Farm Fragmentation in Irish Dairying

Overcoming and Adapting to it.

A report for

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Farming Scholarships

By Sean O'Donnell

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Scholar Contact Details

Sean O'Donnell
Behy beg
Ballina
County Mayo
Ireland

seanod281@gmail.com

+353877939345

In submitting this report, the Scholar has agreed to Nuffield Ireland publishing this material in its edited form.

NUFFIELD IRELAND Contact Details

Executive Secretary: John Tyrrell
Phone: (+353) 087-2563501
E-mail: exec@nuffield.ie
Web site: www.nuffield.ie

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Executive Summary

Dairy farming has consistently been the most profitable farming sector in Irish Agriculture. However farm fragmentation is a major limiting factor in relation to dairy expansion in Ireland.

The average farm in Ireland consists of 3.5 land parcels.

There is a huge appetite amongst Irish dairy farmers to expand their businesses post quota in 2015. Land availability around the milking parlour will now become the new "quota". However mindset and adaptability will have a much greater influence on Irish farms and their ability to grow.

The development of second milking sites within a fragmented dairy farm will deliver a more profitable return than the alternative sectors, albeit less efficiently than if all of the lands were together.

The aims and objectives are to find alternative solutions to the farm fragmentation issue:

- To identify the various milking systems that could facilitate farmers to increase cow numbers where land fragmentation and milking platform size limits the development of viable spring calving units. The focus will mainly be on:
    - Automatic milking systems
    - Second parlours
    - Zero grazing systems
    - Once a day (OAD) milking through a second parlour
- To determine which of these systems are the most cost effective and efficient in bringing those out farms into milk production
- To elaborate on the advantages and disadvantages of each system
- To make recommendations for smaller scale dairy farmers who wish to increase cow numbers where land around the milking platform is limiting.

Research of this paper comprised of numerous study trips to Canada, New Zealand, Netherlands, the UK and throughout Ireland. A number of farm visits and interviews were conducted during these trips.

Research was also conducted through consultation of many written papers and on-line publications.

Findings:

- There is a huge appetite from Irish farmers to expand post quota in 2015, land availability around the Milking parlour will now become the new “Quota”
- Adaptabilty and mindset will greatly influence to what degree individual farmers can expand their businesses
- The development of second milking sites within a fragmented dairy farm will deliver a more profitable return than the alternative sectors albeit less efficiently than if all the lands were together
- Automatic Milking Systems (AMS) will work in a low input grass based system
- AMS are capital intensive and this will limit their uptake – particularly on greenfield sites where additional infrastructure is limited
- Developing a second milking parlour allows greater flexibility in terms of future expansion on outside blocks of land, although they rely heavily on additional labour where cows are milked twice a day
- Zero Grazing Systems have a role in overcoming farm fragmentation, predominantly to reduce the dependence on meal feeding during the spring and autumn where the milking platform has been heavily stocked
- The long term sustainablity of the Zero Grazing System is questionable due to it demand on labour
- Once a Day (OAD) will result in 20 –30% drop in milk production, but overall farm production can be partially offset with an increase in stocking rate
- OAD is potentially the highest profit system in a farm fragmentation context but it is hugely dependent on a reduction of production costs and labour input in line with the drop in milk production

Abreviations:

AMS – Automatic Milking System

CFO – Chief Financial Officer

C/l – Cents per litre

DAFFM – Department of Agriculture, Food, Forestry and Marine

DARD – Department of Agriculture and Rural Development (Northern Ireland)

DM – Dry Matter

E.g – Example

Ha – Hectare

Kg – Kilogram

MS – Milk solids

N.Z – New Zealand

OAD – Once a Day

SCC – Somatic Cell Count

TAD – Twice a Day

TMR – Total mixed ration

UK – United Kingdom

Personal Introduction:

I am a 33 year old dairy farmer from Ballina in County Mayo in the north west of Ireland. I am married to Jackie and we have 3 boys.

I graduated from Galway/Mayo institute of Technology with an honours degree in business studies in 2002. I worked off farm for a number of years until my father decided to enter the early farm retirement scheme at the start of 2008. I took over the home farm which at the time was milking 44 cows. I am now milking 110 cows in a low cost, grass based, compact calving expanding herd situation. I am also involved in a contract rearing agreement and a contract silage agreement which has freed up my own land and streamlined my business. I was also awarded the title of FBD/Macra young farmer of the year in 2014.

I am current chairman of the West Awake Discussion group which has 15 members from the 5 counties in connaught. Average herd size is 190 cows supplying 16 million litres to Aurivo Co-op.

I am also involved in local discussion groups, the Aurivo co-op advisory board, along with my local GAA club Bonniconlon.

Introduction:

In 2015 Irish Dairy farmers will have a once in a generational opportunity to expand their dairy businesses in a no quota environment. Irish dairy farmers have been preparing themselves for this expansion over the past number of years, for example through the breeding of extra replacement heifers, development of their farm yards during the farm waste management scheme, and also in ongoing investment in milking facilities, farm roadways, reseeding etc.

However the biggest restriction for Irish dairy farmers post 2015 will be the number of hectares available to milk cows off around the milking parlour, otherwise known as the milking platform. Ireland has a unique land structure that is considerably fragmented in nature, whilst at the same time it is bound by the family farming structure which historically has limited the amount and frequency of land traded. This in turn has compounded the issue leading farmers who wish to expand to either sell their original home farms and scale up, but in most cases to purchase or lease outside blocks of land

It is with this in mind that this paper seeks to discuss and determine what viable options are available to allow dairy farmers where possible to milk cows on these lands. Numerous past Nuffield papers have focused on the areas of collaborative farming and partnership arrangements, and whilst these scenarios have worked well in certain situations, they will ultimately be relationship specific. So it should be stated that this paper seeks an alternative view.

In this paper the discussion will be based around which of the following options would be most cost effective, compatible and ultimately most sustainable within an Irish Dairying context.

The options that are being looked at are:

Automatic milking systems, Second Milking Parlours – including Mobile milking units, The Mobistar, and cheap / second hand milking parlours, Zero grazing systems and The Once a Day System. It is absolutely critical that all of these systems work within a grass based scenario, simply because this is the dairy industry's competitive advantage both from a cost of production and marketing point of view.

Table 1: The average net profitability per hectare for different enterprises from the national farm survey. It does not include the single farm payment

System	2010	2011	2012	Average	40 ha
Dairy cows	€771	€1310	€783	€955	€38,187
Single Suckling	- €203	- €39	- €46	- €96	- €3,840
Cattle Finishing	- €24	- €67	- €70	- €54	- €2,147
Sheep	- €74	€264	€163	€118	€4,733
Spring Barley	€149	€115	€133	€132	€5,293
Winter Wheat	€433	€388	€123	€315	€12,587

(New Entrants to Dairying – 50 frequently asked questions, Teagasc, July 2014)

"Irelands competitive advantage in Milk production is based on the efficient production and utilisiation of pasture; this must remain the only viable model going forward" (Pat Dillon, Teagasc, Moorepark, October 2013)

Chapter 1:Dairy Farmer Expansion

Introduction:

Dairy farming unlike most businesses is unique given that, dairy farmers by and large are not in control of the price they receive for the product that they produce, however dairy farmers like any other business want to grow their enterprises with the aspiration being obtaining a better income or lifestyle, or in most cases both.

Often regarded as an industry, particularly in Europe over the past 30 years since the introduction of the milk quota regime, that has been largely insulated from any major price swings,(although in recent years milk price has become more influenced by global conditions rather than just European) it is now entering a period of opportunity with quotas going but also a period of uncertainty

1:1

Increasing output

The Irish agricultural industry and its stakeholders have developed the “harvest 2020” report which in it states:

“On the basis of available data the Committee believes that a target of a 50 per cent increase in milk production by 2020 (using the average of the years 2007 to 2009 as a baseline) would be realistic and achievable, and that this will set the foundation for further expansion in subsequent years”(DAFFM Harvest 2020 report).

It is with this in mind that Irish dairy farmers will be gearing up for expansion, but also the fact that the abolition of quotas offers farmers a huge opportunity to potentially increase their income. This in itself will be the main driver behind why dairy farmers will increase milk production. In the past when milk quotas were not a limiting factor Irish milk production increased steadily in the 10 year period prior to their introduction. Also if we are to compare ourselves to other grass based milk producing countries such as New Zealand, where expansion has taken place on a huge scale over the past 28 years, it would suggest Irish dairy farmers will expand comparatively.

In the period 1975 to 1985 milk production in Ireland increased by 5.7% per year and was associated with:
49% increase in milk yield/cow
11% increase in cow numbers
47% decrease in dairy farm numbers

In the period 1986 to 2010 milk solids in New Zealand increased by 4.4% per year and was associated with:
~100% increase in cow numbers
30% increase in milk yield per cow
55% increase in land area allocated to dairying **'**Dillon,P.(Nov 2011)

It is interesting to note that a large proportion of the expansion that happened in New Zealand occurred at a time when milk price was at its lowest, but also when interest rates were low during the late 1990's and early 2000's.

"Our business had to deal with interest rates of 14-18% on borrowed money during the 1980's, it meant that we had to develop a really low cost operating base if we wanted to survive and even expand. So when interest rates dropped to 4-5% in the late 1990's we were perfectly positioned to take advantage of any opportunity that came our way" ' Bryan,A. (Oct 2013)

1:2
Larger Herds

The average herd size currently in Ireland is 60 cows. Then compare that with the United Kingdom (UK) which has a herd size average of 125 cows and a similar number of milk suppliers. The UK has essentially operated in a non quota restricted environment for the past decade and hence has seen a substantial increase in herd size.
For Ireland to achieve its Food Harvest 2020 target then it is suggested it will have an average herd size of 85 cows.

Table 2: Industry Structure by 2020

	Average 2007-2009	2015	2020
Milk Delivered (M Litres)	**4950**	**5456**	**7480**
Cow No. (000)	**1100**	**1200**	**1355**
Milk yield (Litres/Cow)	**4631**	**5123**	**5520**
Protein	**3.33**	**3.37**	**3.42**
Fat	**3.82**	**3.89**	**3.97**
Dairy farm No:	**18,970**	**17,000**	**16,000**
Average Herd Size	**58**	**71**	**85**

Source:(Pat Dillon,The Irish Dairy Industry-planning for 2020, Nov 2011)

In an interview with Colin Glass, chief financial officer with Dairy Holdings ltd, New Zealand he stated:

"Larger herd sizes require a different set of management skills, which include better use of the farmer's time, given the fact that the farmer's resources are spread over a larger number of animals, individual treatment becomes less and the number of labour hours per livestock unit are diluted. However where the farmer has the required skill set the rewards in terms of through put and efficiency are great. This in turn transmits into better economic benefits." 'Glass,C. (Nov 2013)

Scale also has the potential to allow the farmer to employ staff either on a full or part time basis, which when incorporated into the business in the right way has huge lifestyle benefits, allowing the farmer more structured time off and time away from the business for strategy and planning.

In a survey of over 300 farmers carried out by Teagasc it showed that 56% of farmers would improve productivity through increasing scale, whilst optimum scale was associated with increased amounts of hired labour. (Technical and Scale Efficiency-Teagasc report)

1:3
The cost of expansion

Dairy farm expansion puts significant additional pressures on the existing dairy farm business and should not be considered without due regard for repayment capacity and the impacts on the family unit. Such expansion necessitates technically excellent systems which are entirely profit focused and highly efficient per unit of land, labour, capital and environmental resources".'Horan,B. & French,P. (June 2012)
Expansion on modern dairy farms is expensive and that any Capital investment on expanding dairy farms should be concentrated on productive assets such as stock, grazing and milking infrastructure. 'Horan,B. & French,P. (June 2012).
When expanding the existing profitability of the dairy farmer it is critical as to whether it financially adds up, as Only the top 1/3 of dairy farmers in terms of financial performance could justify a significant per cow cost with expansion. 'Horan,B. & French,P. (June 2012)

The cost of expansion ranges from €2000 to €6000 per cow depending on the level of investment required. Also while expansion is ongoing both variable and fixed costs will increase 'Ramsbottom,G. (Jan 2014)

1:4
Milk production on the outside farm

Traditionally farms that are fragmented in nature tend to be less efficient than farms where all of the utilizable lands are in one block. However the decision to expand milk production onto an outside block of land can in some regards exaggerate the efficiency problem, and come from a lack of opportunity elsewhere. That lack of opportunity can be where no adjoining land to the milking platform is available to purchase or lease long term.

It has also been well documented that the utilization of all lands under the farmers original control is the first step towards improving the affore mentioned efficiency.
So the farmer has to ask how large can they grow their herd on the home block before it starts to impact on the efficiency.

An example of this can be seen in Northern Ireland where many farms have reached their limit in the number of cows they can graze but push up cow numbers anyway.

To cope, cows need to be fed more conserved forages and concentrate in the summer. While the farm output is greater, so are the costs. The Dairy benchmarking run by DARD in Northern Ireland shows that in general a farm business expanding in this situation ends up financially no better off as efficiency has been lost. 'Somerville,G. (Dec 2010)

In any case most dairy farms are run at their most efficient where there is 150 cows per man, this is true in New Zealand where herd sizes tend to be in the 300-500 cow bracket based on the 2-3 labour unit rule.
During an interview with Colin Armer, Majority shareholder in Dairy Holdings New Zealand which owns 55,000 cows, he stated:
"Most of our farms run between 500-600 cows operating with 4 staff. We have found that once you go over 800 cows you need more staff and the efficiency rate between cows/labour unit drops." 'Armer,C. (Oct 2013)

So for a typical 60 cow Irish dairy farmer who wishes to expand, but the only option is onto an outside block a few miles away, the decision should be based entirely on how simply that farm can be integrated into the original unit.
Simplicity is absolutely critical, as running what is essentially a second unit will require extra decision making. Limiting those decisions to be made is crucial.
Colin Glass (CFO Dairy holdings N.Z) states:
"Focus on 4-5 key drivers of your business, the ones that really make you money. Things like cows, breeding, utilizing grass, scc's etc. and do budgets, always stay on budget" 'Glass,C. (Nov 2013)

Whether the farmer in question can milk an additional 30 cows or 100 cows will influence the technology they use, but the ability to delegate and decide what work impacts more on the bottom line, whilst being able to delegate the secondary jobs, such as slurry spreading etc, will give the farmer more free time. This is especially true in the one man unit scenario.

Conclusions:

- The decision to increase herd size will be driven almost entirely by financial gain
- Larger herds tend to be more efficient and have better use of labour alongside improved lifestyle benefits
- Expansion is expensive and should only be considered by the most efficient.
- The decision within a fragmented farm to bring an outside block of land into milk production will be determined by the individual operator
- Simplicity of decision making is critical
- Economies of scale must add up

Chapter 2: Automatic Milking Systems

Introduction:

Automatic Milking Systems (AMS) have been in commercial use since the early 1990's when they were introduced mainly in countries such as the Netherlands and Denmark. These original robotic units were used almost exclusively in confinement systems, where the cows are kept indoors all year round with those cows being feed typically on a Total Mixed Ration (TMR) diet.

The installation of these robotic units has grown mostly on Mainland Europe, (Netherlands having the highest proportion of units in use), but also grown in the United States where the popularity of confinement farming has grown in recent decades. Ireland has lagged behind considerably in the use of this technology; predominantly due to the pre-conception that Automatic Milking Systems didn't work within a grazing environment but also that the units themselves were expensive and costly to run.

However a recent trial at the Moorepark research station has set about looking at whether AMS can work in a grass based system. Also strong marketing and sales by AMS providers such as Lely, Fullwood and De-Laval have pushed the number of farmers who are using them in Ireland upwards from just 9 five years ago to almost a predicted 200 at the end of 2013. 'McGauran,N. (May 2014)

2:1

Automatic Milking Systems and Farmer Mindset

The Decision of the farmer to switch from a conventional milking system to the introduction of an AMS is primarily driven by the reduction of labour associated with the milking routine.

Frank VanOverveld is a dairy farmer from Rotterdam in the Netherlands with 3 robots. During a conversation he stated, *"the main driver for us was a reduced labour input that allows us to reach our goal of 2 million litres of milk per labour unit on the farm" 'Van Overveld,F. (Aug 2014)*

Similarly when meeting with Mellanie Vellekoop senior comunications and customer relations manager with Lely international she stated *" most of our customers decide to install robotic milking units to reduce labour, improve milk production per cow,*

improve forage quality and develop a system that maximises farm performance" 'Vellekoop,M. (August, 2014).

Within an Irish Dairy farming context most farmers that have implemented AMS on their farms tend to be either younger new entrant farmers or older generation farmers looking to remain in dairying with a reduced work load.

In a meeting with a new entrant dairy farmer Noel Kelly he said:

"I decided to install a milking robot on the basis that I didn't want to be tied to milking cows 7 days a week and that it gives me the lifestyle that I enjoyed prior to entering dairying" 'Kelly,N. New entrant, (April 2014)

2:2
Automatic Milking Systems and Grazing

Traditionally AMS have been used where cows have been housed at all times with the feed brought into them rather than being let out to graze.

"In a production system where grazing constitutes a significant proportion of the cows diet, such as in Ireland, grass has to be the main motivator for cows to move voluntarily from the field to the Automatic milking system (AMS), thus new grazing technologies are needed to optimize integration of AMS and grazing. The combination of AMS and grazing has potential beneficial effects on labour, utilization of cheaper feed (grazed grass) and milk quality. This system also offers possibilities for precision management of individual cows in a herd, freeing up of labour and allowing the cow greater control of her activities."

'O'Brien,B. & Foley,C. (April 2014)

In conversation with Niall McGauran, From the Lely centre,Mullingar he stated:

"Getting the cows to travel from the paddock to the robot and back again is the biggest challenge, so in order for cows to do it consistently and reliably, grassland management and feed allocation must be excellent".

'Mcgauran,N. (May 2014)

Grassland management and allocation is the key to the success of the system with most farmers operating two grazing areas (grazing area A and grazing area B), based on 12 hour allocations of grass. Some farmers choose to use a third grazing area, or C and allocate fresh grass every 8 hours.

It is this fresh allocation of grass that entices the cow to move through the robot.

Over or under allocation of grass to the cows tended to negatively affect the number visits to the robot.

It has also been the findings of this paper that walking distances were not a major factor on whether the cows would travel to the robot, rather roadways and access, along with strategic positioning of water troughs influenced the cow's decision to move from a paddock.
In an interview with Dairy farmer Pat Farrelly he stated:
"Cows on our farm are travelling up to 2 km comfortably to the robot, what's important is a pre grazing cover of around 1300kg/dm with an allocation of 8-9 kgs of grass in a 12 hour strip. We feed only 1 kg of concentrate during the main grazing season, unless there is a deficit. We have only 8 drinking troughs on the farm for 330 cows and these are located along the internal roadways and at the robot. The robot just milks the cows, but we run the system and it's a low input one" 'Farrelly,P. (May 2014)

On farms visits it was found that it can take anything from only a matter of days to quite a few months for the cows to settle into the habit of visiting the robot while at grass, weather conditions and cow type alongside the milk production levels being looked for by the farmer influenced the time period as disruption to the cows routine prolonged the settling in period.
Grassland management had a huge impact on the settling in period, which was testified during a meeting with dairy farmer Shay Monaghan:

"Since I installed a robotic milking unit, it has forced me to become a better grassland manager. Weekly grass budgeting is now a must do job, I found I was over allocating grass and cows were staying too long in the paddock" 'Monaghan,S. (Jan 2014)

2:3
Automatic Milking Systems on a Fragmented farm

The AMS as a standalone unit milking from 50 to potentially 90 cows has the ability to work well on an outside block of land.
"A robotic milking unit will carry out 180 –200 milkings per day, the farmer decides whether they wish to milk the cows twice or three times per day"
'Mcgauran,N. (April 2014)

However it has been found from research work done here in Ireland and abroad in New Zealand that labour is only partially reduced.

On AMS farms manual milking is no longer required; there is an increase in the monitoring of the farm and cows, and a decrease in physical work. More time is spent checking and servicing equipment, training cows, fetching individual or small groups of cows, checking cows that appear on attention lists, and in some cases cleaning. For grazing farms, pasture management requires special attention. 'Jago, J. (2011)

It is with this in mind that any farmer considering setting up a AMS on an outside farm must realise that there is still a substantial work load and time commitment required to run the system.
Also it is important that the outside block of land has somewhere to take the cows off to during periods of wet weather or during the shoulders of the year otherwise damage could occur to the farms pasture.

"We operate a third allocation area on our farm in the form of the slatted shed in periods of wet weather or for buffer feeding. It's important to have it as it aids flexibility in the system" 'Farrelly,P. (May 2014)

This could be a potential road block to developing an outside farm as investing in additional infrastructure could lead it being too expensive to put in place.

The seasonal calving and milk supply pattern of Irish dairy farms is also a concern as the fixed costs associated in relation to the purchase of a AMS would traditionally have suited year round production. In practical terms it is necessary to be able to train new heifers and cows to walk through the robot during a dry period so as to reduce stress in the system. It is therefore important to have housing facilities close to the AMS as most seasonal calving herds in Ireland are dry during the winter months and stock are held indoors.

2:4
Development Costs of an AMS on a fragmented farm

The initial capital investment for the development of a AMS is generally higher than those associated with a conventional milking parlour. In order to cost the development correctly the following scenario has been chosen to illustrate the capital required.

The following example will involve the development of a AMS taking into account the capital cost of the AMS, debt servicing, the cost of purchasing the cows, infrastructural costs, energy costs, maintenance costs etc. There will also be a labour value included.

It will also be assumed that this Greenfield site consisting of a 70 acre (28.3Hectare) land block.
The capital investment will be assumed as being borrowed, as there would be an opportunity cost if the money was used from the farmers own funds.

Table 3:Costs associated with the establishment of a new Automatic Milking System on a 70 acre outside farm.*

Item	Description	Cost
Automatic milking system	Medium spec unit	€145,000
Cows	70 @ €1200	€84,000
Reseeding	Power harrow/fert/seed 50% of farm	€7,000
Fencing	2,500m @ €0.8/m	€2,000
Meal Bin	6 tonne bin	€2,000
Electricity	Transformer & Connection	€2,200
Roadways	400m @ ½ normal width €7.50 per metre	€3,000
Water	5, 180 gallon troughs plus piping	€2800
Milk Tank	5,500l	€13,000
Slurry storage/Stand off area	3 bay slatted tank with 12ft slats and conc. apron	€11,500
Miscellaneous	Steel, gates, barriers etc	€5,000
Contingency	10% of investment	€27,750
Total cost		**€305,250 (€4,360 per Cow)**

Table 4. Cost of Debt and repayments on a 10 year time frame.*

Item	Cost	Interest rate	Total repaid	Monthly Payment	Yearly Payment
Robotic milking unit	€145,000	5.3% Hire purchase	€187,114	€1,559	€18,708
Farm set up costs	€160,250	5.74% term loan	€210,988	€1,758	€21,096

The total cost of repayments in one year would be €39,804, which is significant. The AMS has to be paid for in full or otherwise through a hire purchase agreement.

The alternative is for the farmer to borrow the total amount relating to setting up of €305,250 and pay for all capital expenditure up front and be in a position to negotiate a reduced interest rate.

Table 5. Repayment cost when total amount is borrowed

Item	Cost	Interest Rate	Total repaid	Monthly Payment	Yearly Payment
Total set up costs including robotic milking unit	€305,250	4.74% reduced rate on loans over €200k	€383,879	€3199	€38,388

The potential saving by doing this is €14,160 over the 10 year loan period.

Table 6. Potential Margin after Debt and Labour of new Automatic milking system set up.*

Production per cow	5000L	5,000L
Milk output for 70 cow herd	350,000L	350,000L
Milk price c/l	€0.28 c/l	€0.33c/l
Turnover	€105,000	€122,500
Cost of debt	€39,804	€39,804
Margin over debt	€65,196	€82,696
Labour (5 hours/day @ €15/hr for 320 days	€24,000	€24,000
Energy running costs (1.2cents/litre)	€4,200	€4,200
Maintence costs	€2,000	€2,000
Margin after labour & debt	€34,996	€52,496
Margin in cents/litre	€0.10c/l	€0.15c/l

If the minimum return for the farmer is €250 per cow, then they would need 5c/l margin at both milk prices. €250 per cow is equivelant to €618 per hectare net profit.

* All costing's relating to the farm set up are in line with those used in the Teagasc Greenfield site. All figures have been verified and modelled with the assistance of Laurence Shalloo, Senior research scientist Teagasc, Moorepark.
No planning costs or machinery costs were included as these are farm specific.

Chapter 3: The Second Milking Parlour

Introduction:

This chapter examines the merits/demerits of developing a second parlour on the outside block of land. The second parlour comes in 3 main formats.

(1) The Mobistar unit: which Irish milking machine manufacturers have developed alongside German engineering firm Europe Dairy Systems.

(2) The mobile milking unit: many farmers have developed both in this country and abroad mobile milking units which can be moved from one block of land to another to facilitate milking

(3) Simple low cost parlours: this would traditionally have been the favoured route of Irish dairy farmers

Each systems advantages and disadvantages will be explored along with how labour and cost efficiently they can be integrated into an existing farm business.

3:1

The Mobistar Milking System.

The Mobistar is a fully installed swing over parlour with 10-12 clusters this parlour can be used as a temporary solution or as a semi permanent parlour. The mobistar has a capacity for 60-80 cows per hour. Purchasing is possible in different ways: buying, renting, leasing and hire purchase with buyback guaranteed. 'Europe-Dairy systems, (July 2014)

Advantages:

- Delivered on site and ready to milk within a short time frame.
- No need for milking shed
- Ability to lease or buy can remove risk of investment
- Can be moved to another location in the case where rented land was no longer available
- Durable and reliable piece of equipment

Disadvantages:

- Expensive, as alternatives can be built cheaper
- There is a need to provide some form of concrete collection yard

- Entry and exit ramps can discourage some cows from entering parlour.
- Not a long term solution if developed on owned land

3:2

The Mobile milking parlour

A mobile milking parlour can be moved from site to site without the need for infrastructure on that particular farm, the idea being that it opens up the potential to milk cows on rented or leased land without any major investment**.** The only cost being the construction of the mobile parlour. It is a great opportunity for the farmer to build equity in stock without over borrowing.

Prospect farming in the UK is a great example of this.
"The idea behind Prospect farming is capital appreciation – we had limited capital to start with and we want to build it up, while also generating cash flow. We always thought we could just sell the cows if it didn't work out and get our money back. Developing a mobile milking parlour limited the amount of investment we had to put towards on farm infrastructure such as roadways, fencing and concrete " 'Grigg,N. (July 2014)

The costs associated with the development of a mobile milking parlour are individually specific but would generally involve the adapting of conventional equipment onto a transportable frame.

Advantages:

- Eliminates need for capital investment in permanent infrastructure
- Can be developed at very low cost
- Suits farmers wishing to build capital in the form of dairy stock
- Suited to lands where rental agreements are for a short time frame
- More suited to once a day (OAD) milking herds

Disadvantages:

- Labour intensive due to time spent assembling and disassembling the unit each time it has to be moved.

- Can result in poaching of paddocks due to no stand- off areas
- More prone to break downs and problems due to moving parts
- More suited to development on dry farms

3:3
Second Milking parlour.

The cost of developing a parlour on an outside block of land will in most cases be specific to the individual farm. However in most cases the installation of the second parlour would be constructed at the least cost.

The overall objective is to harvest the maximum volume of milk with the least amount of labour, under the least stressful conditions for the person and cow. The main time saving elements of milking include an adequate number of milking units, milking units with minimum vacuum losses, an efficient work routine time, fast cow flow at entry and exit, a reliable drafting system and stall work that gives good cow control.'O'Callaghan,E. O'Brien,B. Gleeson,D, O'Donovan,K. (2001)

When developing a second parlour on an outside block of land a lot of consideration should be given to the time involved in the milking process. Infrastructure in and around the milking site will also aid a quicker milking routine.

An optimum number of units allows for 10 rows of cows per milking to enable each milking and clean up being completed within two hours. This calculation is based on

10 minutes per milking row in the flush, which is 100 minutes per milking plus 20 minutes cleaning. ‘Dairytech N.Z. (July 2014)

Based on this statement a farmer milking in a second parlour would need many more units to further reduce the time spent milking cows.
Eg. A farmer milking 100 cows through a 10 unit parlour would take him two hours, whilst a farmer milking 100 cows through a 20 unit parlour would be finished in one hour.

Maximising the number of units at minimum cost would be critical in order to reduce time demands.
Another accepted standard is one operator per 24 clusters of cups (24-aside) so the design of a herringbone has also to consider the number of operators as well as the milking time. ‘Dairytech N.Z. (July 2014)
This is particularly true where the second parlour is located on a larger block of land.
The cost of purchasing and getting a low cost parlour working can be as low as €1000 per unit space.

Advantages:

- Ideal solution where land is owned, but will work where land is leased
- Can maximise cow flow and cow comfort in a built parlour
- Easier to extend parlour should more land become available adjoining outside farm
- Potentially cheapest option versus the others

Disadvantages:

- Requires much more additional infrastructure across outside farm
- Will add to labour costs as milking will have to be performed on two farms

3:4
Comparing establishment costs of each system.

The following table outlines the initial investment cost of a 12 unit parlour based on the three different types, including the cost of a new and second hand parlour.

It only includes the cost of establishing the parlour and does not include accompanying works, such as electrical, plumbing and additional concrete etc.

Table 7. Second Parlour Costs*.

System	Mobistar	Mobile milking unit	New low cost parlour	Second hand parlour
Invested cost	€57,793	€30,000	€19,920	€12,000
Meal feeders			€7,000	€3,500
Shed			€8,000	€8,000
Concrete	€1500		€2,400	€2,400
Steel Work			€3,000	€3,000
Total cost	**€59,293**	**€30,000**	**€40,320**	**€28,900**
Cost per unit	€4,941	€2,500	€3,360	€2,408

*Based on Quotations obtained from companies specialising in the supply of milking equipment

Table 8. The capital investment required in developing a 70 acre outside block with a second milking parlour.**

Item	Description	Mobistar	Mobile milking unit	New low cost parlour	Second hand parlour
Stock	70 cows@1200	84,000	84,000	84,000	84,000
Reseeding	50% of farm	7,000	7,000	7,000	7,000
Fencing	3,500m @0.8m	2,800		2,800	2,800
Meal bin	6 tonne bin	2,000	2,000	2,000	2,000
Electricity	Transformer &connection or generator	2,200	2,200	2,200	2,200
Roadways	1000m@13.50m	13,500		13,500	13,500
Water	Pipe & troughs	5,600	1,850	5,600	5,600
Slurry/stand off area	3 bay slatted tank	11,500		11,500	11,500
Miscellaneous	Steel, gates etc	5,000	5,000	5,000	5,000
Total		133,600	102,050	133,600	133,600
Milk tank	5,500L tank	13,000	13,000	13,000	13,000
Cost of Parlour		59,293	30,000	40,320	28,900
Total Cost		205,893	145,050	186,920	175,500
contingency	10% of total cost	20,589	14,505	18,692	17,550
Final cost		226,482	159,555	205,612	193,050

Table 9. Illustrates the repayments based on 100% of the cost of new development being borrowed.**

Item	Mobistar	Mobile milking unit	New low cost parlour	Second hand parlour
Amount borrowed	226,482	159,555	205,612	193,050
Term & Interest rate	10 years 4.74%	10 years 4.74%	10 years 4.74%	10 years 4.74%
Total repayment	284,821	200,654	258,575	242,777
Monthly repayment	2373	1672	2154	2023
Annual repayment	28,476	20,064	25,848	24,276

Table 10. Illustrates the potential margin after debt and labour in establishing a second milking parlour.**

Item	**Mobistar**	**Mobile milking unit**	**New low cost parlour**	**Second hand parlour**
Production per cow	5,000l	5,000l	5,000l	5,000l
Milk output from 70 cows	350,000l	350,000l	350,000l	350,000l
Milk price	0.28c/l	0.28c/l	0.28c/l	0.28c/l
Turnover	105,000	105,000	105,000	105,000
Cost of debt	28,476	20,064	25,848	24,276
Margin over debt	76,524	84,936	79,152	80,724
Labour at 15e/hour	24,000	33,600	24,000	24,000
Energy costs @ 0.7c/l	2,450	2,450	2,450	2,450
Maintenence	2,000	3,500	2,000	2,000
Margin after debt and labour	48,074	45,386	50,702	52,274
Margin in Cent/litre after labour&debt	0.14c/l	0.13c/l	0.145c/l	0.15c/l

** All costings relating to the farm set up are in line with those used in the Teagasc Greenfield site. All figures have been verified and modelled with the assistance of Laurence Shalloo, Senior research scientist Teagasc, Moorepark.

No planning costs or machinery costs were included as these are farm specific.

Chapter 4: The Zero Grazing System

Introduction:

The zero grazing system is a system whereby grass is cut and carried generally from an outside block of land and fed out to cows whilst they are held indoors. These cows may be kept indoors full time or for only a few hours depending on the demand for feed.

There are numerous different Irish companies manufacturing and distributing these machines throughout the country and in recent years their popularity has grown considerably. Also many farmers have adapted existing machinery to carry out this system, in the form of trailed silage harvesters, silage wagons and front mounted mowers have also been used.

The main driver again of this system is the lack of land around the milking parlour, which then forces the farmer if they wish to expand cow numbers to bring in feed from another source, in this case an outside block of land.

4:1

Farmer Experience

Farmers who introduce this system to their dairy farms, tend to have numerous restrictions impacting on the farm. A limited number of hectares on the milking platform being the main culprit, however other issues such as crossing roads and traffic, along with grazing conditions also contributing.

"I am stocked at 4.5 cows per hectare on my milking platform, which means I have a demand for grass of 76kg/dm a day. I cannot grow this amount of grass at the shoulders of the year, so I use the Zero grazer to bring fresh grass from outside farms to fill the feed gap and reduce an over reliance on meal feeding" 'Quinn,T. (Sept.2013)

Some farmers that were interviewed cited the fact that if they didn't zero graze grass then overall farm output would be severely restricted.

"Our milking platform is only 14 hectares, meaning that in a conventional system I would only be able to carry at most 50 cows. Now that I am Zero grazing I am carrying 70 cows. I am producing an extra 120,000 litres of milk worth over €40,000". 'Clarke,M. (Jan 2014)

One farmer visited began zero grazing in order to reduce the time spent walking cows on a public road.

"We were walking 125 cows along a public road, with a school and a few houses along the route, we had a few issues when meeting traffic on the road. We had been doing this 7-8 days every month, it was hard work and eventually something had to give". 'Mulherin,J. (July 2014)

Poaching and damage to grazing pasture was another issue more so when interviewing Dutch dairy farmers. Many did not have any grazing infrastructure present as they had focused on feeding cows indoors.

"Cows don't go out to graze on this farm, we feed silage mainly but we also bring some fresh grass to the dry cows. We don't put these animals outdoors as the land can get very messy when they are in the fields". 'Van den Berg,G. (August 2014)

4:2
Cost of Zero Grazed Grass

Running a zero grazing system cost effectively depends on a number of different things, such as the cost of the equipment involved, the frequency of use, and whether or not it has the potential to use grass to replace more expensive concentrates. Overall the discussion on zero grazing should not focus on the machinery but how the grass is been used to feed the cows.

''There is always a danger with this, or any other buffer feeding system, that it becomes a gimmick or distraction to profitable farming,'' 'Lawlor,J. (July 2010)

Table 11. The annual capital cost of keeping a zero grazing machine is as follows:

Machine purchase price	Loan term	Interest rate	Yearly payment	Total amount paid
€30,000	7 years	6.5%	€5,345	€37,415

(Kennedy.J. March 2012)

To work out the per kilo of drymatter cost of zero grazed grass it is taken that it costs €5,345 to service the payment on the machine and a farmer carries 130 tonnes of grass dry matter, this equates to 4.1cents/kg of dry matter carried.

Eg. 5,345/130 = €41.1 per tonne. 130 tonnes of grass will feed approximately 25 cows fully allowing 5.2 tonnes of dry matter.
The farmer must grow the grass first and this typically according to Teagasc costs 7 cents/kg dry matter to grow. This cost includes fertiliser, reseeding, and an assumed lease charge of €260 per hectare. It would cost the same on the home block.

The other costs involved are the variable costs involved in zero grazing grass such as labour, diesel, feeding out, slurry spreading and extra nitrogen. If it is assumed for this example that the round trip to the out farm is 3 miles each way (6 miles total) then it would take about 1 hour to complete the trip. Labour then costed on an hourly rate would be €15.

Diesel for this trip would involve burning approx. 12-15 litres for a typical 100 horse power tractor. So that is: ave 13.5litres@ 0.90Cents/litre = €12.15
The additional cost of feeding out, slurry spreading, extra nitrogen and towing etc has been allowed at €20 per tonne of dry matter. When all these are added together on a €/tonne of dry matter it is €15+€12.15+€20= €47.15 per tonne of dry matter or 4.7 cents

Table 12. The cost of Zero grazing a Kilo of dry matter grass comes to:

Machine costs	4.1 cent/kg DM
Variable costs	4.7 cent/kg DM
Grass growing costs	7.0 cent/kg DM
Total costs of Zero grazing	15.8 cent/ kg DM

When the cost of Zero grazed grass is compared to silage which is approximately 2.5 times the cost of normally grazed grass or 17.5 cents/kg DM, the difference between it and zero grazed grass is marginal. However the feeding value of fresh grass that has been zero grazed would be much higher. It would also be more likely to have higher intakes and would result in better Milk yield and solids production. The flexibility of using the zero grazed grass in a feed deficit situation and a lower substitution rate of normally grazed grass would mean it has an advantage over silage. ‘Ramsbottom,G. (Jan 2014)

Meal prices over the last 5 years have made on average €200/ tonne, with prices in excess of €300/ tonne in the last year. If it is assumed an average price of €250/ tonne as fed, then this equates to 0.25 cents/kg DM, which when compared to the

zero grazed grass is much more expensive, however meal is an excellent feed stuff and is ideal in short term feed deficits. In a fragmented farm scenario feeding if we take the 130 tonnes/DM of zero grazed grass at its total cost, which would be: 0.158 c/kg Dm X 1000 X 130 = €20,540 and compare it to meal at: 0.25 c/kg Dm X 1000 X 130 = €32,500, that is a difference of €12,050 for the same amount of brought in feed.

4:3
System Sustainability

The containing of its use to only the shoulders of the year, ie. Early spring and Autumn, will prolong its participation in the dairy system. If the farmer has to spend endless hours zero grazing grass then the sustainability comes into question.

At the end of the 7 year loan period of the initial zero grazing machine being purchased, it will have a tradeable value against a new machine, thus reducing the cost of the amount of money borrowed and consequently reducing the cost per kg/DM of grass.
Also if the farmer was to purchase a larger machine it would also be more expensive again increasing the costs. There would also be a limit in terms of herd size with this system as it would be important that the farmer could buffer feed up to 50% of the cows diet in grass if needed. In this case with a load carrying capacity of 1.3 tonnes of DM, it would suggest the maximum herd size in this system if 8 kgs/DM of grass was needed to be zero grazed would be 150 cows.

4:4
The Zero grazing system and labour input

Farmers rarely if ever quantify or cost their time when carrying out tasks on farm. However it is absolutely crucial that labour input is costed properly in the Zero grazing system as there would be a large amount of time involved in its operation. It is also imperative in the context of this paper as fragmented farms carry additional labour costs.

For the farmer to carry out this work daily may not be feasible and so this would result in him paying labour to drive the machinery and so the cost would be incurred

anyway. For instance if the farmer is busy during the spring period calving cows, this would be much higher value work in the context of the overall farm business, rather than driving machinery, yet the Zero grazing would need to be carried out, then it would be more cost effective to pay for a driver.

The overall cost of running a zero grazing system on a fragmented dairy farm may also be reduced if the work could be contracted out, reducing the cost of borrowed money as well as labour, however this would most likely reduce the flexibility of the system.

4:5
Cost of Establishing a Zero grazing System

In order to cost the zero grazing system comparibly to the AMS and Second milking parlour options certain costs had to included in the Comparison model

Such as:

- Model assumes all of the 70 cows diet is being met from zero grazed grass
- Debt relating to the system includes the cost of additional milking units through an existing milking parlour. These have been costed according to Teagasc guidelines at €2,000 per unit for basic equipment
- Debt relating to the Milking equipment is €20,000 with €5,345 associated to the cost of purchasing a Zero Grazer
- Labour is costed at €30 per hour in this system as it includes time spent Zero grazing and time spent milking the additional cows.
- Running costs include diesel for running the Zero grazing system plus the additional running costs of the milking parlour.

Table 13. Illustrates the potential margin from operating a zero grazing system*:

Production per cow	5000L
Milk output for 70 cow herd	350,000
Milk price	€0.28c/l
Turnover	€105,000
Cost of debt	€25,345
Margin over debt	€79,655
Labour 3 hrs/day @€30	€28,800
Energy running costs	€9,720
Maintenance	€500
Margin after debt and labour	€40,635
Margin in cents/litre	€0.12

* All costings relating to the farm system set up are in line with those used in the Teagasc Greenfield site. All figures have been verified and modelled with the assistance of Laurence Shalloo, Senior research scientist Teagasc, Moorepark.
No planning costs or machinery costs were included as these are farm specific.

Chapter 5: Once a Day Milking

Introduction:

Once a Day milking is a technique that has been used by farmers traditionally in situations where land type has not been ideally suited to conventional twice a day milking. Farms where cows may have to walk large distances, marginal type land with poor internal infrastructure and larger farms with less labour available.

In a meeting with dairy farmer Doug Turner who milks 8,700 cows on Raikia Island, he stated:

"We have used Once a Day milking as a means to develop a large scale farm, it has allowed us extra time to focus on getting the farm up and running, while also allowing us to build stock numbers. Labour could be directed away from milking towards other areas critical to the development of the business." 'Turner,D. (Nov 2013)

Irish Dairy farmers have traditionally been reluctant to use once a day milking at any point during a milking season, with the main reason cited being the drop in milk production and an increase in somatic cell count (SCC)

5:1
Milking Once a Day on an outside farm

Milking cows conventionally is generally regarded as a twice a day occupation, however milking cows in a once a day (OAD) scenario has the potential within a fragmented farm situation to allow the farmer to milk more cows without spending much more additional time in the parlour.

The additional costs would be associated with the development of a second milking parlour, and its associated infrastructure, roadways, water etc., the decision to move to OAD on the second site would primarly be driven by labour issues. The costs associated with developing a second milking parlour have been illustrated in chapter 3.

All cows would be calved and milked initially on the home farm. This would be particularly be the case where the total number of cows being milked would be less

than 150. Take for example an average sized milk supplier milking 70 cows on their home milking platform, but with an additional block of land that would allow them to milk an extra 70 cows, it may make more sense from a labour point of view to milk the home farm herds twice a day (2 milkings a day) and milk the cows on the outside farm once a day (OAD) as the cost of additional labour would take out any potential extra profit.

5:2
Does the drop in production from TAD to OAD affect profitability?

Once-a-day milking provides a major opportunity to reduce farm costs, leading to an increase in on-farm productivity. The potential benefits from once-a-day milking include an increase in labour productivity, a reduction in shed expenses, better utilisation of the milking plant and obvious lifestyle advantages. However, for once-a-day milking to be economically viable, practical on-farm strategies to overcome the milk production losses must be implemented. Cows milked once-a-day have a reduced dry matter intake and an increased liveweight relative to those milked twice-a-day. Therefore, an increased stocking rate under once-a-day milking may help maintain efficient pasture utilisation and overcome the reduction in milksolids production ‘Cooper,C. Clark,D.and Tong,M. (2002).

It is this increase in stocking rate that will offset individual cow performance and reduce the overall drop in farm production.
Milk production loss is one of the critical areas which will influence the profitability of the system.
Once-a-day (OAD) milking for a whole lactation decreases milk and milksolids (MS) yield per cow by 20-30% compared with twice-a-day (TAD) milking. ‘Phyn,C.(2008).

However in a Irish context where the majority of milk processors are paying for milk in the A+B-C system which focuses heavily on the Fat and protein in the milk or milk solids (MS) it means that while production of MS is down, the value of the milk is higher. In a coversation with Dairy farmer Paul Harper from Stowe in the south east of Scotland he stated:
“I started milking cows OAD in 2002 as a strategy to reduce my work load, production per cow suffered badly for the first year, but within three lactations I had culled cows not suited to the system along with introducing a better quality replacement heifers.

Production per cow has settled at 20% less than when I milked twice a day" 'Harper,P. (July 2014)

Advantages:

- Hugely efficient from a labour saving point of view
- Increased time to spend on other high priority tasks
- Increase in milk price, matched by a reduction in working expenses
- Potential to increase stocking rate

Disadvantages:

- Substantial drop in milk yield when cows are milked once a day
- Reduced production will reduce dilution effect on fixed costs
- Risk of higher somatic cell count(SCC) within the herd

Table 14. Illustrates the Potential Margin from a Once a Day System*.

	Second parlour*	**Once a day**
Production per cow	5,000l	3,750l
Milk output (70 cows)	350,000	262,500
Milk price	0.28 c/l	0.28c/l
Turnover	105,000	86,625
Cost of Debt	25,848	25,848
Margin over debt	79,152	60,777
Labour (15e/hr)	24,000	9,000
Energy costs	2,450	1,633
Maintenance	2,000	1,400
Margin after debt and labour	50,702	48,744
Margin in cent/litre after labour & debt	0.145c/l	0.185c/l

* All costings relating to the farm system set up are in line with those used in the Teagasc Greenfield site. All figures have been verified and modelled with the assistance of Laurence Shalloo, Senior research scientist Teagasc, Moorepark.
No planning costs or machinery costs were included as these are farm specific.

Chapter 6: Conclusion Table

The following table illustrates the potential margin of each farming system implemented within a fragmented farm situation. It takes into account the following:

- Production per cow is 5,000 litres for both the home farm and the outside farm, except in the OAD model which has a yield of 5,000litres for the home farm and 3,750litres for the outside farm (average 4,375l)
- The model combines production from both farms with 70 cows on each
- It is assumed there is no debt on the home farm
- Labour, Energy and Maintenance costs are included for the running of both farms
- Margin in cents/litre shows what margin is available to run the farm

Table 15. Potential Margin of Farm system when integrated with home farm*.

System	AMS	Zero grazing	Second parlour	OAD
Production/cow	5000l	5000l	5000l	4,375l
Combined output from 140 cows	700,000l	700,000l	700,000l	612,500l
Milk price	0.28 c/l	0.28 c/l	0.28 c/l	0.28 c/l
Turnover	€210,000	€210,000	€210,000	€191,625
Cost of debt	€39,804	€25,345	€25,848	€25,848
Cost of labour	€43,200	€52,800	€48,000	€33,000
Energy running costs	€6,650	€12,170	€4,900	€4,083
Maintenance costs	€4,000	€2,500	€4,000	€3,400
Margin after debt/labour & running costs	€116,346	€117,185	€127,252	€125,294
Margin in cents/litre	0.166c/l	0.167c/l	0.181c/l	0.204c/l

Conclusions:

Dairy farmer expansion:

- There is huge appetite amongst Irish dairy farmers to expand their businesses post 2015
- The decision to expand will be driven primarily by financial gain, with a reduction in labour input secondary
- Land availability around the milking parlour will be the new “quota”
- Adaptability and mindset will greatly influence to what degree individual farmers can expand their businesses
- Expansion is hugely expensive and puts additional pressure on the dairy farm
- The development of second milking sites within a fragmented Dairy farm will deliver a more profitable return than the alternative sectors, albeit less efficiently than if all of the lands were together.

Automatic Milking Systems (AMS):

- AMS will work in a low input grass based system
- In general the decision to purchase an AMS should be based around current scientific research rather than on oppertunistic salesmanship
- The reliability and technology of the AMS has improved greatly
- AMS have the ability to bring outside blocks of land into milk production, however the settling in period during setup may restrict its uptake.
- AMS are capital intensive and this will limit their use
- Automatic milking systems will not universally suit every fragmented farm situation as additional infrastructure will be needed
- Development of a Automatic milking system on an outside block of land is better suited where the land is fully owned, as operation on a leased holding is not profitable

The Second Milking Parlour:

- Developing a second parlour allows greater flexibility in term of future expansion
- The second parlour system is hugely reliant on labour input, meaning that a minimum level of scale would be required to make it economical

- Second milking parlours can be constructed cheaply, meaning capital expenditure is reduced
- It would cause little disruption to running of the farm system other than extra milking

Zero Grazing System:

- Zero grazers have a role in overcoming farm fragmentation, predominantly to reduce dependence on meal feeding during spring and autumn where the milking platform has been heavily stocked.
- The feeding value and performance from zero grazed grass is greater than from feeding silage in a grazing system
- The Zero grazing system is labour intensive and when labour charges are included it increases the running cost of the farming system.
- Zero grazing can be used where cows are housed full time and grass is brought into the cows from outside lands, however these systems are much more labour intensive and usually have higher operating costs
- Long term sustainability of the system is questionable.

Once a Day Milking:

- Will result in 20-30% drop in milk production, but overall farm production can be partially offset with an increase in stocking rate
- Hugely beneficial as a means to reduce labour input
- Will result in a higher milk price on a per litre or Kilos of milk solids basis
- Potentially highest profit performance of all systems but it is hugely dependent on production costs reducing in line with milk yield

Recommendations

- Further research needs to be carried out on each of the discussed systems in order to definitively determine which options can generate the best return for Irish Dairy farmers. (Teagasc have just comissioned a 4 year Phd based out of Moorepark to further research this topic). The current research project relating to AMS run by Teagasc has been poorly executed with it delivering little for Irish farmers
- Teagasc as a research body needs to develop alternative viable models by which Irish dairy farmers can expand their businesses. A commercially run research programme using existing fragmented dairy farms where the cows are milked in a low cost grass based system needs to be established. All associated costs involved should be made available to the dairy industry. This is currently not the case.
- The commercially run research farm project should be developed in a part of the country where farm fragmentation is particularly prominent, with a minimum of 5 farms involved using different methods to overcome the land challenges
- The implementation of a zero grazing system should only be entertained whereby concentrate useage can be severly reduced or eliminated. Also it needs to be identified at what stocking rate it no longer remains feasible to continue the system
- The role of AMS should be encouraged to allow smaller scale farmers remain in the dairy industry, particularly where they wish to seek off farm employment
- The EBI index should include within its future weightings a sub index to identify which sires are more suited to breed animals suited to Once a Day milking

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