Milk Price, Jan. 1985=1



[3] A 16% dairy ratio is composed of 51% (by weight) of corn, 8% soybeans and 41% alfalfa hay.

I.2. A Short History of the LGM-Dairy Insurance Program

Livestock Gross Margin insurance programs have existed for swine and feeder cattle for more than a decade. These insurance programs, administered through USDA's Risk Management Agency (RMA), are designed to offer protection against declines in livestock feeding margins (i.e., selling price minus feed costs). For beef cattle, the insurance product pays producers an indemnity when the spread between fed cattle sales value and the costs associated with feeder cattle and corn feed are reduced. With swine, an indemnity is paid based on the relative sale price of market hogs and the costs associated with the feeding of corn and soybeans.

In 2007, the Federal Crop Insurance Corporation approved the establishment of the Livestock Gross Margin insurance program for dairy farms (LGM-Dairy). This program became available starting in August 2008 for dairy producers in Wisconsin and 30 other states across the U.S.[4] As of July 2010, LGM-Dairy became available to all the lower 48 states.

LGM-Dairy is a natural extension of the cattle and swine insurance programs. This program is a risk management tool that allows dairy farm operators to purchase insurance to protect against unanticipated decreases in their gross margin, or the difference between estimated milk revenue and feed costs or income over feed cost (IOFC).[5] Under this policy, an indemnity (insurance payment) at the end of coverage period is the difference, if positive, between the anticipated gross margins at contract purchase and actual gross margins.[6]

Under LGM-Dairy the evaluation of all revenues and feed costs are based on current futures contract settle prices that exist at insurance sign-up. In contrast to the use of traditional futures and options strategies, there are no purchases of futures and options to offset the insurance position. CME Class III, corn and SBM futures and options markets are only used as an information source in the setting of premiums and at the end of the contract, an insurance

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[4] As noted in the program rules, only milk sold for commercial or private sale primarily intended for final human consumption from dairy cattle fed in any of the eligible states can be covered by LGM-Dairy.

[5] Note that the policy does not insure against death or other loss or destruction of dairy cattle, production loss of milk, or unexpected changes in feed rations.

[6] As will be noted later, there is a difference between the *insurance* vs. *coverage* period. The *insurance* period is the 11 months after the purchase of the insurance contract. The coverage period is up to 10 months and is dependent upon the months of marketings elected by the producer to be insured.

payment determination. As there are no actual futures markets transactions, there will be no margin calls, should prices move against one's position. In addition, in spite of the Class III options market being relatively thin, the desired LGM-Dairy contract may be undertaken, regardless of the level of activity in the actual Class III options market.

The contract premiums are established to be actuarially sound in the sense that over the long run, the expected indemnities paid equals the producer premiums.[7] A unique feature of LGM-Dairy is that premiums are not due until the last actual prices can be estimated. This could be 13 months after the contract was purchased In contrast, when purchasing futures and options contracts, premiums and other fees must be paid at the time of purchase of these contracts.

Table 1 summarizes the use of LGM-Dairy since its inception in August 2008. It was only in July 2010 that all states except for Hawaii and Alaska could participate in the program. In addition, starting in Dec. 2010, significant premium subsidies were available for all adopting dairy producers. From this table one can see the dramatic increase in LGM-Dairy contract purchases during the insurance year. In spite of the last LGM-Dairy contract being offered in March 2011 due to program funding limitations, the 46.2 million cwt sold during the last insurance year represents 2.4% of the amount of milk produced in the U.S. during all of 2010.[8] This amount of milk is equivalent to the amount of current open interest in Class III futures contracts.

Table 1 Summary of LGM-Dairy Insurance Activities

Insurance Year	Policies Sold (No.)	CWT Insured (000)	GMG ($000)	Premium ($000)	Indemnities Paid ($000)	Subsidy ($000)	Loss Ratio
2008/2009	40	402	4,716	288	718	0	2.5
2009/2010	153	1,872	24,915	782	280	0	0.36
2010/2011	1,409	46,209	770,270	25,041	58	10,742	0

Note: The March 2011 contract offering was the last contract available due to funding limitations. The 46.2 million cwt insured in 2010/11 represents approximately 2.4% of 2010 U.S. milk production.

[7] The Federal Crop Insurance Act requires that when determining premiums for LGM-Dairy a reasonable "reserve load" be added to account for the occurrence of unanticipated catastrophic events. A 3% reserve load is added to initial producer premiums to determine the total producer premium.

[8] An insurance year runs from July 1 – June 30th.

II. General Overview of LGM-Dairy Program Structure

The risk management objective of the LGM-Dairy insurance program is to establish a floor on the level of income over feed costs (IOFC) available to a dairy producer for the marketing of insured milk.[9] Note that with the establishment of an IOFC floor, the producer can take advantage of higher IOFC's regardless if this increase is due to higher milk prices, lower feed costs or both. The establishment of an IOFC floor is similar to the outcome that is obtained via the use of a *bundled options* strategy for revenue risk management. The following provides a brief overview of the use of bundled options for the established of a minimum IOFC. Understanding how a bundled options strategy can establish a floor of IOFC will be useful in understanding how LGM-Dairy can be used for revenue management and to provide a comparison of the relative costs of these two strategies.

II.1. Use of Bundled Options Strategy for Dairy Revenue Risk Management

Figure 4 shows how a bundled options strategy by a dairy producer can establish an IOFC floor. Purchasing Class III put options sufficient to cover monthly milk marketings establishes a Class III milk price (and revenue) floor. This effective floor is the value of the Class III put options minus the cost of undertaking a particular options purchase such as an options premium and related brokerage fees. Given an estimate of the corn and SBM equivalents required to produce the above milk, purchasing the necessary feed call options represented by these amounts can be used to establish a ceiling on feed equivalent costs.[10] This ceiling equals the options value plus the contract premium and any fees associated with the option purchase (i.e., brokerage fees).[11]

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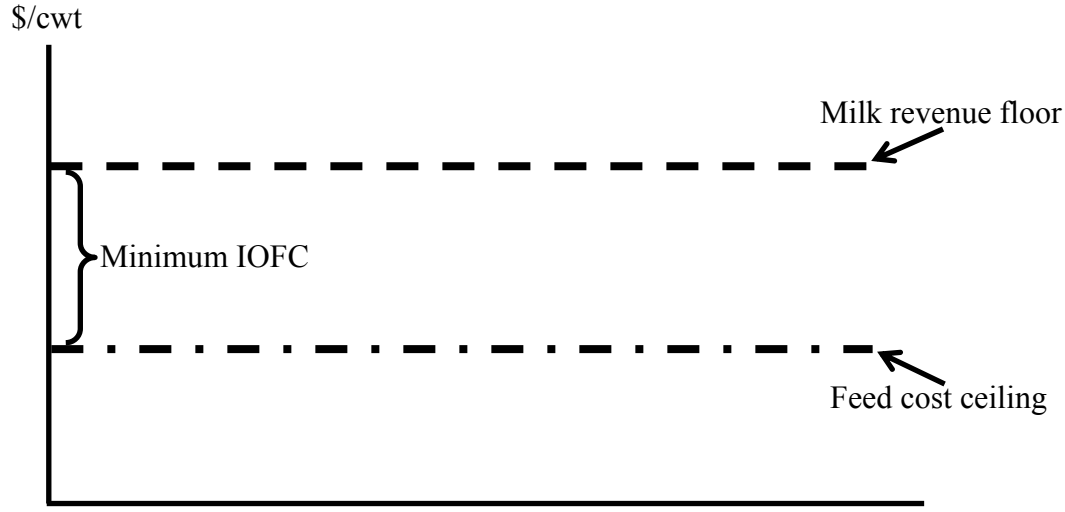
[9] This is referred to as the total gross margin guarantee (TGMG) using LGM-Dairy program terminology.

[10] Corn equivalents are used to represent the amount of energy associated with the dairy feed from corn and other feed sources. SBM equivalents are used to represent the amount of protein associated with the dairy feed from SBM and other feed sources.

[11] For Class III, there are two sizes of option contracts, one representing 2,000 cwt and another representing 1,000 cwt. A majority of the open interest in Class III options is associated with the larger sized options contract For corn options, the size of the contract is 5,000 bushels. A SBM options contracts represents 100 short tons (i.e. 2000 lbs.) or approximately 0.91 metric tons.

To understand the potential outcome of using a bundled options strategy to establish a gross margin floor, notice what happens if the announced Class III price is above the put options price minus options related costs. If this should occur, the producer will sell the associated milk in the cash market and let the option expire worthless. The net impact on the IOFC will be an increase in the IOFC. Alternatively, should the cost of feed decrease relative to the feed costs established during the undertaking of the bundled options strategy, the producer will not exercise the corn and/or SBM options and, due to the lower cash prices, increase the IOFC above the established floor. Unfortunately in many situations the use of the bundled options strategy can be quite costly. Historically, given the thinness of the Class III options market the producer may not be able to undertake the desired option strategy.

Figure 4 Use of Bundled Options Strategy to Establish an IOFC Floor

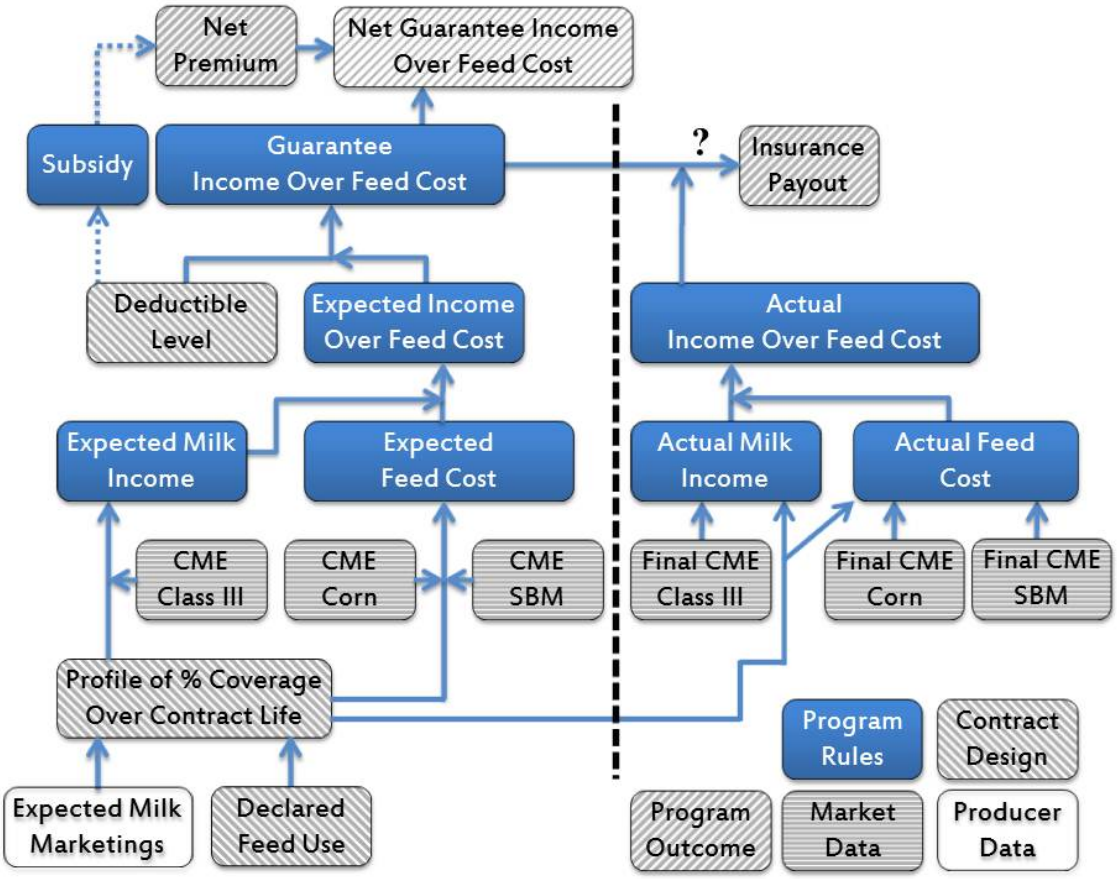


II.2. Use of LGM-Dairy for Revenue Risk Management

A general representation of the LGM-Dairy system is shown in Figure 5. This figure is partitioned into two sections. The portion to the left of the vertical dashed line shows the flow of information associated with the development and net cost of a particular contract design. The cost and level of protection are known at insurance sign-up given the use of expected: (i) milk marketings (ii) feed use, (iii) milk price, (iv) corn price and (v) SBM price. The material on the right side of the vertical dashed line is used to provide a representation of how the LGM-Dairy system works with respect to the determination of actual market conditions, likelihood of the occurrence of an insurable event (i.e., actual margin being less the guaranteed minimum) and the level of insurance indemnity. Contained within Figure 5 are five major program components: (i)

market data, (ii) insurance program rules, (iii) producer production profile, (iv) contract design parameters and (v) potential contract outcomes.

Figure 5 General Structure of the LGM-Dairy Insurance Program



Starting in the lower left of Figure 5 we see that once the expected milk marketings over the insurance period are identified, the contract design is established via (i) the choice as to the amount and type of feed declared for insurance purposes, (ii) percent coverage for each month and (iii) insurance deductible level. As described below, the data used to determine minimum insured IOFC and associated contract premium are obtained from the CME and outside the control of the dairy producer. In addition, the calculation of the minimum IOFC and associated premium for a particular contract design is determined via insurance program rules and again beyond the control of the individual producer. As shown in Figure 5 there are only three locations within this system that the producer has the opportunity to supply information that impacts program costs, performance and protection levels (i.e., boxes A, B and C). In spite of

this, there still remain a large number of contract designs (and implied program protection and costs) available to the producer.

The IOFC, for the purposes of the LGM-Dairy program, is defined as the value of insured farm milk minus the imputed cost of the declared feed use. Using the terminology of LGM-Dairy, the IOFC is the expected *dairy gross margin*. Under LGM-Dairy an insurance indemnity will be paid when the total actual contract gross margin is less than the expected, or, using LGM-Dairy terminology, the total gross margin guarantee. The total expected gross margin guarantee is known by the producer prior to the purchase of the insurance policy.

Expected (i.e., anticipated) monthly milk revenue is the product of the farm's insured monthly milk marketings and the associated expected monthly milk prices. The total contract expected milk value is the sum of the individual monthly values for the milk that is insured. Expected feed costs are the anticipated costs of feeding the amount of declared corn and soybean meal equivalents associated with the insured marketings.

The outcomes resulting from the purchase of an LGM-Dairy contract are (i) the net (of subsidy) premium payment that must be paid by the producer; (ii) a net (of net premium) guaranteed income over feed cost and (iii) the possibility of an insurance payout if market conditions should deteriorate after insurance purchase (i.e., higher milk prices, lower feed costs or both.

From the above discussion it should be emphasized that actual farm mailbox (milk) price, purchased feed prices or actual cost of production of home-produced feed are not used in the determination of possible indemnities. Market average prices are used. How they are obtained is detailed below.

II.3. When Can LGM-Dairy Contracts Be Purchased?

As specified in the insurance underwriting rules, LGM-Dairy can be purchased once a month or 12 times a year. Each insurance contract can be purchased during a very short sign-up window starting as soon as the RMA reviews the market data after the CME futures markets close on the *last business Friday of each month*. This means that contract purchases typically start at approximately 4 pm, Central Time. The contract needs to be purchased by 8:00 pm Central Time Saturday night. Only one LGM-Dairy contract can be purchased by a dairy operation per month. This is not as restrictive as it sounds; as noted above each LGM-Dairy contract can insure from 1 – 10 months of milk marketings for those months where 100% of that month's milk marketings have not been insured by already purchased LGM-Dairy contracts.

Using LGM-Dairy terminology, the *insurance period* is the 11-months associated with a particular LGM-Dairy insurance contract. It does represent the months insured. For example suppose a producer purchases a 2-month contract covering Dec. 2011 and Jan. 2012 production utilizing the Oct. 2011 contract offering. This contract's insurance period is the 11 month period Nov. 2011 - Sept. 2012 while the coverage period is Dec 2011 –Jan 2012. By rule no milk can be insured the first month of any insurance period. This implies that, at most, 10 months of revenues can be insured under any one contract. For example, if a producer wants to cover his margins for December 2012, such a contract can be purchased no earlier than the January 2012 contract offering.[12] Note that the Jan. 2012 contract has the potential to insure expected milk marketing over any or all months between March 2012 – Dec. 2012. Also note that Feb. 2012 – Oct. 2012 LGM-Dairy contract offerings could also be used to insure Dec. 2012 milk production so long as all of the Dec. 2012 marketings had not been insured by previously purchased contracts.

Table 2 Dates When LGM-Dairy Can be Purchased and Possible Coverage Months

Purchase Date Coverage Period	Oct 28 – 29, ′11 Dec ′11 – Sep ′12	Nov 18 – 19, ′11 Jan′12 – Oct ′12	Dec 30 – 31, ′11 Feb′12 – Nov ′12	Jan 27-28, ′12 Mar′12 – Dec ′12
Purchase Date Coverage Period	Feb 24 – 25, ′12 Apr ′12 – Jan ′13	Mar 31 – Apr 1 ′12 May ′12 – Feb ′13	Apr. 27 – 28, ′12 Jun ′12 – Mar ′13	May 25-26, ′12 Jul ′12 – Apr ′13
Purchase Date Coverage Period	Jun 29 – 30, ′12 Aug ′12 – May ′13	Jul 27 – 28, ′12 Sep ′12 – Jun ′13	Aug 31 – Sep 1, ′12 Oct ′12 – Jul ′13	Sep 28 – 29, ′12 Nov ′12 – Aug ′13

Note: Purchases usually can start at approximately 4:00 pm Central time on Friday and must be completed by 8:00 pm Saturday.

II.4. Data Required of the Dairy Producer

As shown in Figure 5, the basic data that needs to be provided by producer are the monthly maximum amount of milk marketings for those months for which coverage is desired (i.e., monthly approved target marketings).[13] For insurance purposes, the producer's actual target

[12] This contract can purchased between Jan 27th and 28th 2012.

[13] Approved target marketings are certified by the producer and are subject to inspection by the insurance company and/or USDA. Approved target marketings will be based on the lesser of farm capacity or underwriting capacity for the ten-month insurance period as determined by the insurance underwriter.

marketings for any month may not be more than that month's approved target marketings. The actual target marketings are the total amount of milk sold and for which the producer has proof of sale.

When purchasing a particular LGM-Dairy contract, the producer must provide an estimate the amount of corn (or corn equivalent) and soybean meal (or soybean meal equivalent) expected to be fed each month to achieve the approved target marketings or at least to be declared for coverage. There are different strategies adopted by dairy producers with respect to the amount of corn and SBM equivalents declared for insurance purposes. For producers who meet a substantial amount of their dairy herd's energy and protein needs via on-farm produced crops, they may only declare the feed equivalents that are purchased in the marketplace, and not include the amount grown on-farm, to account for only their market-based risk. Alternatively, to encompass any opportunity cost of feeding on-farm produced feed, a producer may want to declare the corn and SBM equivalents actually being fed regardless of feed source. There is no set rule to determine the level of corn and SBM feed equivalents to declare. The declared amount is very specific to the characteristics of the farm being insured. In contrast to the level of milk marketings, there is no auditing of feed use.

The declared feed use will have a significant impact on the level of gross margin guarantee and insurance cost as lowering feed costs will increase the IOFC and during more stable times this would clearly result in higher premiums, both at the aggregate and per cwt of insured milk basis.[14] This is why, in Figure 5, we show the amount of feed equivalents declared as a contract design parameter and not farm data.

Whatever the method used to identify the feed to declare for insurance purposes, there is no set way to convert the various feedstuffs to corn and SBM equivalents. Two example alternative methods based on: (i) the Penn. State Dairy Reference Manual (Penn State, 1995) and (ii) the National Research Council (NRC, 2001) are available from the University of Wisconsin LGM-

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[14] However, given the recent volatility in grain markets we have found that decreasing the use of feed, although increasing the IOFC has resulted in *reduced* premiums. This reduction has been due to the relative reduction in the IOFC risk by reducing feed use compared to the relative increase in IOFC with this lower declared feed cost.

Dairy website (http://future.aae.wisc.edu/lgm-dairy.html).[15] These are just two of many methods that could be used.

The following provides an example of how the feeding of oats and meat meal can be converted to corn and SBM equivalents using the method suggested by the RMA(2010) and follows the procedure based on Penn State (1995).[16] Assume a producer fed 140 bushels of oats and 0.2 tons of meat meal to his milking herd last month. What are the corn and SBM equivalents of this ration? The conversion for of the amount of oats fed to corn equivalents can be undertaken in two steps:

Step 1: Convert bushels to tons of oats fed.
((140 bushels of oats fed) x (32 lbs/1 bus of oats))/(2000 pounds) = 2.24 tons of oats fed

Step 2: Use suggested conversion rates for corn and SBM equivalents
Corn conversion rate: 0.779 tons of corn/ton of oats
SBM conversion rate: 0.120 tons of SBM/ton of oats
→2.24 tons of oats x 0.779 tons of corn/ton of oats
= **1.745** tons of corn equivalents fed
→2.24 tons of oats x 0.120 tons of SBM/ton of oats
= **0.269** tons of SBM equivalents fed

The conversion of the meat meal to corn and SBM equivalents can be achieved in one step as meat meal is already measured in tons:

Step 1: Use suggested conversion rates for corn and SBM equivalents.
Corn conversion rate: –0.349 tons of corn/ton of meat meal
SBM conversion rate: 1.227 tons of SBM/ton of meat meal
0.2 tons of meat meal x (–0.349) tons of corn/ton of meat meal
= **–0.070** tons of corn equivalents fed
0.2 tons of meat meal x 1.227 tons of SBM/ton of meat meal
= **0.245** tons of SBM equivalents fed

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[15] The Penn. State Reference Manual based converter can be found at: http://future.aae.wisc.edu/lgm-dairy/excel_files/feed_conversions_2.xls and the NRC-based converter can be found at the following URL: http://dairymgt.info/lgmfeeds/index.html. A user's manual for this 2nd conversion system can be found at: http://dairymgt.info/tools/lgmfeeds/lgmfeeds.pdf .

[16] USDA, Risk Management Agency, Commodity Exchange Endorsement for Livestock Gross Margin for Dairy Cattle, http://future.aae.wisc.edu/lgm-dairy/rma_material/11lgmdairycee.pdf.

Pennsylvania State University, 1996. Dairy Reference Manual, NRAES-63, 3rd edition

The above implies that the corn and soybean meal equivalents for 140 bushels of oats and 0.2 tons of meat meal are 1.675 (=1.745 – 0.070) tons of corn equivalent and 0.514 (= 0.269 + 0.245) tons of SBM.

As there is no one method for converting feed sources into corn and SBM equivalents producers may utilize their own conversion rates to create corn and SBM equivalents. The only restriction is that it should be based on "accepted" industry methods and as noted below the corn and SBM equivalent use should be within minimum/maximum limits that are explicitly stated in the insurance policy. A producer's feed supplier should be able to provide these conversion factors.

The RMA specified minimum, maximum and default values of corn and SBM equivalents declared per cwt of milk marketings are shown in Table 3. The producer cannot exceed the maximum feeding limits or declare less than the minimum values specified in this table. Many producers use the default values to minimize the calculations required to purchase a particular contract. It is recommended that producers investigate how the cost (and performance) of a particular contract varies with changes in declared feed equivalents.

Table 3 Range of Feed Equivalents Allowed Under LGM-Dairy

Feed Equiv.	Minimum	Maximum	Default
Corn (bu/cwt)	0.13	1.36	0.50
SBM (lb/cwt)	1.61	26.00	4.00

If the producer uses the minimum feed values to determine the number of feed equivalents necessary to produce the insured milk, this essentially establishes a "synthetic put". That is, there is a floor on milk revenue and virtually no protection on the cost of feed. The question that needs to be addressed is whether this is a viable risk management objective. Can the operation handle market-based feed price volatility?

When purchasing an insurance contract it is important to remember that the declared expected milk marketings and declared feed equivalents set the expected margin, even if the actual production and feeding practices do not follow the expected pattern established at sign-up. So long as the level of actual total contract marketings is at least 75% of insured marketings there are no adjustments of any potential indemnities. If less than 75% of insured marketings are actually produced, then any indemnities forthcoming will be adjusted downward by the percentage of actual marketings less than expected marketings. The total premium due will not be adjusted.

II.5. Determination of When an Insurance Payment is Due and Payment Level

As noted above, the use of LGM-Dairy as a revenue risk management tool is undertaken with the objective of establishing a minimum IOFC (i.e., total contract gross margin guarantee) and the producer can take advantage of higher IOFC values that reflect higher milk prices, lower feed costs or both. When the producer purchases an LMG-Dairy contract, this minimum target IOFC is determined at sign-up and known to the producer before the contract is signed.

An indemnity (i.e., insurance payment) is made to the producer when the above minimum IOFC guarantee is greater than the actual IOFC value. For a particular contract there is only one indemnity determination undertaken regardless of the number of months of insured marketings. There was an early misconception that there would be monthly determinations of indemnities under a particular LGM-Dairy contract. This is not the case. Only one indemnity determination is made after the end of the *coverage period*. The producer does not need to wait until the end of the insurance period for an indemnity determination. If the last month of the coverage period is prior to the last month of the insurance period, it is the coverage period that determines when an indemnity determination is undertaken.

Table 4 Calculation of Total Contract Indemnity

	Minimum IOFC ($)	Actual IOFC ($)	Gain/Loss ($)
Month 1	25,000	23,200	-1,800
Month 2	24,750	27,000	2,250
Month 3	22,500	23,000	500
Month 4	21,750	20,000	-1,750
Total Contract	94,000	93,200	- 800

Table 4 provides an example where a particular contract has 4 months of coverage where individually some of the months have the actual gross margin greater than the expected (i.e., gain) and some where the actual gross margin is less than expected (i.e., loss). If this was the actual contract there would not be four indemnity determinations. There would be one indemnity determination undertaken with a total contract indemnity of $800. This example shows those months in which there is a gain (i.e., actual IOFC is more than expected) offset those months in which the actual IOFC is less than expected.

Like any other insurance contract, the insured hopes not to need to use the insurance product. In the context of LGM-Dairy, if the dairy operator is not due an indemnity this implies that market conditions that actually occurred were more favorable either in terms of higher milk revenue or lower feed costs or both. In that regard, a producer should not view the purchase of an LGM-Dairy contract as a profit center given that like any insurance program, it is hoped the insurance will not have to be used.

II.5.1. Determination of Expected Milk and Grain Prices

The question remains as to how the expected IOFC guarantee and actual IOFC are determined under the LGM-Dairy insurance program. A detailed presentation of how these values are determined will be presented in Section V of this document. The following provides a general overview of how the minimum and guaranteed IOFC's are established for a particular LGM-Dairy contract.

To determine the minimum IOFC guarantee for the LGM-Dairy contract regardless of length, anticipated (*expected*) monthly Class III milk, corn grain and SBM (ESP) prices need to be obtained. According to contract rules, all milk is valued as Class III with the assumed standard component composition regardless of how a producer's milk is actually used (Class I, II, III or IV) and the quality of the milk. As noted above all declared feed are converted to corn and SBM equivalents and total costs of the corn and SBM equivalents are used to determine feed costs.

All prices are obtained from the CME Class III, corn and SBM futures contracts' settle prices over what is referred to as the *expected price measurement period*. This time period typically starts on the Wed. prior to the last business Friday of each month and ends two days later on the last business Friday of that month. Using the settle prices for the above three commodities, the RMA calculates 3-day averages of each of the 30 prices (10 Class III, 10 corn and 10 SBM prices) corresponding to the 10 months associated with the LGM-Dairy insurance period of the insurance contract currently being offered. For example for the Oct. 2011 contract offering the RMA will estimate expected prices for the Dec. 2011 – Sept. 2012 period using the above method.

As noted above under LGM-Dairy all insured milk is valued as if it was standard Class III milk with 3.5% fat and the skim portion having 3.1% protein and 5.9% other solids.[17] Farm-specific average herd component compositions ***are not used*** in milk valuation. If, for example, a producer has a milking herd with significantly greater component percentages than the standard Class III milk (i.e., a Jersey herd), the producer may want to convert the amount of milk insured to a *standard Class III milk* quantity either based on the relative amount of fat, protein or a combination of both when compared to the Class III standard milk. However, one cannot insure more milk than the cwt of milk physically marketed regardless of its composition.

Given that CME corn and SBM future settle prices observed over the expected price measurement period are used to determine expected prices and there are ***no farm-specific*** bases used to adjust the average values, all feed is valued at Chicago. To obtain an estimate of the level of local margin that is being protected the farm specific mailbox-Class III basis and (Chicago – local) corn/SBM bases can be used. Assuming that these bases don't change then the *farm specific* indemnity equals the indemnity determined by minimum IOFC guarantee – actual IOFC when the minimum guarantee is greater than the actual.

II.5.2. Choosing an Insurance Deductible Level

Under auto, home, business and other common insurance policies an insurance deductible can be chosen that identifies that portion of the insured asset not covered by the particular insurance policy. For LGM-Dairy we can consider the minimum IOFC as the insured asset. As such, under LGM-Dairy, the producer can identify that level of *expected total gross margin* (or deductible) that is not covered by the insurance program. This deductible is the amount of the IOFC not covered by the insurance program. These deductible levels (defined in $/cwt of milk) are allowed to be in the range of $0.00/cwt to $2.00/cwt of minimum IOFC in 10¢/cwt increments. This deductible does not change across coverage month and thus is fixed for the entire insurance period.

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[17] For more detail refer to E. Jesse and B. Cropp, Basic Milk Pricing Concepts for Dairy Farmers, University of Wisconsin Extension, 2008. This publication can be obtained from the following URL contained within the University of Wisconsin *Understanding Dairy Markets* website:

The amount of revenue represented by the deductible, since it is not covered by insurance, reduces both the minimum guarantee and insurance premium. The greater the deductible, the more risk is being assumed by the producer as it is easier for the **actual IOFC** to be at least as great as the original minimum guaranteed IOFC – the total deductible.

II.5.3. Determination of the Actual Income Over Feed Cost

Over the course of a contract's coverage period, calculations are undertaken using expiring futures contracts to determine actual monthly gross margins. This *actual* gross margin is the value of milk based on the *actual* Class III milk price minus the imputed feed costs based on the *actual* prices for corn and SBM. In the above, the word "actual" is italicized as a particular producer's mailbox price is **not** used in these calculations. That is, using a similar method as was used to calculate the expected Class III, corn and SBM prices and the associated minimum IOFC guarantee, 3-day averages of CME final futures contract settle prices are used as a proxy for *actual* farm prices.

As specified in the LGM-Dairy insurance operating procedures, the final settle prices for a particular futures contract are obtained from the 1st , 2nd, and 3rd days *prior to the last trading day* of a particular futures contract. These three days are referred to as the *actual price measurement period*. Using the average prices obtained over the actual price measurement period for a particular month, the actual monthly gross margin is estimated. Adding together monthly gross margins associated with a particular LGM-Dairy contract (which may be less than 10 and may not be contiguous) gives the actual IOFC (or total gross margin guarantee).

II.5.4. When Will There be an Insurance Payout?

With the known minimum IOFC guarantee and the estimated actual IOFC, an insurance indemnity (payout) will occur when the guarantee is greater than the actual.[18] That is, an indemnity occurs when markets change such that the actual margin value is less than the guarantee that was obtained at the time of insurance purchase. It should be remembered that the

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[18] This implies that the actual IOFC will not be able to be calculated until the last actual Class III, actual corn and actual SBM prices are able to be calculated and published by the RMA. This may be as much as 2 months after the last insured month due to 5 corn and 8 soybean meal futures contracts being traded each year.

indemnity, when it does occur, is equal to the actual value of the producer's "loss". That is, the producer's loss is the *difference* between the guarantee and the actual IOFC. It is *not equal* to the guarantee level.

III. What Factors Impact LGM-Dairy Insurance Premiums?

As shown in Figure 1, dairy producers must make several decisions when purchasing an LGM-Dairy policy that impacts the total insurance premium. These decisions include: (i) the percentage of milk production covered each month (**%Cover$_t$**); (ii) the profile of expected target marketings (**EMM$_t$**); (iii) the quantity of feed declared for insurance purposes (**ECE$_t$, ESME$_t$**); and (iv) the expected gross margin deductible rate (**DL**, $/cwt).

III.1. Impact of Approved Target Marketings on Insurance Premiums

The producer's approved target marketings are the maximum amount of milk that the producer can insure via a particular LGM-Dairy contract. Approved target marketings are certified by the producer and are subject to verification by the insurance company or the RMA. A producer's approved target marketings will be the lesser of the capacity of the producer's dairy operation as determined by the insurance provider versus the underwriting capacity limit of the insurance program at the time the producer wishes to purchase insurance. The contract premium (**PREM**) will tend to increase with the level of milk insured.

Not only does the amount of milk insured determine the overall contract premium, but the timing of the coverage also has an impact. To understand how timing can impact premiums it should be noted that a particular LGM-Dairy contract premium is specific to the farm's production profile, declared feed use and the unique contract design being purchased by the producer.

By insurance program rule, producer premiums are set such that in the *long run*, the average payouts would equal the average pay-ins.[19] That is, premiums are initially set such that the program is actuarially sound. To determine a farm specific premium, the RMA uses the historical statistical relationship between the above 30 commodity prices associated with a particular contract offering. The RMA then generates 5,000 random sets (collections) of these

[19] A 3% surcharge is added to the average pay-ins to allow for build-up of a reserve fund.

30 prices. These 5,000 sets of prices are used to represent the *long-run actual* prices. Then using the farm specific LGM-Dairy contract represented by equation (7), 5,000 simulated TAGM's (**STAGM**) are calculated. A comparison is then made between each of the 5,000 **STAGM** values and the one **TGMG** established by equation (6). Each comparison is used to determine whether an indemnity would have been generated for that particular simulation using the decision rule specified in equation (8). That is, we act as if that particular STAGM is the result of an actual set of 10 Class III, corn and SBM prices. The RMA then undertakes the calculation of these simulated differences between a particular STAGM and TGMG 5,000 times. From the above 5,000 comparisons, the RMA then determines the average indemnity of these 5,000 values. The average indemnity plus 3% is then set as the contract specific premium.

We can represent the above procedure via the following:

$$SMGM_{st} = \left(EMM_t * SCL3P_{st} - ECE_t\left(2000/56\right) * SCP_{st} - ESME_t * SSP_{st}\right) * \%Cover_t$$
$$t = 1,...,10;\ s = 1,...,5000$$
$$STGM_s = \sum_{t=1}^{10} SMGM_{st}$$
$$INDEM_s = \text{Max}\left(TGMG - STGM_s, 0\right) \qquad (9)$$
$$PREMIUM = 1.03 * \frac{\sum_{s=1}^{5,000} INDEM_s}{5,000}$$

where $SMGM_{st}$ = the s^{th} simulation of the t^{th} month's actual gross margin using the s^{th} random price draw

$SCL3P_{st}$ = the s^{th} simulated value of the Class III price for the t^{th} month

SCP_{st} = the s^{th} simulated value of the corn price for the t^{th} month

SSP_{st} = the s^{th} simulated value of the soybean meal price for the t^{th} month

$INDEM_s$ = s^{th} simulated indemnity value

PREMIUM = the actuarial sound contract specific premium

Note that in each of the 5,000 indemnity determinations in equation (9) the same **TGMG**, determined at sign-up, is used. In addition, across all simulations, the contract design, milk production and declared feed amounts do not change. The only model variables that do change across simulations are the 30 commodity prices.

The last row of equation (7) shows how the level of average indemnities across the simulations directly determines premium level. Any change in the system that impacts the average indemnity will impact the premium level in a similar manner. That is, the estimated

premium is specific to all the arguments of equation (4) and (7) such as contract design parameters, dairy cow productivity and declared feed. This implies that the premiums obtained from equation (7) are specific to the contract and farm's production/marketing characteristics.

III.2. Impact of Deductible Level on Net Producer Premiums

As noted above, the deductible is the portion of ETGM not insured. As with any insurance policy, increasing the deductible decreases the premium as the producer is assuming more of the risk on the uninsured gross margin. LGM-Dairy is unique when compared to other livestock revenue insurance products in that there exists a premium subsidy paid directly by the RMA on behalf of the dairy producer. The contract specific subsidy rate **(%SUBSIDY**) is determined as a percentage of the original premium (i.e., bottom of equation (9)) that will be paid on behalf of the producer by the RMA. The net premium (**NET_PREM**) that must be paid by the producer can be obtained via the following:

NET_PREM = (1-%SUBSIDY) *PREMIUM (10)

The total subsidy paid by the RMA on behalf of the producer is:

SUBSIDY = %SUBSIDY*PREMIUM (11)

It should be noted that in both (10) and (11) the values are defined by the farm-specific marketings, feeding regime and contract design.

Table 5 Relationship Between Deductible and Premium Subsidy

Deductible ($/cwt)	Subsidy (%)	Deductible ($/cwt)	Subsidy (%)
0	0.18	0.60	0.31
0.10	0.19	0.70	0.34
0.20	0.21	0.80	0.38
0.30	0.23	0.90	0.43
0.40	0.25	1.00	0.48
0.50	0.28	1.10 – 2.00	0.50

A characteristic of the RMA subsidy schedule is that the subsidy percentage increases with deductible level. Table 5 presents the schedule of premium subsidies. The range in subsidy values is from a minimum of 18% for those contracts where the producers chose a $0/cwt deductible to a maximum of 50% for contracts with $1.10 - $2.00/cwt deductible.

The schedule shown in Table 5 implies that by increasing the deductible rate there are two impacts on the premium for a particular LGM-Dairy contract that will cost the producer. First, an increase in deductible has the direct impact of reducing the insurance contract premium given the reduced probability of a particular contract generating an insurance payout. This lower probability of payout is due to the lower TGMG (i.e., equation (9)). Secondly, the subsidy that must be paid by the producer is directly reduced by the application of the subsidy percentage (i.e. equation (10)).

IV. An Example in the Use of LGM-Dairy

To further illustrate the structure of LGM-Dairy, we construct a general example of a medium sized operation with a milking herd of 350 cows. We use a general example not specific to a particular state as one characteristic of LGM-Dairy is that its per cwt of insured milk cost and performance are the same regardless of farm size if (i) the same LGM-Dairy contract design is used by the producer, (ii) declared feed use per cwt of milk is the same across operation and (iii) the per cow productivity does not differ across operation. The following example can easily be modified to reflect local feeding regimes, productivity, etc.

IV.1. Description of the Case Study Farm and LGM-Dairy Contract

For this example, we assume the producer is making the decision as to insurance purchase at the end of July 2011.[20] This implies that the possible months of coverage are Sep. 2011 – June 2012. For this example we assume a 350 cow milking herd. Per cow productivity is allowed to change across months. To allow for this month-specific productivity we use the average monthly U.S. per cow milk productivity observed over September 2010 – June 2011 period. Column [1] in Table 6 shows the assumed per cow productivity.

The total herd production (marketings) shown in column [2] are used to estimate maximum marketings and expected maximum milk revenue. For this analysis average feed coefficients established by the RMA and shown in Table 3 to determine monthly feed use. Multiplying these coefficients by the monthly marketings provides an estimate of the corn and soybean meal equivalents fed to the herd.

[20] We chose the July 2011 contract offering due to the need to use actual premium data.

Table 6 Monthly Production Profile and Feed Use Case-Study

Month	Prod/Cow (lbs) [1]	Total Production (cwt) [2]	Corn Equiv. (Tons) [3]	Soybean Meal Equiv. (Tons) [4]
Sep '11	1,704	5,964.0	83.5	11.9
Oct '11	1,743	6,100.5	85.4	12.2
Nov '11	1,698	5,943.0	83.2	11.9
Dec '11	1,767	6,184.5	86.6	12.4
Jan '12	1,789	6,261.5	87.7	12.5
Feb '12	1,645	5,757.5	80.6	11.5
Mar '12	1,849	6,471.5	90.6	12.9
Apr '12	1,812	6,342.0	88.8	12.7
May '12	1,877	6,569.5	92.0	13.1
Jun '12	1,795	6,282.5	88.0	12.6
Total	17,679	61,876.5	866.3	123.8

Source: The Sep. 2010-Jun. 2011 average production/cow was obtained from NASS and contained within the Understanding Dairy Markets Website: (http://future.aae.wisc.edu/data/monthly_values/by_area/98?tab=production).
Note: Default feed coefficients are assumed for this example. Refer to Table 3 for more detail as to allowable feed values.

As noted in Section II of this report, besides the level of production and feed use, other factors that define the LGM-Dairy contract design is the percent coverage each month and the deductible rate to be applied to the covered milk. For this example we assume the producer would like to assume a deductible of $1.10 so as to maximize the benefits of the premium subsidy. In terms of coverage percentages, we assume the producer is more concerned with the

distant months as this is where the most uncertainty exists. Table 7 shows the percentage of target marketings that are insured under the July 2011 LGM-Dairy contract offering.[21]

Table 7 Percent of Monthly Marketings Insured

Month [1]	% Insured [2]	Covered Marketings (cwt) [3]	Month [4]	% Insured [5]	Covered Marketings (cwt) [6]
Sep ′11	0	0	Feb ′12	75	4,318
Oct ′11	0	0	Mar ′12	75	3,235
Nov ′11	25	1,485	Apr ′12	50	1,585
Dec ′11	50	3,092	May ′12	25	1,642
Jan ′12	75	4,696	Jun ′12	25	1,570
				Total Covered Marketings (cwt)	21,626
				Covered Marketings as % of Total (%)	40.1

Note: Covered Marketings is the product of the monthly % insured value shown in [2] and [5] by the monthly marketings in column [2] of Table 5.

Using the above coverage percentages, we find that over the 10 month insurance period the gross margin for 21,626 cwt are insured. For the first two months the producer elects not to insure any production as the producer feels there is little downside risk to price movements for September and October 2011. By January 2012, three quarters of the monthly production are insured. By the end of the insurance period, only 25% of monthly production is being covered. Over the entire insurance period, 35.0% of total marketings are insured.

IV.2. Calculation of Expected Prices, Revenues, Costs and Gross Margins

We estimate the expected Class III price for the 10 months encompassed by the July LGM-Dairy contract offering from the Class III futures settlement prices observed during the expected

[21] For those months encompassed by the July contract but with less than 100% coverage, additional coverage can be obtained via the use of other contract offerings.

price measurement period, which in this case is July 27th – 29th. The purchase period starts on July 29th after the markets close and must be purchased by 8 pm Central Time on July 30th.

Table 8 is used to provide the data necessary to calculate the expected Class III milk price for each month and the resulting expected total revenue stream given the production profile shown in Table 6. Over the 10 months encompassed by the July 2011 LGM-Dairy contract, the average Class III price was $17.80 with a range from $16.83 in April 2012 to a high of $20.64 for Sep. 2011. Given the 3-day average settle prices we then multiply by the monthly covered marketings to obtain the insured milk value. These values are shown in column [6] of Table 7. Over the 10 month contract period, the total value of the insured milk is $371,535.

Table 8 Calculation of Expected Milk Price and Revenues

Month	Class III Settle Price				Covered Marketings (cwt) [5]	Insured Revenue ($) [6]
	July 27 ($/cwt) [1]	July 28 ($/cwt) [2]	July 29 ($/cwt) [3]	Avg. ($/cwt) [4]		
Sep ′11	20.55	20.71	20.67	20.64	0	0
Oct ′11	19.49	19.63	19.67	19.60	0	0
Nov ′11	18.52	18.61	18.65	18.59	1,485	27,620
Dec ′11	17.61	17.73	17.71	17.68	3,092	54,666
Jan ′12	17.20	17.28	17.21	17.23	4,696	80,907
Feb ′12	16.81	16.99	16.96	16.92	4,318	73,056
Mar ′12	16.81	16.95	16.90	16.89	3,235	54,647
Apr ′12	16.71	16.90	16.89	16.83	1,585	26,683
May ′12	16.69	16.81	16.85	16.78	1,642	27,556
Jun ′12	16.72	16.84	16.87	16.81	1,570	26,400
					Total Revenue	371,535

Note: *[4] = ([1] + [2] + [3])/3*
[6] = [4] x [5] (May differ due to rounding)

To complete the calculation of expected gross margins, we need monthly estimates of feed costs. Table 6 displays the expected corn and soybean meal equivalent feed amounts. We multiply these values by the percentages shown in Table 7 to determine the feed equivalents associated with the insured marketings. For the expected feed prices, we use average futures settle prices calculated over the same expected price measurement period as used in the estimation of expected milk revenues. Table 9 shows the resulting expected feed prices and

associated feed costs. Columns [1]-[3] in this table are used to display the corn futures settle prices during the expected price measurement period. Average corn settle prices are shown in column [4].

As shown in Table 2 and in contrast to Class III milk, corn futures are not traded for each of the 12 months within a year. For those months for which corn is not traded, a weighted average of the average settlement prices in column [4] for the month prior and following the month of concern are used to obtain the missing settlement prices. For corn futures there are two month gaps between futures contracts (i.e., Sep/Dec and Dec/Mar). Equation (3) in Section III shows the weighting system used in such a situation to evaluate the Oct/Nov and Jan/Feb expected settle prices. Column [5] shows the expected corn prices obtained from this process. Over the 10 month contract period, the average corn price was $6.90/bu with a narrow range of $6.80 in Sep. to $7.04 in June 2012 to a low of $6.80 in September 2011.

The calculations associated with the estimating expected soybean meal prices are shown in Columns [6] – [10]. Unlike corn futures, the largest gap between consecutive SBM futures contracts is 1 month. The expected soybean meal prices are shown in column [10] of Table 8. The average SBM price over the insurance period was $363.17/ton with a range of $356.37 in Sep. 2011 to 366.77 in Jun 2012.

Columns [11] and [15] list the amounts of corn and soybean equivalents insured. Multiplying these amounts by the expected feed prices gives the total expected corn and soybean meal feed costs for the insured marketings. Combining the corn and soybean meal costs gives a total feed cost over the 10 month period of $90,451 of which corn equivalent costs account for 82.6% of total feed costs.

Table 9 Calculation of Expected Feed Prices and Costs, July 2011 LGM-Dairy Contract

Month	Corn Settle Price				Expected Corn Price	Soybean Meal Settle Prices				Expected SBM Price	Covered Corn Fed	Total Corn Costs	Covered SBM Fed	Total SBM Costs
	July 27 ($/bu) [1]	July 28 ($/bu) [2]	July 29 ($/bu) [3]	Avg. ($/bu) [4]	($/bu) [5]	July 27 ($/ton) [6]	July 28 ($/ton) [7]	July 29 ($/ton) [8]	Avg. ($/ton) [9]	($/ton) [10]	(bu) [11]	($) [12]	(Tons) [13]	($) [14]
Sep ′11	6.92	6.82	6.66	6.80	6.80	358.30	357.60	353.20	356.37	356.37	0	0	0	0
Oct ′11	-----	-----	-----	-----	6.81	360.00	359.50	355.10	358.20	358.20	0	0	0	0
Nov ′11	-----	-----	-----	-----	6.81	-----	-----	-----	-----	360.10	743	5,058	3.0	1,071
Dec ′11	6.92	6.86	6.69	6.82	6.82	363.60	363.60	358.80	362.00	362.00	1,546	10,546	6.2	2,244
Jan ′12	-----	-----	-----	-----	6.86	365.40	365.40	360.70	363.83	363.83	2,350	16,114	9.4	3,410
Feb ′12	-----	-----	-----	-----	6.91	-----	-----	-----	-----	365.10	2,161	14,918	8.6	3,148
Mar ′12	7.04	6.99	6.82	6.95	6.95	367.6	367.90	363.60	366.37	366.37	1,618	11,244	6.5	2,363
Apr ′12	-----	-----	-----	-----	6.98	-----	-----	-----	-----	366.43	793	5,534	3.2	1,163
May ′12	7.10	7.06	6.88	7.01	7.01	367.30	367.90	364.30	366.50	366.50	821	5,758	3.3	1,200
Jun ′12	-----	-----	-----	-----	7.04	-----	-----	-----	-----	366.77	750	5,525	3.1	1,155
Jul ′12	7.15	7.11	6.92	7.06	7.06	367.60	368.50	365.00	367.03	367.03	-----	-----	-----	-----
										Total	10,782	74,697	43.3	15,754

Note: [4] = ([1] + [2] + [3])/3 [10] detailed in text

[5] detailed in text [12] = [5] * [11]

[9] = ([6] + [7] + [8])/3 [14] = [10] * [13]

Table 10 is used to provide a summary of the monthly gross margin (with and without the deductible of $1.10 per cwt). For the contract as a whole the gross margin was found to be $281,101 and subtracting the associated deductible amount, the contract **TGMG** was $257,293. Per cwt of covered milk, the **TGMG** is $11.90/cwt.

Table 10 Monthly Gross Margins and Contract GMG Under Base Deductible

Month	Gross Margin		Month	Gross Margin	
	Without Deductible	With Deductible		Without Deductible	With Deductible
Sep-11	0	0	Feb-12	54,995	50,239
Oct-11	0	0	Mar-12	41,045	37,481
Nov-11	21,490	19,855	Apr-12	19,986	18,242
Dec-11	41,880	38,474	May-12	20,601	18,791
Jan-12	61,388	56,216	Jun-12	19,715	17,992
Total Contract Margin				281,101	257,293

Remember for this example we used the default feed coefficients to estimate the cost of purchased feed. If we had used the maximum feed rates, the **TGMG** would have decreased to $42,014 or $1.94 per cwt of covered milk. At the minimum feed coefficients, the **TGMG** increases to $322,007 or $14.89 /cwt of milk marketing.

IV.3. Calculation of Insurance Premium Costs and Impact on the TGMG

The above results pertain to the estimation of the monthly gross margins (i.e., **EMGM**'s) and the **TGMG** for this particular LGM-Dairy contract.[22] To evaluate the costs of this one scenario we need to follow the procedures used by the RMA in the determination of actuarial sound premiums. At the University of Wisconsin we have developed a software system that allows for an estimation of the premium costs of a particular LGM-Dairy

[22] The insurance contract is defined by the % of monthly marketings that are insured and the deductible rate.

contract design. This software system is referred to as the ***LGM-Dairy Analyzer***©. This system is used as a basis of the remainder of this manuscript. The Analyzer is a web-based decision tool and can be reached by accessing the University of Wisconsin LGM- Dairy website at the URL: http://future.aae.wisc.edu/lgm_dairy.html. Navigating to the *Supporting Software* tab the ***LGM-Analyzer***© is the first software choice available.

Using the above case-study farm and contract specification the ***LGM-Dairy Analyzer***© generates the overall contract results shown in Table 11. With the $1.10 deductible the net premium was $6,445 or 30¢/cwt of covered milk. Again, remember this contract is used to establish a T**GMG** of $257,311. This premium represents 2.5% of the **TGMG**. Subtracting this net premium from the **TGMG** generates what we refer to as the net total contract gross margin (**NTGMG)**. For this example the **NTGMG** is $250,848. Per cwt of covered milk the **NTGMG** was found to be $11.60 ($11.90 - $0.30).

Table 11 Summary of Contract Costs

	Net Premium ($)	GMG ($)	Net GMG ($)
Total ($)	6,445	257,293	250,848
Per CWT of Covered Milk	0.30	11.90	11.60

IV.4. Impact of Alternative Deductible Levels on Key Program Parameters

Besides estimating the **TGMG** and net premium under a particular contract design, the ***LGM-Dairy Analyzer***© has the ability to evaluate contract costs and **TGMG** for the same contract except for all allowable deductible levels, i.e., $0 to $2.00/cwt. Changing the insurance deductible has a significant impact on a number of key parameters some of which are shown in Table 12.

Table 12 is used to present a sensitivity analysis of changes in key program characteristics under alternative deductible rates.[23] The first column of Table 13 displays the insurance deductible level used in a particular simulation. The 21 displayed deductible

[23] Marketings, feed use and % coverage profile remains unchanged.

values are the only ones allowed by the current LGM-Dairy program. For each of these 21 scenarios, 5,000 simulations are undertaken in which simulation-specific collections of the 30 prices (i.e., 10 Class III, 10 corn, and 10 SBM) are used to determine the contract specific average indemnity. The average indemnity is then multiplied by 1.03 to provide a simulated premium value.[24]

Table 12 Impact of Increases in Deductible Rate

Contract Parameter	Impact of an Deductible Rate Increase
Premium	↓
Subsidy	↑
TGMG	↓
Probability of Payout	↓
Indemnity	↓
Premium as % of **TGMG**	↓

The 2nd column of Table 13 provides an estimate of the percentage of 5,000 simulated price scenarios where the **TSGM** is less than the **TGMG** (i.e., a simulated indemnity was positive). As asserted above, increasing the deductible does decrease the probability of an insurable event occurring. At $0/cwt deductible more than 50% of the simulations had a simulated insurance payout. At $1.00 the percentage of simulations generating an indemnity decreases to 37.3%. At the maximum deductible level (i.e., $2.00/cwt) less than 25% of the simulated scenarios has an indemnity payment. Column [4] shows the reduced **TGMG**'s with higher deductible levels. The TGMG decreases a total of 15.4% when the deductible is increased from $0/cwt to $2.00/cwt.

Comparing the movement of the **TGMG**, we see that as noted above the actuarial sound premium (i.e., Column [6]) decreases significantly with deductible due to lower **TGMG**'s.

[24] The extra 3% is used to generate a reserve fund for use in the LGM-Dairy program.

Table 13 Gross Margin, Gross Margin Guarantees and Premiums

Deduc. Rate ($/cwt) [1]	Prob. of Payout (%) [2]	Deduc. Amount ($) [3]	**TGMG** ($) [4]	% **TGMG** Change from $0 Deduc. (%) [5]	Total Prem. ($) [6]	Net Prem. ($) [7]	% Net Prem. Change from $0 Deduc. (%) [8]	Net Prem. as % of **TGMG** (%) [9]	Net **TGMG** ($) [10]	% Net **TGMG** Change from $0 Deduc. (%) [11]
0	52.2	0	281,101	-----	23,683	19,420	-----	6.91	261,681	-----
0.10	50.6	2,163	278,938	-0.8	22,537	18,255	-6.0	6.54	260,683	-0.4
0.20	49.1	4,325	276,776	-1.5	21,428	16,928	-12.8	6.12	259,847	-0.7
0.30	47.8	6,488	274,613	-2.3	20,349	15,669	-19.3	5.71	258,944	-1.0
0.40	46.2	8,650	272,450	-3.1	19,303	14,477	-25.5	5.31	257,973	-1.4
0.50	44.9	10,813	270,288	-3.8	18,290	13,169	-32.2	4.87	257,119	-1.7
0.60	43.4	12,976	268,125	-4.6	17,306	11,941	-38.5	4.45	256,184	-2.1
0.70	42.0	15,138	265,962	-5.4	16,352	10,793	-44.4	4.06	255,170	-2.5
0.80	40.4	17,301	263,800	-6.2	15,435	9,570	-50.7	3.63	254,230	-2.8
0.90	38.7	19,463	261,637	-6.9	14,553	8,732	-55.0	3.34	252,905	-3.4
1.00	37.3	21,626	259,474	-7.7	13,707	7,128	-63.3	2.75	252,346	-3.6
1.10	35.8	23,789	257,312	-8.5	12,892	6,446	-66.8	2.51	250,865	-4.1
1.20	34.2	25,951	255,149	-9.2	12,114	6,057	-68.8	2.37	249,092	-4.8
1.30	32.6	28,114	252,986	-10.0	11,371	5,686	-70.7	2.25	247,301	-5.5
1.40	31.1	30,276	250,824	-10.8	10,660	5,330	-72.6	2.13	245,494	-6.2
1.50	29.6	32,439	248,661	-11.5	9,987	4,993	-74.3	2.01	243,668	-6.9
1.60	28.4	34,602	246,498	-12.3	9,342	4,671	-75.9	1.89	241,828	-7.6
1.70	26.9	36,764	244,336	-13.1	8,727	4,363	-77.5	1.79	239,972	-8.3
1.80	26.0	38,927	242,173	-13.8	8,139	4,070	-79.0	1.68	238,103	-9.0
1.90	24.8	41,089	240,010	-14.6	7,574	3,787	-80.5	1.58	236,224	-9.7
2.00	23.5	43,252	237,848	-15.4	7,036	3,518	-81.9	1.48	234,330	-10.5

In addition, as noted in Section II, there exist substantial premium subsidies whose value increases with deductible (i.e., Table 5). When we apply these percentages to the premium levels shown in column [6], column [7] shows the resulting net premium values that would actually have to have been paid by the producer. In contrast to the relatively modest change in the **TGMG** over the range of the deductibles, the percentage change in net premium due to higher deductibles is quite large. When compared to the $0 deductible, the net premium decreases by more than 63% at the $1.00 deductible level. At the maximum deductible rate, the net premium has decreased by almost 82%.

For increases in deductible rate, combining the effect of slightly lower **TGMG** values associated with higher deductibles and the significantly lower net premiums for these higher deductibles, we see a reduction in the percentage decrease in **NTGMG** when compared to the decrease in the **TGMG** over the deductible range.

IV.5. Impact of Deductible Rate Changes on Key Per CWT Program Parameters

The above tables have presented an overview of the costs of a particular LGM-Dairy contract under alternative deductible values from an aggregate perspective. In contrast, the ***LGM-Analyzer***© has the ability to present results on a per cwt basis in addition to the aggregate level. Table 14 provides a summary of the above contract characteristics per cwt of covered milk. At $0 deductible, the **TGMG** was $13.00. At $2.00/cwt deductible, this obviously decreases to $11.00/cwt . The pre-subsidized premium was $1.10. for the $13.00/cwt TGMG. The $11.00/cwt **TGMG** required a pre-subsidized premium of $0.33/cwt.

Column [3] in Table 14 shows the net premium that the producer would have to actually pay for the particular insurance contract after premium subsidy. At $0 deductible the $13.00 **TGMG** required a net premium of $0.90/cwt. At $12.00 **TGMG**, the net premium was $0.33/cwt. At a **TGMG** level of $11.00 the net premium would be $0.16/cwt.

Column [5] shows the net premium has been subtracted from the **TGMG** (i.e., **NTGMG**). The NTGMG/cwt decreases from $12.10/cwt under the $0 deductible to $11.67/cwt at the $1.00 deductible and $10.84 at the $2.00 deductible.

Table 14 Impact of Alternative Deductible Level on Program Cost and Performance ($/cwt)

Deductible Rate [1]	Premium [2]	Net Premium [3]	TGMG/cwt Covered Milk [4]	NTGMG/cwt Covered Milk [5]
0	1.10	0.90	13.00	12.10
0.10	1.04	0.84	12.90	12.05
0.20	0.99	0.78	12.80	12.02
0.30	0.94	0.72	12.70	11.97
0.40	0.89	0.67	12.60	11.93
0.50	0.85	0.61	12.50	11.89
0.60	0.80	0.55	12.40	11.85
0.70	0.76	0.50	12.30	11.80
0.80	0.71	0.44	12.20	11.76
0.90	0.67	0.40	12.10	11.69
1.00	0.63	0.33	12.00	11.67
1.10	0.60	0.30	11.90	11.60
1.20	0.56	0.28	11.80	11.52
1.30	0.53	0.26	11.70	11.44
1.40	0.49	0.25	11.60	11.35
1.50	0.46	0.23	11.50	11.27
1.60	0.43	0.22	11.40	11.18
1.70	0.40	0.20	11.30	11.10
1.80	0.38	0.19	11.20	11.01
1.90	0.35	0.18	11.10	10.92
2.00	0.33	0.16	11.00	10.84

Note: [3] = [2] – premium subsidy
[5] = [4] – [3]

V. Detailed Calculation of Expected Gross Margin and Gross Margin Guarantee

The above discussion has provided an overview of the workings of LGM-Dairy. We next provide more detail as to the calculation of gross margins (IOFC), how program indemnities are evaluated, how premiums are determined, and the timing of premium payments. Throughout this section we will use the terminology used in the LGM-Dairy contract documentation to enable one to better understand the program specifics. We use abbreviations where appropriate to shorten the length of the discussion. Appendices A and B provide more detail about specific acronyms. Skip this section if the level of detail provided is not of interest.

V.1. Calculation of Contract Expected Gross Margin

When the insurance contract is purchased, the expected *monthly* gross margin (**EMGM**) in the t^{th} month is calculated as:

$$EMGM_t = (EMM_t * ECL3P_t - ECE_t(2000/56)* ECP_t - ESME_t*ESP_t)*\%COVER_t \quad (1)$$

where: t = Month of concern (t = 1,…,10)

$EMGM_t$ = *Expected* monthly gross margin in the t^{th} month. This represents the monthly IOFC. ($)

EMM_t = *Expected* amount of milk to be marketed in month t (cwt)[25]

$ECL3P_t$ = The t^{th} month's *expected* Class III milk price ($/cwt)

ECE_t = Expected total amount of corn equivalent to be declared for insurance purposes for the t^{th} month (tons)

ECP_t = *Expected* corn price in the t^{th} month ($/bu)

$ESME_t$ = The t^{th} month's total amount of soybean meal equivalent *expected to be declared* for insurance purposes (tons)

ESP_t = *Expected* soybean price in the t^{th} month ($/ton)

[25] For purposes of equation (1) the difference between milk marketings and production is the amount of milk that stays on the farm either used as feed or lost. It is also important to remember that the amount of milk marketed is not the amount insured.

$\%COVER_t$ = the % of the t^{th} month's milk marketing revenue and associated declared feed costs to be insured (%). The range of $\%COVER_t$ values is from 0.0 to 1.0 .

Note that all items listed to the right of the equal sign in equation (1) are allowed to vary across months encompassed by the coverage period under consideration. Note that the percentage of a particular month's insured marketing can vary across months. Summing the **EMGM** for months during the contract's insurance period provides an estimate of the total expected gross margin, **TEGM**, for that contract:

$$TEGM = \sum_{t=1}^{10} EMGM_t \qquad (2)$$

where $EMGM_t = 0$ for those months with no insurance coverage.

Table 15 Expected Price Measurement Period (EPMP), Last Trading Day for Class III, Corn and Soybean Meal Futures Contracts and Actual Price Measurement Period (APMP), Oct 2011 – Sep 2012

		Class III		Corn		Soybean Meal	
Month	EPMP	Last Trading Day	APMP	Last Trading Day	APMP	Last Trading Day	APMP
Oct ′11	Oct 26 – 28	Nov. 4	Oct 31, Nov 1–2	-----	-----	-----	-----
Nov ′12	Nov 16 - 18	Dec 2	Nov 28 – 29	-----	-----	Nov 14	Nov 9–11
Dec ′11	Dec 28 – 30	Dec 30	Dec 26–28	Dec 14	Dec 9, 12–13	Dec 14	Dec 9, 12–13
Jan ′12	Jan 25 – 27	Feb 3	Jan 30–31,Feb 1	-----	-----	Jan	
Feb ′12	Feb 22 – 24	Mar 2	Feb 27–29	-----	-----	-----	-----
Mar ′12	Mar 28 – 30	Mar 30	Mar 26–28	Mar 14	Mar 9, 12–13	Mar 14	Mar 9, 12–13
Apr ′12	Apr 25 – 27	May 4	Apr 30,May 1–2	-----	-----	-----	-----
May ′12	May 23 – 25	Jun 1	May 24,29–30	May 14	May 9–11	May 14	May 9–11
Jun ′12	Jun 27 – 29	Jun 29	Jun 25–27	-----	-----	-----	-----
Jul ′12	Jul 25 – 27	Aug 3	Jul 30–31, Aug 1	Jul 13	Jul 10–12	Jul 13	Jul 10–12
Aug ′12	Aug 29 – 31	Aug 31	Aug 27–29	-----	-----	Aug	
Sep ′12	Sep 26 – 28	Oct 5	Oct 1–3	Sep 14	Sep 11–13	Sep 14	Sep 11–13

As noted in Section II, prior to insurance purchase, the producer identifies the production months to be covered by the insurance contract. By program rule, there can be no insurance coverage for the month immediately following the month of purchase. Figure 6 is used to show a hypothetical insurance contract entered into at the end of October 2011. Note the difference between this contract's insurance vs. coverage period. The contract shown is composed of four covered months. The contract displayed is used to illustrate: (i) the flexibility in the number of the months covered with a singly LGM-dairy contract, (ii) the month-specific coverage percentages, (iii) the first coverage month need not be the 2nd month of the insurance period and (iv) that covered months need not be continuous.

After the October 2011 contract purchase, additional insurance contracts can be purchased during other contract purchase periods to cover those months not covered by the Oct. 2011 contract and/or any remaining production for months that do not have 100% coverage (i.e., Mar, Apr, Jun and Jul 2012). It should be emphasized that at the time of contract purchase, expected maximum monthly milk marketing (**EMM_t**) and expected feed use (**ECE_t, $ESME_t$**) need to be specified for all insured months. Once the insurance contract is purchased, this production and feeding profile cannot be changed.

Table 16 Cycles Within Insurance Periods for LGM for Dairy Cattle Insurance

Sales Closing Month	Insurance Period	Insurance Month	Settle Price Used in Expected and Actual Price Calculations		
			Class III Milk	Corn Price	Soybean Meal Price
January	February-December	Mar	Mar	Mar	Mar
		Apr	Apr	Mar, May	Mar, May
		May	May	May	May
		Jun	Jun	May, Jul	May, Jul
		Jul	Jul	Jul	Jul
		Aug	Aug	Jul, Sep	Aug
		Sep	Sep	Sep	Sep
		Oct	Oct	Sep, Dec	Oct
		Nov	Nov	Sep, Dec	Oct, Dec
		Dec	Dec	Dec	Dec
February	March-January	Apr	Apr	Mar, May	Mar, May
		May	May	May	May
		Jun	Jun	May, Jul	May, Jul
		Jul	Jul	Jul	Jul
		Aug	Aug	Jul, Sep	Aug
		Sep	Sep	Sep	Sep
		Oct	Oct	Sep, Dec	Oct
		Nov	Nov	Sep, Dec	Oct, Dec
		Dec	Dec	Dec	Dec
		Jan	Jan	Dec, Mar	Jan
March	April-February	May	May	May	May
		Jun	Jun	May, Jul	May, Jul
		Jul	Jul	Jul	Jul
		Aug	Aug	Jul, Sep	Aug
		Sep	Sep	Sep	Sep
		Oct	Oct	Sep, Dec	Oct
		Nov	Nov	Sep, Dec	Oct, Dec
		Dec	Dec	Dec	Dec
		Jan	Jan	Dec, Mar	Jan
		Feb	Feb	Dec, Mar	Jan, Mar
April	May-March	Jun	Jun	May, Jul	May, Jul
		Jul	Jul	Jul	Jul
		Aug	Aug	Jul, Sep	Aug
		Sep	Sep	Sep	Sep
		Oct	Oct	Sep, Dec	Oct
		Nov	Nov	Sep, Dec	Oct, Dec
		Dec	Dec	Dec	Dec
		Jan	Jan	Dec, Mar	Jan
		Feb	Feb	Dec, Mar	Jan, Mar
		Mar	Mar	Mar	Mar

Table 16 Cycles Within Insurance Periods for LGM for Dairy Cattle Insurance (Cont.)

Sales Closing Month	Insurance Period	Insurance Month	Settle Prices Used in Expected and Actual Price Calculations		
			Class III Milk	Corn Price	Soybean Meal
May	June-April	Jul	Jul	Jul	Jul
		Aug	Aug	Jul, Sep	Aug
		Sep	Sep	Sep	Sep
		Oct	Oct	Sep, Dec	Oct
		Nov	Nov	Sep, Dec	Oct, Dec
		Dec	Dec	Dec	Dec
		Jan	Jan	Dec, Mar	Jan
		Feb	Feb	Dec, Mar	Jan, Mar
		Mar	Mar	Mar	Mar
		Apr	Apr	Mar, Jul	Mar, Jul
June	July-May	Aug	Aug	Jul, Sep	Aug
		Sep	Sep	Sep	Sep
		Oct	Oct	Sep, Dec	Oct
		Nov	Nov	Sep, Dec	Oct, Dec
		Dec	Dec	Dec	Dec
		Jan	Jan	Dec, Mar	Jan
		Feb	Feb	Dec, Mar	Jan, Mar
		Mar	Mar	Mar	Mar
		Apr	Apr	Mar, Jul	Mar, Jul
		May	May	May	May
July	August-June	Sep	Sep	Sep	Sep
		Oct	Oct	Sep, Dec	Oct
		Nov	Nov	Sep, Dec	Oct, Dec
		Dec	Dec	Dec	Dec
		Jan	Jan	Dec, Mar	Jan
		Feb	Feb	Dec, Mar	Jan, Mar
		Mar	Mar	Mar	Mar
		Apr	Apr	Mar, Jul	Mar, Jul
		May	May	May	May
		June	June	May, Jul	May, Jul
August	September-July	Oct	Oct	Sep, Dec	Oct
		Nov	Nov	Sep, Dec	Oct, Dec
		Dec	Dec	Dec	Dec
		Jan	Jan	Dec, Mar	Jan
		Feb	Feb	Dec, Mar	Jan, Mar
		Mar	Mar	Mar	Mar
		Apr	Apr	Mar, Jul	Mar, Jul
		May	May	May	May
		June	June	May, Jul	May, Jul
		Jul	Jul	Jul	Jul

Table 16 Cycles Within Insurance Periods for LGM for Dairy Cattle Insurance (Cont.)

Sales Closing Month	Insurance Period	Insurance Month	Settle Prices Used in Expected and Actual Price Calculations		
			Class III Milk	Corn Price	Soybean Meal
September	October-August	November	Nov	Sep, Dec	Oct, Dec
		December	Dec	Dec	Dec
		January	Jan	Dec, Mar	Jan
		February	Feb	Dec, Mar	Jan, Mar
		March	Mar	Mar	Mar
		April	Apr	Mar, May	Mar, May
		May	May	May	May
		June	Jun	May, Jul	May, Jul
		July	Jul	Jul	Jul
		August	Aug	Jul. Sep	Aug
October	November-September	December	Dec	Dec	Dec
		January	Jan	Dec, Mar	Jan
		February	Feb	Dec, Mar	Jan, Mar
		March	Mar	Mar	Mar
		April	Apr	Mar, May	Mar, May
		May	May	May	May
		June	Jun	May, Jul	May, Jul
		July	Jul	Jul	Jul
		August	Aug	Jul. Sep	Aug
		September	Sep	Sep	Sep
November	December-October	January	Jan	Dec, Mar	Jan
		February	Feb	Dec, Mar	Jan, Mar
		March	Mar	Mar	Mar
		April	Apr	Mar, May	Mar, May
		May	May	May	May
		June	Jun	May, Jul	May, Jul
		July	Jul	Jul	Jul
		August	Aug	Jul. Sep	Aug
		September	Sep	Sep	Sep
		October	Oct	Sep, Dec	Oct
December	January-November	February	Feb	Dec, Mar	Jan, Mar
		March	Mar	Mar	Mar
		April	Apr	Mar, May	Mar, May
		May	May	May	May
		June	Jun	May, Jul	May, Jul
		July	Jul	Jul	Jul
		August	Aug	Jul. Sep	Aug
		September	Sep	Sep	Sep
		October	Oct	Sep, Dec	Oct
		November	Nov	Sep, Dec	Oct, Dec

V.1.1. How Are Expected Class III Prices Determined?

At the time of enrollment, each month's expected Class III milk price (**ECL3P**) for the 10 possible coverage months included in a particular contract offering is defined as the simple average of the daily settlement prices of the CME Class III milk futures contracts observed over the expected price measurement period (**EPMP**) where the EPMP is defined as the three CME futures market trading days up to and including the contract purchase Friday. This purchase Friday is the last business Friday of the purchase month.

Table 2, which was first discussed in Section 0 of this report, is used to show the dates over which the Oct 2011 – Sep 2012 contract offerings can be purchased and the possible coverage months associated with each offering. Table 16 summarizes the months whose futures settle prices are used to calculate Class III, corn and SBM expected and actual prices for the 12 contract offerings. Table 15 provides the specific dates of the **EPMP** for the 12 LGM-Dairy contracts offered over Oct 2011 – Sep 2012.

Assume a producer wants to insure an operation's **TEGM** over Dec 2011 – Sep 2012. This coverage can be obtained by purchasing an 11 month contract at the end of Oct. 2011. For this purchase, the expected price measurement period is October 26th – 28th 2011. Expected Class III milk prices (**ECL3P**) for Dec 2011- Sep 2012 are based on the average daily settlement prices calculated over these three days for each for the above ten Class III futures contracts.

V.1.2. How are Expected Feed Costs Determined?

To evaluate monthly expected gross margins, a producer needs estimates of expected monthly feed costs. These need to be estimated at the time of contract purchase (i.e., last business Friday of the month). For LGM-Dairy, feed costs are composed of the cost for energy (corn) and protein (SBM). Expected monthly feedings for other feedstuffs must be converted to corn and soybean meal equivalents using any recognized feed conversion system. At the time of contract purchase, the producer is expected to supply expected whole-herd feeding rates over the life of the contract. Similar to the milk production, these feeding rates do not change over the life of the contract but can vary across months. Given these feeding rates cannot be changed once the contract is signed, they may not reflect actual feeding rates used by the producer that may have changed due to changing feed costs, weather conditions etc. The bottom line is that the producer is not bound to actually feed

according the insurance contract specifications but any indemnity, if due, will be based upon the rates specified in the LGM-Dairy contract.

Using a similar procedure as used to calculate expected milk revenue, expected monthly corn equivalent feed costs are the expected feeding of corn equivalents (set at time of contract purchase, **ECE**) multiplied by expected corn grain price (i.e., **ECP**). The **ECP**'s are obtained from the futures markets corn grain settlement prices during the **EPMP**.

Table 17 Trading Months for Class III, Corn and Soybean Meal

Contract	Trading Months	Last Trading Day
Class III	Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec	The day prior to the release of USDA's Announced Price. This day will be on a Thurs on or before the 4th of the month following the contract month
Corn	Mar, May, Jul, Sep, Dec	The business day prior to the 15th calendar day of the contract month
SBM	Jan, Mar, May, Jul, Aug, Sep, Oct, Dec,	The business day prior to the 15th calendar day of the contract month

Unlike Class III milk futures, which have 12 futures contracts traded per year, only five contracts are traded for corn grain for a particular calendar year and only eight for SBM. Table 17 shows the contract months available for Class III, Corn and Soybean Meal during a calendar year. For months in which the CME trades futures contracts, the expected corn price is the simple average of the settlement prices for the CME corn futures contract for those months, calculated over the same **EPMP** as used in the calculation of the **ECL3P**. For insurance months with no corn futures contracts, the **ECP** is weighted average of the immediately surrounding corn futures months' simple average of the daily settlement prices obtained during the **EPMP**. The weights are based on the distance between the desired month and the futures contract months actually used and are inversely related to the number of months until the futures contract expires. For example, to obtain the January, February, and Jun 2012 expected corn prices at the time of purchasing at the end of Oct 2011, the following formulas are used:

$$\begin{aligned} ECP_{Jan12} &= \frac{2}{3} ECP_{Dec11} + \frac{1}{3} ECP_{Mar12} \\ ECP_{Feb12} &= \frac{1}{3} ECP_{Dec11} + \frac{2}{3} ECP_{Mar12} \\ ECP_{Jun12} &= \frac{1}{2} ECP_{May12} + \frac{1}{2} ECP_{Jul12} \end{aligned} \qquad (3)$$

where ECP_{Jan12} is the expected corn price for Jan ′12, ECP_{Dec11} is the expected corn price for Dec ′11, ECP_{Mar12} is the expected corn price for Mar ′12, ECP_{Feb12} is the expected corn price for Feb ′12, ECP_{May12} is the expected corn price for May ′12, ECP_{Jul12} is the expected corn price for Jul ′12 and ECP_{Jun12} is the expected corn price for Jun ′12.

Similarly, expected energy (SBM equivalent) feed costs are based on the soybean meal equivalent (**ESME**) used as a protein source and the expected soybean meal price (**ESP**). The producer reports the expected amount of soybean meal (or equivalent) fed each month over the entire contract period at the time of insurance contract purchase. Similar to corn, there are less than 12 trading months in SBM within a calendar year. Given that SBM futures are traded for 8 months, the implementation of equation (3) with respect to the evaluation of **ESP** is such that all the weights are ½, as there is at most a 1 month gap between consecutive SBM futures contracts. For Feb. and June ′12, the **ESP** is obtained via the following:

$$\begin{aligned} ECP_{Feb12} &= \frac{1}{2} ECP_{Jan11} + \frac{1}{2} ECP_{Mar12} \\ ECP_{Jun12} &= \frac{1}{2} ECP_{May12} + \frac{1}{2} ECP_{Jul12} \end{aligned} \qquad (4)$$

V.2. How is Insurance Coverage Across Months Allowed to Vary?

Given the identification of the maximum level of milk marketings that the producer is able to produce over an insurance contract period (i.e., the 10 possible coverage months), to determine the actual amount of milk and feed insured for each month, as shown in equation (1), the monthly milk revenue and estimated feed costs are multiplied by the month-specific percent coverage declared by the dairy producer (**%Cover$_t$**).

As shown in (1), using the **EPC, EPS** and the producer-selected monthly insurance coverage rates (**%Cover**), expected monthly gross margins (**EMGM**) can be estimated for

each of the months encompassed by the insurance contract offering. The sum of the monthly EGM's covered by the insurance program $\left(\sum_{t=1}^{10} \text{EMGM}_t\right)$ divided by the sum of insured marketings over this same period $\left(\sum_{t=1}^{10} \text{EMM}_t * \text{Cover}_t\right)$ provides a measure of the expected gross margin per cwt of insured milk (EGM_C, $/cwt):

$$\text{EGM\_C} = \frac{\sum_{t=1}^{10} \text{EGM}_t}{\sum_{t=1}^{10} \text{EMM}_t * \text{Cover}_t}. \qquad (5)$$

Note that in the above calculation, for those months in which %Cover = 0, there will be zero milk insured and the EGM in that month will be 0 as well.

V.3. How Can the Producer Elect an Insurance Deductible?

Similar to car, home and business insurance policies, the dairy producer has the ability to declare a deductible rate (**DL**, $/cwt) that will reduce the insurance premium. This deductible is defined in terms of that portion of **EGM_C** not covered by insurance. That is, the deductible is that portion of the expected gross margin not being insured. For LGM-Dairy, allowable deductibles range from $0 to $2.00 of **ECM_C** in $0.10 per cwt increments. Under the current LGM-Dairy rules, there is only one DL value that is applied to all months covered by a particular LGM-Dairy contract offering.

Not covering a portion of the **ETGM** implies that the overall insurance premium will be reduced given that the producer is assuming more of the risk. That is, the greater the declaration, the greater the reduction in **AGM** has to occur before an insurance payout will occur (i.e, reduces the potential insurance liability).

V.4. Evaluation of the Total Contract Gross Margin Guarantee

Once the producer chooses a gross margin deductible, DL, and has established the total contract expected gross margin, the contract Total Gross Margin Guarantee (TGMG) is obtained by subtracting from the TEGM the total deductible:

$$\begin{aligned} \text{TGMG} &= \sum_{t=1}^{10} \text{EGM}_t - \sum_{t=1}^{10} \left(\text{DL}*\text{EMM}_t * \%\text{Cover}_t\right) \\ &= \text{ETGM} - \text{TDEDUCT} \end{aligned} \qquad (6)$$

where TDEDUCT is the total deductible amount ($)

Note that equation (6) implies that similar to ETGM, there is only one TGMG per LGM-Dairy contract regardless of the number of months of production covered by a particular contract design. As noted above, if there is zero coverage in a particular month then $(EMM_t * \%Cover_t) = 0$.

VI. Detailed Description of the Determination of Indemnity Payments

VI.1. Calculation of the Actual Gross Margins (AGM)

For a particular insurance contract coverage period, the total insurance indemnity (INDEM) is the difference, if positive, between the GMG and the contract total actual gross margin (TAGM).[26] That is, the contract TAGM is calculated via the following:

$$TAGM = \sum_{t=1}^{10} AMGM_t \qquad (7)$$

where $AMGM_t = (EMM_t * ACL3P_t - ECE_t(2000/56) * ACP_t - ESME_t * ASP_t) * \%Cover_t$

= Actual monthly gross margin

ACL3P = Actual Class III milk price

ACP = Actual corn price

ASP = Actual soybean meal price

Note that in equation (7), for those months in which there is no insurance coverage, $\mathbf{AMGM_t} = 0$. Also note that the $\mathbf{AMGM_t}$ is evaluated using the same expected milk marketings, corn equivalents, SBM equivalents and percent coverage rates used in the calculation of the **EMGM**. Only different price values are used in margin valuation.

In order to evaluate the **TAGM** we need estimates of the actual Class III, corn and SBM prices. For all three commodities the actual prices are obtained from the 3-day average futures settlement prices over the actual price measurement period (**APMP**) which is defined as the 1st – 3rd days *prior to the last trading day* of a particular futures contract.

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[26] The *coverage period* is the period starting with the 1st month of insured production and ends with the last insured month. The *insurance period* is that time 11-month time period associated with a particular LGM-Dairy contract (i.e., 1 month of no coverage and 10 months of possible coverage).

Table 16 lists the last trading days of each futures contract over the 10 months that could be covered by the October 2011 LGM-Dairy insurance contract offering.

For months in which a CME corn contract expires, the actual corn price (**ACP**) for the month of concern is the simple average of the daily settlement prices for the CME corn futures contract for this month during the actual price measurement period. For corn, each futures contract expires on the 15th calendar day of the contract month. The last trading day is the last business day prior to the 15th of each month. Table 16 is used to show both the last trading day and actual price measurement period for corn futures contracts used in the calculation of **ACP** for the months whose feed use could be covered by the Oct. 2011 contract offering.

For months with no corn futures contract, the **ACP** is the weighted average of the immediately surrounding months' simple average of the daily settlement prices during the AMPM. This weighting system is the same as used in the calculation of expected corn prices.

Note that in contrast to the calculation of expected prices, the **APMP** varies across commodity even when the actual prices pertain to the same month. The difference is due the less than 12 corn (and SBM) futures contracts trading with respect to a particular year.

Similar to corn futures contracts, for months in which a CME SBM contract expires, the actual soybean meal price (**ASP**) is the simple average of the daily settlement prices for the CME soybean meal contract for the month during the actual price measurement period. The last trading day for soybean meal contracts is the last business day prior to the 15th of each month of the contract month. The last 3 columns of Table 16 contain information of the last trading day and APMP used to calculate the **ASP**. For other months, the actual SBM price is the weighted average of actual SBM prices in the immediately surrounding months as was used to calculate the **ESP** (i.e., ½).

Comparing the actual price measurement periods illustrates one characteristic of LGM-Dairy. Specifically, the actual milk and feed values can potentially be calculated for 1 to 2 months prior to the month associated with a particular actual feed price. As an example, this will occur when calculating the actual prices for values for October 2011. The October 2011 **ACL3P** is based on the average settle price for the October 2011 Class III contract during Oct 31st – Nov. 2nd. To calculate the **ASP**, the average settle price for soybean meal

futures over the dates of October 11th - 13th, an approximate 2-week difference. In contrast, to calculate the **ACP**, the weighted average settle prices will be based on the September and December corn settled prices over the September 10th, 12th and 13th and December 9th, 12th, and 13th trading days, respectively. Each of these periods is 1.5 months apart from the actual price measurement period of the October Class III price.

With the estimation of the actual Class III, corn and SBM prices, an estimate of the **TAGM** can be obtained using equation (5). The **TAGM** is similar to the **TGMG** as the same amount of covered milk revenue and feed costs are evaluated, but this time using the actual in place of the expected prices. The other difference between the **TAGM** and **TGMG** is that no deductible is subtracted from the TAGM value. A similarity between **TGMG** and **TAGM** is that regardless of the number of months of marketings insured (i.e. 1-10 months), there is only one value per contract.

In summary, the **TGMG** is known at the time the insurance contract is purchased. In contrast, the **TAGM** may not be known until after the insurance period ends. This will happen when the last insured month occurs during a month in which either corn and/or SBM futures contracts mature.

VI.2. Determination of Whether an Indemnity is Due

Like any insurance program, the hope is that one would not have to use the insurance. In terms of LGM-Dairy, if there is no indemnity, this implies that market conditions, as represented by gross margins, are better than existed at insurance sign-up. Given the **TGMG** that was established at sign-up and the **TAGM** being set after the last actual price is calculated, an indemnity (**INDEM**) can be determined via the following:

$$INDEM = Max(TGMG - TAGM, 0) \quad (8)$$

Equation (8) can be interpreted to mean that there will be an indemnity if the **TGMG** is greater than the **TAGM**, otherwise there will not be an indemnity forthcoming. The indemnity amount will be equal to the difference between **TGMG** and **TAGM**, not the **TGMG**. When there is an insurance payout, i.e., when the **TGMG** is greater than the **TAGM**, this indicates that the actual market conditions were not as good as existed when the LGM-Dairy contract was purchased.

For contracts in which an indemnity is forthcoming, the indemnity will be paid on the first Monday of the month after the *last actual price is determined for covered months*. This

means that for contracts less than 10 months in length, the producer does not have to wait until the end of the insurance period (i.e. 11 months after purchase) to receive an indemnity payment if one is due. For example, assume a producer purchases an October 2011 LGM-Dairy contract which is used to cover a portion of marketings that occur during January – March 2012. An indemnity determination will be made after March 28, 2012 when the March **ACL3P** can be estimated. Two weeks prior to this time period, the March **ACP** and **ASP** can be evaluated. In comparison, the October 2011 insurance period ends at the end of September 2012, and the last actual price will be available at the end of business on October 3rd with the release of the September 2012 Class III on October 5, 2012 (i.e., based on 3 days of data prior to the last trading day, October 4th).

VII. Undertaking an Historical Analysis Using the *LGM-Dairy Analyzer*

As indicated above, the ***LGM-Dairy Analyzer*** can be used to provide an estimate the costs of purchasing a particular insurance contract at the next contract offering, it can also be used to (i) evaluate not only the costs but also the actual indemnity that would have occurred to a completed LGM-Dairy contract and (ii) monitor an on-going LGM-Dairy contract to provide an assessment of whether an indemnity will be forthcoming at the end of the contract. In this section of this Guidebook we present an historical analysis of a completed LGM-Dairy contract. For this analysis we will adopt the same percentage coverage pattern as in the previous example except we will examine the cost and performance of the March 2009 contract when applied to a 350 head milking herd (i.e., 0% coverage in May and June 2009, etc). Under the March 2009 LGM-Dairy contract offering, the first month of possible coverage was May 2009.

We used average U.S. per cow productivity values for the May 2009 – Feb 2010 period. Similar to the previous example we used default feed values. The same contract design will be used here but instead of applying the contract to the July 2011 contract offering (as defined by the relative percent coverage), we will examine contract cost and performance when applied to the March 2009 contract offering. Table 18 shows the allowable target marketings, declared feed use and the percentage of marketings to be insured. Over the entire May 2009 contract, 39.5% of the 10 month total marketings are insured.

Table 18 Monthly Milk Marketing Profile and Feed Use for the Case-Study

Month	Prod/Cow (lbs) [1]	Total Marketings (cwt) [2]	Corn Equiv. (Tons) [3]	SBM Equiv. (Tons) [4]	% Marketings (%) [5]
May '09	1,812	6,342	83.5	11.9	0
Jun '09	1,726	6,041	85.4	12.2	0
Jul '09	1,743	6,101	83.2	11.9	25
Aug '09	1,718	6,013	86.6	12.4	50
Sep '09	1,649	5,772	87.7	12.5	75
Oct '09	1,695	5,933	80.6	11.5	75
Nov '09	1,657	5,800	90.6	12.9	75
Dec '09	1,737	6,080	88.8	12.7	50
Jan '10	1,763	6,171	92.0	13.1	25
Feb '10	1,623	5,681	88.0	12.6	25
Total	17,123	59,934	866.3	123.8	39.5

Source: The May 2009 – Feb 2010 average production/cow was obtained from NASS and contained within the Understanding Dairy Markets Website: (http://future.aae.wisc.edu/data/monthly_values/by_area/98?tab=production).
Note: Default feed coefficients are assumed for this example.

VII.1. Cost of a March 2009 LGM-Dairy Contract

Table 19 contains a summary of the costs of the LGM-Dairy contract using the production and percent coverage pattern shown in Table 18. Under the May 2009 contract, to generate a $12.22 per cwt **TGMG** with $1.10 deductible, the cost per cwt of covered milk was $0.29. Subtracting this premium from the **TGMG** value results in a **NTGMG** of $11.94.

Table 19 LGM-Dairy Contract Costs, Mar 2009 vs. July 2011: $1.10 Deductible

	July 2011			May 2009		
	Net Premium ($)	TGMG ($)	Net TGMG ($)	Net Premium ($)	TGMG ($)	Net TGMG ($)
Total ($)	6,445	257,293	250,848	5.913	252,927	247,014
Per CWT of	0.30	11.90	11.60	0.29	12.22	11.94

VII.2. Comparison of Expected and Actual Prices

The Mar 2009 LGM-Dairy contract offering allowed coverage over the May 2009 – Feb 2010 period. Using the coverage distribution shown in Table 18, milk marketings during Jul 2009 – Feb 2010 are insured with varying percentage coverage. In Table 20 we present a comparison of expected prices determined at sign-up at the end of Mar 2009 with the actual prices that occurred as the LGM-Dairy contract matured. Given that the March 2009 contract expired at the end of March 2010 (due to the Class III release date and grain futures trading during March) all of the actual prices were known.

Table 20 Comparison of Expected and Actual Prices

Coverage Month	Expected Prices			Actual Prices					
	Class III	Corn	SBM	Class III	% Change	Corn	% Change	SBM	% Change
Jul ′09	14.46	3.98	284.83	9.94	-31.3	3.49	-12.3	367.70	29.1
Aug′09	15.44	4.03	277.70	11.21	-27.4	3.30	-18.1	387.37	39.5
Sep ′09	15.96	4.08	268.03	12.08	-24.3	3.10	-24.0	345.27	28.8
Oct ′09	16.29	4.12	258.57	12.76	-21.7	3.33	-19.2	319.80	23.7
Nov ′09	16.24	4.16	257.48	14.09	-13.2	3.55	-14.7	316.87	23.1
Dec ′09	16.29	4.20	256.40	14.91	-8.5	3.78	-10.0	313.93	22.4
Jan ′10	16.07	4.24	257.63	14.49	-9.8	3.71	-12.5	300.20	16.5
Feb ′10	15.92	4.28	259.25	14.29	-10.2	3.64	-15.0	277.98	7.2

Note: The shaded cells identify those months where actual Class III prices were less than expected Class III prices and actual feed prices are greater than expected prices.

Over this period there were double digit percentage Class III price decreases between expected and actual prices for all insured months. During September 2009 – November 2009, 75% of milk marketings were insured, 50% in Dec 2009 and 25% in both Jan and Feb 2010. For all covered months the actual corn price was less than the expected with percentage decrease ranging from 10.0% in December 2009 to a 24.0% decrease in September 2009. Actual soybean meal prices increased over expected prices in all 8 covered monthly marketings with a range of 7.2% increase for February 2010 to 39.5% for August 2009.

VII.3. Impact of Deductible Rate on Contract Cost and Indemnity Level

Table 21 provides a sensitivity analysis of the impact of changes in deductible rate on the **TGMG** generate by the particular Mar 2009 contract used here, cost of the contract and indemnity level. Given that this analysis is based on the actual data used by the RMA to estimate premiums, the values shown in Table 21 represent what would have actually happened if the contract as specified was purchased. At $0 deductible, the subsidized premium was $18,305 for a **TGMG** of $275,687. This level of subsidized premium represents 6.6% of the **TGMG**. At $2.00 deductible the TGMG was $234,306 and the subsidized premium of $3,122 represents 1.3% of the **TGMG**.

Table 21 Effect of Deductible Rate On Mar 2009 LGM-Dairy Contract

Deductible ($/cwt) [1]	TGMG ($) [2]	Premium ($) [3]	Subsidized Premium ($) [4]	Indemnity ($)		Covered Milk Indemnity ($/cwt) [7]	Net Indemnity ($)		Covered Milk Net Indemnity ($/cwt) [10]
				($) [5]	% Change [6]		($) [8]	% Change [9]	
0.0	275,687	22,323	18,305	60,604	-----	2.93	42,300	-----	2.04
0.1	273,618	21,205	17,176	58,535	-3.4	2.83	41,359	-2.2	2.00
0.2	271,549	20,119	15,894	56,466	-6.8	2.73	40,572	-4.1	1.96
0.3	269,480	19,062	14,678	54,397	-10.2	2.63	39,720	-6.1	1.92
0.4	267,411	18,033	13,525	52,328	-13.7	2.53	38,803	-8.3	1.88
0.5	265,342	17,036	12,266	50,259	-17.1	2.43	37,993	-10.2	1.84
0.6	263,273	16,079	11,094	48,190	-20.5	2.33	37,096	-12.3	1.79
0.7	261,203	15,159	10,005	46,121	-23.9	2.23	36,116	-14.6	1.75
0.8	259,134	14,274	8,850	44,052	-27.3	2.13	35,202	-16.8	1.70
0.9	257,065	13,424	8,055	41,983	-30.7	2.03	33,928	-19.8	1.64
1.0	254,996	12,607	6,556	39,914	-34.1	1.93	33,358	-21.1	1.61
1.1	252,927	11,826	5,913	37,845	-37.6	1.83	31,932	-24.5	1.54
1.2	250,858	11,085	5,543	35,776	-41.0	1.73	30,233	-28.5	1.46
1.3	248,789	10,376	5,188	33,707	-44.4	1.63	28,519	-32.6	1.38
1.4	246,720	9,696	4,848	31,638	-47.8	1.53	26,790	-36.7	1.29
1.5	244,651	9,046	4,523	29,569	-51.2	1.43	25,046	-40.8	1.21
1.6	242,582	8,430	4,215	27,500	-54.6	1.33	23,284	-45.0	1.13
1.7	240,513	7,841	3,920	25,430	-58.0	1.23	21,510	-49.1	1.04
1.8	238,444	7,280	3,640	23,361	-61.5	1.13	19,721	-53.4	0.95
1.9	236,375	6,746	3,373	21,292	-64.9	1.03	17,919	-57.6	0.87
2.0	234,306	6,244	3,122	19,223	-68.3	0.93	16,101	-61.9	0.78

Note: Columns [6] and [9] are the percent change from the $0 deductible net indemnity level.

At $0 deductible, the producer would receive an $60,604 indemnity, the difference between the **TGMG** and the **TAGM**. Dividing the total indemnity by the total marketings insured, this indemnity was $2.93/cwt. Given the relative value of the indemnity versus the contract's premium, the net indemnity per cwt of covered milk was $2.04. Not surprisingly, the indemnity level decreased with increased deductible rates as the **TGMGs** under higher deductibles are decreased**.** At $2.00 deductible, the indemnity decreased to $19,223. Compared to the 0% deductible at $1.10 deductible, the indemnity decreased by 37.6% . At $2.00/cwt deductible the indemnity decreased 68.3% from the $0 deductible indemnity. The net (of premium costs) indemnity when compared to the $0 deductible level decreased 24.5% at $1.10 deductible and 61.9% at $2.00 deductible.

VIII. Summary

Initial analyses show that insurance premiums are very sensitive to changes in gross revenue deductible levels. Using July 2011 as an example, increasing the deductible from 0$/cwt to $2.00/cwt the guaranteed gross revenue target is decreased by approximately 15% while the total premium is cut by more than 80%. Additional work needs to be undertaken to determine how alternative market conditions (e.g. volatility) impact this deductible/premium relationship.

Appendix A: Abbreviations Used in Reviewing the LGM-Dairy Program

Abbreviation	Definition
ACL3P	Actual Class III price
ACP	Actual price of corn
AMGM	Actual monthly gross margin
APMP	Actual price measurement period
ASP	Actual price of soybean meal
ATGM	Actual total contract gross margin
CME	Chicago Mercantile Exchange
DL	Deductible percentage
ECE	Expected corn equivalents declared
ECL3P	Expected Class III price
ECP	Expected price of corn
EGM_C	Expected Gross Margin per cwt of Cover Milk
EMGM	Expected monthly gross margin
EMM	Expected milk marketings
EPMP	Expected price measurement period
ESME	Expected SBM equivalents declared
ESP	Expected price of SBM
ETGM	Expected total contract gross margin
FMMO	Federal Milk Marketing Order
INDEM	Insurance indemnity
IOFC	Income over feed cost
LGM-Dairy	Livestock Gross Margin Insurance for Dairy
NET_PREM	Net Insurance Premium After Subsidy
PREMIUM	Unsubsidized Insurance Premium
RMA	Risk Management Agency
SBM	Soybean meal
SCL3P	Simulated Class III Price
SCP	Simulated Corn Price
SMGM	Simulated Monthly Gross Margin
SSP	Simulated Soybean Price
TEGM	Total expect contract gross margin
STGM	Simulated total contract gross margin
TDEDUCT	Total deductible
TGMG	Total contract gross margin guarantee
USDA	U.S. Department of Agriculture
%COVER	% of monthly marketings to be insured
%SUBSIDY	% of premium subsidized by the USDA
net-TGMG	Total contract gross margin guarantee net of subsidized premium paid by the producer

Appendix B: Definition of Key Terms Associated with LGM-Dairy

Act - The Federal Crop Insurance Act (7 U.S.C. 1501- 1524).

Actual corn price (ACP) - For months in which a CME Group corn contract expires, the simple average of the daily settlement prices for the CME Group corn futures contract for the month during the actual price measurement period. For other months, the weighted average of the immediately surrounding months' simple average of the daily settlement prices during the actual price measurement period.

Actual cost of feed - The actual cost of feed for each month equals the target corn (or corn equivalent) to be fed times 2,000/56 (to convert tons to bushels) times the actual corn price for that month, plus the target protein meal (or protein meal equivalent) to be fed times the actual soybean meal price for that month.

Actual gross margin per month (AMGM) - Actual revenue less the actual cost of feed for the month.

Actual marketings - The total amount of milk sold by you in each month of the insurance period and for which you have proof of sale. Actual marketings are used to verify ownership of milk and determine approved target marketings.

Actual milk price (ACL3P) - The simple average of the daily settlement prices of the CME Group Class III milk futures contract for the month during the actual price measurement period.

Actual milk revenue - The actual milk price for a month times target marketings for the month.

Actual price measurement period (APMP) - The last three trading days prior to the last trading day for the futures contract

Actual soybean meal price (ASP) - For months in which a CME Group soybean meal contract expires, the simple average of the daily settlement prices for the CME Group soybean meal contract for the month during the actual price measurement period. For other months, the weighted average of actual soybean meal prices in the immediately surrounding months.

Actual total gross margin (ATGM) - The sum of actual gross margins per month across all months of the insurance period.

Application - The form required to be completed by you and accepted by us before insurance coverage will commence.

Approved target marketings - The maximum target marketings allowed for the designated months of the applicable insurance period. Approved target marketings will be based on the lesser of farm capacity or underwriting capacity for the ten-month insurance period as determined by the insurance underwriter.

Assignment of indemnity - A transfer of policy rights, made on a FCIC form, and effective when approved in writing by the FCIC. It is the arrangement whereby you assign your right to an indemnity payment for the crop year but such assignment can only be made to creditors or other persons to whom you have a financial debt or other pecuniary obligation.

Bundled options – A risk management strategy where the producer purchases Class III put options and feed calls to establish a minimum income over feed cost (IOFC).

CME Group (CME) - The Chicago Mercantile Exchange Group.

Company - The insurance company reinsured by FCIC that is identified on, and issuing, your summary of insurance.

Consent - Approval in writing by the FCIC allowing you to take a specific action.

Contract change date - The calendar date by which we make any policy changes available for inspection in the agent's office.

Corn equivalent (ECE) - The amount of corn equivalent to the energy content of the dairy ration used by the producer.

Coverage - The insurance provided by this policy, against insured loss of gross margin as shown on your summary of insurance.

Crop Year - The twelve-month period, beginning July 1 and ending the following June 30, which is designated by the calendar year in which it ends.

Date coverage begins - The calendar date the insurance provided by this policy begins.

Days - Calendar days.

Deductible (DL) - The portion of the expected total gross margin that you elect not to insure. Per hundredweight deductible amounts range from zero to $2.00 per cwt in 10¢ increments. The deductible equals the selected per hundredweight deductible times the sum of target marketings across all months of the insurance period.

End of insurance period, date of - The date the insurance provided by this policy ceases.

Expected corn price (ECP) - For months in which a CME Group corn contract expires, the simple average of the settlement prices for the CME Group corn futures contract for the month during the expected price measurement period. For other months, the weighted average of the immediately surrounding months' simple average of the daily settlement prices during the expected price measurement period.

Expected cost of feed - The expected cost of feed for each month equals the target corn (or corn equivalent) to be fed times 2000/56 (to convert tons to bushels) times the expected corn price for that month, plus the target protein meal (or protein meal equivalent) to be fed times the expected soybean meal price for that month.

Expected gross margin per month (EMGM) - Expected revenue less the expected cost of feed for the month.

Expected milk price (ECL3P) - The simple average of the daily futures settlement prices of the CME Group Class III milk futures contract for the month during the expected price measurement period.

Expected milk revenue - The expected milk price for a month times target marketings for the month.

Expected price measurement period (EPMP) - The three trading days prior to and including the last Friday of the month that is a business day on which sales takes place.

Expected soybean meal price (ESP) - For months in which a CME Group soybean meal contract expires, the simple average of the daily settlement prices of the CME Group soybean meal futures contract for the month during the expected price measurement period. For other months, the weighted average of the immediately surrounding months' simple average of the daily settlement prices during the expected price measurement period.

Expected total gross margin (ETGM) - The sum of expected gross margins per month across all months of the insurance period.

FCIC - The Federal Crop Insurance Corporation, a wholly owned government corporation and agency within USDA.

Gross margin guarantee (TGMG) - The gross margin guarantee for an insurance period is the expected total gross margin for an insurance period minus the deductible.

Income over feed costs (IOFC) – Total value of milk minus the total purchase feed costs.

Insurance period - The eleven-month period designated in the summary of insurance to which this policy is applicable.

Insured - The person as shown on the summary of insurance as the insured. This term does not extend to any other person having a share or interest in the animals (for example, a partnership, landlord, or any other person) unless also specifically indicated on the summary of insurance as the insured.

Marketing report - A report submitted by a producer on an FCIC form showing for each month your actual marketings for that month of milk insured under this policy. The marketing report must be accompanied by copies of sales receipts that provide records of the actual marketings shown on the marketing report.

Milk - Milk produced from any species of domesticated mammal of the family *Bovidae* commonly grown for production of dairy products, also referred to as dairy cows.

Net-Gross Margin Guarantee (NTGMG) – The total contract gross margin guarantee after subtracting the premium that is actually paid by the producer after the premium subsidy has been utilized.

Notice of probable loss - Our notice to you of a probable loss on your insured milk.

Person - An individual, partnership, association, corporation, estate, trust, or other legal entity.

Policy - The agreement between you and the FCIC consisting of these provisions, the Special Provisions, the summary of insurance, the Commodity Exchange Endorsement, and the applicable regulations published in 7 CFR Chapter IV.

Premium - The amount you owe the FCIC for the insurance coverage based on your target marketings

Premium billing date - The earliest date upon which you will be billed for insurance coverage based on your target marketing report. The premium billing date is the first business day of the month following the last month of the insurance period in which you have target marketings.

Producer premium - The total premium minus the premium subsidy paid by FCIC.

RMA - Risk Management Agency, an agency within USDA.

Sales closing date - A date by which your completed application and premium must be received by us. Also, the last date by which you may change your insurance coverage for an insurance period.

Sales period - The period that begins on the last business Friday of the month after validation of prices and rates and ends at 8:00 PM Central Time of the following day.

Share - The lesser of your percentage interest in the insured milk as an owner at the time insurance attaches and at the time of sale. Persons who lease or hold some other interest in the milk, other than as an owner, are not considered to have a share in the milk.

Soybean meal equivalent - The amount of soybean meal equivalent to the protein content of the dairy ration used by the producer.

Substantial beneficial interest - An interest held by a person of at least 10% in the applicant or insured. All spouses that reside in the household will be considered to have a substantial beneficial interest in the applicant or insured unless the spouse can prove that the milk owned is in a totally separate farming operation in accordance with FCIC procedures and the spouse derives no benefit from the dairy operation of the insured or applicant.

Summary of insurance - Our statement to you, based upon your application, specifying the insured, the milk, the target marketings, gross margin guarantee, and the premium for an insurance period.

Target corn to be fed (ECE) - Your determination as to the number of tons of corn or corn equivalent that you will feed for each month.

Target protein meal to be fed (ESME) - Your determination as to the number of tons of soybean meal or protein meal equivalent you will feed each month.

Target marketings - A determination as to the number of hundredweight of milk you elect to insure in each month during the insurance period.

Target marketings report - A report submitted by you on an FCIC form showing for each month your target marketings for that month.

Termination date - The calendar date upon which your insurance ceases to be in effect because of nonpayment of any amount due us under the policy, including premium.

UCM - FCIC's Underwriting Capacity Manager (UCM) web site. This is a facility through which FCIC manages underwriting capacity for livestock.

USDA - The United States Department of Agriculture.

Void - When the Policy is considered not to have existed for an insurance period as a result of concealment, fraud, or misrepresentation

Appendix C: LGM-Dairy Application Form

LIVESTOCK GROSS MARGIN INSURANCE FOR DAIRY CATTLE POLICY
APPLICATION, TARGET MARKETINGS AND CHANGE FORM

Policy #: 1	State: 2
Reinsurance Year 3	Page # 4 Of
Confirmation Number: 5	

Applicant's Name: 6	Agency Name: 16
Street or Mailing Address: 7	Agency/Agent Street or Mailing Address 17
City and State: 8 Zip Code	City and State 18 Zip Code
Applicant's E-Mail Address: 9 / Applicant's Fax #	Agent's E-Mail Address/Fax # 19
Phone # 10	Phone # 20
Tax Identification # 11 / Check One ☐ SSN ☐ EIN ☐ Other 12	Agency Code 21
Spouse's Tax ID # 13 / Type of Entity 14	Applicant's Authorized Representative (Submit Completed Power of Attorney Form)
Is applicant at least 18 years old? ☐ Yes ☐ No 15	22

23

☐ New Applicant
☐ Name Change
☐ Address Change
☐ Policy Cancellation
__ *Reason for Cancellation
☐ Correct Spelling of Insured Name
☐ Successor-In-Interest & Effective Ins. Period _____
☐ Transfer
☐ Additional Insurance Period
☐ Policy Change
☐ Correct Tax ID
☐ Cancellation
☐ In House Transfer
☐ Add/Change nsured's Auth. Rep.*

CERTIFICATION: 24

☐ YES ☐ NO (a) I certify that the Target Marketings and Feed stated in this application reflect milk that I plan to produce and feed that I plan to use for milk production.

☐ YES ☐ NO (b) I certify that I control adequate facilities to produce the amount of milk reflected by the Target Marketings stated in this application.

☐ YES ☐ NO (c) I understand that, in the event of a claim, my coverage will be reduced to the amount of milk sold and no premium will be refunded if the amount of milk sold is less than 75% of the Target Marketings stated in this application.

(Complete for Transfer only) Current Insurer and Policy Number: 25

☐ YES ☐ NO I REQUEST INSURANCE COVERAGE FOR ALL MILK SPECIFIED BELOW. (Complete for Application and Additional Insurance Periods) 26

County 27	Approved Marketings 28	Deductible ($/cwt.) 29		30 Target Marketings and Feed By Month (Enter Month)									
				Month 2	Month 3	Month 4	Month 5	Month 6	Month7	Month 8	Month 9	Month 10	Month 11
			Hundredweight of Milk										
			Tons of Corn										
			Tons of Protein Meal										

31 CONDITIONS OF ACCEPTANCE: This application is accepted and insurance attaches in accordance with the policy unless: (1) The Risk Management Agency determines that livestock insurance capacity limitations in accordance with the Federal Crop Insurance Act have been reached and this policy will exceed the limitations; (2) any material fact is omitted, concealed or misrepresented in this application and endorsement or in the submission of this application; (3) you have failed to provide complete and accurate information required by this application; (4) the answer to any of the following questions is "yes."

☐ YES ☐ NO (a) Are you now indebted, and the debt is delinquent, for crop insurance coverage under the Federal Crop Insurance Act?

☐ YES ☐ NO (b) Have you ever had crop insurance terminated for violation of the terms of the contract or regulations, or for failure to pay your indebtedness?

☐ YES ☐ NO (c) Are you disqualified or debarred under the Federal Crop Insurance Act, or the Regulations of the Federal Crop Insurance Corporation or the United States Department of Agriculture?

☐ YES ☐ NO (d) Have you in the last five years been convicted under Federal or State law of planting, cultivating, growing, producing, harvesting or storing a controlled substance?

☐ YES ☐ NO (e) Have you ever entered into an agreement with the Federal Crop Insurance Corporation or the Department of Justice that you would refrain from participating in the crop insurance program and that agreement is still effective?

☐ YES ☐ NO (f) Do you have like insurance on any of the above livestock?

For Office Use Only
☐ ITS _____
☐ Audit _____
☐ Keyed _____
☐ Upload _____

Appendix C: LGM-Dairy Application Form (cont.)

I understand Livestock Gross Margin for Dairy Cattle Insurance may not be purchased for the month immediately following the application date. I also understand that only a limited number of applications for Livestock Gross Margin for Dairy Cattle Insurance coverage will be accepted and that I will have no Livestock Gross Margin for Dairy Cattle Insurance coverage for the milk described in this application unless the insurance company issues a written summary of insurance to me. I certify that the information on this application is complete and accurate; that none of the reasons for rejection in items 1 through 4 of the "Conditions of Acceptance" apply; and that I am aware of and understand the requirements of the Collection of Information and Data (Privacy Act), as well as all other provisions contained on this application.

Applicant's Signature **32** _____ Date **33** _____

Licensed Agent's Signature **34** _____ Agent Code **35** _____

REMARKS: **36**

SEE REVERSE SIDE OF FORM FOR COMPLIANCE STATEMENTS AND THE STATEMENT REQUIRED BY THE PRIVACY ACT OF 1974

1. Policy #: Enter the policy number from the confirmation screen.
2. State: Enter your state.
3. Reinsurance year: Enter the year in which coverage will end.
4. Page # _ of _: Enter the number of the page and the number of pages of the complete application. For example, if four pages were used to complete the application and this is the second page, fill in Page # 2 of 4.
5. Confirmation Number: Enter the confirmation number from the confirmation screen.
6. Applicant's Name: Enter the applicant's name.
7. Street or Mailing Address: Enter the applicant's street or mailing address.
8. City, State, Zip Code: Enter the applicant's city, state, and zip code.
9. Applicant's E-Mail Address/Fax: Enter the applicant's email address and fax number if available.
10. Phone #: Enter the applicant's phone number.
11. Tax identification #: Enter the applicant's tax identification number. This may be the same as the applicant's social security number or employer identification number. This information is used to report any loss payments to the IRS.
12. Check One; SSN, EIN, Other: Check the type of tax identification number used.
13. Spouse's Tax ID #: Enter the applicant's spouse's tax identification number. This may be the same as the applicant's social security number. This information is used to report any loss payments to the IRS.
14. Type of Entity: State the applicant's type of business entity (individual, corporation, partnership).
15. Is the applicant at least 18 years old? Check yes or no.
16. Agency Name: Enter the insurance agency name.
17. Agency/Agent Street or Mailing Address: Enter the street or mailing address of the insurance agency.
18. City, State, and Zip Code: Enter the city, state and zip code of the insurance agency.
19. Agent's Email Address/Fax: Enter the email address and fax number of the insurance agency.
20. Phone #: Enter the phone number of the agency.
21. Agency Code: Enter the agency code.

22. Applicant's Authorized Representative: If applicable, enter the applicant's authorized representative. A completed Power of Attorney form must be submitted with the initial application.
23. Check all that apply. If cancelling the policy, list the code of the reason for cancellation.
Cancellation Reason Codes I Insured's Request D Death, Incompetency, or Dissolution M Mutual Consent O Other (Please Explain)
24. Certification: Check yes or no.

25. (Complete for transfer only) Current Insurer and Policy Number: If transferring the Livestock Gross Margin for Dairy Cattle Policy to a different insurance company, provide the name of the current insurer and the policy number. If not transferring, leave blank.

26. Check yes if the applicant is requesting insurance coverage for the milk specified in the target marketings portion of the application.

27. Enter County dairy cattle are domiciled in.

28. Enter the applicant's number of approved marketings.

29. Enter the desired deductible amount per hundredweight of milk. The allowable deductible amounts range from $0 per cwt. to $1.50 per cwt. in $0.10 per cwt. increments.
30. Target Marketings and Feed. Enter the target marketings and feed for each month. If there are months where the applicant is not marketing and/or insuring milk, enter a zero
(0) for all three components. For each month, target tons of corn must be between 0.00364 and 0.02912 tons per hundredweight of insured milk and target tons of protein meal must be between 0.000805 and 0.006425 tons per hundredweight of insured milk.
31. Conditions of Acceptance. Answer yes or no for each question. Explain any "yes" answers in the Remarks section.

32. Applicant's signature.

33. Date of applicant's signature.

34. Agent's signature.

35. Agent's Code

36. Remarks. Enter any remarks that should be known by the insurance company.

Appendix D: Substantial Beneficial Interest

Substantial Beneficial Interest Form

NAME OF APPLICANT/INSURED:	CONTRACT NUMBER:
☐ SSN ☐ EIN ☐ OTHER (Check One)	
SOCIAL SECURITY NUMBER OR EMPLOYER IDENTIFICATION NUMER:	ADDRESS OF AGENT:
AGENT NAME AGENT CODE NUMBER:	COMPANY NAME:

List persons and/or entities with 10 percent or more interest in the insurance entity identified above as the Applicant/Insured.

NAME (Print or Type)	COMPLETE ADDRESS (St., R.R., P.O. Box, Zip, etc.)	SSN/EIN (Check One & Enter No.)	TELEPHONE NUMBER	ENTITY TYPE	SHARE
		☐ SSN ☐ EIN ☐ OTHER	( )		
		☐ SSN ☐ EIN ☐ OTHER	( )		
		☐ SSN ☐ EIN ☐ OTHER	( )		
		☐ SSN ☐ EIN ☐ OTHER	( )		
		☐ SSN ☐ EIN ☐ OTHER	( )		
		☐ SSN ☐ EIN ☐ OTHER	( )		
		☐ SSN ☐ EIN ☐ OTHER	( )		

SIGNATURE OF APPLICANT/INSURED:	DATE:

Substantial Business Interest Completion Instructions:

1, Type or print information about the applicant for insurance in section 1. Include first name, middle initial and last name. Fill in the applicant's social security number (SSN) and employer identification number (EIN) if applicable and indicate which number is being provided. Enter the policy number. Provide the agent's name and code number and the street or mailing address, city, county, state, zip code, and company name where the agent can be reached.

2. For each person or entity with 10 percent or more interest in the insurance entity, fill in the person or entity's name, complete address including mailing address, city, state, and zip code. Enter the social security number or employer identification number and check the box that indicates what number was provided. Enter the person's or entity's telephone number and type of entity. Enter that entity's share in the insurance entity.

3. The applicant must sign and date the form.

Appendix E: LGM-Dairy Marketing Report Form

LIVESTOCK GROSS MARGIN INSURANCE FOR DAIRY CATTLE POLICY
MARKETING REPORT

Policy # 1	State 2
Reinsurance Year 3	Page # 4 Of
Confirmation Number 5	

Insured's Name 6	
Street or Mailing Address 7	
City and State 8	Zip Code
Insured's E-Mail Address 9	Insured's Fax #
Phone # 10	
Tax Identification # 11	12 Check One SSN ☐ EIN ☐ Other ☐
Spouse's Tax ID # 13	Type of Entity* 14
Is applicant at least 18 years old? Yes☐ No☐ 15	

Producer's Initials

CONDITIONS: 16

_____ (a) All of the information on this Marketing Report is true to the best of my knowledge.

_____ (b) I understand that falsifying information on this marketing report is a crime punishable by jail or fine.

_____ (c) Copies of all marketing receipts and claim statements are attached.

CERTIFICATION: 17

☐ YES ☐ NO (a) I certify that the Actual Marketings stated in this marketing report reflect milk that I have produced during the insurance period using facilities that I control.

☐ YES ☐ NO (b) I certify that I control adequate facilities to produce the amount of milk reflected by the Actual Marketings stated in this marketing report.

☐ YES ☐ NO (c) I understand that, in the event of a claim, my coverage will be reduced to the amount of milk sold and no premium will be refunded if the amount of milk sold is less than 75% of the Target Marketings stated in this application.

COPIES OF ALL MARKETING RECEIPTS AND CLAIM STATEMENTS FOR THE APPLICABLE MARKETING PERIOD MUST BE ATTACHED TO THIS MARKETING REPORT.

LIST ALL COVERED MARKETINGS

	County 18	Approved Marketings 19	Deductible ($ per cwt.) 20	21 Actual Marketings By Month (enter month)									
				Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11
Hundredweight of Milk													

Insured's Signature 22 _____ Date 23 _____

Licensed Agent's Signature 24 _____ Agent Code 25 _____

REMARKS: 26

SEE REVERSE SIDE OF FORM FOR COMPLIANCE STATEMENTS AND THE STATEMENT REQUIRED BY THE PRIVACY ACT OF 1974

Marketing Report Form Instructions

1. Policy #. Enter the policy number from the confirmation screen.
2. State. Enter your state.
3. Reinsurance year. Enter the year in which coverage will end.
4. Page # _ of _. Enter the number of the page and the number of pages of the complete application. For example, if four pages were used to complete the application and this is the second page, fill in Page # 2 of 4.
5. Confirmation Number. Enter the confirmation number from the confirmation screen.
6. Insured's Name. Enter the insured's name.
7. Street or Mailing Address. Enter the insured's street or mailing address.
8. City, State, and Zip Code. Enter the insured's city, state, and zip code.
9. Insured's E-Mail Address/Fax. Enter the insured's email address and fax number if available.
10. Phone #. Enter the insured's phone number.
11. Tax Identification. Enter the insured's tax identification code. This may be the same as the insured's social security number, employer tax identification number, or other similar tax identification number.
12. Check one. Check the type of tax identification number used. If other, please write in the type of tax identification used.
13. Spouse's Tax ID #. Enter the insured's spouse's tax identification number. This may be the same as the insured's social security number. This information is used to report any loss payments to the IRS.
14. Type of Entity. Fill in the insured's type of tax entity. For example, corporation, partnership, L.L.C, etc. For an individual, leave blank.
15. Applicant over 18 years of age, check yes or no.
16. Conditions. Check yes or no.
17. Certification. Check yes or no.
18. Enter County dairy cattle are domiciled.
19. Enter the insured's number of approved marketings.
20. Enter the desired deductible amount per hundredweight of milk. The allowable deductible amounts range from $0 per cwt. to $1.50 per cwt. in $0.10 per cwt. increments.
21. Actual Marketings. Enter the actual marketings for each month. Feed rations are held fixed at the target feed levels reported on the Application, Target Marketings, and Change Form. If there are months where the insured did not market milk, enter a zero (0).

22. Insured's Signature.

23. Date. Date of insured's signature.

24. Agent's signature.

25. Agent's Code

26. Remarks. Fill in any information that claims adjusters or insurance companies should be aware of.

The New York State Department of Agriculture and Markets has partnered with USDA Risk Management Agency (RMA) to provide crop insurance education to New York State farmers. For more information, please visit the NYS Crop Insurance Education website at www.agmkt.state.ny.us/AP/CropInsurance.html or contact Sarah Johnston at 518-457-4531 or 800-554-4501. To find a crop insurance agent, please contact your local Farm Service Agency (FSA) office or use the USDA RMA crop insurance agent locator tool on the web at www3.rma.usda.gov/apps/agents/.