Risky Business

Managing Dairy Volatility

A report for

NUFFIELD IRELAND

Farming Scholarships

by Peter Farrell

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Executive Summary

There are now three certainties in the life of an Irish dairy farmer, death, taxes and volatility. Like its two predecessors, volatility cannot be avoided but it can be managed to reduce the effects it can have on farm businesses.

The aim of my research was to investigate the role risk management plays in volatility management and what solutions are currently available in other dairy exporting nations, at farm, industry and government level and then to determine what is best suited for the Irish industry.

The key areas of interest for me were:

1. Understanding risk management and hedging.
2. Cause and effect of volatility along the dairy supply chain.
3. The role of Futures and Options.
4. Co-op solutions and supports, e.g. Forward Contracts.
5. Government Policy.

Findings

1. **Volatility -** here to stay and it benefits no one in the dairy supply chain. A combination of price inelasticity, change in EU policy, increasing US exports and reliance on developing economies have all contributed to this new reality. Long term, volatility will benefit Irish dairy farmers, but only if its acute, short term risks are sufficiently managed.
2. **Responsibility** - As dairy farmers and Cooperatives we championed the removal of milk quotas. Irish Government policy, via Food Harvest 2020, challenged the industry to expand production by 50%. Therefore, we all have a responsibility to be part of the volatility solution.
3. **What is the risk?** - When farmers are considering a risk management strategy, they first need to quantify what the risk actually is. In my opinion the biggest risk volatility creates is the risk to cashflow in the lowest of milk price years. Therefore, the main aim to any farmer risk management strategy should be avoid or mitigate against this cashflow risk. If your dairy business can withstand volatility, implementing such risk management tools may only add unnecessary costs to your business.
4. **Hedging** - is a risk management tool that should be viewed in the same light as an insurance policy. It costs money just like an insurance premium. Hedging itself is a simple concept but trusting and embracing it can be difficult. It is an emotional and

psychological exercise, involving the human capacity to self-doubt and measure performance against the "what if".

5. **Cost** - risk management in whatever form costs money. Therefore, farmers hedging their milk price should only hedge enough milk to survive the lowest of milk price years.
6. **Direct Supports** - Dairying is profitable business and as a result there is little appetite among policy makers and tax payers to support dairy farmers in low milk price years via direct supports. Solutions should come from within the industry and any Government supports should have little or no cost to the tax payer.

Main recommendations

1. **Develop a Resilient Business** – Dairy farmers need to develop resilient, efficient businesses to survive the effects of volatility. It is the first and most effective step in risk management. A return to regulated markets should be resisted at every opportunity.
2. **Know your 'Magic Number'** – Dairy farmers need to know their cash breakeven point. By knowing this they can decide on a risk management strategy, varying from the 'do nothing' approach through to hedging as much inputs and outputs as possible.
3. **Develop and Expand Physical Forward Contracts** - They offer the simplest and cost effective way for farmers to hedge their future milk price. They are hedging and income averaging rolled into one. The use of the Futures market should only be used to manage the risk that physical contracts cannot.
4. **Volatility Cashflow Loan** – A new EU and EIB backed loan scheme similar to the Agriculture Cashflow Support Loan Scheme should be developed and become EU's primary dairy risk management tool. A 'Volatility Loan' fund of €150m would equate to 2-3c/l on Irelands annual production. Drawdown and repayments would be triggered by milk price. Such a fund would be cost neutral to the tax payer.
5. **Taxation Deposit** – A taxation deposit scheme beyond Ireland's current income averaging scheme is urgently required. This would allow farmers to build a rainy day reserve fund in a tax efficient manner. Although this will require a change in State Aid rules, similar schemes in New Zealand and Australia have been shown to be highly effective cashflow management tools.

Table of Contents

Table of Figures

Foreword

I began my dairy farming career in May 2009 when I returned home to farm in partnership with my father, David. Milk price was 21c/l, a ton of fertiliser cost €350 and an 18% dairy nut would set you back €280. It was an early and costly introduction to the world of volatile commodity prices.

Since then we have implemented changes on farm to help combat this volatility. These have included reducing our cost of production, reducing our reliance on bought in concentrate and increasing our milk protein and butterfat constituents to maximise the value of our milk.

However, these measures alone are sometimes not sufficient to combat the effects of price volatility. Like most Irish dairy farms in the post quota environment, we have expanded our dairy business and this expansion can exacerbate the effects of volatility has on our business.

I undertook a Nuffield Scholarship to learn about risk management and how the Irish dairy industry could best manage the volatility in dairy prices that we now experience. I spent 15 weeks in total over the past two years travelling as part of my Nuffield Scholarship, visiting over 10 countries.

As part of my Nuffield research I travelled to Australia, China, Canada, the United States, United Kingdom, the Netherlands and Brussels, Belgium. Some of the highlights of my travels include a visit to the trading floor of the CME in Chicago, learning how Australian dairy farmers cope with volatile weather patterns, getting to understand the Chinese business culture and visiting successful Irish dairy farmers who have emigrated to South Dakota, USA.

I would sincerely like to thank Nuffield Ireland for awarding me the opportunity to undertake a Nuffield Scholarship and especially my sponsor, the Golden Jubilee Trust

Acknowledgments

First of all I would like to thank my girlfriend, Ciara, for your support over the last two years. I no longer have the excuse of having to do 'Nuffield stuff'!

I would also like to thank my family for all their help and support and in particular my father, David and the late Mattie Killion who ran the farm in my lengthy absences. This journey would not have been possible without you.

I would also like to thank my fellow 2016 scholars who I shared this great experience with, especially my Global Focus Program group of John, Emily, Bede, Mitch, Jack, Michael and John Stevenson.

Thanks also to my mentor, John Grogan for your words of advice along the way.

To Nuffield Ireland for affording me the opportunity to undertake a Nuffield Scholarship, especially John Tyrrell and Bill O'Keefe, thank you. I would also sincerely like to thank my sponsor, the Golden Jubilee Trust for their generous support and contribution.

A huge thank you to the people I have met throughout the study; many generous hosts, visitors and interviewees who gave generously of their experience, thinking, time and hospitality.

Finally, I would like to thank those who believed I was a suitable candidate for a Nuffield Scholarship and encouraged me to apply, especially Joe Leonard.

Abbreviations

CAP	Common Agricultural Policy
CME	Chicago Mercantile Exchange
COP	Cost of Production
COSME	Competitiveness of Enterprises and SME's
EEX	European Energy Exchange
EIB	European Investment Bank
FMD	Farm Management Deposit
FMP	Fixed Milk Price
FTA	Free Trade Agreement
GAP	Glanbia Advanced Payment
GMP	Guaranteed Milk Price
ICOS	Irish Cooperative Organisation Society
ISIF	Irish Strategic Investment Fund
MOFC	Margin Over Feed Costs
MPP	Margin Protection Program
SBCI	Strategic Banking Corporation of Ireland
SMP	Skim Milk Powder
USDA	United States Department of Agriculture
UW	University of Wisconsin

Objectives

- To understand volatility and the role of risk management.
- To discover what risk management solutions are available in large dairy exporting nations.
- To investigate the role of futures markets and forward contracts in managing volatility.
- To investigate the effectiveness of current Government policies in dealing with volatility and what new solutions are required.
- To learn how farm businesses successfully manage volatility.
- To determine what risk management solutions are best suited to Irish dairy farmers.
- To quantify the level risk management required by dairy farmers.

Introduction

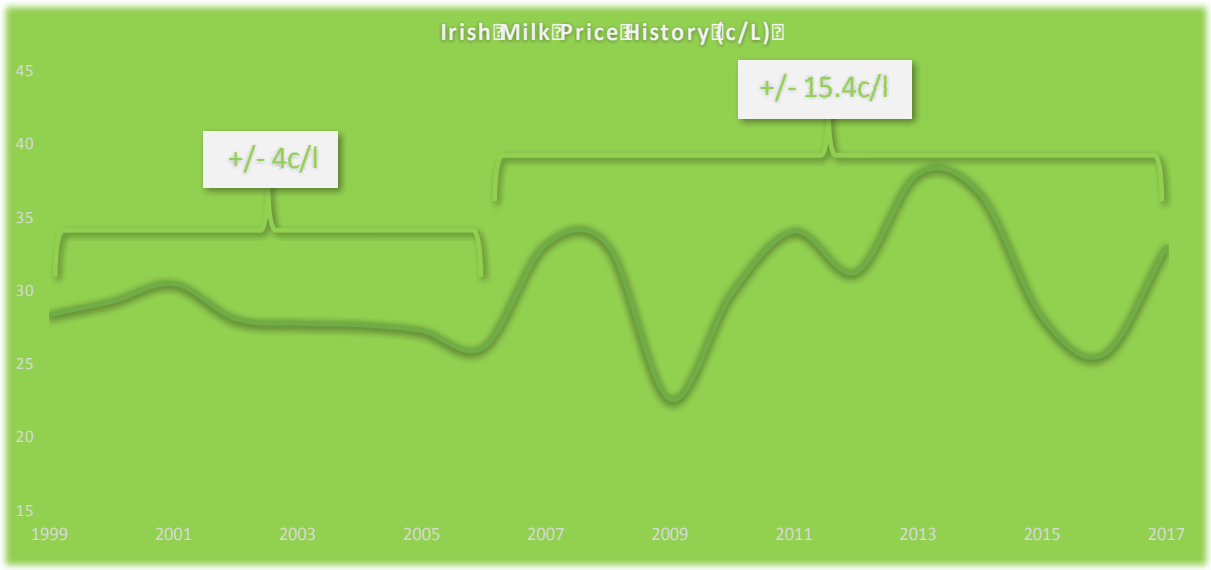
"Dairy farmers are cowboys and they don't even know it…"

Nelson Neale, Land O'Lakes

There are now three certainties in the life of an Irish dairy farmer - death, taxes and volatility. Like its two predecessors, volatility cannot be avoided, but it can be managed to reduce the effects it can have on farm businesses.

Normal volatility itself is not a major problem but extreme volatility is. "Since 2007, with a fundamental change in the EU CAP away from market supports and towards direct payments, greater levels of international trade and increased political turbulence, the prices of dairy commodities have become significantly more volatile – from 50% variations to peak to trough fluctuations of up to 175% in the post 2007 era." (Lascurettes, 2016). This can be clearly seen in Figure 1.

Figure 1. Historic Irish Milk Prices



Source: CSO

Dairy has now become one of the most volatile commodities traded on the world market, ahead of oil (22%) and sugar (26%) (Fonterra, 2015). Ireland's dairy industry export over 90% of its dairy production, worth €3.38bn in 2016 (Bord Bia, 2017), so it is highly exposed to this volatility.

Volatility at farm level

Volatility is not new to Irish dairy farmers. They deal with it every day managing unpredictable weather, changeable grass growth and uncertain input prices. Their seasonal, grass based milk production system has been developed over time to help manage and remove some of the risks associated with these.

However, milk price volatility is relatively new. Dairy farmers are price takers at the bottom of the dairy supply chain. They have little control over the base price they receive for their produce. As a result, they are fully exposed to the volatility shown in Figure 1.

While volatile milk prices will have little effect on the long term profitability, its effect on short term profits and cashflow are huge, especially for highly leveraged and expanding dairy farms. Full exposure to the boom and bust nature of milk prices illustrated above is unsustainable at farm level.

In order to reduce the effect that such extreme volatility has on their business, farmers will require financial risk management solutions to survive and grow into the future.

Where will these solutions come from?

Solutions will have to come from all stakeholders in the dairy industry. It was the Irish Government's policy, Food Harvest 2020[1], who challenged the dairy industry to increase production by 50% by 2020. Therefore, the onus of responsibility is on them to be part of the solution. But any such solution must not come at a cost to the tax payer. It will be politically hard to justify having a national plan to expand dairy production and then look for financial support when prices fall as a result of that plan.

All other stakeholders in the industry, the Co-ops, banks and dairy farmers themselves have a role to play in being part of the volatility solution. All have financially invested in this dairy expansion and the financial sustainability of dairy farms is paramount to their success.

The aim of this report is to investigate what solutions are available in other dairy exporting nations, at farm, industry and government level and determine what is best suited for the Irish industry.

[1] (Department of Agriculture, Food and Marine, 2013)

1. Price Volatility

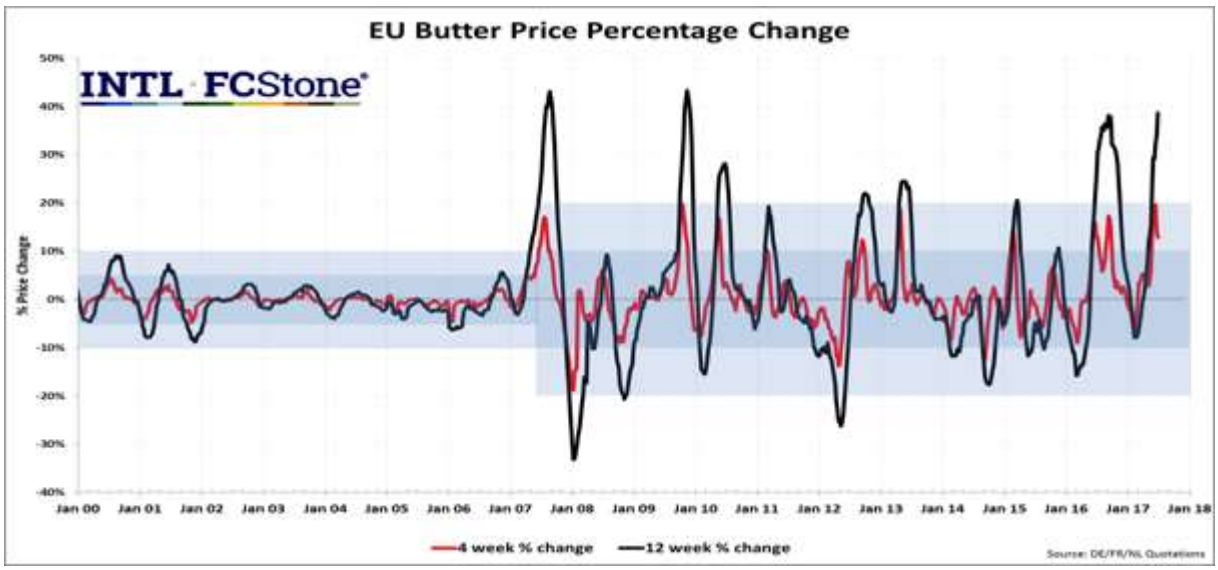
What is Price Volatility

Volatility has now become a buzzword in the Irish dairy industry, associated with increased risk and low farm gate returns. However low prices alone do not constitute volatility. It is the speed and degree of change in prices which constitute volatility[2].

Volatility can be defined as "a measure for variation of price of a financial instrument over time[3]."

The level of volatility now experienced by dairy farmers is illustrated in Figure 2 below, which shows the increase in price variation for EU Butter for the last 18 years.

Figure 2. EU Butter Price Percentage Change



Source: INTL FCStone

[2] (O'Connor, et al., 2015)

[3] (Hull, 2013)

Causes of Dairy Volatility

Inelastic Demand and Supply

Milk and dairy products have an inelastic demand, that is, consumers don't buy less dairy products when prices are high, conversely, they don't buy more when prices are low (Stevenson, 2016).

On the supply side, dairy producers are slow to reduce output due to price signals. Some of this can be explained by the seasonal nature of dairy but it is also down to the capital intensive nature of dairy farming.

"Why are we getting this increase in volatility? Some of this price volatility we see is demand side orientated, but some of it is supply orientated. We have the ability now to make fast, rapid increases in milk production that our grandfathers never did. When we get a big demand stimulation, that's a market signal telling dairy producers we want more product. But once farms make that investment, they hold onto that investment, so it ratchets supply up a notch" (Neales, 2016).

EU policy

Prior to 2007 EU policy had successfully insulated EU dairy producers from the volatile nature of world prices. Milk Quota, Intervention, Private Storage Aid and Export Refunds all aided in stable farm gate milk prices for dairy producers. However, the Luxemburg agreement of 2003 began a fundamental shift in EU policy away from market supports towards direct payment for dairy producers. The ending of the milk quota regime in 2015 was the last step in this process. As a result, EU dairy commodities are now closely aligned to world markets.

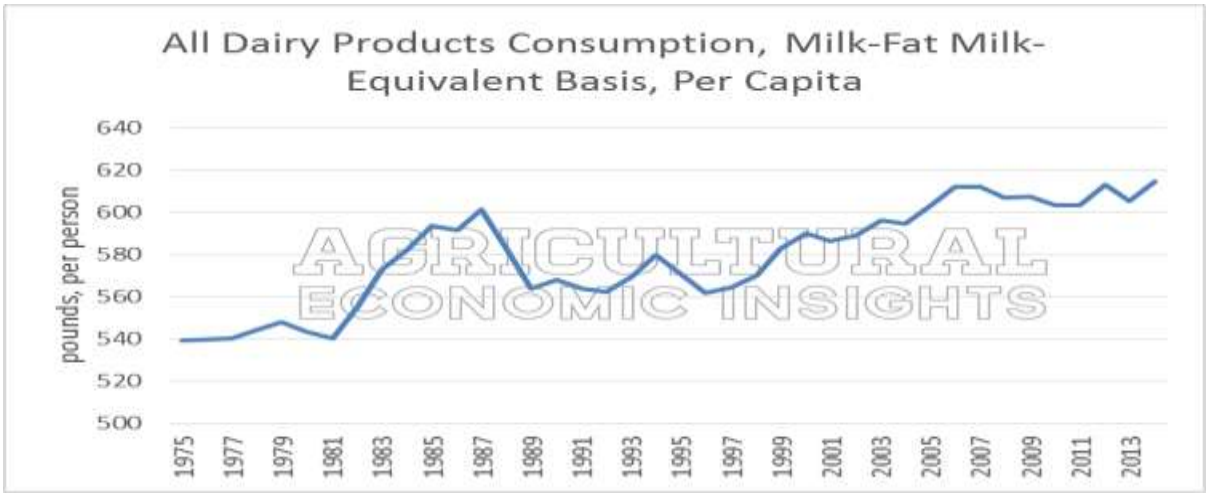
US Dairy Exports

The USA is home to some 9.3 million dairy cows who produce on average 10,000 litres/cow/year. Overall production has increased by approximately 25% over the past 15 years to reach a total of 96bn litres in 2016[4].

However, as you can see from Figure 3, dairy consumption per capita has only increased by 4% in the same time period and has levelled off in recent years.

[4] (USDA Economic Research Service, 2017)

Figure 3. US Dairy Consumption per Capita

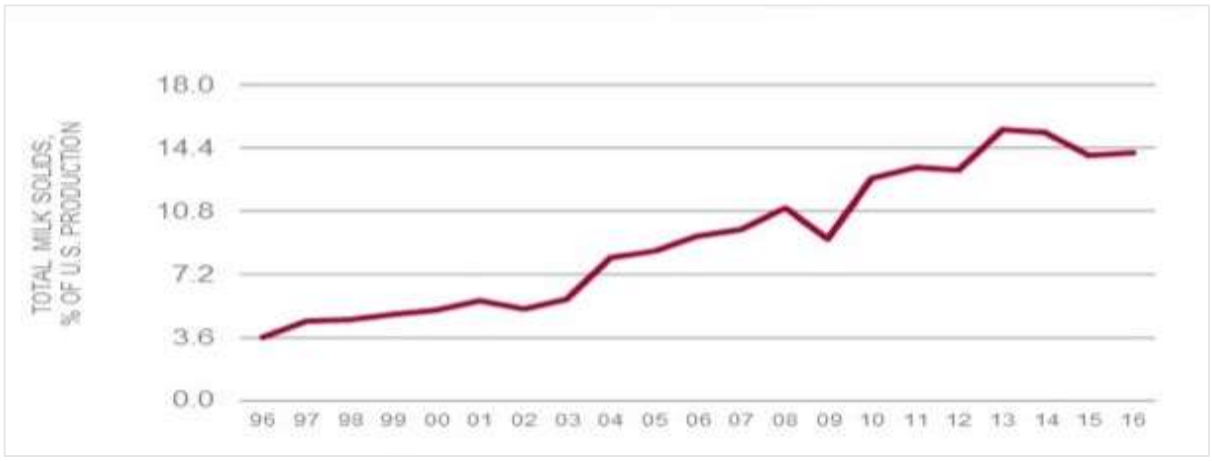


Source: Progressive Dairyman/USDA

Free trade agreements (FTAs) have also contributed to the growth in US dairy exports. US dairy exports to FTA partners grew from $690 million to $2.8 billion in 2015, driven by lower trade barriers and increased U.S. competitiveness[5].

As a result, US exports of dairy products have increased steadily to reach 14.2% of production in 2016 (see Figure 4). This is the equivalent of 13.6bn litres of milk, over twice Ireland's annual production being exported annually.

Figure 4. US Dairy Export Trend – Percentage of Production



Source: USDA

[5] (USDA Foreign Agricultural Service, 2016)

World Markets

As can be seen from Figure 5, volatility in world dairy markets is caused by many factors. While the supply side of the market is mainly weather driven, the demand side has many influencing factors, including Government policy, geopolitical events such as the Russian ban, the pace of global economic growth – particularly in emerging economies, energy prices and currency exchange rates.

Figure 5. EU SMP/Butter Price Volatility

Source: Glanbia Ireland

2. Market Based Solutions

Hedge your bets

"It's tough to make predictions…especially about the future!"

Lawrence P. "Yogi" Berra

What Is Hedging?

Hedging can be defined as a risk management strategy used in limiting or offsetting the risk of adverse price movements of an asset.

The best way to understand hedging is to think of it as insurance. When people decide to hedge, they are insuring themselves against a negative event. This doesn't prevent a negative event from happening, but if it does happen and you're properly hedged, the impact of the event is reduced.

For example, if you buy house insurance, you are hedging yourself against fires, break-ins or other unforeseen disasters.

Cost of Hedging

For dairy producers, the objective of hedging is to reduce or control milk price risk due to extreme volatility. But like house insurance, you pay a premium for this reduced risk.

"Risk management ought to cost you something, you shouldn't expect to do better in the long run" Mark Stevenson, UW.

Research carried out by Blimling & Associates on a US producer group is shown in Figure 6. It shows that over a 15 year period the average milk price of dairy producers who hedged their milk price was $15.04/cwt versus $15.41/cwt for those who did not.

This $0.37/cwt difference equates to a premium that hedged dairy producers pay to reduce their price risk. It represents a 2.5% reduction in milk price for the hedged producer.

For a typical Irish dairy farmer supplying 500,000 litres of milk this would equate to 0.7c/l or €3,544 reduction in milk income before brokerage fees are taken into account.

However, the level of volatility experienced by the hedged producers was almost half that of the unhedged ($7.49 vs $15.49), illustrating the effect hedging has on volatile dairy prices.

Figure 6. Hedged Contract Price vs Unhedged Actual Price

Source: Blimling & Associates 2017

Role of Hedging

Hedging is **not** about beating the market, hedging is about profit stability. *"Beating the market is fool's errand, a successful hedging strategy should allow a dairy producer to predict profit margins, develop reliable business plans and most importantly create certainty"* (Mark Stevenson UW).

In terms of dairy price risk management, the two most common forms of hedging are futures contracts and forward contracts.

Dairy Futures Contracts

Dairy futures contracts are legally binding obligations to buy or sell a specific amount and specific quality (set grade and standard) of a dairy product e.g. milk, butter, SMP, cheese, etc.– at a specific time and place in the future. All Dairy futures contracts are binding obligations that the trader must fulfill before the contract expires.

The purpose of a futures market is to make it possible for those who want to manage price risk (Hedgers) to transfer that risk to those who are willing to accept in (Speculators)[6]

[6] (INTL FCStone, 2015)

Futures contracts can be either physically settled, by making or taking delivery of the physical dairy product, or cash settled upon expiration based on a specific price or index. Traders can also exit their futures contract at any stage by offsetting the initial futures market position by entering an opposite trade at any time prior to the last day of trading.

Although Dairy futures contracts can be offset at any time, most hedgers will offset their positions in the futures market when they either buy or sell the physical dairy product in the cash market. In other words, when the price risk of a physical purchase or sale is removed, they no longer need their futures position.

Dairy producers concerned about declining prices going forward can initially sell Dairy futures to lock in current price levels, thereby eliminating the risk of falling prices over time. On the contrary, dairy product consumers, processors and manufacturers can lock in current price levels and protect against price increases by buying futures[7]

A dairy hedger's cash market (farm gate milk price) position is always opposite to their futures market position (see Figure 7 below). So, if the futures market moves against a hedger's futures position, possibly resulting in a margin call, their cash market position (milk price) should simultaneously be improving, thus resulting in a hedged milk price.

[7] (CME, 2015)

Figure 7 Examples of Producer Hedging via Futures

Hedging - Producer

	Cash	Futures
June 1:	Expanded herd based on average milk price of $15.00 but now expects lower prices	Sell 12-month strip of futures at average price of $14.75
Sep 1:	Average price received = $14.00	Buy (liquidate) futures at average price of $13.75
Profit:	($1.00)	$1.00

Net price received for milk = $14.00 + $1.00 futures profit = $15.00

CME Group

14

Hedging - Producer

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June 1:	Expanded herd based on average milk price of $15.00 but now expects lower prices	Sell 12-month strip of futures at average price of $14.75
Sep 1:	Average price received = $16.00	Buy (liquidate) futures at average price of $15.75
Profit:	$1.00	($1.00)

Net price received for milk = $16.00 - $1.00 futures loss = $15.00

CME Group

15

Source: CME Group

Margin Account

The margin system is a key concept which ensures the financial integrity of each and every futures and option contract. Every buyer and every seller of a futures contract must post and maintain a margin account to ensure their adherence to the terms of the futures contract. A typical margin account requires an initial deposit of 10-15% of the futures contract value. This is established by the Exchange on which the contract is traded.

Once a position is initiated in a futures contract, the margin account will be adjusted daily, based on movements in the futures market. This daily adjustment process, called marked to market, is based on the futures contract's settlement price for that day. The margin account will receive a credit if the futures market moves in favour of the customer's position, or will be debited if the futures market moves against the position.

A ***margin call*** is a request from the commodity broker for the customer to deposit additional funds into their margin account. This occurs when the balance in the margin account falls below a specified maintenance margin level. The amount of the additional margin to be deposited must be enough to return the margin account balance back to the initial margin level. For large losses, deposits may be required by the next morning.

Futures can become capital intensive if the market moves against your position. According to Phil Proud of Blimling and Associates, due to the volatile nature of dairy commodities, a dairy farmer could need up to €0.15 per litre hedged to fund a margin account.

For an Irish dairy farmer typically hedging 25% of his supply that would equate to 3.75c/l over their total milk supply required in working capital to finance a margin account.

In the US farmers typically borrow money from their bank to fund their margin accounts.

Basis Risk

The basis reflects the difference between a producer's cash price (farm gate milk price) and the underlying commodity futures price used to hedge against. The lower the basis is, the more accurate the hedge will be.

Options

An option is the right, but not the obligation, for the purchaser, to buy or sell an underlying asset at a price agreed today at a set date in the future.

There are five key components of an option:

Underlying Asset

The underlying asset of an option is what is delivered if the option is exercised. This could be shares or commodities or a futures contract.

Type

There are two types of options:

- A call option gives the holder (purchaser) of an option, the right but not the obligation, to buy futures at the exercise price.

- A put option gives the holder (purchaser) of an option, the right but not the obligation, to sell futures at the exercise price.

Exercise Price (Strike Price)

This is the price you receive, or pay for the underlying asset, ie futures.

Expiry Date

This is the date at which all unexercised options expire. Each option has a range of different expiry months to choose from. As one month expires a new option with a later expiry date is created.

Premium

Option buyers pay a price for purchasing an option known as the premium.

Options on Dairy futures allow producers and manufacturers to limit their price risks, while allowing them to take advantage of positive price movement.

Futures Markets in Action

USA

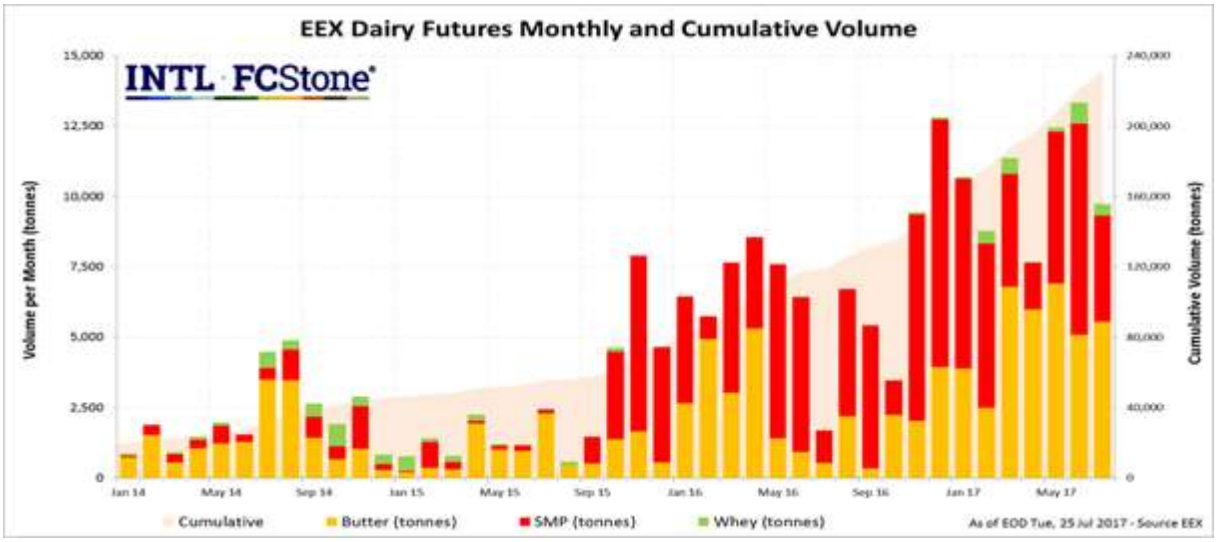
The Chicago Mercantile Exchange (CME) is the home of the US dairy commodity market and is the largest dairy futures market in the world. Dairy futures began trading on the CME in in 1996 and now have a total of 6 listings: Class III milk (milk for cheese), Class IV milk (milk for butter), cheese, butter, dry whey and NFDM (SMP equivalent). All of these contracts are cash settled to the USDA monthly weighted announced price for these products, meaning no physical product ever changes hands. Settlement to USDA prices means futures contract prices align with class prices (Class III and Class IV) and component prices (butter, powder, cheese, whey) which used to calculate farm gate milk price across the US (excluding California and Idaho).

Although the CME dairy futures are well established, there is still a lack of liquidity in the market. On average, approximately 2,000 dairy contracts are traded daily versus 360000 corn contracts.

Europe

The European Energy Exchange (EEX) is the leading futures exchange for dairy products in Europe. Butter, SMP and Whey are traded on the exchange in 5 tonne contracts. The contracts are settled to a price index based on prices from Germany, The Netherlands and France.

Figure 8. EEX Dairy Futures Volume



Source: INTL FCStone

Liquidity is still quite low with, on average, only 63 dairy contracts traded daily in 2016, but as you can see in Figure 8 volume has grown rapidly in the past 24 months, showing a sharp rise in the level of interest in risk management in Europe. While liquidity is growing rapidly, O'Connor et al note that a number of issues still hinder its development, notably the lack of a standardised EU price index to settle to, the diverse nature of dairy products across the EU and price and data reporting from Member States.

New Zealand

The New Zealand Stock Exchange (NZX) runs an increasingly popular dairy futures market, which runs alongside the GlobalDairyTrade (GDT) bi-monthly auction platform.

Launched in 2010, the NZX's Global Dairy Futures and Options market has provided tools for farmers, producers, manufacturers and others to manage the price risk in the global dairy industry.

Whole Milk Powder (WMP), Anhydrous Milk Fat (AMF), SMP and Butter Futures are exchange listed and cash settled to GDT prices.

In May 2016 the NZX launched its NZ Milk Price Futures contract. The contract is cash settled to the Fonterra Farmgate Milk Price and traded in 6000 kilograms of milk solids (kg MS). This allows NZ dairy farmers to directly hedge their milk price.

At the EU Dairy Outlook & Educational Forum held in Dublin in September 2017, it was estimated that only approximately 50-100 NZ dairy farmers actively trade Milk Price Futures and they tend to be large, corporate type dairy operations.

Case Study - Koepke Farms Inc: Using Futures, a farmer's perspective

John Koepke along with his family run Koepke Farms Inc, milking 350 pedigree cows on a 1100ac farm in Oconomowoc, Wisconsin. He is the third generation Koepke to farm here, his grandfather having established the farm in 1936.

As is typical in the US, cows are housed 365 days a year in a freestall barn. They are fed a diet mainly of home grown corn (maize) silage, alfalfa, soya, wheat and some bought in distiller by products. Cows are milked three times a day in a 10 unit double up herringbone parlour, averaging 45 ltrs/cow/day.

John started to hedge his milk price in 1999. At any one moment, he has between 25-75% of his milk hedged on the futures market, "typically we are 50% or greater forward sold, sometimes three months ahead, maybe 15 months on a small portion. It allows us to put forward a budget going forward."

Know what you are doing

John says its vital to understand how futures and options work before jumping in. "It's a good way to lose one's ass if you don't know what you are doing!"

Costs of Production – Know your 'magic number'

He says to quantify your exposure to volatility its vital to know your own costs of production, "when deciding on risk management the most important part is to know your 'magic number'. That's your farm's cash breakeven point per litre of milk. If you know this you know if risk management is necessary."

Reasons for Hedging

"It's not about guessing if the prices are going to higher or lower, it's about making a margin. The most important part is getting the margin in there, if the margin is there then you don't have too much to worry about. There are sometimes your neighbour may make more than you but so what, your still in business, it's a lot easier to sleep at night."

Missing out on the highs

"In 2014 we left money on the table but we still made a lot of money and in 2015 we more than made up for it. In '09 a lot of dairy farmers in America lost a lot of money but we had an ok year, and frankly its maybe better to have money in those times than to capture all the dollars in the high years because in '09 when nobody had any money there was a lot bargains to be had. And if you have the money to pay your bills, people don't forget that."

Forward Contracts

A forward contract is a customized contract between two parties to buy or sell an asset at a specified price on a future date.

As a forward contract is not standardised, it can be customised to any commodity, amount or delivery date. A forward contract settlement can occur on a cash or delivery basis. Forward contracts do not trade on a centralized exchange like the CME and are therefore regarded as over-the-counter (OTC) instruments. While their OTC nature makes it easier to customize terms, the lack of a centralized exchange also gives rise to a higher degree on counterparty default risk.

The benefits of a forward contract over futures contract is that they are more straightforward, there is no margin account and can be smaller, more flexible contract size.

Forward Contracts in Action

USA

Most large dairy processors in the US offer forward contracts to their milk suppliers. Forward contracts offered by processors are either based on the futures market or are physical, 'back to back' customer contracts.

Case Study - Land O'Lakes Co-op, St. Paul, Minnesota

Land O'Lakes is a dairy co-op that was founded in 1921 in St Paul, Minnesota with one simple idea – to join together to effectively market and distribute members' dairy production across the country.

Today they own the number one butter brand in the US, processing 5.9bn litres of milk with dairy revenues of $3.8bn in 2016.

They offer their milk suppliers a variety of forward contracts based on the futures market. Their brochure which is included in the Appendix states the following:

Benefits of Land O'Lakes Programs

- Work with people you know rather than a broker.
- Pay when you settle the contract, not when you make it.
- No margin account. Land O'Lakes handles all margin calls.
- Smaller contracts available.
- Simple and convenient – one fax to lock in your price.

Two Requirements

- You must know your cost to produce milk on your farm to judge if a price offered provides you a profit.
- You must know your basis. The amount of money you receive on your milk cheque above/below the Class III price.

No Margin Account

Steve Watrin, Head of Member Risk Management, states that 10-15% of their milk pool is hedged with their forward contract programs. The big incentive is the lack of a margin account, "members utilise capital in the Co-op they can't physically access to manage a margin account, letting the Co-op utilise their working capital instead of their own."

Simplicity

Another benefit is their simplicity, "dairy men will say 'I just don't have time, I can't operate my dairy and be a risk manager at the same time'. Our forward contracts solve that problem"

Trying to beat the market

The idea of using forward or futures contracts to beat the market was addressed by Nelson Neale, Director of Crop Risk/Insurance. "As a general rule, producers who jump in when its high and jump out when its low end up getting whipped solid and lose on both sides."

Farmers mindset

To manage volatility, farmers need to change the way they think about milk prices. "Farmers' mindset is prices are always going to go up, at the top of the market you would think that you would see a rush to hedge forward and lock in those prices but you don't, they just ride it all the way back down again, and we saw that in 2014"

The 'Do Nothing' approach

"If a dairy man has a big enough balance sheet, it doesn't matter if they hedge, they can stay in the game. But they must know their costs of production. Only then will they know. Doing nothing is a strategy, and it does have consequences and it does have rewards."

Europe

Forward Contracts have been slow to emerge in Europe since the abolition of milk quota's. This is in large part due to the large domestic market in Europe relative to what it exports, therefore experience lower levels of volatility. Ireland however export 90% of what it produces so it is heavily exposed to commodity price swings.

Case Study – Glanbia Ireland: Innovators in Risk Management

Fixed Milk Price (FMP) Scheme

Glanbia Ireland have been to the forefront in Europe for developing forward contracts for its suppliers in the form of Fixed Milk Price (FMP) schemes. Beginning in 2011, they have launched 10 schemes to date.

FMP schemes are based on back to back customer contracts where a price is agreed with a customer for a certain volume of dairy product and then Glanbia offer this back to its suppliers at the equivalent farm gate milk price. Therefore, Glanbia take on no risk with this form of contract.

Margin

A number of these schemes have been 'indexed linked' to farm input costs. This has enabled supplier margins to be maintained in either inflationary or deflationary environments.

Farmer Take-up

The majority of the 10 phases of Glanbia's FMP schemes have been oversubscribed by suppliers.

Currently 60% of suppliers are involved in FMP schemes with, on average, 30% of their milk locked in, equating to 18% of Glanbia's milk pool. At present, there is more demand at farm level for more volume in these schemes than at customer level.

Glanbia Advanced Payment (GAP) Scheme

In 2016 Glanbia launched its €55 million GAP scheme for both dairy and grain. This voluntary scheme allows members to draw down interest free cashflow support when the market prices for milk and grain fall below specific 'price trigger' levels' set annually by the Board of the Co-op. The interest-free repayments to the GAP Scheme will be triggered when markets recover above specific levels.

The main points of the scheme are:

- The GAP Scheme will automatically advance a maximum payment of 2c/l on milk supply in any month where the base Glanbia milk price falls below 24c/l.
- The trigger for interest free 'return' payment to the GAP Scheme will be a GII base manufacturing price above 30c/l. Return payments will be set at a maximum of 2c/L.
- They are no repayments during low supply months of November – February.

Milk Flex Loan Scheme

Glanbia launched their Milk Flex loan scheme in March 2016. Backed by the Ireland Strategic Investment Fund (ISIF) and Rabobank and administered by Finance Ireland, the finance scheme of €100m offers loans of between €25,000 and €300,000 to its dairy suppliers with flexible repayments indexed to milk prices.

The repayments have "flex triggers" built in to adjust the repayments amount throughout the year to match the seasonality of milk supply and also in line with changes in milk price. The interest rate charged on the loans will be 3.75% above the Euribor rate.

Praise

Glanbia have earned praise worldwide in the dairy industry for their innovative solutions to volatile milk prices. Phil Proud of Blimling & Associates says, *"I've been impressed by the work that Glanbia have done in helping its supplier base. Other EU co-ops are now looking to copy those forward contracts".*

Their Milk Flex Loan Scheme was shortlisted for a Copa-Cogeca European Award for Cooperative Innovation in September 2017.

New Zealand/Australia

Fonterra Guaranteed Milk Price (GMP) Scheme

Fonterra, who process approximately 90% and 18% of New Zealand's and Australia's milk respectively launched a Guaranteed Milk Price in the 2013-2014 season. It offered dairy producers the opportunity to bid for a fixed milk price twice yearly.

Although the scheme was often oversubscribed, it was withdrawn in 2015 due to lack of farmer shareholder support and claims that it was against the Co-op principles of milk price equality.

Case Study – 'Magic Number' and Forward Contracts… A Worked Example

Below is a worked example of how to calculate a dairy farm's cash breakeven point in terms of base milk price. Based on this calculation the amount of milk that should be hedged in a Fixed Milk Price (FMP) scheme to breakeven in low milk price years can be accurately calculated.

Figure 9. Calculating your Magic Number

Calculating your 'Magic Number'
(Cash breakeven base milk price)

Assumptions
200 cows
5000lt/cow @ 3.5Pr & 4.2Bf
Capital Bank Repayments €20,000
Single Farm Payment €49,000 (based on national ave)
Total Drawings €50,000
Stock Sales €50,000

	Cash Costs			
	Whole Farm Variable Costs*	160,000		
	Whole Farm Fixed Costs*	140,000		
	Capital Bank Repayments	20,000		
	Cap Ex	0		
	Other Farm Costs	0		
	Drawings	50,000	370,000	
Add Back	Depreciation	21,000		
	SFP	49,000		
	Stock Sales	50,000		
	Other Farm Income	0	120,000	
			250,000	
Divide by	Milk volume sold	1,000,000	25.00	c/l
Calculate base price based on % Pr & Bf				
	3.5Pr & 4.2Bf **		23	c/l
	Magic Number		**23**	**c/l**

* from Teagasc eProfit Monitor Whole Farm Report
** based on prevailing Co-op price for Protein and Butterfat

As can be seen from this example, the magic number for this dairy farm is 23 c/l. With EU Intervention effectively supporting a base milk price of 21 c/l this farm has a potential cash deficit of 2 c/l

To overcome this shortfall, the farmer has a number of options. They can:

A. Reduce their COP by 2c/l

B. Build a reserve fund equal to 2c/l

C. Hedge a percentage of their milk with a Fixed Milk Price scheme

While options A & B offer the most profitable and cost effective way of overcoming this potential cash deficit, they are not always possible. This is where option C is required.

The exact percentage of milk that is required to be hedged can be easily calculated by knowing three key figures: your magic number, the FMP on offer and the lowest possible milk price, in this case the assumed EU Intervention equivalent price of 21c/l.

Figure 10. Calculating Percentage of Milk Supply to Hedge

What % to Fix?

Intervention Price	21	c/l
Magic Number	23	c/l
Shortfall	2	c/l

Calculate % of milk to Fix based on Fixed Price Offer

$$\frac{2c/l}{\text{Fixed Price Offer (31c/l) - Intervention Price (21c/l)}} = 20.00\%$$

Based on this example, the farm in question needs to hedge 20% in the FMP scheme of 31c/l to breakeven at Intervention price levels.

3. Policy Based Solutions

"There will never cease to be ferment in the world unless people are sure of their food." Pearl S. Buck (1892-1973)

Farming is the fabric of rural society and, in many countries of the world, it is the main economic activity. Any sudden and profound changes which impacted on the farm sector could have severe consequences in terms of social and political stability in economically developing countries.

In rural areas throughout the world, agriculture represents the predominant land use and a major component of the viability of rural areas.

In recent years, there has been a marked shift in US and EU Agricultural Policy away from production supports towards greater market orientation. This shift away from market management has increased trade opportunities for farmers but also increased the level of risk they are exposed to.

As a result, Government supported risk management instruments are now required to help farmers combat these new challenges.

USA

The 2014 Farm Bill brought about a major reform of U.S. dairy support policy. It moved away from long established price support systems and export subsidies to a more market driven, voluntary risk management system. This shift in policy saw the introduction of the Milk Protection Program for Dairy Producers (MPP).

MPP

MPP is a voluntary, insurance based risk management program for dairy farmers based on margin over feed cost (MOFC). It allows farmers to insure against low margins by offering financial protection when the national average margin between the US all-milk price and the average feed cost falls below a certain level. This level is selected in advance by the dairy producers and should the margin fall below the coverage level selected by a producer for two consecutive months, the producer is eligible to receive payments.

Enrollment in the program costs $100 per year, which provides automatic margin protection at the lowest MOFC level of $4.00/cwt. Available coverage levels range from $4.00 to $8.00 per

cwt. Premium costs per cwt increase as farmers choose higher coverage levels (see Figure 11).

Figure 11. MPP Premium levels

Margin premiums by coverage level and pounds covered

Coverage level (margin) per cwt	Tier 1 premium for 2014 and 2015	Tier 1 premium for 2016-18	Tier 2 premium for 2014-18
	Covered production history less than 4 million pounds with 25 percent reduction	Covered production history less than 4 million pounds	Covered production history greater than 4 million pounds
$4.00	None	None	None
$4.50	$0.008	$0.010	$0.020
$5.00	$0.019	$0.025	$0.040
$5.50	$0.030	$0.040	$0.100
$6.00	$0.041	$0.055	$0.155
$6.50	$0.068	$0.090	$0.290
$7.00	$0.163	$0.217	$0.830
$7.50	$0.225	$0.300	$1.060
$8.00	$0.475	$0.475	$1.360

Note: cwt = hundredweight.
Source: USDA, Economic Research Service, Farm Service Agency, 2014, Margin Protection Program for Dairy (MPP-Dairy) Fact Sheet, revised October 2014.

Source: USDA ERS

Premiums increase if more than 4 million pounds of milk production (equivalent to a herd of approx. 185 cows) is enrolled in the program. This is known as Tier 1 & 2. Payment levels are not tied to milk production in the current year but between 25-90% of historical production, thereby reducing the incentive to increase production to maximize payments. Once dairy farmers have signed up, they remain in the program at the minimum coverage level of $4/cwt, with an annual option to “buy up” to a higher level of coverage, for the duration of the program through to 2018.

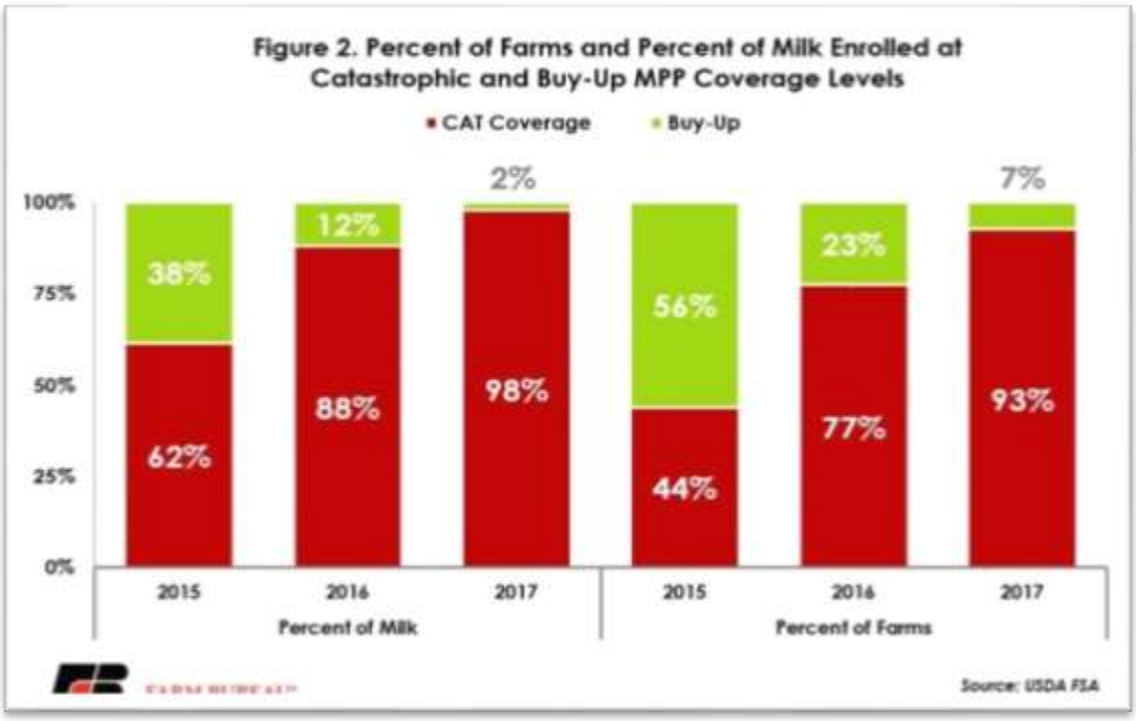
MPP-Dairy is less likely to distort the U.S. dairy market compared to previous policy instruments. It does not provide price support and there is little incentive to produce more milk to increase payments. The coverage is based on historical production and the program is voluntary. The shift to market-based policy tools helps dairy farmers manage risk while avoiding the types of market distortions that price supports and export subsidies create[8].

[8] (USDA Economic Research Service, 2016)

Farmer Uptake

Almost 25,000 farms representing 80% of total US production enrolled in the program in 2015. As can be seen from Figure 12, 44% of farms chose the basic $4.00 'catastrophic' level with 56% of enrolees choosing to pay a premium for a higher level of coverage. However, in 2017 only 7% of enrolees chose to pay a premium. This reflects both the improving market conditions but also farmer dissatisfaction with the program.

Figure 12. Breakdown of MPP sign up



Source: Farm Bureau

Farmer Dissatisfaction

Speaking about this fall off, Mark Stephenson said that *"farmers have yet to change their mindset from subsidy to risk management. Everyone wants to talk about risk management when prices are low but prices and margins have improved in the last few years so farmers say 'hey, why bother'. That's a dangerous game as it's hard to get on the right side of them rhythm. MPP is a meant to protect farms against catastrophic years, not be a subsidy."*

Cost of MPP

Figure 13 shows the premium that three different size dairy farms would pay for different levels of coverage.

Figure 13. MPP Premiums

Dairy Size		100 Head	500 Head	1,000 Head
Milk Production History (pounds)		1,967,397	11,304,071	24,641,052
90 Percent Covered (pounds)		1,770,657	10,173,664	22,176,947
Margin Protection Coverage	$4.00	No cost	No cost	No cost
	$4.50	$177	$1,635	$4,035
	$5.00	$443	$3,469	$8,271
	$5.50	$708	$7,774	$19,777
	$6.00	$974	$11,769	$30,374
	$6.50	$1,594	$21,504	$56,313
	$7.00	$3,842	$59,921	$159,549
	$7.50	$5,312	$77,441	$204,676
	$8.00	$8,411	$102,962	$266,206

Source: NMPF

Take the 100 head farm as a comparable example for Irish dairy farms. This farm has an output of 894,000 litres. To have full $8.00 coverage on 90% of its milk will cost $8,411 or €7152 in premiums, which is the equivalent to 0.9c/litre in Irish terms.

EU

The European Commission via the Common Agricultural Policy (CAP) has a number tools at its disposal to aid its members with dairy volatility.

Intervention

One of these market tools is the buying-in of butter and skimmed milk powder (SMP) into public storage – known as "intervention". The aim of intervention is to provide a crisis safety net to EU dairy farmers.

The Commission can offer to take a maximum quantity of 109,000 t SMP and 50,000 t butter complying with specific quality requirements from private operators. Once these volumes are reached, intervention continues by tender until the end of the intervention period which can be extended under exceptional circumstances.

Since the introduction of the Russian import ban in 2014 the public intervention scheme has been extended four times to reach 350,000t of SMP and 100,000t of butter[9].

The Intervention price of €1698/ton for SMP and €2217.50/ton for Butter effectively equate to a safety net base price of 21c/l.

When market conditions so allow, butter and SMP are sold back on the market via a Commission Regulation.

Storage Aid - PSA

Another market tool is the granting of support for the private storage of butter, SMP and cheese. This aid helps processors by taking products temporarily off the market, but differs to public intervention, as the goods remain under the ownership of private operator. The aid available comprises a fixed rate per tonne, plus a set daily amount per tonne.

Figure 14 shows the level of SMP in Intervention and PSA stocks up to the end of May 2017.

Comment

While both these measures assist in putting a floor on domestic prices, many in the industry argue their long term effectiveness as its encourages continued production despite market signals and these stocks are likely to slow down natural market recovery as they overhang the market.

Figure 14. EU SMP Intervention and PSA Stocks

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	2017
PUBLIC STOCK													
Begin of month	351 028	350 159	350 158	350 158	352 394								**351 028**
In	0	0	0	2 237	5 102								**7 339**
Out	869	1	0	0	0								**870**
End of month	350 159	350 158	350 158	352 394	357 496								**357 496**
PRIVATE STOCK													
Begin of month	65 956	62 120	67 892	58 454	51 022								**65 956**
In	7 754	16 851	0	0	0								**24 606**
Out	11 590	11 080	9 438	7 432	13 403								**52 943**
End of month	62 120	67 892	58 454	51 022	37 618								**37 618**
TOTAL STOCK													
End of month	**412 279**	**418 050**	**408 612**	**403 416**	**395 115**								**395 115**

Source: MMO

[9] (European Commission, 2017)

Milk Reduction Scheme 2016

The Commission also has at its disposal a number of 'Exceptional Measures'. One of these was the recently implemented Milk Reduction Scheme.

Aid was made available to milk producers in the EU who voluntarily reduced milk production for a 3 month period. Producers could receive aid of 14c/l for every litre reduced up to a maximum 50% reduction in milk deliveries.

The total EU budget for this scheme was €150 million[10].

Single Farm Payment (SFP)

The main instrument in the CAP to stabilise farm income is direct payments. European Union farmers receive direct payments in the form of the Single Farm Payment, on the condition that they respect strict rules on human and animal health and welfare, plant health and the environment. The amount of support they receive is not linked to the quantities they produce, and is designed to provide EU farmers with a safety net against volatile market prices.

Direct payments account for 72% of the CAP budget and 27% of the overall EU budget amounting to €41bn per annum.

SFP on Irish Dairy Farms

According to the 2016 Teagasc National Farm Survey the average dairy farm produced 382,752 litres of milk while the average direct payment paid to Irish dairy farmers was €19,735.

Based on this data, the average direct payments to Irish dairy farms was the equivalent of 4.9c/l, which in 2016 accounted for 38% of total farm income.

Agri Cashflow Support Loan Scheme

In 2016, the Irish Department of Agriculture (DAFM) launched the "Agriculture Cashflow Support Loan Scheme." It was in recognition of the reduced cashflow for farmers due to lower commodity prices and the sterling exchange rate. It made €150 million available to farmers at interest rates of 2.95%.

[10] (European Commission, 2016)

Developed in co-operation with the Strategic Banking Corporation of Ireland (SBCI) and administered by the main three 'Pillar' banks. It was innovative scheme developed by DAFM that moved away from a straightforward direct payment towards a support based scheme.

DAFM's contribution of €25 million included €11 million from the EU's 'exceptional adjustment aid for milk and other livestock farmers' and €14 million in national funding, which is the maximum allowed under State Aid rules.

SBCI used the €25 million of funding provided by DAFM to leverage the total amount of €150 million and, along with the European Investment Fund's 'COSME' (the EU programme for the Competitiveness of Enterprises and SMEs), provided the guarantee which was required to underpin the loan's flexibility and lower the cost of the loans (DAFM, 2017).

4. Agri Taxation Based Solutions

Taxation can have a large impact on the business and personal lives of most dairy farms. Due to the uncertain and volatile nature of farm incomes, agricultural taxation reliefs are required to assist farm businesses.

US

Cash Accounting

Primary US agricultural businesses are allowed used cash-basis accounting for tax purposes. It allows them to accelerate expenses and defer income.

This allows them balance out price volatility and help manage their operations consistent with their cash flow.

“In 2014 there massive profit for dairy farmers, pre-buying feed and fertiliser really helped reduce those taxes” Mark Stephenson, UW.

Carry Losses

US taxation rules allows farmers who make a Net Operating Loss (NOL) in a year to carry over that loss and deduct it against future profits for up to 20 years or until it is used up.

New Zealand

Income Equalisation Scheme

The income equalization scheme allows taxpayers to deposit income from farming, fishing or forestry with Inland Revenue. The money is paid into a special account and earns interest at 3% per annum on amounts left on deposit. The deposit is held for a maximum period of five years. Deposits are tax deductible in the year for which they are made and are taxable in the year they are brought back into the business.

This allows farmers to average out their taxable income over a number of years and is an effective tool against volatile prices. It also includes discretionary relief for any significant extreme or adverse events.

Australia

Australian Farm Management Deposit Scheme

Similar to New Zealand, Australian farmers have access to a tax deference scheme. The farm management deposits (FMD) scheme is a risk-management tool to help primary producers deal with uneven cash flows. The FMD scheme allows primary producers to set aside pre-tax income from primary production in years of good cash flow to draw on in years of lesser cash flow. Tax is then paid on the money withdrawn.

Up to $800,000 can be held in deposits at any one time. As of June 2017 there were 54,383 primary producer FMD accounts with just over $6bn on deposit[11].

Ireland

Income Averaging

Ireland currently has a five year income averaging scheme. It allows farmers to pay tax on the average of the aggregate farming profits over a five year period. Any losses made these years are also included in the aggregate.

There is also a 'Step Out' option which allows a farmer to opt out of income averaging in a very poor income year. They would only pay tax due on that current year and the deffered tax liability would then be paid over the subsequent four year period. This 'Step Out' option can only be used once every 5 years.

Comment

ICOS argue that the current income averaging scheme is not effective against dairy volatility. "In reality, income averaging is tax averaging. Income averaging as currently conceived derives a benefit by ensuring that participating farmers aren't forced into paying excessively high rates of tax in any one year. The tax benefits will arise where profits are increasing. However, these benefits will be clawed back when profits are falling. Therefore, there is a fundamental weakness in income averaging as a volatility tool." (ICOS, 2016)

Current EU State Aid rules prohibit a taxation deposit scheme similar to that of Australia and New Zealand.

[11] (Australian Department of Agriculure, 2017)

5. Farm Based Solutions

Managing risk caused by price volatility starts at farm level. Farmers deal with risk every day managing unpredictable weather, changeable grass growth and uncertain input prices. Numerous systems and strategies have been developed to help combat the effects of these risks. There are also a variety of strategies available to them to help manage price volatility.

Teagasc – resilient systems

Brendan Horan of Teagasc states that resilience denotes the capacity of a system to absorb shocks and thrive in a changing and uncertain production environment. Such shocks may originate in the form of weather events, disease outbreaks, low milk prices, etc. How the farm business is structured will determine the capability of the business to respond to these events[12].

He states that *"fundamentally, resilient systems must have a low cost base production system to insulate the dairy farm business from price shocks."*

For Ireland's grass based dairy farms the key farm management practices of focus are

- Increasing production efficiency
- Creating a cash reserve
- Fixing milk price
- Appropriate debt levels

Rainy day fund – Creating a cash reserve

"One solution that has been talked about but isn't as sexy as other risk management solutions is a farm savings account" Mark Stephenson, UW

A key strategy to manage price volatility involves creating a cash reserve when prices are high. This places responsilbity for risk management in the farmer's hands.

[12] (Teagasc, 2017)

However, while this strategy is possible at farm level, it currently has large tax implications in Ireland due to the lack of tax efficient schemes like the USA, New Zealand and Australia mentioned above. Currently such a scheme would contravene EU State Aid rules.

Case Study – Living with Volatility

Rodney and Dorothy Elliot – Living the American Dream

Farm Facts

- 4500 cows
- 50 employees
- 50m litres/yr
- COP 30.5c/l
- Milk Price 36.8c/l

In 2006 Rodney Elliot and his wife Dorothy sold their 180ac Fermanagh dairy farm and moved to South Dakota, USA to begin a new adventure.

Starting with a 300ac greenfield site and 1400 cows, they now milk 4500 cow through two parlours, producing nearly 1 million litres of milk per week while employing 50 staff.

Dealing with Volatile Prices

"The price collapse in 2009 was a stressful time considering how young the dairy was. A big lesson we took from that experience was the how to work with our lenders on controlling our operating costs and implementing reserve funds for when the markets turn against us. Having a strong balance sheet and, as a result of that, available working capital has allowed us to expand and grow during these market swings. Having all accounts paid up to date and strong reserves of feed along with a strong inventory of equipment and facilities that have very little depreciation. This allows a strong balance sheet to be represented so if there is a market crash you are in good stead".

Taking advantage of high prices

"Maintaining a strong relationship with vendors and contractors allows for rapid development when the market turns around. Having a plan that is not dictated by market cycles but rather having a series of plans for all eventualities is the best practice". In 2014 we probably made

the equivalent of 10 year's profit in one year, and it allowed us to build the 2,300 cow extension that cost $4.5m out of cashflow."

Controlling the controllable

“We cannot control the milk price as our operation has minimal impact on any market. Additionally, feed prices are largely based on corn and soybeans. The areas such as waste production, pregnancy rate and operational cost. These areas if successful can make us profitable due do the efficiency’s we have in money saved. In my opinion volatility is part of the business and risk is what you are comfortable with. You can control the prices you pay to the penny or you can let the markets run their course. One thing we have done over the years is the times we have strong balance sheets we have maximized our lending potential so at the other side of the cycle we have already negotiated the terms we need to survive. In our opinion the markets will change and it is important to keep focused on what is the most profitable way to convert feed into fat and protein the in most efficient manner, how you do that is dictated by the market”.

Conclusions

1. Volatility is here to stay for Irish dairy farmers. A combination of price inelasticity, change in EU policy, increasing US exports and reliance on developing economies have all contributed to this new reality.
2. The first step in risk management for Irish dairy farmers starts at farm level. Developing a highly efficient, resilient dairy business will be the most effective step in managing milk price volatility.
3. By knowing their cash breakeven cost of production, farmers can quantify what risk management solutions they require. As John Koepke says, they must know their 'magic number'.
4. Hedging is a risk management tool that should be viewed in the same light as an insurance policy. It costs money just like an insurance premium. If your dairy business can withstand volatility, implementing risk management tools may only add unnecessary costs to your business. Therefore, farmers should only hedge enough milk to survive the low milk price years.
5. The EEX European Futures market is developing rapidly despite significant barriers still existing. However, I do not believe they have a role to play at farm level in Ireland. The scale, time and finance required to manage a Futures account is beyond that of most Irish dairy farmers.
6. Physical Forward contracts are the most effective tool for reducing risk along the dairy supply chain. For a dairy producer, they are risk management and income averaging rolled into one.
7. EU Intervention and PSA have in the past been effective safety net measures that put a floor price on the most volatile dairy commodities in the short term but slows market recovery in the long term. Recently however, with SMP being bought into Intervention while dairy prices are relatively high, the current model needs to be adjusted
8. The CAP currently plays a huge role in supporting income at farm level. With the next CAP budget already under political pressure, new innovative non-subsidy supports will be required by farmers.

Recommendations

1. **Resilient Business** – Dairy farmers need to develop resilient, efficient businesses as a first step to survive the effects of volatility.
2. **Magic Number** - Farmers need to determine their cash breakeven point. By knowing this they can decide on a risk management strategy, varying from 'do nothing' approach through to hedging as much inputs and outputs as possible.
3. **Develop and Expand Physical Contracts** - Co-ops need to develop more fixed milk price contracts with customers to meet farmer demand, preferably indexed linked to inputs The use of the Futures market should only be used to manage the risk that physical contracts cannot.
4. **Co-op support** – This should be done in a clear and transparent manner. Co-op supports play a vital role in supporting their suppliers in times of low milk price. A transparent scheme similar to the Glanbia GAP scheme should be developed by all Co-ops. Such schemes could be used to develop mutual funds in the future.
5. **EU support** - With the likely decrease in CAP budgets in the future, the EU Commission need to develop innovative non-subsidy based support schemes for dairy farmers. Implementation at member state level will require flexibility due to the diverse range of dairy production systems in the EU.
6. **Volatility Loan** – A new Government supported loan scheme similar to the Agriculture Cashflow Support Loan Scheme should be developed. A 'Volatility Loan' fund of €150m would equate to 2-3c/l on Irelands annual production. Its drawdown and repayment would be triggered by milk price. Such a fund would be cost neutral to the tax payer.
7. **Taxation Deposit** – A taxation deposit scheme beyond Ireland's current income averaging scheme is urgently required. This would allow farmers to build a 'rainy day' fund in a tax efficient manner. Although this will require a change in State Aid rules, similar schemes in New Zealand and Australia have been shown to be highly effective cashflow management tools.
8. **Education** - Farmers need to educate themselves in the area of risk management. Understanding and identifying risk is a prerequisite to managing it. Teagasc, ICOS and Co-ops have a key role to play in this area.

References

Australian Department of Agriculure, 2017. *Farm Management Deposit Scheme.* [Online]
Available at: http://www.agriculture.gov.au/SiteCollectionDocuments/agriculture-food/drought/assistance/fmd/fmdstats-sep2017.pdf
[Accessed June 2017].

Bord Bia, 2017. *www.bordbia.ie.* [Online]
Available at: http://www.bordbia.ie/industry/buyers/industryinfo/agri/pages/default.aspx

CME, 2015. *Introduction to Dairy Futures and Options,* Chicago: CME.

Commission, E., 2016. *Direct Agricultural Supports.* [Online]
Available at: https://ec.europa.eu/agriculture/direct-support/direct-payments_en

DAFM, 2013. *Food Harvest 2020,* Dublin: s.n.

DAFM, 2017. *Annual Outlook and Review,* Dublin: DAFM.

Department of Agriculture, Food and Marine, 2013. *Food Harvest 2020,* Dublin: s.n.

European Commission, 2016. *Commission Delegated Regulation (EU) 2016/1612 of 8 September 2016 providing aid for milk production reduction,* Luxemburg: European Commission.

European Commission, 2017. *ec.europa.eu.* [Online]
Available at: https://ec.europa.eu/agriculture/sites/agriculture/files/milk/policy-instruments/crisis-measures-pi_en.pdf
[Accessed 15 September 2017].

Fonterra, 2015. *Guaranteed Milk Price,* Auckland: Fonterra.

Hull, J. C., 2013. *Fundamentals of Futures and Options Markets.* 8th Edition ed. Toronto: Pearson.

ICOS, 2016. *5-5-5 Income Stability Tool,* Dublin: ICOS.

INTL FCStone, 2016. *Intro to Hedging,* Chicago: INTL FCStone.

Lascurettes, C., 2016. *IFA Dairy Executive* [Interview] (15 July 2016).

Neales, N., 2016. *Land O'Lakes* [Interview] (25 September 2016).

O'Connor, D., Bergmann, D. & Keane, M., 2015. *The challenges posed by price volatility in the dairy sector..* Prague, s.n.

Proud, P., 2016. *Blimling and Associates* [Interview] (15 September 2016).

Stevenson, M., 2016. *University of Wisconsin* [Interview] (2016 September 2016).

Teagasc, 2016. *National Farm Survey,* s.l.: Teagasc.

Teagasc, 2017. *Irish Dairying – Resilient Technologies,* s.l.: Teagasc.

USDA Economic Research Service, 2016. *The Effects of the Margin Protection Program for Dairy Producers,* s.l.: USDA ERS.

USDA Economic Research Service, 2017. *USDA Economic Research Service.* [Online] Available at: https://www.ers.usda.gov/topics/animal-products/dairy/ [Accessed 15 June 2017].

USDA Foreign Agricultural Service, 2016. *International Agricultural Trade Report,* 2016: USDA.

Appendix

Australian Farm Management Deposit Scheme Statistics

Australian Government
Department of Agriculture and Water Resources

FARM MANAGEMENT DEPOSITS SCHEME STATISTICS – SEPTEMBER 2017

INDUSTRY DESCRIPTION	NSW		VIC		QLD		SA		WA		TAS		ACT & NT		NATIONAL TOTALS	
	No. of FMD accounts	Value of deposits ($'000)	No. of FMD accounts	Value of deposits ($'000)	No. of FMD accounts	Value of deposits ($'000)	No. of FMD accounts	Value of deposits ($'000)	No. of FMD accounts	Value of deposits ($'000)	No. of FMD accounts	Value of deposits ($'000)	No. of FMD accounts	Value of deposits ($'000)	No. of FMD accounts	Value of deposits ($'000)
HORTICULTURE	1,031	115,091	1,099	131,221	1,135	164,062	974	98,177	371	50,638	119	13,572	13	1,430	4,742	574,191
SUGAR	113	6,975	*	*	1,498	136,705	0	0	0	0	0	0	0	0	1,611	143,680
CROPS	789	79,801	383	27,195	732	89,699	369	30,537	86	8,680	59	3,126	6	235	2,424	239,273
GRAIN	2,048	251,202	1,474	136,213	935	136,803	2,548	311,707	1,665	260,058	14	852	**	**	8,684	1,096,835
GRAIN-SHEEP/BEEF	3,627	374,951	2,342	211,128	1,121	126,700	2,553	272,059	1,990	266,044	87	7,423	11	2,085	11,731	1,260,390
BEEF	2,353	188,208	1,654	120,430	3,299	415,852	350	37,630	414	48,309	224	18,416	30	6,039	8,324	834,884
SHEEP-BEEF	1,668	134,970	989	74,219	509	50,370	590	53,820	192	17,694	105	6,169	8	350	4,061	337,592
SHEEP	1,452	127,099	1,056	76,862	124	10,845	563	44,011	304	27,553	91	8,672	8	708	3,598	295,750
PIG	31	3,273	29	4,587	51	4,337	40	3,946	10	620	8	858	0	0	169	17,621
INTENSIVE LIVESTOCK	571	48,450	294	24,514	334	30,649	157	12,972	83	6,406	31	1,274	**	**	1,470	124,265
DAIRY	357	32,419	1,906	166,535	289	22,615	154	14,907	102	10,379	122	9,923	0	0	2,930	256,778
FORESTRY & FISHING	201	13,689	165	12,415	180	14,514	184	21,330	172	24,436	53	3,111	**	**	955	89,495
OTHER	16	867	11	720	***	***	5	245	***	***	***	***	0	0	32	1,832
#STATE/TERRITORY TOTAL	**14,257**	**1,376,995**	**11,402**	**986,039**	**10,207**	**1,203,151**	**8,487**	**901,341**	**5,389**	**720,817**	**913**	**73,396**	**76**	**10,847**	**50,731**	**5,272,586**

#Note: The total number of accounts does not indicate the number of primary producers participating in the FMD Scheme as a primary producer may hold multiple FMD accounts.

* *Victorian sugar industry FMD accounts and holdings have been aggregated with the respective New South Wales FMD accounts and holdings for privacy reasons.*

** *Northern Territory and Australian Capital Territory grain, intensive livestock and forestry & fishing industries FMD accounts and holdings have been aggregated with the respective New South Wales FMD accounts and holdings for privacy reasons.*

*** *Queensland, Western Australian and Tasmanian other industry FMD accounts and holdings have been aggregated with the respective Victorian FMD accounts and holdings for privacy reasons.*

These monthly FMD statistics are derived from data provided by Authorised Deposit-taking Institutions (ADIs) (such as banks and credit unions). These statistics may, due to the complex nature of FMDs, include a level of discrepancy, leading to a minor overstatement or understatement of the actual holdings eligible for the FMD taxation concessions. The Australian Government, acting through the Department of Agriculture and Water Resources, has exercised due care in compiling this information. Notwithstanding, the department, its employees and advisers disclaim all liability, including liability for negligence, for any loss, damage, injury, expense or cost incurred by any person as a result of accessing, using or relying upon any of the information or data on FMDs to the maximum extent permitted by law.

NZX Milk Futures Contract Specifications

Milk Price Futures - Individual Contract Specification		
Unit of Trading	6,000 kilograms of milk solids (kg MS)	
Price Basis	NZD / kg MS	
Minimum Price Movement (Tick Size and Value)	0.01 NZD per kg MS (NZD 60)	
Daily Price Limits by Contract	Contract 1 in the current Expiry Calendar: 10% above or below the previous Trading Day's Daily Settlement Price. Contracts 2-3 in the current Expiry Calendar: 15% above or below the previous Trading Day's Daily Settlement Price. Contracts 4-5 in the current Expiry Calendar: 20% above or below the previous Trading Day's Daily Settlement Price. Price Limits only apply to a Contract once a Trade has been executed in that contract on the Market. Price Limits do not apply for 5 Trading Days preceding and including the Last Trading Day.	
Contract Months	Every September such that up to 5 calendar years are available for Trading.	
Trading Hours	As determined from time to time by NZX by notice to the Market in accordance with the NZX Derivatives Market Rules and Procedures.	
Last Trading Day	Trading shall terminate at the Close of Trading on the second Thursday of September each calendar year, or such other time as specified by NZX in accordance with the Contract Terms and Administrative Procedures for Derivatives Market Contract No 8 ("**Contract T&Ps**"). The Last Trading Day is the day specified in the Expiry Calendar for NZX Derivatives Market Contract No 8, or such other day specified by NZX in accordance with the Contract T&Ps.	
Final Settlement	Cash settled to the Final Settlement Price determined by NZX by reference to the relevant Farmgate Milk Price, in accordance with the Contract T&Ps.	
Clearing House	New Zealand Clearing Limited	
Common Trading Facilities	Block Trading Facility	√
	Exchange for Physicals Facility	√
	Exchange for Swaps Facility	√
Common Trading Facilities Minimum	Minimum Volume Thresholds for each Contract or Class of Contracts are specified in Part C, Appendix One of the Procedures.	

EEX Dairy Futures Contract Specifications

Market price indices as the price base in the dairy market

During index calculation, recognised prices established in Germany, France and the Netherlands are used and consolidated into an unweighted average. Historically, the correlation between these price quotations has been higher than 90 percent. As a result, these indices reflect the market price for the use of this food type within the European economic area.

Futures positions which are still open after the last day of trading are settled in cash against the final settlement price – which corresponds to the respective market price index. The European Whey Powder Index is calculated by Agrarmarkt Informations-Gesellschaft mbH (AMI) in Bonn. It reflects the current market situation for whey powder, in bulk, ex-works, exclusive of value-added tax and other levies in the respective countries. The European Whey Powder Index constitutes the average of these quotations.

Germany	France	Netherlands
33.3 %	33.3 %	33.3 %

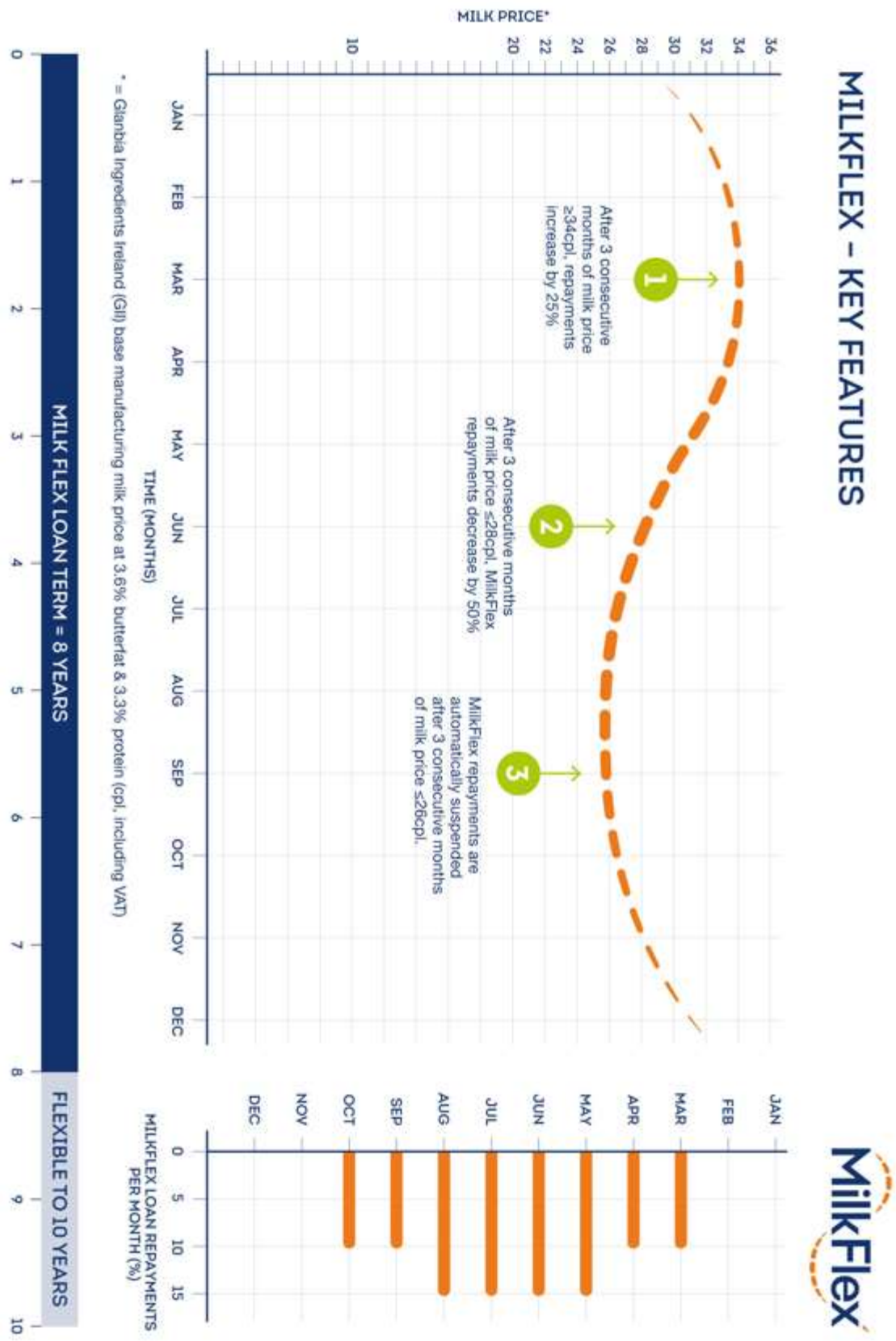
Market price index (Butter Index, Skimmed Milk Powder Index, European Whey Powder Index)

Contract specifications

	Butter Future	Skimmed Milk Powder Future	European Whey Powder Futures
Product ID	FABT	FASM	FAWH
Product ISIN	DE000A13RUP8	DE000A13RUM5	DE000A13RUN3
Underlying	Butter Index	Skimmed Milk Powder Index	European Whey Powder Index
Contract volume/quotation	5 metric tonnes /EUR per metric tonne		
Pricing and minimum price change	Pricing in EUR per tonne, minimum price change of 1 EUR per tonne		
Due dates	At EEX, at a maximum, the following maturities can be traded: the maturities of the current and of the next 18 consecutive calendar months.		
Trading hours	Continuous trading, 8:45 to 18:00 CET; last day of trading until 12:00 CET		
Last day of trading	– The last Wednesday of the respective maturity month (If this is not a trading day, the preceding exchange trading day shall be the last trading day.) – The third Wednesday of the month in the maturity month of December (If this is not a trading day, the following exchange trading day shall be the last trading day.)		
Settlement	Cash settlement, difference between the final settlement price and the settlement price of the previous exchange trading day		
Final settlement price	Status of the respective index at 19:00 CET on the last day of trading		

All products are offered for exchange trading at EEX. In addition, transactions concluded off the exchange can also be registered for clearing (Trade Registration). Clearing and settlement of all transactions are provided by ECC, the clearing house of EEX Group.

Glanbia Milk Flex Loan Scheme



Magic Number Worksheet: Example and Blank

Calculating your 'Magic Number'

(Cash breakeven base milk price)

Assumptions

200 cows
5000lt/cow @ 3.5Pr & 4.2Bf
Capital Bank Repayments €20,000
Single Farm Payment €49,000 (based on national average)
Total Drawings €50,000
Stock Sales €50,000

	Cash Costs			
	Whole Farm Variable Costs*	160,000		
	Whole Farm Fixed Costs*	140,000		
	Capital Bank Repayments	20,000		
	Cap Ex	0		
	Other Farm Costs	0		
	Drawings	50,000	370,000	
Add Back	Depreciation	21,000		
	SFP	49,000		
	Stock Sales	50,000		
	Other Farm Income	0	120,000	
			250,000	
Divide by	Milk volume sold	1,000,000	25.00	c/l
Calculate base price based on % Pr & Bf				
	3.5Pr & 4.2Bf **		23	c/l
	Magic Number		**23**	**c/l**

* from Teagasc eProfit Monitor Whole Farm Report

** based on prevailing Co-op price for Protein and Butterfat

	Calculating your 'Magic Number'			
	(Cash breakeven base milk price)			
Assumptions				
	Cash Costs			
	Whole Farm Variable Costs*			
	Whole Farm Fixed Costs*			
	Capital Bank Repayments			
	Cap Ex			
	Other Farm Costs			
	Drawings		0	
Add Back	Depreciation			
	SFP			
	Stock Sales			
	Other Farm Income	0	0	
			0	
Divide by	Milk Volume Sold			c/l
Calculate base price based on annual farm %Pr&Bf**				
				c/l
	Magic Number			**c/l**
*from Teagasc e Profit Monitor Whole Farm Report				
**use prevailing Co-op price for Protein and Butterfat				

Percentage To Fix Worksheet: Example and Blank

What % to Fix?

Intervention Price	21	c/l
Magic Number	23	c/l
Shortfall	2	c/l

Calculate % of milk to Fix based on Fixed Price Offer

$$\frac{\text{2c/l}}{\text{Fixed Price Offer (31c/l) - Intervention Price (21c/l)}} = 20.00\%$$

	What % to Fix to Breakeven?		
	Intervention Price		c/l
	Magic Number		c/l
	Shortfall		c/l
Calculate % of milk to Fix based on Fixed Price Offer			
	Shortfall	=	%
	Fixed Price Offer (31c/l) - Intervention Price (21c/l)		
*assumes Intervention price to be lowest milk price paid			