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Today's Farm

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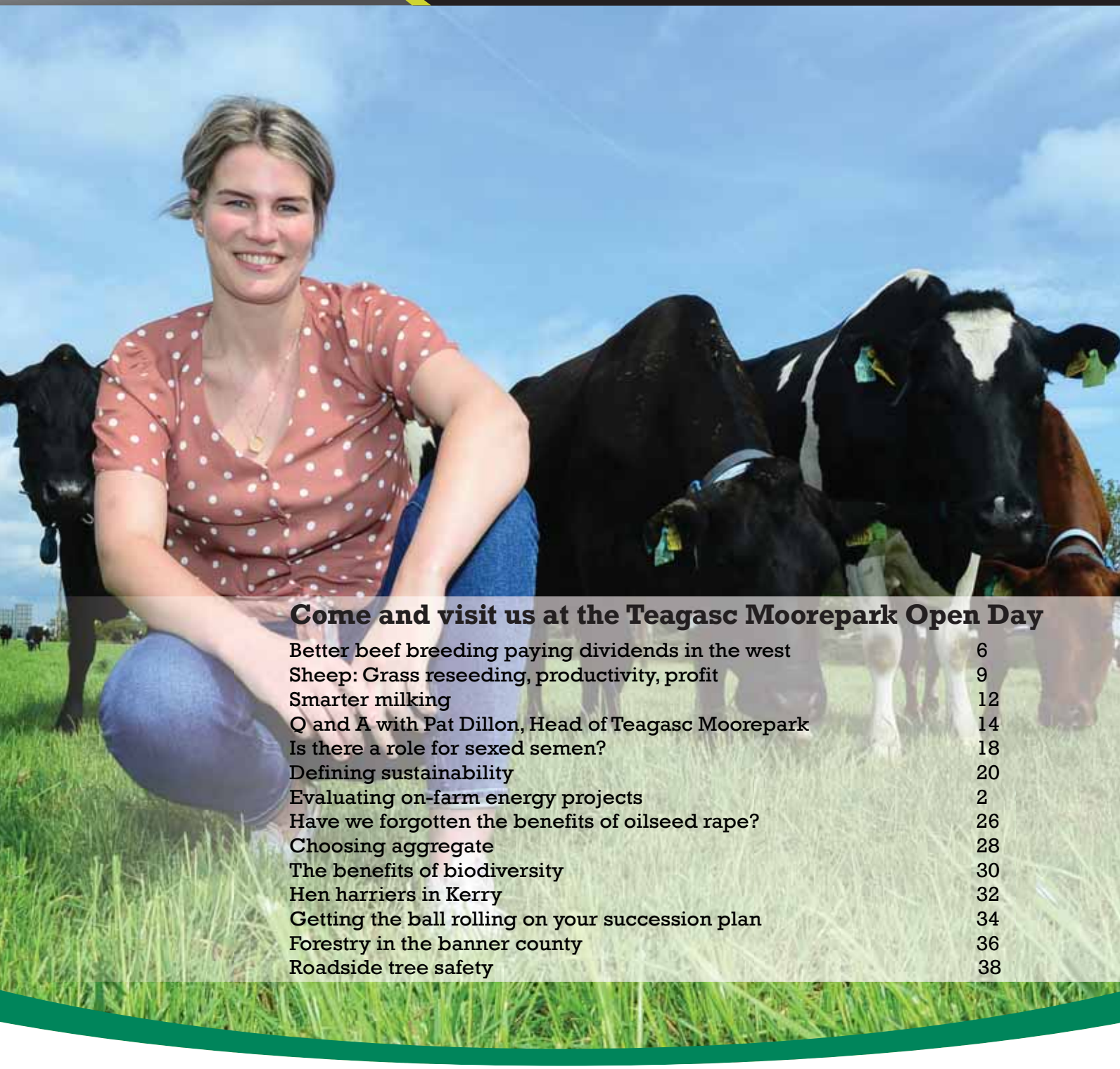

Come and visit us at the Teagasc Moorepark Open Day

teagasc

Agriculture and Food Development Authority

Growing the global success of the Irish dairy industry

Ornua's success begins with what is truly special about Ireland. Our grass-fed family farming system and the commitment of Irish dairy farmers to produce the best quality milk in the world form the foundations on which Ornua has been able, and will continue, to thrive.

Learn more at the Ornua tent, Moorepark '19

Ornua
THE HOME OF IRISH DAIRY

Moorepark Open Day 2019
Comprehensive preview
>> 14-25

Today's farm is a bi-monthly publication produced in a joint venture between Teagasc and the Agricultural Trust, publishers of the *Irish Farmers Journal* and *The Irish Field.*

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Cover | Sophie Helene Evers at Teagasc Moorepark is investigating: "Alternative autumn and spring grazing management practices within intensive pasture-based spring milk production systems" High stocking rates place added pressure on feed resources on dairy farms and can result in increased feed supplementation and a shortening of the grazing season. Therefore, grazing management practices must be adapted for more intensive systems in an environmentally sustainable manner. Currently, research is being conducted on the Teagasc Curtin's research farm to evaluate different feed budgets for the autumn and spring to identify an optimum combination of grazing practices which could support increased stocking rates and superior pasture utilisation. \ Mark Moore

COMMENT

Mark Moore
Editor,
Today's Farm

Teagasc Moorepark Open Day

The Teagasc Moorepark Open Day is a big. Huge. Because it's just a single day every two years with 'delivery' concentrated into one 12-hour window, staff put their all into it and finish the day exhausted. Of course, behind the one-day event are months of planning and preparing. The full gamut of topics related to dairying will be addressed at the event. The latest knowledge and research in breeding, feeding, economics, outlook, education opportunities, dairy-based foods, environment factors and much more will be on show. And it's not just for dairy farmers. Livestock farmers of any type will find something relevant and of interest to them. See you on Wednesday July 3rd.

Lá Oscailte na Cloiche Léithe le Teagasc

Scéal mór amach is amach is ea Lá Oscailte na Cloiche Léithe. Ní thuigeann tú cé chomh mór a bheidh sé! Toisc nach mbíonn sé ar siúl ach ar feadh 12 uair an chloig ar lá amháin gach dhá bhliain, cuireann na baill foirne a gcroí agus a n-anam isteach ann agus bíonn tuirseach traochta ina dhiaidh. Ach, ar ndóigh, bíonn neart obair phleanála agus ullmhúcháin le déanamh roimh an lá mór. Déanfar plé leis an uile ábhar a bhaineann leis an déiríocht ag an imeacht. I lár an aonaigh beidh an saineolas agus an taighde is déanaí dá bhfuil ann maidir le pórú, beathú, cúrsaí eacnamaíochta, ionchas, deiseanna oideachais, bianna bainnebhunaithe, tosca comhshaoil agus a thuilleadh nach iad. Ní hamháin go gcuirfidh feirmeoirí déiríochta spéis sa mhéid a bheidh le feiceáil, ach is féidir a bheith cinnte freisin go mbeidh rud éigin ann d'fheirmeoirí beostoic d'aon chineál. Feicimid an 3 Iúil sibh.

Teagasc National Dairy Open Day

WEDNESDAY, 3 JULY 2019

Teagasc Open Day
• Event Time 8.30am-5pm.
• Venue Teagasc Moorepark, Fermoy, Co Cork.

We are delighted to invite all dairy farmers and dairy industry stakeholders to Moorepark '19, the Teagasc National Dairy Event for 2019, on Wednesday 3 July at the Teagasc, Animal & Grassland Research and Innovation Centre, Moorepark, Fermoy, Co Cork.

The theme of this year's event is 'Growing Sustainably'. The continuing expansion of the Irish dairy industry provides opportunities to increase the profitability of family farms, while also further developing climate smart dairy farming systems. Future expansion will require close alignment of national agricultural and environmental targets, with a particular focus on carbon emissions, water and air quality, and biodiversity.

Highlights

• Special Forum: Meeting the Challenges and Opportunities of Continued Expansion

There will be panel discussions facilitated by Sharon Ní Bheoláin from RTÉ. The panel will discuss the importance of the dairy industry to the Irish economy, the environmental challenges of continued expansion, the nutritional benefits of dairy and future market requirements. The panel will include Irish and EU agricultural policy representatives, dairy market analysts, an expert in human nutrition and award winning dairy farmers. The Minister for Agriculture, Food and the Marine, Mr. Michael Creed TD, will also contribute to the discussion.

Live displays, demonstrations and workshops

A large range of Irish dairy products will be on display promoting their image, quality, taste and nutritional credentials. Demonstrations on grazing management, reseeding, farm infrastructure, body condition and locomotion scoring, calf rearing, high EBI genetics, and health and safety will take place throughout the day. There will be workshops on milk quality, anti-microbial resistance, new entrants to dairy farming and people management. A number of national and international experts have accepted invitations to participate in the workshops.

Research to adoption: extension methods

A wide range of extension methodologies are employed to facilitate best practice adoption on dairy farms.

These include discussion groups, farm walks, seminars, newsletters and short courses on financial management, breeding and grassland. Information on how to avail of these programmes will be available on the day.

Industry partnerships

Key industry experts from Department of Agriculture, Food and Marine, Irish Cattle Breeding Federation, Animal Health Ireland, Ornua, Bord Bia, National Dairy Council, Health & Safety Authority and Agri Aware will be present at the Open Day.

Growing sustainably

Taking stock and looking to the future
• What has been achieved?
• Where to now?
• Key drivers of successful expansion.

Future Systems: The Sustainable Expansion Challenge
• Future grass-based systems – key efficiency parameters.
• Meeting the challenge on farm.
• Towards more profitable and climate smart farm practices.

Increasing grass utilisation
• Key requirements for high-performing pastures.
• Successful grazing management requires weekly measurement.
• Utilizing 13 t of grass DM/ha.

High-EBI cows are more sustainable
• What are high EBI cows?


Moorepark 2017.

• 90% calving in six weeks.
• Sustainable breeding plans.

Grazing demo
• Pasture measurement.
• Pasture composition.
• Increasing grass utilisation.

Technology villages

Putting grazing management into practice
• PastureBase Ireland.
• Importance of soil fertility.
• Increasing nutrient use efficiency.

Sustainable milk production systems
• Key drivers of farm efficiency.
• Choosing optimum stocking rate and calving date combinations.
• Improving farm biodiversity.

Healthy cow – high-quality milk
• Non-chlorine protocols for cleaning milking equipment.
• Reducing antibiotic use on dairy farms.
• Increasing dairy cow welfare.

Next generation breeding and reproduction
• Benefits of genomic technology.
• Sexed semen — latest results.
• Beef crosses from the dairy herd.

People farming smarter
• Increasing labour efficiency on dairy farms.
• Training the next generation of dairy farmers.
• Priorities for new entrants.

Dairy farm infrastructure
• Grazing infrastructure to increase grass utilisation.
• Efficient milking practices.
• Importance of drainage infrastructure.

Keeping you and your family safe
• Making the farm a safe place to work.
• Working with machinery and animals.
• Increasing personal wellbeing.

Teagasc acknowledges with gratitude the support of:

FBD INSURANCE Ornua Ulster Bank

WEDNESDAY, 3 JULY 2019

Organic Demonstration Farm Walk - Sligo
• Event Time 2pm
• Venue Paul Kelly, Castledargan, Ballygawley, Co. Sligo
Suckler to Weanling & Store
• Teagasc, Department of Agriculture, Food & the Marine and organic organisations invite all farmers and members of the public to see organic farming in practice and to meet and speak with the producers and sector's experts.

WEDNESDAY, 3 JULY 2019

Ash Management Event
• Event Time -
• Venue John Lockes GAA Grounds, Callan, Co. Kilkenny.

THURSDAY, 4 JULY 2019

Teagasc / Irish Farmers Journal BETTER Beef Farm Walk- Monaghan
• Venue: Wesley Browne, Dunraymond, Co Monaghan.

THURSDAY, 11 JULY 2019

Teagasc / Irish Farmers Journal BETTER Beef Farm Walk- Laois
• Venue: Harry Lalor, Ballacolla, Co Laois.

TUESDAY, 16 JULY 2019

Sheep Sheep Breeding Workshop - Leitrim
• Event time – contact local Teagasc office.
• Venue: Ballinamore, Co Leitrim.

THURSDAY, 18 JULY 2019

Sheep Sheep Breeding Workshop - Louth
Venue: Feraghs, Dundalk, Co. Louth
Event Time.

TUESDAY, 23 JULY 2019

Sheep Sheep Breeding Workshop - Tipperary
Venue: Templederry, Co Tipperary.

WEDNESDAY, 10 JULY 2019

Broadleaf Management Event
Venue: John Lockes GAA grounds, Callan, Co Kilkenny.

Better beef breeding pays dividends in the west

Catherine Egan, Teagasc Animal and Grassland Research and Innovation Program,
John Galvin, Teagasc Athenry.

Niall O'Meara farms full-time on his 24ha (60 acre) farm just outside the village of Killimor in east Galway. Male progeny from Niall's 30-cow suckler herd are sold at 12 months, with a high percentage of the heifers retained in the herd and bred at fourteen-and-a-half months.

Last December, Niall was named as the national commercial herd winner of the FBD €200 replacement index herd competition 2018. Niall took the overall award along with the Connacht/Ulster title. The award rewards the excellence in beef breeding performance of his suckler herd.

"We've made a lot of changes in recent years," says Niall. "These were all simple steps but together they have proved very beneficial. Our focus is on breeding, herd health and grass; three very important areas for a profitable beef enterprise.

"It was clear we had huge scope for improvement. We changed to a compact calving period: mid-August to the end of October." For the past five years, the herd has been consistently achieving a calving interval of less than 370 days and delivering one calf per cow per year.

"The main aim has been to increase output on the farm while controlling costs by focusing on a grass-based system," says Niall. "Since we began regularly weighing the stock, we have really focused our attention on achieving high daily liveweight gains from grass."

The changes on the farm have not required significant capital outlay. Niall continues to target a gross margin of €1,000/ha annually. While big advances have been made in this area of the business, there is still room for improvement.

Breeds

Niall's herd consists primarily of Limousin and Simmental cross cows with a selection of Charolais, Angus and Salers cows. He has been using maternal AI sires in a bid to generate sufficient replacements for the herd.

"I use maternal AI sires as it gives me options," says Niall. "There is only one route for terminal-sired animals. I admit I may be taking 10-20c/kg less but, given their genetic potential, the weight for age compensates for this. I always look at the average in my herd and not just the top cows."

Careful selection for traits such as calving difficulty, docility, carcase weight and daughter milk have led to the herd achieving an average replacement index of €108. Niall operates at two LU/ha and in 2018 achieved at output per LU of 380kg, which was above the national average of 298kg/ha. Similarly, output per hectare at 759kg is higher than the national average of 450kg/ha. The output being achieved on the farm makes it one of the top herds in the country.

Calving at two years old

All of Niall's heifers calve at 22 to 26 months of age. Nationally, only 24% of heifers are calving within this range. "Maximising performance of the heifers from birth to breeding is critical to ensuring they routinely reach the target bulling weight of 475kg at 14.5 months by 1 November," says Niall.

"By calving at 24 months, I get more calves from each heifer over her lifetime. It also offers the possibility to reduce the number of stock groups, which makes grassland management easier."

Niall says he places huge emphasis on the sire selection for maiden heifers. The main focus is on ease of calving and high reliability. "This year I used a Salers AI sire called SA2189 on my replacement heifers. The sire's calving difficulty is only 1% and he has a reliability of 98% which is very important. He has five stars on the replacement index, with a replacement value of €212."

Heifers that are not kept as replacements are sold as beef. As all the heifers are of high genetic merit, there is also the option to sell these at breeding sales.

Selecting sires

Niall has been using 100% AI on the farm for the past decade. He concentrates on the replacement index when selecting sires. "In the past I always relied on the €uro-Star replacement index values and rarely looked at what the sire looked like. More recently, I have moved away from looking at the actual replacement index value and I am more focused on the

Catherine Egan, John Galvin (Teagasc), Niall O'Meara, Chris Daly (ICBF).

sub-indexes," says Niall.

"Calving difficulty, docility and carcase weight are my main focus. I target a carcase weight of >25kg as I cannot afford to compromise on the quality of my bull weanlings. The target for daughter milk on the farm is +10kg with as high reliability as possible alongside a negative calving interval figure of -2 days. I am not partial to any breed, I rely on the €uro-Star figures. Sires used include OCD, ISL, Biouvac and SI2469."

BGDP & BEEP

Niall participates in the Beef Data and Genomics Programme (BGDP) and Beef Environmental Efficiency Pilot (BEEP) Scheme. "BDGP has got a lot of bad press which I don't think it deserves. I can see myself making progress on this farm. What other country would pay you for making progress? I have a weanling efficiency performance target of 42%."

Through genetic selection and improved grassland management, the weight of the weanling bulls at sale has increased as outlined in Table 1 below. Niall has a target weight of 500kg for male progeny at 12 months and has been consistently above this in recent years. This has been achieved through minimum use of concentrates. Weights declined slightly due to the extreme weather conditions experienced last year.

"While concentrating on heavier bull weanlings, the main emphasis is on further increasing grass in the diet and decreasing concentrates."

Grazing performance

High-quality grass swards play a

Continued on p8

Continued from p7

Table 1: Bull liveweight and concentrate input

Year	Bull live-weight at sale (kg)	Total concentrate input from birth to sale /head (kg)
2015	499	150
2016	513	125
2017	525	100
2018	497	125

huge role in achieving consistent target weight gains of the yearling bulls and getting heifers to target breeding weights at 14.5 months. According to Niall: "Achieving high output cheaply is very important and I pay a lot of attention to grassland management during the year to ensure a long grazing season and high-quality swards for grazing."

Niall has made huge progress in recent years in grazing management and has recently put in new roadways and increased the number of paddocks on the farm. He also uses pigtails and reels to further divide paddocks during peak grazing periods.

"I have 24ha of land, but 45 paddocks," says Niall. I'm completely convinced of the value of grazed grass. I operate a rotational paddock system, but it doesn't matter what kind of system you have so long as you are getting fresh grass into them every few days. To do that, you need really good infrastructure.

"The aim is to graze each paddock for three days and allow 18 to 21 days recovery and re-growth."

Winter management

All animals are housed on 1 November. The calved cows and all the breeding heifers are fed ad-lib high-quality silage and 2kg of concentrates for six weeks from mid-October to the end of November. Calves have creep access to as many as 12 paddocks in rotation from November onwards.

Niall has been measuring grass growth on the farm using a plateameter for the past number of years to aid management decisions. This information is entered into the Teagasc grass measurement programme Pasture-Base Ireland.

"It can establish my number of grazing days ahead and I can decide if I need to take out surplus grass as baled silage or spread extra fertiliser," says Niall. Grass budgeting is key to maintaining a high-quality grass sward at all stages during the grazing season. In addition, Niall says he has found that the quality of silage produced on his farm has improved and the quantity coming from surplus grass has increased.

In 2017 grass production was almost 11t DM/ha which decreased, due to drought conditions, in 2018 to 8.5t DM/ha as in Table 2. The annual tonnage report helps Niall to identify poor-performing paddocks that may need reseeding or have soil fertility issues which are limiting grass growth. Niall's view is that: "I used to be a beef farmer but now I am a grass farmer who feeds beef."

Not to be missed

Niall will host an open day on his farm on **Tuesday 16 July at 2pm**. Visitors will be able to view demonstrations, discussions and stock. The emphasis is on highlighting the technologies and management tools Niall uses to achieve the excellent beef breeding performance of his commercial suckler cow herd.

Technologies related to beef genetics, reproductive management, grassland management and animal health will be on display. The day will also provide an opportunity to meet with industry stakeholders with a selection presenting display stands on the day.

John Galvin concludes: "The open day will provide an excellent opportunity to see and discuss the key elements involved in operating a high-performing family-run suckler herd that has consistently achieved top results over the last number of years."

> "I used to be a beef farmer but now I am a grass farmer who feeds beef

Table 2: Grazing performance

	2018	2017
Grass production (t DM/ha)	8.5	10.9
No. grass measures completed/yr	36	34

Knowledge Transfer group

Niall is an active member of his local knowledge transfer (KT) discussion group facilitated by Teagasc advisor John Galvin. Prior to this he was involved in the BTAP discussion group. "Participating in my local discussion group has been invaluable, for the amount I have learned from local farmers as well as Teagasc. Members of my group have had a huge influence in the development of my farm," says Niall.

Teagasc advisor John Galvin said: "Niall is a very active member of the Portumna/Killimor Beef Discussion group. It is a pleasure to work both with him and the other members of the group. The primary focus of the group is to generate ideas and implement technologies to make improvements in each members system of producing beef as efficiently as possible. Niall's positive attitude and business-like approach is invaluable within the group."

Reseeding, productivity, profit

New swards yield high-quality grass, just when sheep farmers need it

Philip Creighton & Michael Gottstein
Teagasc Animal and Grassland Research and Innovation Programme

A grazing ewe and her lamb(s) will eat just under one tonne (900kg) of grass dry matter in a single year. On lowland farm systems, grass production lies within the 6t to 14t DM/ha range.

To optimise lamb production and profitability from a grass-based system, you should estimate the actual and potential production from your grass swards.

Where there is scope to increase grass growth (very few farms are reaching their maximum potential), extra production will offer the possibility to raise stocking rates and improve profitability.

If your output is at the lower end of the grass output range, you may be able to make significant progress by improving soil fertility (N, P, K and pH), management (grazing divisions, autumn closing and grazing management), soil structure (drainage) and weed control.

If your goal is to increase grass growth further, there is the option to reseed pastures. Reseeding is expensive and you should only consider it where the above points have already been optimised and the stocking rate on the farm is such that extra grass will be utilised. Good-quality grass can reduce the need for meal.

Cultivar choice

Select grass cultivars from the Irish recommended lists. These varieties have been tested under our conditions. The Teagasc Pasture Profit Index is also a valuable tool when selecting grass cultivars for your farm.

The key variety traits to consider:

- High seasonal production (especially during spring).
- High quality figures.
- Late heading.

Demand for grass is very high on sheep farms early in the year, so se-

Continued on p10

lect varieties that exhibit good spring growth. Varieties with high quality figures will be easier to manage and will result in better lamb thrive, especially in the period immediately before and after weaning.

Choose late heading varieties, as these won't go to seed until close to weaning for most mid-season lambing flocks. Early or intermediate heading varieties will start to head out from early May onwards, so avoid those.

Early heading makes grazing management difficult because it leads to lower-quality swards when lambs are starting to consume larger quantities of grass.

As already stated, late heading varieties do not mean lower total spring growth. You can select late heading varieties with high spring growth from the recommended list and the PPI. Further information is available at www.teagasc.ie/crops/grassland/pasture-profit-index.

The Teagasc recommendation is to sow 35kg seed/ha (14kg/ac) to ensure good establishment of the sward. We also recommend a minimum of 3kg of each cultivar within a mixture and no more than three or four cultivars per mix. Include 60% to 70% diploid grasses and 30% to 40% tetraploid.

On heavier soils, in particular where cattle will also be grazing, the sward shouldn't go above 30% to 35% tetraploid in the mix, as it results in a more open sward and can lead to greater sward damage in wet weather. Those on drier ground or in an all-sheep situation can go closer to a 50:50 split if desired.

Formulating a grass mixture

- Minimum of 3kg of an individual cultivar (any less is very unlikely to contribute anything to the sward and is diluting the positive effects of other varieties in the mix).
- Less than seven-day range in heading date between cultivars.
- Cultivars exhibiting high simulated grazing yields in recommended lists.
- High seasonal growth to extend grazing season.
- High values for digestibility.
- 35% to 50% tetraploid – depending on soil type.
- Small leaf clovers for sheep

Establishment methods

How ground is reseeded will depend on soil type, amount of underlying stone and machine/contractor availability. There are many different cultivation and sowing methods available. All methods, when implemented correctly, are equally effective.

Timing of reseeding

Timing of reseeding depends very much on current weather conditions, grass supply and whether or not you have planned for reseeding.

Surveys suggest that grassland farmers focus their reseeding on the autumn. This may make sense from a feed budget perspective, but it does have some negative consequences.

Soil conditions deteriorate as autumn progresses – lower soil temperatures can reduce seed germination and variable weather conditions reduce the chances of grazing the new sward.

The opportunity to apply a post-emergence spray in autumn is also uncertain, as ground conditions are often unsuitable for machinery.

Aim to get reseeding completed as early in the year as possible. On sheep farms, July is a good month to target as grass demand will fall post-weaning.

The new reseed will be back in the rotation when grass demand increases again in the autumn for finishing lambs and building grass covers for ewes into the winter.

Management of reseeds

Weeds in new reseeds are best controlled in the seedling stage, before the first grazing. Use a clover-safe herbicide if there is clover in the sward.

If over-sowing, it may be better to control established weeds beforehand. If planning this, consider the residue period from application to over-sowing the clover, as it can vary from one to four months.

All pesticide users should comply with the regulations outlined in the sustainable use directive (SUD).

It generally takes a reseeded sward around 11 months to establish fully. Reseeded swards should be grazed as soon as the new grass plant roots are strong enough to withstand grazing (root stays anchored in the ground when pulled).

Early grazing allows light to reach the base of the plant, encouraging tillering and, where relevant, clover establishment.

A new reseed can be grazed at a pre-grazing yield of 700kg to 1,000kg DM/ha. Frequent grazing of reseeds at low covers (< 1,400kg DM/ha or <8cm) during the first year will aid establishment.

If possible, avoid closing reseeded swards for silage in their first year of production. The shading effect will inhibit tillering and clover establishment.

Key points

- Spray off old sward.
- Graze sward tightly or mow to minimise surface trash.
- Apply lime.
- Choose a method that suits your farm.
- Soil test.
- Firm fine seedbed with good seed/soil contact is essential.
- Roll after sowing.

Table 1: Differences between diploid and tetraploid cultivars

Tetraploid cultivars	Diploid cultivars
Tall upright growth habit.	Prostrate growth habit.
Create more 'open' sward.	Create a denser sward with less 'open' spaces.
Higher digestibility value.	Generally lower digestibility and yield.
More palatable = higher intakes.	

Table 2: Cultivation techniques

	Dos	Don'ts
Ploughing	Shallow plough. Develop a fine, firm and level seedbed.	Plough too deep (>15cm). Cloddy, loose seedbed.
Discing	Graze tight, apply lime. Three or four runs in angled directions.	Forward speed too fast – rough, uneven seedbed.
One-pass	Graze tight, apply lime. Slow forward speed at cultivation.	Forward speed too fast – rough, patchy seedbed.
Direct drill	Graze tight, apply lime and slug pellets. Wait for moist ground conditions (slight cut in ground).	'Trashy' seedbed - no seed/soil contact. Use when ground is dry and hard.

FARMER PROFILE

Edward Gavin farms over 200 acres near Goresbridge, Co Kilkenny. His Teagasc advisor is Hugh Mahon. Half the land produces spring and winter cereals, the remainder is in pasture grazed by over 300 ewes and beef cattle.

The ewes are Suffolk-Texel-cross, with the majority of the progeny sold to the factory and the remainder through marts. Replacement ewes are bought in. Charollais and Texel rams are used.

"Our aim is to sell more lambs off grass with minimal meal input," says Gavin. "Reseeding has played a big part in that. We've reseeded nearly three-quarters of the pastures in the last five years, including tillage ground we've brought into lamb production to achieve higher margins."

Gross output on the farm in 2018 exceeded €1,700/ha and with variable costs at around €600, the gross margin came in at comfortably over €1,100/ha.

"Reseeding means we have more, and better-quality grass in the spring and autumn, which has allowed us to increase stocking rate and keep input costs manageable," concludes Gavin.

Gavin with his Teagasc advisor is Hugh Mahon.

The cows coming in for milking on the Hannon farm and, inset, one of the milking staff at work

Smarter Milking

Milking is the most important job on a dairy farm, taking up to one-third of the total labour input

Padraig O'Connor,
Teagasc Animal and Grassland Research and Innovation Programme.

With herd size increasing and ever-larger milking units, the demands on the milker are growing. Working smarter can help. Teagasc, in association with the Farm Relief Service (FRS), Animal Health Ireland and the dairy co-ops, is running a series of Smarter Milking events across the country during July.

These events will outline how dairy farmers and their staff can implement techniques to enable a more efficient and safer milking process which delivers high-quality milk and greater profit. Farmers will be able to discuss the milking system with the host farmers.

These events will focus on five aspects of the milking process:

1) Getting cows in and out (cow flow)
2) Milking technique (doing it right)
3) Producing high quality milk
4) Saving energy and money
5) Reducing time spent on milking

Stand 1 Jim Dockery from Farm Relief Services (FRS) will focus on getting the cows from the paddock or shed into the collecting yard through the milking parlour and back to paddock or shed again. He will look at areas such as cow road infrastructure and preventing bottlenecks. Jim will also focus on the collecting yard, backing gate and drafting cows after milking.

Stand 2 will be covered by me (Padraig O'Connor, Teagasc). I will focus on what happens in the milking parlour, including preparing the parlour, the milker and cows for milking. I will also address cluster attachment and removal and techniques to avoid repetitive strain injury. Efficient milking and correct application of teat spray will also be covered.

Stand 3 is about producing high-quality milk and this will be covered by co-op personnel. The focus will be on reducing trichloromethane (TCM) and chlorine residues in milk. Washing and cleaning the milking equipment, ie the milking machine and bulk tank, will be covered.

The volume of rinse water used per unit as well as the cleaning products used are key elements in ensuring dairy farmers reach the required standards in terms of reducing the risk of these residues in milk. The quality of milk produced on farm has a big impact on its processability. The higher the milk quality, the more marketable Irish dairy products will be.

Stand 4 will cover saving energy and money and this will be led by John Upton from Teagasc. John will discuss energy efficiency on dairy farms, with an emphasis on electricity usage, night v day rates while explaining how to benchmark your energy costs against other farms. Milk cooling is the largest energy consumer on dairy farms and pre-cooling and refrigeration will be discussed. Water heating and the use of variable speed drive (VPD) vacuum pumps are other areas where dairy farmers can make

FARMER PROFILE

David and Catherine Hannon, Drumree, Co Meath

David and Catherine Hannon from Drumree, Co Meath hosted one of the Smarter Milking Events in 2018. They milk 300 cows through a 25-unit herringbone parlour. The objective for the Hannons is to produce top-quality milk as efficiently as possible in an environment that is stress-free for both milkers and cows. In recent years, David has made a number of improvements in the milking process.

"I place a big emphasis on the movement of cows from the paddocks to the milking parlour and we've undertaken a number of improvements over the last few years to the cow roadway," says David. "We've rerouted the roadway to eliminate two right-hand bends, cut overgrown hedges, increased the width and resurfaced areas of the road way. This has greatly reduced the time it takes to move the cows from the paddocks to the yard for milking."

David has also incorporated some concrete roadway nearest the collecting yard as this part of the roadway is used every day. "This is cleaned regularly with a mechanical brush," he adds.

The collecting yard and backing gate.

The collecting yard at the Hannons' farm is capable of holding all the cows. David also has a backing gate to help with cow flow into the parlour with a facility attached to clean the yard. David points out that the backing gate is used to decrease the size of the yard and not used to force the cows into the parlour.

There is also a siren attached to the gate as it moves so the cows associate the sound of the siren with gate movement. It is also fitted with an auto stop device to allow the gate to move a set distance each time it is turned on. This is to ensure the gate doesn't run continuously and injure cows.

Best practice is adopted in terms of the milking routine on the farm. All milkers wear a clean milking apron and nitrile disposable gloves. The milking starts as soon as the cows enter the collecting yard and clusters are attached to clean dry teats starting at the front of the parlour.

"I encourage staff to practice changing hands to hold the cluster while milking to reduce repetitive strain injury," adds David.

Cows' teats are sprayed in batches as the milker moves down the parlour. This enables the row exit gate to be opened while removing clusters and teat spraying the last couple of cows in the row.

A fully automatic drafting unit is located where cows leave the parlour after milking.

Written standard operating procedures (SOPs) have been used on the farm for over 15 years now. David has a number of full-time and part-time staff that milk for him and SOPs are essential for the milking process to be carried out safely and efficiently while producing top-quality milk. They provide direction and improve communication for his staff. As David says: "Always assume that you won't be around tomorrow." Could the milking take place without you?

savings on energy consumption. The benefits of reducing electricity consumption for the farmer include lower production costs and also a reduction in carbon footprint.

Stand 5 is saving time around milking and the content of this stand will be covered by the local Teagasc dairy adviser. This includes the use of standard operating procedures (SOPs), for example preparing for milking, milking routine and washing up after milking.

A SOP is a document consisting of step-by-step instructions on how to complete a particular job or procedure on the dairy farm.

A well-written SOP will provide direction, improve communication and reduce training time. With herd size increasing on many farms and the use of hired help more commonplace, the use of SOPs will help streamline the operation.

Labelling of milking components and having a set place for items used at milking will also allow for a more efficient milking to take place. Having a well-organised milking parlour and dairy will allow the task of milking cows much easier to complete.

A number of Smart Milking events will take place in July. Check the Teagasc website for details.

> A well-written SOP will provide direction, improve communication and reduce training time

Q&A WITH PAT DILLON

Dr Pat Dillon is Head of the Teagasc Animal and Grassland Research and Innovation Programme. This means he is in charge of all Teagasc research into both dairying and drystock. Pat is a native of west Clare where his family were dairy farmers

1 Times have been relatively good in dairying in recent years, can this continue indefinitely?

I'm optimistic that the dairy industry in Ireland can continue to prosper. Globally, demand for dairy products is increasing all the time and we compete in premium categories in 120 countries worldwide. The FH2020 target was to reach 7.5 billion litres by 2020; this was surpassed in 2018. In 2019, Ireland will probably exceed eight billion litres; the fact that Ireland could reach this milestone so quickly has to be viewed as a huge success. Ireland could reach 10 billion litres by 2025.

But it's not just about production increases either. Our recent analysis of farm level trends indicates that Irish farmers are increasing productivity year on year through increased grazed pasture utilisation and this means that the quality of product we produce is increasing and the sustainability of our systems is improving in tandem with expansion.

The CSO report for this March indicated that average protein content of Irish milk was 3.31%. This is a great achievement that would have been unthinkable 10 years ago. While the base price per litre of milk has been flat for the last five to six years, most farmers are achieving a price four to five cents higher because of increased fat and protein levels due to better genetics and improved grassland management.

IN MY VIEW IT'S NOT ABOUT PRIORITISING ONE ENTERPRISE OVER ANOTHER, BUT INSTEAD GETTING THE BEST MIX OF LAND USE ACROSS THE LANDSCAPE

The future of the industry depends on having profitable farms that reinvest in improved systems. From an economic standpoint, the expansion has improved the profitability of family farms and brought more money into the rural economy. Farm costs/l of milk produced has actually reduced between 2013 and 2017.

The "Food Harvest 2020" strategy was a huge success with all stakeholders in the dairy industry playing their part; it provided clear targets and effective communication channels to all stakeholders. For example, the processing side of the industry has invested more than €1.5 billion in extra capacity.

2 What did we learn from the recent fodder crisis?

I think it's important not to be overly reactive to a poor grass year such as 2018. Grass is a valuable feed and when you get a combination of slow spring and dry summer, grass growth was reduced on many farms by three to five tonnes/ha. I think farmers managed extraordinarily well in the circumstances and this shows you how resilient Irish dairy farms are.

For sure, as farms expand, you do need to have an adequate amount of silage in the yard (in a pit or in bales) to manage during periods of poor grass growth and most farms have built these reserves on the back of last year which should stand them in good stead going forward.

We must be able to produce the feed for our animals, and it is good management practice to have a reserve of silage and cash available for unexpected contingencies. The silage reserve can be rotated with new production from year to year.

3 The EBI has served Irish dairying well over the last 20 years or so, how much further can it take the industry?

Average EBI (€) of the national herd is just under 100, and the target should be close to 200; at the current rate of progress we are 10 years from where we want to be. This means that the EBI can be significantly increased in most herds.

The EBI of the Teagasc Next Generation Herd is in the top 1% of cows nationally. Our research shows that high EBI cows are extremely profitable and further gain in EBI at farm level will continue to improve both the productivity and sustainability of our systems in the future.

4 If Ireland as a country/economy has to reduce carbon emissions, why should it prioritise dairy production?

In my view it's not about prioritising one enterprise over another but instead getting the best mix of land use across the landscape. In addition to milk, the dairy industry contributes around 50% of the raw material for the beef processing sector to a value of 1.2 billion euros annually.

I believe that the ongoing expansion of the dairy sector is also providing additional benefits to other land users in terms of contract rearing and feed supply opportunities which were not there previously. The performance of the dairy industry over the last five years has been unparalleled, both in terms of other indigenous sectors of the Irish economy and other international dairy industries.

Every €1 of additional dairy exports corresponds to an additional €0.90 spend in the wider domestic economy. The value of Irish dairy exports exceeded €4 billion for the first time in 2018, and accounted for 35% of total food and drink exports. Ireland's status as the lowest carbon emitting dairy sector in the Northern Hemisphere is recognised across a growing global customer base.

Restrictions on dairy cow numbers would conflict with the national objectives in FoodWise 2025 that seek to grow the contribution of the Irish agri-food sector to the Irish economy. It also makes little sense to restrict Irish dairy production for another country to produce dairy products at possibly twice the carbon footprint of Irish produced dairy products.

Continued on page 16

Continued from page 15

5 How can dairy farmers contribute to reducing greenhouse gas emissions and preventing climate change?

Ireland's status as the lowest carbon emitting dairy producer in the Northern Hemisphere is recognised across a growing global customer base and we continue to reduce carbon intensity over time. There are a number of management practices that dairy farmers can implement that will improve the sustainability of Irish farming systems and reduce emissions.

These include incorporation of white clover into grassland swards to reduce chemical N application, coupled with the use of protected urea fertilisers and low emissions slurry applications. Additionally, future systems will continue to rely primarily on high EBI cows fed highly productive pastures.

There are also a number of new products (such as 3NOP and Mootral) that are about to be launched on the market which have the potential to further reduce methane emissions by up to 30%. These have yet to be tested for efficacy in grass-based systems and we are undertaking this work now at Teagasc Moorepark.

6 As the Farm Labour event at Teagasc Moorepark last year showed, finding affordable, qualified labour is a challenge. What role will automation play in addressing that problem?

Automation in relation to milking (eg cow drafting, cluster removers in large parlours, automatic washing of the milking plant and indoor parlour feeders) can significantly improve labour productivity on dairy farms. The benefits of other automation are less tested on commercial farms.

Rotary milking parlours are becoming much more popular in herds of greater than 300 cows, with the objective of increasing labour efficiency and reducing milking times to less than 5-hours per day. As with all new technologies, a careful cost benefit analysis is needed prior to making investments.

"Good grazing infrastructure and an efficient milking system are a requirement on all dairy farms. Having good farm road ways, adequate drinking water, suitably sized and shaped paddocks with multiple access points (plus drainage systems where necessary) are essential to maximise grass utilisation, cow performance, cow health and labour efficiency. Additionally, milking efficiency can be increased by matching the number of milking units to herd size and improving cow flow through the parlour.

7 What advice would you give farmers who might be first-time employers?

Dairy farming must be a desirable job in order to attract and retain young people. The farming system needs to be labour efficient, and it needs to eliminate wasteful and often physically demanding tasks and long working days.

Additionally, there is a need for career progression

L-R: Tom O'Dwyer, Teagasc; Ann Marie Butler, Ulster Bank; Pat Dillon, Teagasc; Philip Cocoman, Ornua; Liam Herlihy, Teagasc chairman; Ailish Byrne, Ulster Bank; Michael Berkery, FBD; and Frank O'Mara, Teagasc, at the launch of Moorepark'19.

pathways such as partnerships, share farming, leasing etc. in order to attract and retain talented young people in the dairy industry that may not have access to owned land.

8 We are perceived as a relatively high animal welfare milk producer. How can we protect that reputation, build on it, and get paid for it?

The Animal Welfare Advisory Council recently published Animal Welfare Guidelines for Dairy Herds. Irish pasture-based systems are perceived to be animal welfare friendly, thereby giving the Irish dairy industry a competitive advantage in international dairy markets.

It's critical that the welfare of animals on dairy farms is prioritised and maintained at a high standard at all times from conception to end of life; there is no excuse for poor animal welfare practices. Calves should receive adequate levels of colostrum immediately after birth (the 1-2-3 system is a good model) and provided with good housing.

Young calves should never receive poor animal treatment on farm or anywhere across the supply chain. While Irish pasture-based systems have many advantages in terms of animal welfare, we also need to be mindful of the need to operate best practice. Important indicators of dairy cow welfare include lameness, mastitis and metabolic disorders, and these should be kept to a minimum by imposing good management practices.

Farm infrastructure should be conducive to high animal welfare standards. The question about whether male dairy calves could be humanely slaughtered at a very young age is an ethical question. These calves have poor beef merit, and as a consequence have low economic value. That, however, can never be a justification for poor welfare practices. I don't think calves should ever be slaughtered on farms.

WE NEED TO WORK WITH THE BEST HUMAN NUTRITIONISTS TO DISPEL THE MYTHS SURROUNDING ALTERNATIVE FOODS

9 What can we say to vegans?

Estimates from Bord Bia are that somewhere between 1 and 2% of the Irish population are vegan; however NDC research indicate that 30% of young men and 41% of young women are limiting the amount of dairy they consume.

Similar to much of the plant based alternatives to dairy, nutritionally these alternatives are a poor substitute but that does not mean that we should be complacent. Dairy alternatives are generally composed of water and ingredients such as soya, rice, almond, oat, coconut etc, and are not nutritionally equivalent to cows' milk. It's uncertain that the calcium in fortified drinks is absorbed and metabolised in the same way as from dairy milk.

We need to work more effectively with the best human nutritionists to dispel the myths surrounding alternative foods in all forms. The scientific evidence tells us that the qualities of nutrients from milk are significantly better and that these key differences are particularly important for at-risk groups (such as growing infants, elderly people and pregnant women).

Plant-based milks are quite variable in what they contain, whereas cows' milk is very well standardised. Unfortunately, the nutritional inadequacies of such foods mean they are substantially lacking many key nutrients while also containing others in less bioavailable forms.

10 What do you see as the likely key technical developments in dairying in the next five years?

In recent times the use of genomic information has had a significant impact in increasing the rate of genetic improvement in dairy cow genetics in Ireland. Likewise the development of precision farming technologies such as PastureBase Ireland has played a significant role in the adoption of best grazing management practices.

New technologies in relation to sustainability will dominate over the coming years. In the next five years there will be a focus on the development of technologies that will reduce methane emission from ruminant livestock; improve farm nitrogen use efficiency; improve labour efficiency and animal welfare; and reduce the administration of both antibiotics and anthelmintics.

11 What message do you have for beef farmers?

It's essential that we get greater integration between the dairy and beef industry. The use of modern genetic and reproductive technologies has the potential to increase the beef quality of the progeny coming from the dairy herd. Currently 50% of dairy calves are bred to dairy sires and 50% to beef. If sexed semen becomes a viable technology we will have the potential to have even more beef/dairy crosses.

Moorepark 2019

Is there a role for sexed semen?

Teagasc and ICBF are working to understand the teething problems holding back this high-potential technology

Stephen Butler, Clio Maicas Palacios, Shauna Holden, Evelyn Drake, Pat Dillon
Teagasc Animal and Grassland Research and Innovation Programme,
and Andrew Cromie,
Irish Cattle Breeding Federation

The option to choose whether a cow has a heifer or bull calf would be hugely beneficial for both the dairy and beef industries. Dairy farmers could breed replacement heifers from only their very best cows. Other cows in the herd could be bred to produce calves with more potential for beef production.

Consistently reliable and cost-effective sexed semen would benefit farmers financially. During 2018, Teagasc and ICBF scientists working with AI companies conducted a large field trial to assess the fertility performance of 'sexed ULTRA 4M' versus conventional semen.

2018 field trial

Ten bulls were identified to produce conventional and sex-sorted semen straws. Of the 10 bulls, four were located in a bull stud at (or close to) the Cogent-ST lab in the UK (two bulls) or the ST Benelux lab in the Netherlands (two bulls). These are termed resident bulls in the analysis.

Additional animals in Ireland (six bulls) were selected for inclusion in the trial, with ejaculates being directly transported from the Irish bull stud to Cogent (six hours door to door). These are termed 'shipped ejaculates' in the analysis.

Each commercial herd that enrolled purchased 60 dairy semen straws (30 sexed and 30 conventional) using a team of five bulls. The same bulls were used for conventional and sexed semen within farm (see Figure 1). Pregnancy diagnosis using ultrasound was conducted on 142 herds, resulting in 7,246 cow records being available for analysis.

Figure 1: The experimental design. Dairy bulls X-sorted (90%)

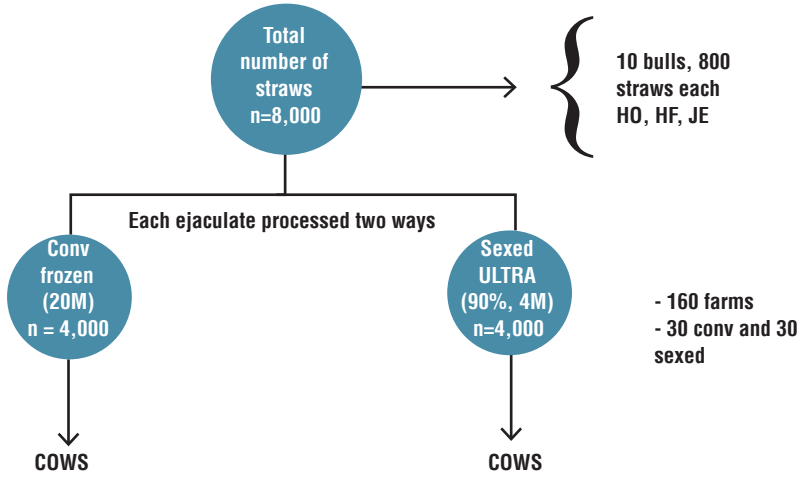
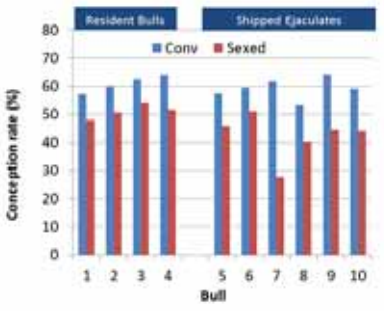
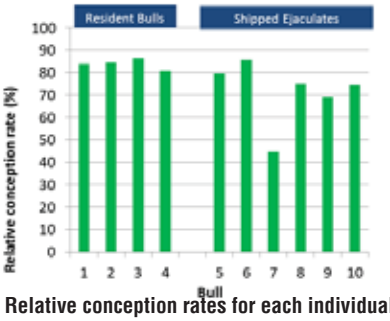


Figure 2: variance in conception rate



Conception rates for conventional and sexed semen treatments for each individual bull



Relative conception rates for each individual bull.

Effect on conception rate

Semen treatment had a significant effect on conception rate (CR). Cows inseminated with conventional semen had an average CR of 59.9% versus 45.5% for cows inseminated with sexed semen. So the conception rate of sexed semen was just over three-quarters (76.6%) that of conventional semen. There was evidence that the conception rate differed depending on the bull (Figure 2).

The biggest differences between conventional and sexed semen treat-

Evelyn Drake and Shauna Holden.

ments were for bulls with shipped ejaculates. All four of the resident bulls exceeded 80% relative CR, with little variation between bulls (average = 84%, range = 81% to 87%).

Of the bulls with shipped ejaculates, only one bull exceeded 80%, and four of the bulls with shipped ejaculates had relative CR ≤75% (average relative CR = 70%, range = 45% to 86%). Bull 7 had the poorest relative CR (45%), but it is important to note that his CR for conventional semen was good.

Herd to herd variation

When herds were ranked based on relative conception rate, approximately one-third had a relative CR of >90, and within this subset, most exceeded 100% (ie sexed semen performed better than conventional semen).

This was an unexpected finding, and suggests that the heat detection management on some farms is particularly well suited to sexed semen, and warrants further investigation.

2019 field trial

In the 2018 study, farmers identified the cows in heat, and the AI technician randomly allocated conventional and sexed straws to the cows that were presented for insemination. Under these field conditions, the relative conception rate achieved with sexed semen was, on average, 76%, which is unsatisfactory.

> The expected lifespan of conventional semen in the cow's reproductive tract is about 24 hours, but it is much less for sexed semen. Hence, inseminations with sexed semen should be conducted close to the time of ovulation

A possible explanation is that the timing of AI is not sufficiently controlled in systems that rely primarily on tail paint removal for heat detection. In such situations, AI is usually conducted once per day an all eligible cows with little regard for time interval since onset of oestrus.

The expected lifespan of conventional semen in the cow's reproductive tract is about 24 hours, but it is much less for sexed semen. Hence, inseminations with sexed semen should be conducted close to the time of ovulation.

A current trial is examining the effect of timing of AI on the conception rates that can be achieved with sexed semen (25 commercial herds, each providing ~100 cows). All 100 cows are subjected to the same synchronisation protocol to control the timing of ovulation and allow fixed-time AI. They are assigned, at random, to receive one of the following treatments:

- AI with conventional semen at the normal time (CONTROL).
- AI with sexed semen at the normal time (SEXED NORMAL).
- AI with sexed semen at a delayed time (SEXED LATE).

In this trial, heat detection and decisions regarding time of AI were removed from the farmer's control, and therefore allow a clear examination of whether or not better fertility performance can be achieved with sexed semen by delaying the timing of AI. The results of this trial will be presented at the Moorepark 19 Open Day on 3 July

Acknowledgments

We gratefully acknowledge funding provided by Dairy Levy Trust, Meat Industry Ireland, Munster AI, Glanbia Ingredients Ireland and CEVA Sante Animale. We would also like to thank the herd owners who participated in the field trials, and the AI companies that conducted the trial inseminations.

Dairy systems for a sustainable tomorrow

Sustainability is hard to define and hard to achieve, but in Ireland dairy farmers start with some great advantages.

Brendan Horan, Teagasc Animal and Grassland Research and Innovation Programme, Moorepark

Can you think of another word for 'sustainable'? Difficult, isn't it. We know it's a good thing for a business, or for any set of circumstances, to be 'sustainable'. Basically, it means there are no weaknesses in the system which might lead to someone crying halt, this just has to stop!

Sustainability, or lack of it, is used a lot in relation to farming systems. And sustainability is not just confined to environmental considerations. It also covers the economic, physical and mental well-being of those involved in farming, the quality of food produced and animal welfare.

If performance in any one of these areas falls below an acceptable standard something will 'give' and the business may fold. The coming decades are likely to see increased pressures on food production systems, both on the demand side, from increasing population and per capita consumption, and on the supply side, from greater competition for inputs and climate change.

Society's requirements are changing too, as discerning consumers have become increasingly engaged in how food is produced and sceptical about industrial-scale food processes. In addition to being more profitable and less complex to farm, future farm systems must be more transparent, supplying healthier foods from traceable production models.

They will differentiate their products based on tangible evidence of improved environmental conservation, biodiversity and animal welfare, and a reduced reliance on hormones, chemicals, and antibiotics. For grassland production models, such as those traditional to Ireland, improving the sustainable production of livestock products provides challenges and opportunities.

While the shift to more intensive production within both industries, has put more pressure on natural resources, at the same time, there is a greater understanding of the role of pasture-based food production in efficiently converting human inedible feed to high-quality nutrients, while building 'natural capital' and delivering a range of multifunctional services to society.

In comparison with cropping, permanent pastures provide an important biological filter that reduces nutrient and chemical run-off to surface and groundwater, conserve soils and support unparalleled biodiversity and carbon storage.

In a European context, improving the efficiency of grazing production systems is considered as the greatest primary opportunity to develop more resilient farming systems in the future.

Future pasture-based dairy systems will continue to depend on highly productive pastures and efficient ruminants.

Substantial additional gains in farm profitability can be achieved on most farms by refining the grazing system. The greatest gains will come from increasing pasture production and utilisation followed by conversion to milk fat plus protein (milk solids; MS), and this will continue to be the primary avenue to improved environmental efficiency over the next two decades.

Research modelling results indicate that for each 1t DM/ha increase in pasture utilisation on dairy farms, GHG emission intensity is reduced by 4% and net farm profit is increased by €173/ha.

Further improvements in pasture productivity can be achieved by improving grazing management, reseeding unproductive swards and improving soil fertility to optimum levels. Optimising the soil pH to ≥ 6.3 through application of lime on acidic mineral grassland soils is vital to ensuring efficient use of applied nutrients.

Teagasc data indicate that a 10-day increase in grazing season length increased annual farm profitability by €30 per cow, and reduced GHG emissions by 2% per annum. In addition, where soils are maintained within the optimum pH range, productive grass and clover persist for longer, resulting in reduced cultivation and increased carbon sequestration.

Selecting more efficient dairy cows is also paramount. There are two key goals: firstly, to extend the lifespan of each animal and reduce the requirement for replacements; and secondly, to further increase individual animal performance from grazed pasture.

Increasing herd Economic Breeding Index (EBI) by €10 per year increases annual farm profitability (by €20/cow) and reduces GHG emissions by 2% per annum. In addition, selection of dairy cows that are capable of achieving large intakes of forage relative to their size and genetic potential

for milk production increases feed efficiency and reduces nutrient losses.

Efficient grazing animals should produce in excess of 90% of their body weight in annual milk solids production to increase N use efficiency. On that basis, dairy farmers should aggressively select using EBI and use milk recording to identify and eliminate inefficient animals.

Stocking rate

Stocking rate (SR) is the key strategic decision for pasture-based dairy farms and is defined as the number of animals allocated to an area of land (ie cows/ha). Although the beneficial impacts of SR on grazing system productivity have been widely reported, as part of a resilient system focus, the impact of SR on environmental efficiency must also be considered.

Previous studies have indicated that where increased SR is associated with increased chemical fertiliser and supplementary feed importation, nutrient surpluses increase, and nutrient-use efficiency is reduced. This can result in increased losses to groundwater and the general environment.

However, recent SR studies have reported either stable or declining nitrate leaching with increasing SR; the critical proviso, however, was that strictly no additional N fertiliser or supplements were introduced at higher SR.

It is now recognised that a number of changes to management practices are required to maintain low levels of nutrient loss within more intensive pasture-based systems, including increased grazed pasture utilisation, greater use of organic manures to replace chemical fertiliser, more strategic use of chemical N.

Reduced cultivation reseeding methodologies, improved grazing management and nutrient budgeting, and, importantly, the preferential management of higher risk farm areas will also play a role. Previous studies have also reported that the carbon footprint of milk production will be reduced by maximising the use of grazed pasture at appropriate overall SRs.

In short

Improved efficiency in dairy systems is a significant challenge for the future. The world demand for food will increase with both population growth and increased economic prosperity, but milk production systems must be sustainable, without negative impacts on animals and the environment.

Resilient pasture-based milk production systems have the capacity to absorb shocks and thrive within the changing and uncertain global milk production environment. Such systems, based on high-productivity grassland management in combination with genetically elite adapted animal genotypes, are well placed to meet the increasing global demand for food within a resource constrained environment, while producing high quality products produced meet the highest standards of sustainability, sanitary quality and nutritional value for increasingly discerning consumers.

Evaluating on-farm energy projects

A new online tool will help farmers make decisions relating to energy use, technology investments, CO_2 mitigation and investment in renewable energy production

John Upton & Michael Breen,
Teagasc Animal and Grassland Research and Innovation Program,

Philip Shine & Michael Murphy,
Cork Institute of Technology

The electricity bill on Irish dairy farms varies from €2.60/1,000L, on the most energy efficient units, to as much as €8.70 per 1,000L. To put it another way, that's from €15 to €45 per cow per year.

The range is partly because no two farms are the same due to herd size, infrastructure specification, farmer age and eligibility for grant aid and availability of grant aid for specific technologies. The variety of circumstances has made it difficult to offer general advice on energy efficiency.

Now working with Cork Institute of Technology (CIT) and the Sustainable Energy Authority of Ireland (SEAI), Teagasc has developed the Dairy Energy Decision Support Tool (DEDST) to assist farmers in evaluating the cost/benefit of key energy efficiency and renewable technologies for their individual farms.

Dairy Energy Decision Support

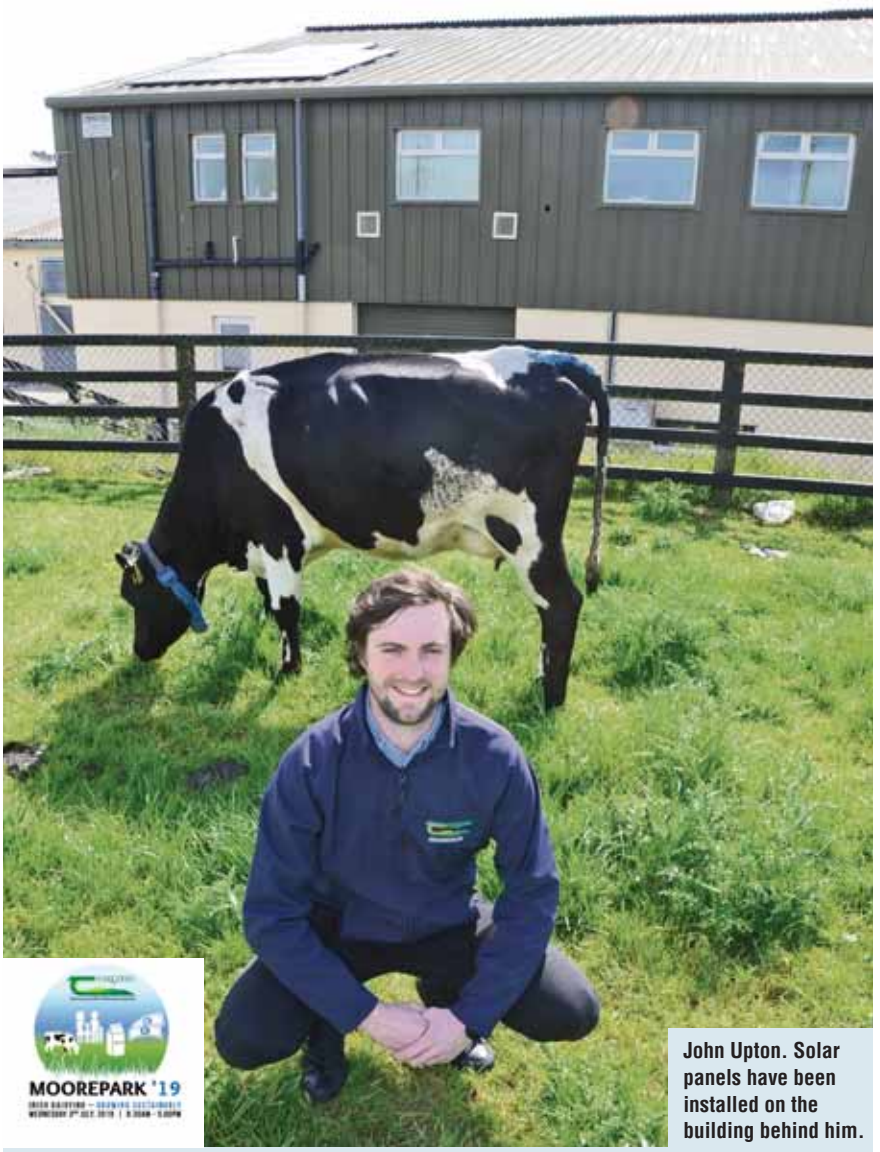
The DEDST is available to use for free at: http://messo.cit.ie/dairy.

This is an interactive and easy-to-use tool aimed at farmers, farm managers and farm advisers, which can be used to evaluate the likely impact of investment in certain technologies and changes in farm management practices.

It's worth noting that the main consumers of electricity on-farm are milk cooling (31%), the milking machine (20%) and water heating (23%).

Possible alternative technologies include plate coolers, variable speed drives, heat recovery systems, solar photovoltaic systems, wind turbines and solar thermal water heating systems.

The DEDST operates as a web-based platform. The user enters details of a specific farm, including farm size, milking times, number of milking units, milk cooling, water heating system type and electricity tariff. Details of an alternative technology to be evaluated on that farm can then be entered. The user may also enter economic details regarding potential future grant aid for technologies, as well as renewable energy feed-in tariffs and inflation. All energy and economic calculations are then computed, and displayed on an easy to interpret output screen.



John Upton. Solar panels have been installed on the building behind him.

Example – investment in a solar photovoltaic system

Solar photovoltaic (PV) cells generate electricity using energy from the sun. These systems can be stand-alone (i.e. the generated electricity is only used by the farm) or grid connected (where surplus electricity is fed into the national electricity grid).

Unfortunately, those in Ireland who export electricity to the grid from small scale PV systems do not currently receive payment.

Hence, the most logical solution would be a stand-alone system, sized so that all electricity generated is consumed by the farm.

For a 100 cow spring calving herd, the ideal PV system size falls at around 6kW of installed capacity, which would cost in the region of €7,500. In the absence of a capital investment grant, this system would pay back after 13 years. If a 40% grant were made available, the payback period would fall to eight years, while a 60% grant would make the payback period fall to five years. The inclusion of a 6kW PV system would result in 28% of the farm's electricity being provided by a renewable source and would offset more than 2.4 tonnes of CO_2 per year.

PV systems qualify for accelerated capital allowances (i.e. the entire cost of the installation can be written off against tax in the year of purchase), which would further reduce the payback period.

Moorepark attractions

Some of the topics which will be on show at the Teagasc Moorepark Open Day on July, 3rd

Teagasc food scientists Dr Daniela Freitas, Dr Alina Kondrashina, Dr Andre Brodkorb and Bhavya Panikuttira discussing the 3D-printed molecular structure of beta-lactoglobulin, a protein found in bovine whey.

Food research at Moorepark 19

The Teagasc Food Research Programme will have a significant presence at Moorepark '19. You will have an opportunity to see butter being made with 'grass-fed' milk and learn about the beneficial effect of 'grass-fed' on the nutritional composition of milk and dairy products.

You will get also be able to see how milk composition is determined using 'in-line' near-infra-red technology. There will be a display demonstrating the vast range of dairy ingredients produced nationally, with information on target markets (nationally and internationally) and nutritional status of these ingredients, in addition to a display featuring the latest in drying technologies (for developing dehydrated dairy products for export markets).

Of course in Teagasc Moorepark, the Food Research Programme always aims to be at the cutting edge, and those attending Moorepark 2019 will be interested to see how we apply 'digital dairy' technologies such as robotics, 3-D printing and virtual reality technologies to the investigation and development of dairy for Ireland.

Did you know that the structure of food has a significant bearing on its digestion? Check out this exhibit and discover the science behind this research.

Something that is always of interest to attendees of open days at Moorepark, is the exhibit that features products developed via Teagasc research and specialist commercial services. Call in and try some of these tasty products. These Teagasc services are available to small and medium sized enterprises, multinational subsidiaries and food entrepreneurs. You might be inspired to develop your own food business!

Moorepark'19 will also feature up to date information on the science behind the role of the gut microbiome in maintaining health (for infants, elderly and athletes), and the potential for using health-promoting microbes to increase the benefits of a range of foods. There will also be a feature on the health benefits of fermented foods. Food Research Programme staff will be available to answer questions about all exhibits.

PastureBase Ireland

At the Moorepark open day the PBI stand will be directly beside the Grazing Demo.

Over 1,500 grass covers are being uploaded weekly.

Help will be available on the day if you have any queries or want to get signed up to use the programme.

At the open day we will be launching the new milk report and phase one of the fodder budget.

At approximately 11am and 12 noon there will be a farmer presentation on why they use PBI and the benefits they are getting from the system.

Micheal O'Leary

Thomas Tubritt.

Choosing varieties.

Increasing the proportion of grazed grass in the diets of dairy cows increases profitability on farm. Perennial ryegrass varieties are known to differ in the level of utilisation they support. Therefore Irish farmers need perennial ryegrass varieties with superior grazing traits.

Suitability of perennial ryegrass varieties to grazing is not routinely measured in Recommended List trials. The objective of our work was to evaluate the grazing performance of the leading perennial ryegrass varieties in Ireland. Varieties were assessed for herbage yield, quality and persistence. After this, dairy cows grazed the plots and post-grazing sward height was recorded as a measure of grazing efficiency.

This study showed that tetraploid varieties are consistently grazed to lower post-grazing sward heights. Farmers wishing to improve utilisation of grazed grass on their farms should opt to sow increased proportions of tetraploid varieties on their farm.

Thomas Tubritt

Continued on p24

Alison Sinnott and Hazel Costigan.

Addressing the labour shortages associated with calf rearing

To maintain a sustainable future for our dairy farms, finding solutions to overcome the labour shortage associated with calf rearing is critical. We are carrying out research to evaluate how calf management practices can be advanced and streamlined in a way that improves labour using LEAN efficiency principals, without negatively affecting the calf.

The project began in spring 2019, with an initial investigation into the effect of automated calf feeding systems on calf health, welfare and labour. Further research will take place over the next four years to develop a comprehensive training programme and guide to rearing calves in an efficient and sustainable way.

Alison Sinnott

Rearing strategies for dairy heifers

Developing an optimum heifer-rearing strategy is becoming increasingly necessary; such a strategy must begin shortly after birth and continue until the heifer calves down.

In spring 2018, we began a three-year study at Teagasc Moorepark to investigate the effect of weaning age and post-weaning growth rate on growth performance, fertility parameters, age at first calving and first-lactation milk production of the maiden heifer.

Heifer calves were weaned at either eight or 12 weeks and subsequently offered either a high or low level of concentrates post-weaning. In the second year, grass was managed so that the heifers previously offered high and low levels of concentrates were grazed to 4.5 and 3.5 cm, respectively. To learn more visit us at Moorepark 2019.

Hazel Costigan

Becoming an employer of choice

As well as technical topics there will be a huge amount to learn about people management at Moorepark 19.

Work by Thomas Lawton, Suzanne Groome, Martina Gormley, Pat Clarke and Marion Beecher have shown that:

- **Good communication and training opportunities are the main characteristics employees seek from their employer**
- **77% of farmers surveyed do not issue payslips to employees**
- **Improvements required regarding fair treatment and respect of employees, including employers compliance with employment law**

VistaMilk

The recently established €40m VistaMilk SFI Research Centre (@VistaMilk; www.vistamilk.ie), co-funded by Science Foundation Ireland, the Department of Agriculture, Food and the Marine, and 40 industry partners, aims to digitalise dairy production and processing in Ireland from the soil, through to the grass and animal, and eventually into the milk and resulting products while considering the impact at the level of the human gut.

The centre will develop sensing, communication and analytical solutions to current and future problem statements across the dairy-food chain. The pillars of focus include the 1) soil and pasture, 2) cow (ie genetics and management) and 3) food. By always considering the entire production chain, potential upstream and downstream ramifications of modifications in any link along the chain can be readily quantified.

Led by Teagasc, the partners in VistaMilk include the ICBF, Tyndall Research institute, Waterford Institute of technology, Dublin City University and University College Dublin and Galway. The opportunities that arise at the interface between the agri-food and technology industries will be the basis for the competitive advantage and international reputation of the centre.

The outputs from VistaMilk are human capital, new knowledge, potential spin-out companies and of excellent scientific publications, all of which will having measurable economic, societal and environmental key performance indicators such as improved competitive metrics, new markets, a vibrant agri-tech industry, foreign direct investment attractor, reputation enhancement, food security, tailored nutrition, more informed policies, and lesser environmental hoofprint.

Grass modelling

The VistaMilk project will draw on the work of a wide range of disciplines and scientists including Elodie Ruelle at Teagasc Moorepark who is modelling grass growth by looking at the influence of weather and other factors on the plant.

Predicting on-farm grass growth is challenging as it depends on soil type, farm management and weather conditions. Since early 2019, the MoSt grass growth model has been live tested on 40 farms. Individual grass growth prediction for each of those farms each Tuesday and Friday is helping farmers with their weekly farm management decisions.

Elodie Ruelle

Ellen Fitzpatrick

Clover

In an era where sustainability is at the forefront of Irish agriculture, including white clover in swards of PRG can offer increased nutritive value of the herbage, improved animal performance and reduced nitrogen application rates.

A study is ongoing in Teagasc, Moorepark to determine the dairy cow performance off four different treatment groups: total mixed ration (TMR), grass-only 250 kg N ha-1, grass-clover 150 kg N ha-1 and grass-clover 100 kg N ha-1.

Milk solids, cumulative milk yields, herbage production, sward clover content, dry matter intakes and methane emissions are recorded to maximise milk production while improving nitrogen use efficiencies on intensive dairy farms. The work carried out for the project aims to enhance the sustainability of milk production in temperate climates based on the inclusion of white clover.

Ellen Fitzpatrick.

Grass only v grass clover

Since the removal of the European milk quotas, the most limiting factor to Ireland's milk production is land. This has spiked a renewed interest in white clover inclusion due to its production benefits. Teagasc Clonakilty trial work is now comparing different N rates, 150 kg N/ha and 250 kg N/ha, both with and without clover to quantify white clover benefits in the sward while also tracking its persistency in an intensive grazing system.

Along with this a grazing plot investigation is being carried out comparing the efficacy of CAN, Urea and NBPT-Urea at both 150 kg N/ha and 250 kg N/ha at two site locations, Clonakilty and Moorepark.

Aine Murray

'Healthy Cows – High Quality Milk'

Of interest to all farmers will be updated research on the effectiveness of treating cows with teat sealant only, compared to teat sealant plus antibiotics at drying off. Chlorine free milking machine cleaning routines are very topical currently, and we will have a panel discussion with farmers, milk quality advisors and researchers on best practice options. Animal Health Ireland will be present at our 'village' at Moorepark 19 discussing all aspects of herd biosecurity with a particular focus on managing Johne's disease.

We will have plenty of research updates from recent trials completed around calf health and contract rearing, and will have a live demo looking at heifer target weights which is a key area to get right for every dairy farmer.

David Gleeson

An old friend with benefits

Winter Oilseed Rape brings many advantages to a crop rotation and deserves to occupy more hectares than it currently does.

Shay Phelan,
Tillage Specialist,
Teagasc Crops Environment and Land Use Programme.

Despite the fact that winter oilseed rape offers many benefits, the area of the crop grown has remained at approximately 8,000ha for the last number of years. In 2017 figures from Teagasc e-Profit monitors (Table 1) show that the crop delivered a net margin of €511/ha. This was better than all cereal crops including winter wheat at €433/ha.

Break crops such as winter oilseed rape offer growers many benefits over growing continuous cereals:

- **Weed control** – oilseed rape gives growers the opportunity to tackle weeds with different chemistry, slowing down the development of resistant weeds. Growers also have a chance to control grass weeds and wild oats which can be difficult in cereals.
- **Disease break** – with cereal diseases becoming more difficult to control, oilseed rape offers the opportunity to break the cycle of these diseases. The next cereal crop will be grown in a cleaner environment.
- **Three-crop rule** – oilseed rape can help farmers to comply with the three-crop rule under 'Greening' for the Basic Payment Scheme.
- **Nutrition in following crop** – as with any "break crop", the following cereal generally has a lower requirement for nitrogen and fertiliser savings can be made.
- **Yield boost** – most cereal crops tend to give higher yields after a break crop compared with a continuous cereal situation.
- **Harvest spread** – oilseed rape is usually ready to harvest in late July or early August, offering growers the chance to get some fields cut before the main harvest. This helps lower workload in August and can also help to reduce machinery costs as you can extend the harvesting window. You may be able to get by with a smaller combine harvester.

> Target 60-80 seeds per square metre, the lower end of the range is for hybrids, with the aim of establishing in the region of 50 plants. Increase the seed rate once you move into September or if conditions are less than ideal.

Table 1: Average Net Margin from e-Profit monitors 2017

Crop	Net margin €/ha
Winter wheat	433
Winter Barley	408
Spring feed barley	277
Spring malting barley	367
Winter Oats	234
Spring Oats	300
Spring wheat	337
Winter Oilseed rape	511

Winter oilseed rape planting normally begins in late August. While this is usually a very busy period, sowing in August as opposed September can be the difference between having a profitable crop or not. Early sowing allows the crop to establish quickly which can help to reduce the amount of pigeon damage later in the season.

Pigeons will attack more backward crops first as they can easily land in them and see potential predators quicker than in tall, dense, crops. Severe pigeon attack in a September-sown crop can result in you having to replant.

Where pigeon grazing is prevented and crops grow well into the spring, significant savings can be made in nitrogen fertiliser as the leaves of the crop contain nitrogen. The more leaf you have, the bigger the potential saving.

The first decision is: What to plant? There are both conventional and hybrid varieties. When planting runs into September, the hybrids tend to have the advantage in terms of vigour. They are also planted at slightly lower seeding rates.

Target 60-80 seeds per square metre, the lower end of the range is for hybrids, with the aim of establishing in the region of 50 plants. Increase the seed rate once you move into September or if conditions are less than ideal.

A fine, firm, seedbed is essential for good establishment as the seed is very small and needs good soil contact for strong establishment rates. This

Conor O'Callaghan, Taegasc, Kellie Snow and her father Ronan.

FARMER PROFILE

Ronan Snow, Co Dublin

Ronan Snow grows potato and cereals in north Co Dublin. "About 10 years ago we started to incorporate winter oilseed rape into the rotation. We've found it to be beneficial, not only financially, but as a great entry for the following cereal.

"These crops benefit from the residual nutrients in the soil lowering their fertiliser requirement, especially compared with following crops of winter wheat." Last year Ronan grew 30ha of PT 256 (Variety) which yielded 3.9 t/ha. A slightly disappointing outcome in an unusual year. "We have averaged more than 5.0t/ha in good years," says Ronan.

The variety grown this year is, once again, PT256 and so far the crop looks promising. "We've been able to make significant savings in the spring on nitrogen as pigeon grazing was kept to a minimum and using crow/bird bangers last autumn."

"The crop had a green area index of 1.5 in February so instead of applying 180kg in total he only used 170kg/ha," adds his local Teagasc advisor Conor O'Callaghan.

"The crop also received three fungicides: one in autumn to control phoma, one in early spring to control light leaf spot and a final application at the mid-flowering stage to control schlerotinia."

Ronan concludes: "I can't speak highly enough about the benefits of winter oilseed rape in our rotation."

can be achieved by either using the conventional plough and one-pass operation or by using a direct drill. Research in Teagasc Oak Park has shown that yield differences between the two systems are quite small.

Weed control

First, assess which are the predominant weeds in the field and choose the appropriate chemistry to deal with them. For most growers, this will mean a pre-emergence application of a herbicide usually containing pendimethalin eg Nirvana, which gives good broad-spectrum weed control of broadleaved weeds.

Where the pre-emergence timing is missed, there are herbicides that can be used. However, they tend to have a more limited weed spectrum. Grass weeds and wild oats can be controlled after emergence with a specific graminicide type herbicide, eg Falcon, Fusilade Max, Stratos Ultra, Centurion Max.

Table 2 :- Phosphorus (P) & Potassium (K) Requirements for A winter Oilseed Rape crop yielding 5t/ha

Soil Index	P (kg/ha)	K (kg/ha)	Suggested Fertiliser
1	55	105	550 kg 0-10-20/ha
2	45	90	450kg 0-10-20/ha
3	35	75	350kg 0-10-20/ha
4	0	0	Omit

Autumn Fertiliser Requirements for Oilseed Rape (OSR) Crops

Aim for soil pH 6.5 on mineral soils and if necessary apply lime based on soil analysis before sowing. The crop has medium demand for P and K as shown in Table 2 for a seed yield of 5t/ha. Consult your most recent soil test report and apply P and K at sowing time depending on soil fertility levels to ensure rapid crop establishment and good root development over the winter.

Alternatively, the crop's nutrient requirements may be supplied by organic manures such as farmyard manure, spent mushroom compost (SMC) or cattle slurry. Oilseeds have a good ability to take up nitrogen over the winter and this overwinter N will contribute to the crop's N requirement in spring.

Drainage: choosing your aggregates

A wide range of sizes, types and costs of aggregate materials are available for use in land drainage across the country.

Ian Byrne, Patrick Tuohy,
Teagasc Animal and Grassland
Owen Fenton,
Teagasc Crops Environment and Land Use Programme
Research and Innovation Programme
Mark Healy NUI Galway

In Ireland, there is a broad range of materials available for use in land drainage systems. These materials, predominantly gravels, can vary widely in type and grade, due to local rock types. The performance and working life of land drainage systems depend on the quality and suitability of the materials used in the field drains, and on keeping such drains well maintained.

The range of materials available in terms of pipes and gravels does not easily fit into any standard classification, and many different combinations are in use. Field drains have to satisfy the often conflicting requirements for water flow and retention of soil particles. Their effectiveness is often reduced by blockages of the drain pipe or the envelope material (the material around the pipe) over time.

Cost and practicality usually drive the choice of material used. The relative costs of stone aggregate can direct the farmer towards unsuitable materials in some cases. While some of these are adequate, many more are unsuitable and as a result there are large variations in the performance of drainage systems.

Currently there is little guidance on the availability and cost of these materials from around the country. A survey conducted in January 2019 aimed to assess this variability in cost and availability of suitable materials. Twenty-five counties are represented within the survey, in which 93 quarries were assessed for the availability of materials and their related costs.

Figure 1: The distribution of quarry types around the country

What aggregates are available and where?

Figure 1 shows the distribution of these quarries across the country. There are 61 crushed rock quarries and 32 sand and gravel pits. The most common quarry type is Limestone (42%) due to the abundance of this

rock type in Ireland. Gravels (38%) have a wide geographical distribution.

Sandstone (11%) is widely available in Munster. Other quarries include Greywacke, a sandstone with >15% clay, and Dolorite and Basalt, medium-grained igneous rocks.

Generally, a single sized, clean stone, in the range of 10-40mm is preferable for use around drainage pipes. A large variation in size will reduce pore space and hinder the ability of the gravel to transmit water. Elongated aggregates can interlock, reducing flow rate.

Although it is important to have adequate flow of water through the gravel, it also needs to act as a filter. The size of aggregates used will depend on the proportion of sand, silt and clay that is within the soil and should be assessed before drainage works commence. However, this is not always possible and differences exist between crushed aggregates and gravels, quarry practices and local preferences.

Gravels act as an ideal drainage stone due to their rounded surface and being a generally clean material when washed, although gravel material is generally more expensive than crushed rock and isn't universally available. Crushed stone has more angular surfaces and is commonly used as base material in construction and concrete production.

Different sized materials are preferred in different areas of the country. The most common aggregate type is 50mm, making up 25% of the used materials, followed by 20mm, 20-40mm and 20-50mm sizes, with the rest being made up of sizes ranging from 10mm to 100mm (Figure 2).

When these data are classified by province, Munster has the highest average size of 53mm, followed by Connacht at 42mm and Leinster at 33mm. Although rainfall levels can vary with elevation and topography, the average annual rainfall is higher in western counties and around Wicklow. The drier counties tend to use a smaller stone size (average size of 36mm) as drainage material, compared to the wetter counties where the average size is 48mm.

What are the costs?

The costs of the materials are quoted per tonne, excluding both haulage and VAT. Fifty millimetre stone, on average, costs €8.87. This can vary anywhere from €5.50 to €12.50. The average cost for 20mm, 20-40mm and 20-50mm stone is €10.00. The larger 75mm and 100mm stone is cheaper at €8.41 on average, with the smaller 10mm, 12mm and 14mm stone costing around €11.

Table 1: Aggregate price by type

Size	Gravel	Sandstone	Limestone
10	€10.16	–	€8
20	€10	–	€9.50
50	€10.13	€9.30	€8.11
75	–	€10	€8.57
100	€10	€7.75	€8.10
20-40	€9	€9.50	€6.50
20-50	€10	€9	€11.5

Table 2: Aggregate price by region

Size	Munster	Connacht	Leinster
50mm	€9.42	€8.36	€8.14
20mm	€10	€9	€10
20-40 & 20-50mm	€11	€9	€9
75 & 100mm	€8.20	€8.86	–
10, 12, 14mm	–	–	€9

Farmers considering a drainage project can acquire a copy of the Teagasc Drainage Manual via their local Teagasc office or on the Teagasc website.

Figure 2: Various aggregates in % total

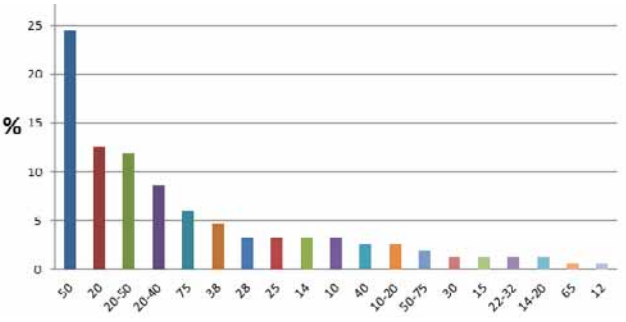


Table 1 shows the breakdown of stone types for the three main rock types. Table 2 outlines the prices for average sizes by region. The prices vary with rock type, size, quantity purchased, delivery distance, and the intensity of grading and washing conducted.

The potential use of limestone and its viability as a drainage stone has come under question and work to assess the suitability of limestone in drainage systems is under way to address questions of excessive dust, the binding together of aggregates and the breakdown of the material over time.

Following this survey, aggregates were collected from 40+ locations across the country with a large geographical spread. These aggregates vary in size, shape and lithology, representing all the aggregates currently used as an envelope material in land drains. A number of tests will be conducted to assess hydraulic capacity, filtration and overall performance of these materials.

This work is part of an ongoing research project to assess the suitability of materials used in land drainage systems. The capacity, performance and lifespan of a range of pipe and envelope combinations will be assessed to provide guidance on their appropriateness.

Biodiversity emergency – why?

Catherine Keena, Teagasc Countryside Management Specialist

Biodiversity or nature is declining globally at rates unprecedented in human history, with one million animal and plant species threatened with extinction. This is according to a new report in May 2019 from the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES).

As well as species becoming extinct, the diversity of landscapes has become more uniform in their species composition.

A major direct driver of this loss is land-use change, with intensification of agriculture and forestry. Protected areas alone cannot prevent biodiversity loss.

However, there is ample room for exploiting the potential of agriculture to contribute to the recommended mainstreaming of biodiversity conservation across sectors.

Understanding biodiversity

Biodiversity has been described as "the diversity of life on earth" – on land and in water. It includes diversity within species, between species and ecosystems. While many definitions of biodiversity complement each other, biodiversity is not always well understood.

There are differences in the vocabulary and approach of scientists, economists and policymakers. A Fáilte Ireland study in Ireland in 2019 found that 52% of adults had never heard of biodiversity and a further 30% had heard of it but did not know what it meant.

An examination of farmers' perceptions of biodiversity in Estonia and Finland found that farmers generally considered biodiversity to be the "wild nature outside the fields" which did not include weeds and pests.

When discussing biodiversity, we cannot assume everyone speaks the same language.

The value of biodiversity

The value of biodiversity is clearly demonstrated in the Millenniums Ecosystem Assessment. Biodiversity plays an important role in ecosystem functions that provide four main types of services: provisioning; regulating; cultural; and supporting.

Provisioning services include food, fibre, fuel, genetic resources, biochemicals and fresh water. Regulating services include pollination, water purification and waste treatment, and the regulation of air, climate, water, erosion, disease, pests, invasive species and natural hazards.

Cultural services include spiritual and religious values, knowledge systems, education and inspiration, recreation and aesthetic values, and a sense of place. Supporting services include soil formation, photosynthesis, primary production, nutrient and water cycling.

Natural environments can contribute to alleviating mental health problems, both in terms of supporting good mental health maintenance and recovery. Attending to natural stimuli such as the gentle rustle of trees in the breeze or other sights and sounds of nature requires little effort and offers respite from cognitive load.

Back in 1865, Olmstad understood that natural scenery "employs the mind without fatigue and yet exercises it; tranquilises it and yet enlivens it; and thus, through the influence of the mind over the body, gives the effect of refreshing rest and reinvigoration of the whole system".

The decline in biodiversity

Biodiversity has always evolved but changes in the past 50 years have been more rapid than at any time in human history. Species extinction rates over the past few hundred years have been as much as 1,000 times the background rates typical over the earth's history. There was a 30% decrease in the Living Planet Index, a single index which aggregates trends in over 7,100 populations of about 2,300 vertebrae species from different world regions between 1970 and 2006. The current biodiversity decline involves homogenization of communities, with a few generalist species benefiting. This explains why there isn't a "silent spring" scenario as discussed by Rachel Carson in her book in 1962, but rather a decline in species richness, with generalist species occupying the vacant niches left by the declining ones.

An assessment in Ireland in 2013 found that 91% of the 58 protected habitats assessed had unfavourable conservation status, while 32% of species were assessed as inadequate or bad. Examples of species assessed as bad were freshwater pearl mussel, sea lamprey, twaite shad, pollan and the natterjack toad. In Ireland, short term (2001-2012) population trends of 27% of breeding birds and 24% of wintering birds were declining. In a revised list of Birds of Conservation Concern in Ireland (BOCCI), of 185

This moth belongs to the species Caloptilla betulicola. Over the next few decades, 40% of the world's insects may become extinct with butterflies and moths, bees, sawflies, wasps, ants and dung beetles most affected. \ P Strickland

Natterjack toad is one of the 32% of Irish species assessed as inedaquate or bad conservation status

This is one of our 77 solitary bees on an oxeye daisy. Thirty percent of our 98 wild bee species are threatened with extinction. \ J. Breen

birds, 37 were placed on the red list and 90 on the amber list. Breeding ranges of 47% of Irish bird species have contracted, while 18% have expanded to new areas. Waders and upland birds are of concern. Examples of farmland birds whose range declined and distribution remains restricted were corncrake, grey partridge, twite, whinchat and yellowhammer.

The state of pollinators and associated plant biodiversity has been well documented. A study of bees using museum specimens collected before 1950 in Belgium, England and The Netherlands showed that bees about to experience significant declines depended on specific plants which declined. Thirty per cent of the 97 wild Irish species are threatened with extinction.

Apart from the more recognisable and generally favoured biodiversity species such as birds and bees, the precipitous decline in insects and its significance has more recently come to the fore with catastrophic repercussions for the planet's ecosystems since insects are at the structural and functional base of the world's ecosystems. Over the next few decades, 40% of the world's insects may become extinct, with butterflies and moths, bees, sawflies, wasps, ants and dung beetles most affected.

Agriculture

The most important direct driver of biodiversity loss is habitat change, including land use change. Both intensification and abandonment have had a significant impact on the levels of biodiversity in farmland all over the continent. The expansion of modern, intensive agriculture causes biodiversity loss, unless it is in a sustainable way. The Strategic Environmental Assessment (SEA) of Food Wise 2025 – a plan for Ireland's agri-food sector – concluded that growth opportunities and innovation as a result of their uncertainty are deemed to represent a negative effect on biodiversity. Food Wise 2025 concluded that future food production systems must be as focused on managing and maintaining natural resources as they are on increasing production. In April 2019, acknowledging the challenge of biodiversity decline and non-point source pollution in regions with intensive agriculture, the European Commissioner for Agriculture Phil Hogan asked the question: "How do we respond?"

Think before you tidy

Think before you tidy areas where biodiversity exists. The quest for neatness and tidiness often misguidedly overrides ecological considerations in an effort to make farms appear well-managed.

Hedgerows, field boundaries, field margins and roadside margins, which are potentially extremely valuable biodiversity hotspots and networks for nature, are all too often over-managed or sprayed, resulting in flowerless, structure-less wasted resources of little or no benefit to biodiversity. Allow space for biodiversity to flourish on your farm.

The Hen Harrier Programme in north Kerry and west Limerick

David Trant, Teagasc, Listowel

The next CAP will almost certainly include more environment-related support payments. The Hen Harrier programme, which pays farmers partly on the basis of its impact on actual bird numbers, may be a taste of things to come.

The Lyracrompane area lies between Listowel and Castleisland and sits between the Stacks and Glanruddery Mountains. This is an area with over 2,000mm of rainfall and, unsurprisingly, wet soils.

A lot of the land has been planted with trees. Farmers in "Lyre" are resilient and despite the challenging circumstances generally tend to think that "the glass is half full rather than half empty".

The Carmody and Collins farm families have farmed in the area for generations. Mattie and Jason Carmody have a suckler cow herd and dairy farmer Gerard Collins is a Lee Strand Co-op supplier. Both families have some of their land designated as Hen Harrier Special Protected Area (SPA). They are happy to be part of the programme as it compliments their farming systems.

"We farm commercially but there's no question that some areas of the farm which would need major attention to perform well commercially are best suited to environmental uses. These areas are more sustainable financially and from an environmental position in the Hen Harrier Scheme than they would be in farming," says Mattie Carmody.

Birds of prey

Hen harriers are medium-sized birds of prey that are widely distributed throughout Ireland, though in very small numbers. Numbers in the past have been in decline and there is estimated to be only 100 to 150 breeding pairs .The new hen harrier programme is aimed at turning this around.

Adult male hen harriers are pale grey with black wing tips. Females are larger, brown in colour and have a white rump and bars on their tails. During their first year, birds of both sexes look similar to adult females, and the term "ringtail" is often used to refer to birds that could be either juveniles or adult females.

Hen Harriers are rare in Ireland throughout the year, although they are more widely present during autumn and winter. During this time, some birds may leave Ireland to winter abroad but greater numbers will arrive here from overseas.

Typically, hen harriers establish their nests in spring. Males provide nearly all of the food required by both adults as well as the chicks for the first five weeks. In Ireland, the hen harrier's diet is comprised mostly of small birds and mammals. Males returning from a successful hunting trip deliver food to their mates in a spectacular aerial manoeuvre called a "food pass".

As he approaches the nest area, the male calls to the female, who rises to meet him. The male then either drops the food for the female to catch, or delivers it to her directly in mid-air, his mate swinging upside down beneath him to take the prey from his feet into the grasp of her own talons.

The hen harrier project programme for farmers

This five-year programme is targeted specifically at farmers with land designated for the protection of breeding hen harrier pairs in Slieve Beagh, Slieve Bloom Mountains, Slieve Felim to Silvermines Mountains, Slieve Aughty Mountains, Stacks to Mullaghereirk Mountains, West Limerick Hills and Mount Eagle and Mullaghanish to Musheramore Mountains Special Protection Areas (SPAs), totalling about 167,117ha.

The programme gives farmers the opportunity to earn extra income by providing environmental goods and services and thereby protect the hen harrier. The programme encourages farmers to protect and enhance high nature value (HNV) farmland and deliver enhanced ecosystem services.

The payments to farmers include a results-based habitat payment which involves an annual "scoring" of the hen harrier fields. A supporting actions payment where farmers are financially reimbursed to varying degrees for capital infrastructure that benefits upland management, and lastly there is a hen harrier payment

David Trant, left, Teagasc, Business and Technology advisor, with Eoin McCarthy, agriculture specialist and project officer for Stacks to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle (Cork, Kerry, Limerick) and Mullaghanish to Musheramore. \ Valerie O'Sullivan

based on the success of the local hen harrier population, ie are there more nests and more chicks and so forth.

In general, average farmer payments are around €3,000 per annum but the range is very broad. There is no compulsion to join the programme and a farmer is not obliged to remain in the project either – they are effectively paid for what they provide annually.

The future

All farmers who applied on time for the programme have been offered contracts and this summer will see an additional 800 participants, bringing the total number of farmers in the project to 1,600.

The Department of Agriculture Food & Marine has a keen interest in EIPs – (European Innovation Partnerships). The hen harrier programme is a very prominent interactive innovation model and is one of the 23 Irish EIP-Agri operational groups. Other EIPs include the Pearl mussel project, Enable conservation tillage, MOPs, BRIDE, and so on. Future environmental schemes will be based on these type of models .

The marketing of Irish produce will also be looking to production systems and farmers who have major environmental credentials and this may be of major value to farmers based in these HNV lands. This programme endeavours to support farmers and farming communities and will hopefully sustain cultural landscapes and vibrant rural communities.

Reminder

Teagasc would remind any farmer that applied for the programme to check with their local project officer or the Hen Harrier team in Oranmore, Galway, if they have applied for the project and not yet received correspondence.

Getting the ball rolling on your succession plan

Given the average age of farmers (57), succession is a topic that is on the radar for many farm families, advisors, industry stakeholders and policy makers alike.

Tom Curran
Teagasc Cork West.

Almost 5,500 families have attended Teagasc Transferring the Family Farm Clinics (TFFC) between 2014 and 2018. The age group was generally on the older side, but in reality all farmers regardless of age should be attending these events.

Succession is important for many reasons:

- The family farm unit is the cornerstone of Irish farming and this is critical to food production (the world population is still growing) but also for rural communities, where farmers are key stakeholders.
- Over the last 20 years, the average age of farmers has increased from 48 to 57 years old and a small proportion are under 35 (5.9% and falling).
- The farm business has a lifecycle of its own and it begins with a development phase that can continue on an upward trend where succession is dealt with early. Progress can stall or go into reverse on farms where there is no identified and committed successor.

What is succession?

The process of succession is regularly misunderstood as meaning the legal transfer of land. Succession is actually the gradual transfer of management and decision making in the farm business, leading eventually to the transfer of financial control. Succession occurs well before farm transfer and should start quite early in life.

Inheritance

Inheritance is a legal process by which land and other farm assets are transferred legally through a life-time transfer or through a will. A significant group in Irish farming, which is growing in importance, are inheritors who do not wish to farm themselves. Collaborative farming business structures such as partnerships, share farming and long-term land leasing, have a key role to play where active farmers can engage with these inheritors to farm the land.

Engaging with succession

A key message from the recent RDS Facilitating Land Mobility and Overcoming Current Issues Seminar for Farm Families was to: "Engage in the succession process early, as a family, rather than putting it on the long finger,".

Speaking to families at the TFFC's over the years, I have seen that farmers build succession up in their minds to be a major mountain rather than a mole hill. In many cases, this is due to a lack of accurate information or being influenced by a relative, friend or contact who has had a bad experience in what was a very particular set of circumstances.

The message is to start early and take your time to gather the required information and to build up an expert, professional team that can help you to make the best decisions possible on succession and inheritance.

Planning for succession:

Planning facilitates earlier engagement of a farming successor through a registered farm partnership, which enables them to grow gradually into the business, allowing a smooth transfer between the generations.

It also allows space and time to achieve clarity for all family members. A key reason for planning is that we are gaining two years in every 10 in life expectancy. This means that a farmer will need an income for many years after retirement. Security and provision for parents or older farmers is a key element in the succession process.

The financial requirements of both generations during the transition phase can have a big impact on the farm business. It may have to generate all, or part of, the necessary income for two generations.

There are very generous reliefs against the main taxes involved in the eventual farm transfer and this is another reason why succession must be planned, so as to maximise the reliefs and reduce any potential tax liability.

Part of this planning must be that a will is made or updated. It is astounding the number of farmers or farming couples who have not made a will, or have a will that is very much out of date. In recent months, a number of cases have come to light where the beneficiaries of a will had predeceased the now deceased farmer by 10-15 years. This created wide ranging legal complexities as the process

Audience members at the ICMSA conference on farm succession in the Tullamore Court Hotel. \Thomas O'Hanlon

Stamp Duty) and the reliefs associated with these taxes including: retirement; agricultural; business; consanguinity and young trained farmer reliefs.

• Mediator: in some cases, it may be necessary to engage a mediator to arrive at an agreed succession plan. This is very dependent on the dynamics in the family and on all family members being willing to engage positively with the mediator.

• Bank manager: the bank will need to be involved in the succession plan where farm loans have been secured using land, or where parents have gone as guarantors on loans for other family members.

Teagasc hosted six 'Transferring the Family Farm' events in the northern half of the country in 2018 and is planning to host six events in the southern half of the country in the autumn of 2019. These meetings will take place in October, consult the Teagasc web site closer to the time for dates and locations.

These events provide a fantastic opportunity to kick-start your succession plan by engaging informally with key professionals to answer initial questions that you may have.

This can be followed up with more detailed consultations with the various professionals at a later stage. Contact your local Teagasc office in southern counties to express an interest in attending.

of passing on the estate played out. This could have been avoided had the farmer updated their will as circumstances changed.

Succession and inheritance team

There are a number of key people who need to be involved in the succession and inheritance plan. The critical thing here is to challenge these professionals to work together to achieve the best outcome. This is especially true in the case of the accountant and the solicitor. The ideal scenario is to get these two professionals into the one room for this part of the planning process. The people who need to be involved are:

• Family: communication and consultation with all family members is critical to arrive at a successful outcome.

• Teagasc advisor: it is important to look at the farm business from a physical and financial perspective, to see if it is capable of providing part, or all, of the income required for both generations.

• There may be scope for the successor to start an agri-tourism or artisan food enterprise on the farm to build expertise, develop their skills and most importantly to help bridge any income gap.

• Solicitor: the ultimate transfer of property is a legal process. What is important here is to find a professional who understands the overlap between the legal elements and taxation requirements.

• Accountant: choose an accountant who is expert in the taxation linked with property transfers (Capital Gains Tax, Capital Acquisitions Tax and

Tom Curran speaking at an ICMSA event on farm succession in the Tullamore Court Hotel on 16 January 2019. \ Thomas O'Hanlon

Harvesting forestry in

Managing a mature forest requires careful planning, market knowledge, and judgement

Michael Somers,
Teagasc Forestry Development Officer

Co Clare has always been a hub of creativity and culture. Michael Cusack, founder of the GAA, was born there. Micko Russell and Willie Clancy lit up the music venues of Ireland with their dizzy fingers and musical genius. The Cliffs of Moher attract more than a million visitors a year. In the very middle of the county is the village of Inagh where the east of the county (where hurling dominates) meets the slightly more Gaelic-football-focused west. Here the Crowe family live and work the land.

Land here is heavy but Clare ground, like most of the west of Ireland, is renowned for producing quality cattle. Pat and Anne Crowe were suckler farmers. As is traditional in this part of the country, weanlings were sold at nine months in the fall of the year. In the early 1990s they were looking to optimise income from the overall enterprise.

At the time Teagasc was running courses on farm diversification opportunities; Pat and Anne attended. This was to change their farming enterprise, and lifestyle, forever. "Our plan was to plant half the farm and build a shed," says Pat. "I looked at this from a business viewpoint, the forestry grant was attractive at the time. "I figured if I took on the forest work, between that and the forest premia this would provide me and my farm with a better income. We made a lot of enquiries and attended many meetings and in the early 1990s our first planting was done.

"Soon after, a piece of land came up for sale beside me and at that stage we planted both farms. "I reckon this was vital for the enterprise. Mainly because it provided me with cashflow from forestry payments."

All of the Crowes' forest is Sitka spruce. Pat says it's an easy crop to manage. "We found that at planting time you need to be on top of issues like vegetation but I see no difference in weeding a tree or fixing a fence." Pat took a different approach to many farmers.

"I took away 5% of the annual premium for work that needed to be carried out like road resurfacing, herbicide, inventory and so on. I think it's a good way of investing back into the forest."

Soon after, Laura was born and Pat reckons she is one of the first children from a farming background to grow up with forestry as the main enterprise.

the Banner County


Pat Crowe and Michael Somers.

"From an early age she went to courses with myself and Anne," he says. "She learned all the technical terms like diameter at breast height (dbh), basal area (BA), various thinning systems and the basics of managing a forest. At 12 she came with me to an inventory course and learned how to calculate volume and how to mark trees. I'm fully convinced when I'm not around that Laura will continue to generate a good living and lifestyle from this forest."

Pat now is coming to the end of annual forestry premiums. Many farmers are in that boat and many are looking at where the monies from the forest will come from. Thinning in west Clare is difficult. This is because of high wind speeds and its proximity to the coast.

"We never feared thinning," says Pat. "We simply got in early. I invested in a forwarder to take my timber out. I look on it as my tractor. Cattle farmers spread manure, mow and so on. Tillage farmers plough and sow. We bring out timber. We cut everything here to 3.1m lengths. There's no shortage of buyers for them.

"There is no question but that thinning brings forward clearfell .The oldest part of the forest here is 25 years old and it has been clearfelled. Many foresters would say that's too young. In general they are right. But I'm running this forest as a business and it's our income. We did our first clearfell in 2019 and it's been very successful .

"I conducted all my own inventory. I investigated my market and we decided to convert the pulp to energy wood. The pallet and sawlog is heading to Murray's sawmill in Ballygar. But the smaller material have not had its branches delimbed. Instead it is stacked on site.

"They will be chipped for eco fuel. Yes it's good to burn wood for energy. But for me it's also halved my reforestation costs and I can fully stock the site. I've been to many open days about clearfelling. Personally I don't like windrowing. This is where the old branches of the trees are stacked into rows and piles and allowed to rot.

The needles will fall off the trees where 80% of the nutrients are. Then we will stack and dry. It improves my cashflow as I will have two to three years of clearfelling revenue. We use and sell every twig.

"This is financial planning and this cannot be underestimated at clearfell. From an accounts point of view, I feel strongly that profit cannot be calculated until reforestation happens. That's when you know what your net profit is. The profit v the costs. Laura is training to be an accountant and I feel that there is a massive area emerging for farmers looking for this kind of advice and service.

"Clearfelling is a serious business. If a clearfell goes wrong you can lose thousands. If it goes right, many forest owners will never see a poor day again."

Forestry has a very favourable tax status and offers potential tax planning opportunities. It's very important that farmers know that, especially when passing on assets to the next generation. We have a great tradition of this in Ireland. Pat and Anne will pass it on in their own time. What Laura wants to do is up to her. Forestry is getting a bad press in so many quarters, but from the point of view of what we have here in Inagh I could not be happier. And we hope our family will live and work here in Clare for many years to come.

Clearfell tips

Pat reckons that farmers need to get professional advice at this stage. "I would offer five bits of advice to farmers approaching clearfell:

1. Have a full and professional inventory carried out. Know what's in the forest and challenge the forest to squeeze the most out of the crop. Also, ask for both and weight and volume price.
2. Timing is critical. We are just at the end of spring here. It will be replanted for the next tax year. But as important is the market. If the price is not right, leave it on the stump. The trees are not going anywhere. Our decision to do a premature clearfell was based on timber price. Our trees had a dbh of 37cm. If they are too big, the mills will penalise you. Pat jokes: "It isn't much different than meat factories."
3. Be on site. It's a massive job with clearfells hitting €30,000+. Some won't hit this price but many of the older higher stocked sites will.
4. Have a good contract drawn up and get it checked by a solicitor.
5. The accountant head is vital. The clearfell revenue can fund farm development for many years to come.

> "If a clearfell goes wrong you can lose thousands. If it goes right, many forest owners will never see a poor day again

Roadside tree safety

Check your roadside trees to make sure they are safe

Eileen Woodbyrne
lecturer at the Teagasc College in the National Botanic Gardens.

Have you ever stopped to think about the trees along your roadside boundaries? What would happen if one of them fell and caused injury or damage? Local authorities are responsible for trees along the roadsides, but not if the trees are on private land.

Trees can fail and cause injury or even death. Deaths associated with falling trees or branches are rare in this country. Excluding incidents involving tree work, approximately one person every two years is killed by a tree. Statistically that's a very low risk so we don't need to take drastic action in terms of pruning or removing roadside trees.

Tree owners do, however, need to take a few simple steps to make sure that their roadside trees are not likely to cause injury or damage. That requirement is set out in the Roads Act of 1993 and there is also a well-established principle of common law that says we may be guilty of negligence if our acts or omissions lead to harm.

If you own a lot of mature roadside trees, consider hiring a professional forester or arborist to inspect them.

> In particular, look for signs of unstable, leaning trees

They will advise on any work that needs to be done and advise when the trees should be assessed again. If you are hiring professionals, make sure they have appropriate training, experience and insurance.

In many cases, though, the landowner can do the tree check. Ideally it should be done once a year and simply involves walking the roadside boundaries looking for signs of defects or problems in trees. Be mindful of your own safety and wear hi-vis clothing.

In particular, look for signs of unstable, leaning trees. Also, look for dieback and dead branches, decay and cracks extending deeply into wood. Based on that inspection, make a decision as to what work (if any) needs to be done. You may need to hire a tree surgeon.

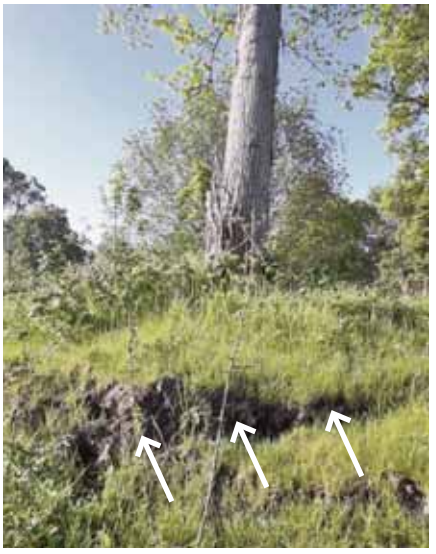
Tree work is hazardous and chainsaws should only be used by people who have had training and who are using appropriate safety gear. When scheduling the work, deal with the most immediate dangers first.

Keep a record of what trees you checked, and when, what problems you found, what work you determined needed to be done, who did that work and when. This record can form part of your normal farm records and can be handwritten or stored on your computer.

Records will serve as a reminder when it's time to do your next roadside tree check. They will help you to notice if tree problems are progressing and finally, in the event that one of your trees fails and causes harm, they will help prove that you were managing your trees responsibly.

Finally, before carrying out any tree work, check for any legal restrictions, for example wildlife legislation or the need for tree felling licences.

Deep cracks can suggest a tree is likely to fail.



The recent cracks in the soil around this tree on a bank indicate it has already started to fail.

Fungal bodies are signs of decay and some can indicate an immediate hazard – seek professional advice if in doubt.

Large cavities in roadside trees are a problem.

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