Milk Quality Farm Walk

19th July 2023

On the farm of Austin and Yvonne Connelly, Tuam, Co. Galway.

NDC & Kerrygold

Quality Milk Awards

Teagasc

Agriculture and Food Development Authority

Aurivo

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An Roinn Talmhaíochta, Bia agus Mara
Department of Agriculture, Food and the Marine

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Welcome: *Connelly Family*

We the Connelly family are delighted to welcome you to our family farm, The Plantation in Tuam Co Galway. Having been awarded the NDC and Kerrygold Quality Milk Award for 2022 we feel both humbled and proud to be recognised for the work that we do given the high standard of the competition. Since starting our dairy enterprise in 2019 we have, and continue to work hard to produce a high quality product. We hope you enjoy the farm walk, and we would encourage people to ask lots of questions as we always say that it is only by asking that we find out and learn new things.

We would like to thank Aurivo for nominating us for the award, the Judging Panel – Dr David Gleeson, Dr Jack Kennedy and Dr Patrick Wall in awarding us overall winners for 2022. We would also like to thank all those farmers who gave so willingly of their time and knowledge when we were planning our conversion. As well as this to Aurivo and Teagasc who were a great support to us both in the transition period and since.

Welcome: *Teagasc and NDC*

Welcome from:

Pat Clarke, *Regional Manager, Teagasc,*

and Zoë Kavanagh, *Chief Executive National Dairy Council*

The NDC & Kerrygold Quality Milk Awards are an important acknowledgment of the unique knowledge base and excellent husbandry skills of Irish milk producers. They recognise the hard work of Irish dairy farmers and their commitment to the rigorous standards necessary to produce top quality milk. The combination of our natural grassland, sustainable farming practices, and the passion and dedication of our farmers and their families means we can bring quality products to markets around the world, with absolute confidence and pride.

Today's event is held with the collaboration of Aurivo Co-op, NDC, Ornua and Teagasc, celebrating the success of Austin and Yvonne Connelly, and their four daughters - Anna, Ava, Jane and Kate. Fifth-generation farmers, they are relatively new to dairy farming having made the transition just four years ago. Converting to dairy farming had its challenges, requiring a lot of patience and control, and would not have been possible without the support and expertise of their advisor, local discussion groups and peer farmers. The epitome of modern farming, the four girls are constantly seeking out ways to make the processes on the farm even more efficient and effective. We look forward to the opportunity to view excellence in operation during today's event.

Teagasc
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Welcome: *Aurivo*

Welcome from:

Donal Tierney, *CEO, Aurivo*

On behalf of Aurivo Co-operative, it gives me great pleasure to welcome you to the Connelly family farm in Galway. This is a fantastic achievement for Yvonne, Austin, Jane, Ava, Anna & Kate and is just recognition of their commitment to the highest standard of dairy farming. We are very proud of the Connelly family's accomplishment and the fact that one of our suppliers is the 2022 National Dairy Council (NDC) / Kerrygold Quality Milk Award winner and this national win is actually our second in three years after the fantastic achievement of the Starrett family from Donegal in 2020.

We are delighted to partner with Teagasc, NDC and Ornua today to celebrate and showcase the commitment to excellence in all aspects of dairy farming which is evident on the Connelly family farm. The family exhibit a passion for dairying and are a wonderful example of what our family farm structure can achieve and the associated benefits to dairy industry and rural Ireland.

Today will give you an opportunity to see first-hand the commitment to sustainable and high quality, milk production, grassland management, breeding and herd health practices which are implemented here on the Connelly farm.

Many thanks to the Connelly's for hosting today's event and for opening their award-winning farm to the public. This is an example of a first-class family farm and I hope you enjoy your day and find it informative."

Aurivo

Introduction

Austin and Yvonne Connelly, together with their daughters Ava, Anna, Jane and Kate, farm on the land known as The Plantation, located on the southern edge of the town of Tuam, Co. Galway. Austin took over the farm from his parents Tom and Frances in 2003 and is the fifth generation farming here. In September 2022 the Connelly's were awarded the top prize in the NDC and Kerrygold Quality Milk Awards. The milk from this farm is supplied to Aurivo.

While farming is in the DNA of the Connelly family, they are relatively new to dairying with the farm traditionally involved in suckler beef and sheep production. It wasn't until 2019 the family started their dairy herd with 72 heifers calving down in their first year of production. This number has increased gradually over the past few years to 97 cows in 2022.

Managing the transition to dairying has required huge commitment from the entire family who have worked tirelessly to make it the success it is today. Having not come from a dairy background, the family have had to up-skill and take on a huge amount of new information over the past few years. The family's willingness to learn and their constant striving to do things better has driven the farm on to where it is today and if you speak to the family they still see lots of room for further development and improvements to come in the future.

Both Austin and Yvonne work fulltime on the farm and while the girls are still in education, either college or secondary school, the evenings and weekends are spent on the farm. Everyone is actively involved with both the day-to-day running of the farm and included in decision-making be that in relation to breeding, grassland management, herd health or future developments.

The Connelly farm is the embodiment of the traditional family-owned Irish dairy farm. With five generations of the family already farming The Plantation, the sixth looks to be in very good hands.

The Connelly family dairy farm

Quality milk

Milk quality is a key focus for the Connelly family and perhaps having come into the industry in recent years they have learned and adopted the blueprint for producing high quality milk and have not let themselves develop any bad habits over this time.

The attention to detail from cow care to milking procedures is excellent on the farm and much of the reason for us being here today.

Milk recoding plays a vital role in the overall decision making on farm from breeding to identifying any problem cows and making culling decisions. Each year at least four milk recordings are carried out with the final one done just prior to drying off.

This approach allows the family to build up a picture of the herd health and allows them to identify and select the correct method of dry cow therapy for each cow in the herd.

Selective dry cow therapy has been carried out over the past two years with 75% of cows receiving sealer only in 2022 up from about 25% in the previous year. All this was achieved with no rise in cell count this spring.

Again attention to detail is critical here and only one line of cows is dried off at any one time so that the procedure is absolutely correct. Hygiene at the time of drying off is of utmost importance but so too is cubical hygiene right throughout the housed period for cows. To date in 2023 there have been just four cases of mastitis with two of these being identified by the recently introduced rumen bolus which identified prior to clinical signs.

Table 1. Connelly Farm trends in production and milk quality metrics

	Annual avg cows	Fat%	Protein %	Kg MS/cow	TBC	SCC
2019	63	4.38	3.7	418	7	54
2020	85	4.59	3.74	484	7	36
2021	91	4.49	3.64	502	7	40
2022	94	4.59	3.73	550	6	49

Table 2. Monthly volume, composition and quality of milk supplied by the Connellys farm in 2021.

	Milk supply l/month	Average TBC	Average SCC	Butterfat %	Protein %
January	0	0	0	0	0
February	15239	6	68	5	3.58
March	57997	3	27	4.71	3.02
April	74058	5	25	4.37	3.43
May	76177	5	31	4.15	3.46
June	65156	5	35	4.13	3.47
July	61237	11	37	4.11	3.55
August	61423	5	38	4.31	3.77
September	53701	15	40	4.6	3.98
October	46659	11	50	5.09	4.15
November	27406	7	48	5.57	4.21
December	6584	7	85	5.91	4.45
Total/average for year	**545637**	**9**	**40**	**4.49**	**3.64**

Herd Genetics

The primary driver of the stock purchase decision was the genetic merit of the stock, EBI. The quality of the stock purchased represented a once in a life time opportunity to get in some of the best genetics in the country. Additional consideration's were avoiding any extremes, keeping sources to a minimum, been correct weight and of course cost. So the net was cast far and wide. Eventually 72 in calf herifers were purchased from herds in Kilkenny and Galway.

Table 1 overleaf shows the EBI of the herd during the summer of 2019. Average EBI of purchased stock was €160 while the average herd in the country was €106.

Table 3: EBI profile of purchased incalf heifers

Animal Group	Num of Cows	Milk Kg / Fat % / Prot %		Surv% / CI Days	Milk	Fertility	Carbon	Calv	Beef	Maint	Mgmt	Health	EBI €
Cows with EBI	72	10			€ 56	€ 61	€ 0	€ 38	€ -16	€ 14	€ 3	€ 4	€ 160
Missing EBI*	0	9.4	0.16	1.7									
Total Cows	72	6.3	0.1	-3.2									
1st Lactation	72	10			€ 56	€ 61	€ 0	€ 38	€ -16	€ 14	€ 3	€ 4	€ 160
		9.4	0.16	1.7									
		6.3	0.1	-3.2									

The breeding goals of Austin and Yvonne are focussing on higher percentages of fat (F %) & protein (P %) and improving fertility. Last year the herd averaged 550 Kg of Milk solids per cow. This came from 4.59% F% and 3.73% P% and 6,424L or 6617 Kgs. This volume puts the herd in the top band of 106 Kg N/cow for nitrates but a 3 year rolling average meant the herd was in the middle band of 92 Kg N/cow. Overall the Connelly's are very happy with the herd performance and genetics. The genetics is delivering on litres and percentages while helping to maintain a compact calving pattern.

Currently the herd is at €198 of an EBI of which €141 comes from the milk sub index and fertility. The milk subindex of the 2023 youngstock has increased to €88, which means they have the genetic perfromance to over 5% fat and 4% protein. Fertility sub index has also increased to €110.

Table 4: EBI Profile for the herd in July 2023

Animal Group	Num of Cows	Milk Kg / Fat % / Prot %		Surv% / CI Days	Milk	Fertility	Carbon	Calv	Beef	Maint	Mgmt	Health	EBI €
Cows with EBI	98	6			€ 61	€ 80	€ 11	€ 36	€ -14	€ 17	€ 2	€ 5	€ 198
Missing EBI*	0	9.8	0.16	2.4									
Total Cows	98	7.1	0.12	-3.9									
1st Lactation	20	7			€ 68	€ 76	€ 11	€ 40	€ -15	€ 16	€ 3	€ -2	€ 198
		8.8	0.15	2.5									
		8.6	0.15	-3.6									
2nd Lactation	17	-25			€ 58	€ 81	€ 16	€ 34	€ -23	€ 21	€ 1	€ 1	€ 188
		9.3	0.17	2.2									
		6.2	0.12	-4.2									
3rd Lactation	13	37			€ 69	€ 84	€ 5	€ 33	€ -2	€ 10	€ 1	€ 7	€ 207
		11.1	0.16	2.5									
		8.4	0.12	-4.3									
4th Lactation	18	-1			€ 48	€ 75	€ 13	€ 34	€ -14	€ 19	€ 2	€ 9	€ 186
		8.3	0.14	2.3									
		5.2	0.09	-3.7									
5th Lactation (+)	30	14			€ 63	€ 82	€ 10	€ 36	€ -13	€ 19	€ 2	€ 10	€ 208
		11.0	0.18	2.6									
		7.0	0.11	-4.0									
2. Dairy Youngstock													
2023 Calves	20	4		2.7	€ 88	€ 110	€ 12	€ 41	€ -11	€ 15	€ 2	€ 1	€ 257
Missing EBI*	0	14.1	0.25										
Total Calves	20	10.0	0.17	-6.1									
2022 Calves	20	9		2.7	€ 83	€ 88	€ 7	€ 41	€ -6	€ 11	€ 3	€ -2	€ 223
Missing EBI*	0	12.0	0.21										
Total Calves	20	10.0	0.17	-4.3									

Buildings and facilities

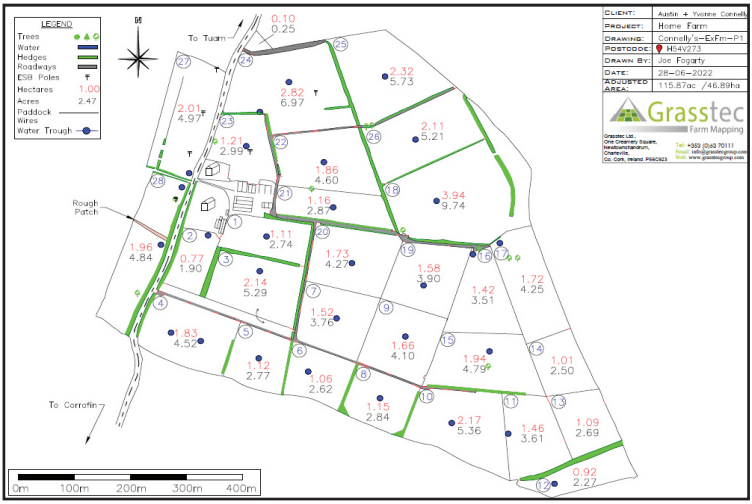
Before going into dairying, the farm had accommodation for 50 sucklers and 240 ewes. There was reasonable buildings on the farm of which some could be converted. The decision was made that the location of the existing sheds were not suitable for the parlour. Cow flow would have been compromised. A new shed was built for the milking parlour, extra slurry and soil water storage added. A new 16 unit parlour was installed, with cluster removers, auto washer, a batch feed system and a simple drafting unit is located at the exit of the parlour which allows cows to be separated for AI or treatment.

Cow numbers have increased from 72 in 2019 to 96 currently, facilities have kept pace with this increase. There are 118 cow cubicles on the farm. While slurry storage has also been increased by roofing tanks and a new tank was constructed last winter. Below summaries what the farm requires and has for slurry and soiled water.

	Require	Available
Soiled water	25M^3	165 M^3
Slurry	705M^3	1095 M^3

Since converting to dairy roughly 1.4 Km of farm road has been installed. The water system has been upgraded with 26 new water troughs and 35% of the farm reseeded.

Farm Map



Farming system

The Connelly's operate a spring calving herd. Calving starts around the 1st week of February and all cows will be dry Mid December. The 2023 Breeding season will last for 10-11 weeks, with dairy AI used for the 1st 4 weeks on suitable cows and then high DBI beef AI's for the remainder of the breeding season. Heifers are AI'd for 3 weeks before an AA bull is ran with them for 6 weeks and then he is put with the cows. The key fertility metrics are shown below.

Connelly's Top 6 Fertility KPI		
	2023	**2022**
Calving Interval (Days)	366	367
Spring 6 Wk Calving Rate %	93	93
Calves per cow per Yr	1	1.02
Cows not calved in period %	0	0
Replacement Rate %	19	19
Heifers calved at 22-26 Mts %	100	100

Calf rearing on the Connelly farm is second to none, with calf mortality in 2023 at 0%. It has always been the policy on this farm that each calf gets its mothers colostrum within two hours of birth followed by transition milk for 3 to 4 days. Only about 20 replacements are kept on the farm and these are reared on whole milk for about 12 weeks in a former lambing shed where they have access to a paddock.

All calves for sale are kept for on average 2-3 weeks and in general the same farmers buy them each year. Time is saved by not having to go to the mart and its great peace of mind having customers.

Grassland management

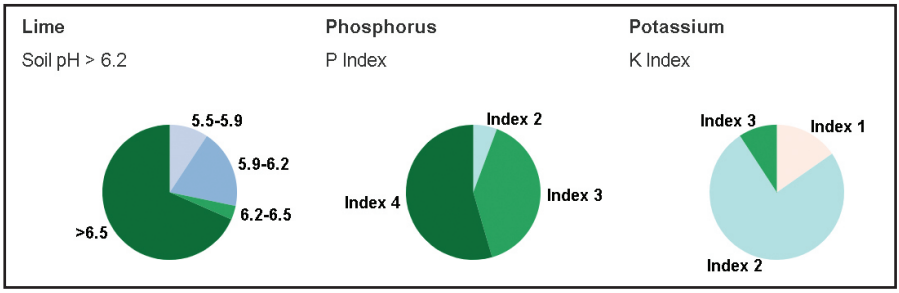
The Connelly family farm can be divided into 40% dry and 60% wetter land. Annual rainfall for the area is about 1.2m. The farm as can be seen below is well able to grow lots of grass. However the key is utilising it. Grass utilisation is increased on farm by the following:

- Flexible attitude
- Great farm roads

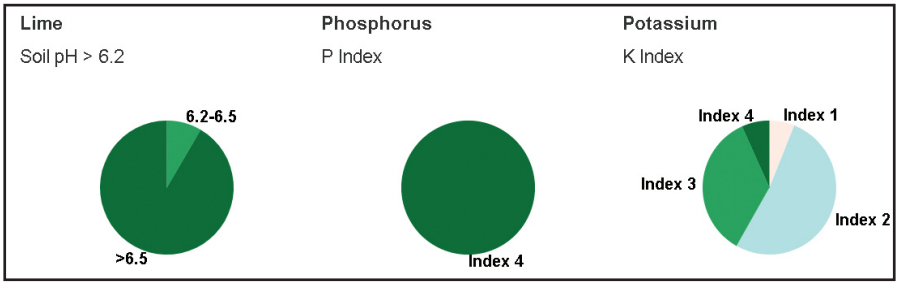
- Good facilities
- High quality silage

Calving start date on the farm has slowly been moving forward. 2023 breeding season started on the 8th of May. The aim here is to ensure that more grass is getting into the milking cows diet in spring. In general cows get out to grass in Feb but it's mid to late March before they really get going at grass. On average the 1st round of grazing is completed by 15th April but this year not all paddocks were grazed in the 1st round because of the rain in March. Staying positive, on-off grazing, having plenty of access to paddocks and the backup of good quality bales are key strategies getting grass into the milking cows diet during wet weather.

2023 Soil Fertility on Connelly's farm



2021 Soil Fertility on Connelly's farm



Soil fertility is the corner stone to driving grass growth on any farm. Austin and Yvonne soil sample every 2 years to keep on top of soil fertility as off takes are high on their farm. Above shows the soil fertility status of the farm from the 2021 and 2023 soil sample results. Soil fertility over the 2 years has slipped on the farm. 3 paddocks need 2 T/ac of lime. While P has reduced this was to be expected as the farm has no P allowance but critically

nearly all the farm is either index 3 or 4 so this will not reduce grass growth and peaty soils don't tend to hold excess P. So careful management here is very important from a grass growth and water quality perspective. K levels on the farm have dropped over the 2 years and needs correcting. An extra 60 to 70 units of K per acre, on low K index ground, will be applied in 2023 and 2024 on a little and often basis.

In terms of measuring grass Austin and Yvonne have been relearning the grass management required for dairy cows. Austin joined the local grass pod and initially did manual covers and focused on getting pre grazing covers correct. For the last 2 years Austin and Ava have been completing grass covers every 5 to 10 days depending on growth and use pasturebase to make management decisions for the week ahead.

While fertiliser and slurry have been the driver of grass growth, clover is also being established on the farm to reduce the requirement for chemical fertiliser Nitrogen. Slurry is applied by Low Emission Slurry Spreading – LESS – thereby maximising the uptake of nutrients. Nitrogen rates have been reduced since using LESS. Protected urea has been used for the last few years and responses in terms of grass growth have been good. Clover has been established on 20 acres over the past couple of years. The plan is the keep these grazed at low covers and reduce the amount of N that will be applied from mid-May onwards, from 20 units to 10 units per acre for each rotation. Clover has been introduced to paddocks by over-sowing and through complete reseeding. To date full reseeding has been more successful for clover establishment.

Maximising the effective operation of automatic washers for milking equipment

David Gleeson and Lorna Twomey

Teagasc, Animal and Grassland Research and Innovation Centre, Moorepark, Fermoy, Co Cork.

Automatic washers were conceived and installed to reduce labour requirements and save time on farms which they undoubtedly do but like any machine they require regular monitoring and calibration to ensure that they are working correctly.

Monitoring the operation of your automatic washer and milking plant

Detergent Usage

1. To know how much detergent or acid is required at each wash occasion it is necessary to establish how much water is used for both rinsing and washing the machine. This can be deduced via the following formula;
   - **Length (cm) x Width (cm) x Height (cm) (height = the water mark)**
   - Where the width of the trough is tapered measure the widths at both the top and bottom of the trough; get the average width and use this in your calculations.
   - Divide the answer (that you get from the above formula) by 1000 to convert to litres. Divide the volume by the number of milking units that you have to determine the volume available per unit. The target volume per unit is 14 litres/ unit for rinsing and 9 litres/ units for washing.
   - A wash trough calculator is also available on the Teagasc milk quality webpage: https://www.teagasc.ie/rural-economy/farm-management/farm-machinery/machinery-calibration/dairy-wash-trough-calculator/

2. Ascertain the recommended usage rates of the chemicals that you are using by reading the label on the drum. Please note that most chemicals will have a different usage rate for hot and cold washes as a greater chemical volume is needed for cold washing (to compensate for the lower temperature).

3. Calculate how much detergent your machine requires by multiplying the volume of water used for washing by the usage rate declared on the product label; For example;
   - Hot wash rate: 200 litres x 0.7% = 1.4 litres of detergent required
   - Cold wash rate/ acid rate: 200 litres x 1% = 2.00 litres of detergent required

Some products describe the usage rate in a way such as 400mls per 45 litres of water. In such cases you divide the volume of water that you have available for washing by the stated volume on the label and multiply the answer by the detergent volume. (200 litres/45 litres = 4.44 x 400mls = 1.78 litres of detergent required)

4. Check to see if your auto washer is using the correct amounts of detergent. This can be done by;
   - Placing a volume of chemical into a jug with the volume in the jug greater than the volume needed by the machine.
   - The bottom of the pipe must be touching the bottom of the jug to maximise "suck up" capacity.
   - Take care not to mix up the "suck up" pipes – blue pipe for caustic detergent and red pipe for acid.
   - Use appropriate protective equipment when handling chemicals and ensure that open jugs cannot be easily accessed by pets or children.

5. Run the wash cycle as normal.

6. Check the jug to see what volume of detergent remains after the wash and subtract the volume that remained from the initial volume placed in the jug to deduce how much was used.

7. Check if the amount used agrees with the calculation from step 3 above.

8. This exercise must be undertaken separately for hot caustic, cold caustic and acid washes.

9. In the event of over or under use contact your service technician to recalibrate the auto washer .

Biggest issue with automatic milking machine cleaning:

a. Usage settings not allowing for increased usage rates required for cold circulation cleaning.

Hot Wash Temperature

1. Check the temperature of the hot wash solution just before it is drawn into the machine for washing; it should be 75–80°C at the start of the cycle. Do not depend on the temperature of the water on the thermostat or the tap as this is not reflective of temperature in the trough.

    - If the hot wash temperature is not reaching these levels;
    - Have your heating system inspected by a professional and adjusted to achieve these temperatures if possible.
        - Reduce the amount of time that it takes to fill the trough with hot water to reduce heat loss by increasing the water pressure and/or increasing the diameter of the pipe filling the trough and/or cover the trough to minimize heat loss with either a steel or perspex lid.

To effectively wash a machine with chlorine free liquid chemicals a minimum of seven hot washes are required. Three acid washes are also required and these can be included in or applied in addition to the seven hot washes.

Detergent Circulation Time

Eight to ten minutes is a more than sufficient amount of time for a hot wash to circulate in the milking machine. Circulation of detergent solutions for >10 minutes will likely result in the solution temperature dropping below 45 °C which has a negative effect on cleaning efficiency. It would be advisable to stay in the dairy during a wash cycle and time the wash on your phone or watch to see if it is within this recommended time frame and if not have it adjusted by your service technician.

Machine Drainage

Observe the milking plant to see whether it is draining effectively. Drain points are usually located near the milk pump in the pit (to drain the receiving vessel) and on the wash line (in low line plants). These may be automatically operated or need to be manually opened. Either way it is vital that they serve their purpose

and expel as much water from the plant as possible between wash cycles. Poor drainage can result in low circulation temperatures in hot wash solutions due to the mixing of retained cold rinse water with hot detergent solutions. Thereby, reducing the efficacy of the wash and wasting energy and money heating water that cannot be used to its full potential.

Poor drainage of final rinse water can also have a negative impact on milk residue levels; especially where chlorinated water (which will almost always contain chlorate) is used for cleaning. Water containing chlorate that remains in the plant will enter the bulk milk tank as it will mix with the first milk through the line. Therefore, this is liable to cause chlorate contamination of the bulk milk tank.

Utilise Useful Features

Warm rinse - Some types of auto washers are fitted with a function allowing a post milking warm rinse to be conducted; 30°C is sufficient as it will aid in the removal of milk fat deposits and is very beneficial during late lactation when fat levels in milk are higher. Keeping the pipework warm will contribute towards the maintenance of the temperature during the hot circulation cycle provided all other aspects of the machine are working correctly.

Discarding the first wash solution through the line - Some types of auto washers have the facility to discard the first portion of water that goes through the machine at the beginning of the hot circulation wash. The amount of water sent to waste is based on time and is adjusted until the water temperature is suitable for circulation. Only after the appropriate temperature is reached will the detergent be added to the trough. This function combined with effective drainage of the plant, adequate initial water temperature and adequate detergent usage rates can maximise the efficacy of your hot wash.

Bulk Tank Cleaning

A bulk tank should use a volume of water that is equivalent to 1 – 2% of the tanks volume for washing. For example; 5,000 litre tank x 1.5% = 75 litres of water used for washing

75 litres water x 0.7% = 525mls of detergent required for a hot wash.

It is recommended that a bulk tank is descaled at least every 3rd collection. If

using a fully automatic system and you do not know the frequency of descaling your tank ask your tank technician to check this and set it up if necessary; at the correct volumes.

Biggest issues regarding bulk tank cleaning on farms:

- Detergent suck up tubes in the wrong drums (Red for acid, Blue for detergent).
- No acid being used.

ASSAP - providing advice on measures to minimise diffuse nutrient losses from farms to waters

Noel Meehan[1] and Joanne Masterson[2]

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[2] *ASSAP Advisor, Mellows Campus, Athenry, Co. Galway*

Summary

- The agricultural sustainability support and advisory programme (ASSAP) and the local authority waters programme (LAWPRO) work in collaboration to identify pressures from agriculture on water quality
- Recent EPA water quality reports highlight deteriorating water quality due to increasing nutrient levels including nitrate in waters
- Targeted action is required to help minimise diffuse nutrient losses to water from agriculture

Ireland has been set a target of achieving 'Good Status' for all waters by the EU Water Framework Directive. Despite a lot of good work over the last 20-30 years we are falling short in achieving this target and water quality has declined slightly over the last few years.

The Agricultural Sustainability Support and Advisory Programme (ASSAP) is a new free advisory service with 20 advisors from Teagasc and 24 advisors from the dairy industry working in 190 catchments or Priority Area's for Action (PAA's) throughout the country. It is designed to work closely with the farming community to assess farms for any potential issues that may be having an effect on the water quality in local streams. Farmer participation in the ASSAP is voluntary.

Where any issues are identified, a plan to put in place mitigation actions designed to 'break the pathway' and prevent nutrients from entering water will

be prepared in collaboration with the farmer. In most cases, these actions will look to capture the diffuse loss of nutrients to water. Diffuse nutrient loss is where nutrients (Nitrogen and Phosphorus) are leached to water from fields/ farms and impact on water at a catchment scale.

How does diffuse Phosphorus (P) loss occur?

Phosphorus (P) loss typically occurs on soils that have low permeability. These are 'heavy', poorly draining soils with high clay content and are quickly saturated with rainfall. When there is heavy rainfall on these saturated soils this leads to the water staying on the surface of the soil. This in turns leads to overland flow of water, particularly on fields with slopes.

The overland flow of water across fields brings with it P available to plants in soluble form from fertiliser application. It also washes off soil particles that have P attached to them. P binds tightly to soil particles. The soluble P and soil particles can then be washed into the drainage network and streams located in the farm and end up impacting on the quality of water in the streams.

Pic 1: Heavy rainfall leads to overland flow of water, Phosphorus and soil particles

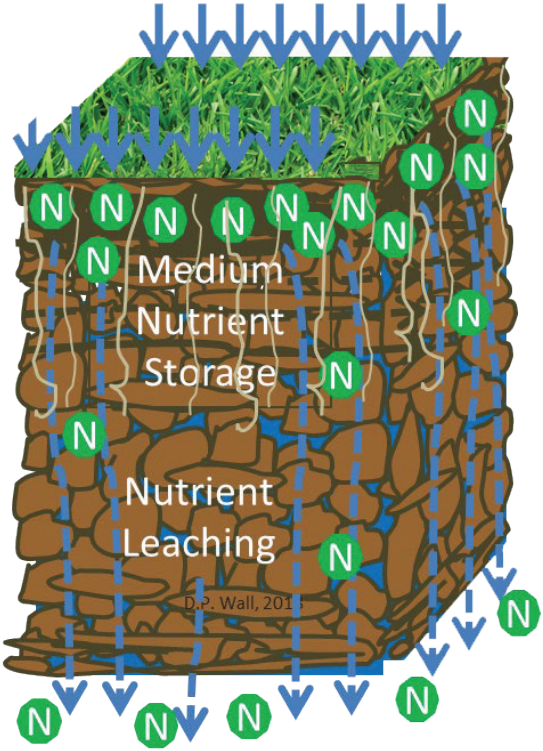
Pic 2: A grass buffer strip along a river bank can prevent the loss of Phosphorus and soil particles to streams and rivers *Photo NFGWS*

ASSAP advisors will identify areas on farm where this can potentially occur and advise measures to prevent P and soil particles from entering into drains/ streams and rivers in a diffuse manner. Measures include riparian margins, hedges and trees, wetland ponds, low earthen mounds, catch crops and management of critical source areas (CSAs).

How does diffuse Nitrogen (N) loss occur?

Nitrogen (N) loss typically occurs on soils that have high permeability. These are 'light' free draining soils with a high sand content and water can quickly permeate through these soils.

Where excess Nitrogen fertiliser is applied above crop requirement, this N is not utilised by the grass or tillage crop and is left in the soil. Nitrogen in the soil is also naturally mineralised, particularly in late summer and autumn, and this requires careful management to minimise N losses. N does not bind tightly to soil like P and therefore when there is heavy rainfall, the water leaches N away to groundwater, streams and rivers.



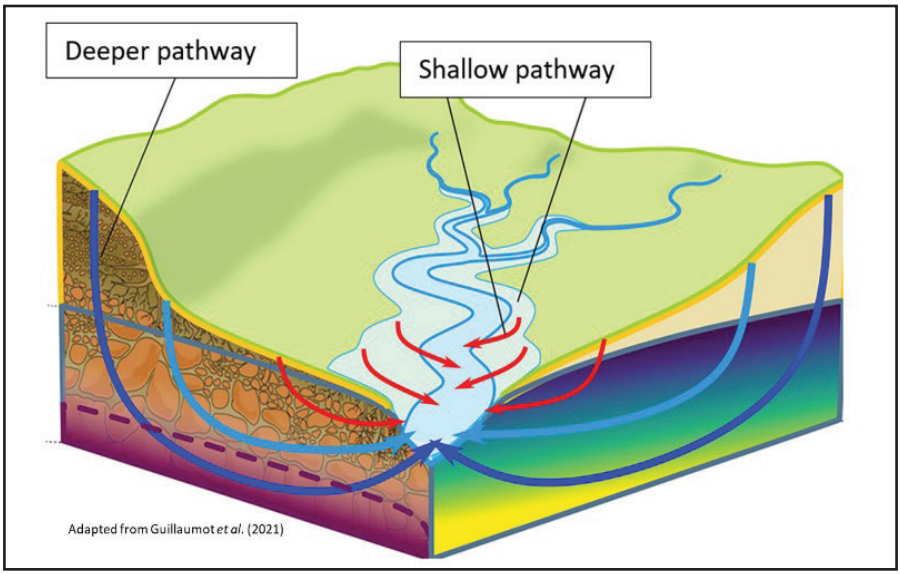
Pic 3: Nitrogen that is not used up by grass/plant growth is available to be leached to groundwater/streams when heavy rainfall occurs. This then filters through the soil and groundwater to the nearest stream/river.

ASSAP advisors will identify areas on farm where this can potentially occur and advise measures to prevent N leaching into ground water, streams and rivers in a diffuse manner. Careful management of nutrient use is required in susceptible areas. When applying N fertilisers it important to consider if you are applying at right time – when soil temperatures are > 5.5°C and rising, what the soil moisture deficits (saturation and drought) is, what is the growth rates and rainfall forecast. Are you applying in the correct locations on the farm – soil fertility, drier fields; match application rate to crop requirements and use the correct products – protected urea with sulphur in late spring and throughout the summer.

Tillage farmers can also further help by not leaving bare fields over autumn and winter and ensuring that catch/cover crops are sown.

Summary

It is in every ones interest to work together to improve Irelands overall water quality. This will have many benefits across the local community and will help with achieving Ireland's obligations under the Water Framework Directive. It will also help to strengthen agriculture by reinforcing our green image as food producers and underpin the future development of sustainable Irish agriculture.



1st Steps to Reducing Greenhouse Gas Emissions on Your Farm

Dr. Siobhán Kavanagh

Teagasc Signpost Programme, Communications and Engagement Specialist

As farmers you are being asked to reduce greenhouse gas emissions by 25% by 2030. This is a challenging target for the sector but we have a plan. Right now there is a suite of technologies that all farmers can adopt to reduce emissions on their farm including reducing reliance on chemical nitrogen, a switch to protected urea from CAN and straight urea, improved grassland management improved breeding & breeding and calving heifers at 24 months. Teagasc also have a very active research programme which will provide additional solutions particularly in the areas of breeding, feed additives and carbon sequestration. We can achieve our targets but it means making a plan for your farm right now.

As a farmer where do I start to reduce emissions?

Sign up to the Signpost Advisory Programme. This is a new, targeted advisory programme which will support climate and sustainability actions on farms, helping farmers to meet our environmental sustainability targets, while remaining profitable. This new programme will be available to all farmers and is free of charge. The programme will provide enhanced advisory and training support to enable farmers to implement climate and sustainability actions specific to their farms. Sign up today at ***www.teagasc.ie***

What are the first technologies I should adopt to reduce emissions?

Step one on any farm should be to reduce the reliance on chemical nitrogen in grassland and cropping systems.

How does reducing chemical N reduce greenhouse gas (GHG) emissions?

Chemical N releases nitrous oxide into the atmosphere when applied to land. Nitrous oxide is one of the 3 main greenhouse gases (carbon dioxide, nitrous oxide and methane). Therefore, if you reduce the amount of chemical N used on the farm you reduce the amount of nitrous oxide emitted.

What are the main fertiliser reduction strategies?

There are a range of proven technologies today to reduce our reliance on chemical N:

- Get soil fertility correct. Moving from pH 5.5 to 6.3 can make between 50 – 70 kg N per ha per year available to the crop as well as reducing N2O emissions per kg N applied. Aim for Index 3 for P and K.
- Apply slurry using LESS between February and May. Slurry nitrogen fertiliser replacement value can be increased (and ammonia emissions reduced) by between 25% - 50% by using trailing hose (dribble bar) or trailing shoe technology.
- Use clover or multi-species swards. Clover can fix between 80 – 120 kg N per ha per year depending on underlying soil fertility and sward management. Multi-species swards also offer extra benefits in terms of drought resistance and cow health. However, care must be taken to ensure adequate dietary roughage (hay or straw) in order to avoid bloat.

Including legumes such as beans in a tillage rotation, incorporating over winter cover crops to reduce N leaching and incorporating organic manures

What type of chemical fertiliser should I use?

If chemical fertiliser must be applied, then switching from CAN and straight urea to protected urea will directly reduce both GHG and ammonia emissions while also being cheaper. New research on low N compound fertilisers has found that N2O emissions could be reduced around 40% with compounds including 18:6:12 compared to high N compounds.

What is the national inventory for greenhouse gases (GHG)?

The national inventory is an accounting system, overseen by the EPA, which accounts for all the GHG emissions from each of the sectors and the country as a whole. So when we talk about a 25% reduction in GHG in agriculture it refers to a reduction in the national inventory figures. For Agriculture, the inventory includes: N fertiliser type and amount used, livestock number, manure storage and application method and lime use.

How is the reduction in chemical N accounted for in the national inventory of greenhouse gas emissions?

For the enabling actions above (liming, LESS, clover etc) to work to reduce GHG and consequently the national inventory figure for Agriculture, N fertiliser application must be decreased by the amount of N that each measure saves, otherwise there is little or no GHG saving. And you, the farmer is losing out as there is no cost saving from applying lime, using LESS or incorporating clover.

The national inventory does not measure clover incorporation levels, it does measure lime application and it counts as a small increase in GHG emissions but the savings from the reduced N fertiliser application due to liming are much greater. Therefore, if chemical N doesn't decrease, then we don't get credit for it in the inventory or our pockets.

What impact will reducing chemical N and switching to protected urea have on national emissions?

Nationally, we have a requirement to reduce greenhouse gas emissions by 5.75Mt by 2030. By reducing chemical N use by 30% and switching to protected urea we have the potential to reduce that figure by 1.25Mt or 22% of what needs to be achieved.

Many farmers have reduced their nitrogen use in 2022 / 2023 due to high fertiliser prices but can you retain that saving in your pocket and your emissions reduction through 2024 and beyond? Take advantage of improved soil pH, applying slurry using LESS and incorporating clover by reducing your chemical N – it's a win win for your farm – good for the environment, good for your pocket. This Autumn is the time to plan. If forward buying fertiliser make sure your straight nitrogen source is protected urea. Why? Because its cheaper, it grows the same grass as CAN and it can be used any time of the year with the regulated spreading periods.

Milking interval effects on milk yield

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Summary

- Milking interval had no effect on milk kg per cow or SCC;
- There were a large range in evening milking finish time. Average milking finish time in study herds was 18:43 across the year. This a key issue for attracting and retaining people in the industry
- A 16:8 hr milking interval will help shorten the standard working day on farms

Introduction

Farm structure in Ireland has seen a dramatic change in recent years. The traditional owner-operator plus additional family help model that previously could manage an average herd size is finding it increasingly challenging to cope with increased herd size. The sustainability of dairy farming increasingly relies on recruiting people to work on farms. However, farmers need to be able to provide employment opportunities where pay and conditions of work are at least as attractive as alternative careers. Previous studies with dairy farm employees have found that hours worked on dairy farms can make these employment opportunities unattractive. Evening finish time was cited as the critical issue for employees. As Irish farms are competing with industries that typically offer a 5-6pm finish time this is an area that needs to be examined.

Data

Milk recording data from 2,366 herds across 23 counties over a one-year period (2020) were analysed. Across all herds, the mean PM milking finish time was

18:43 and the length of the working day was nearly 12 hours, however, there was large variation between herds with PM milking finish time ranging from 16:39 to 23:22 and the length of the working day ranging from 8.5 hours to 16.4 hours.

Table 1. Mean milking time from 2,366 herds recorded during 2020

	Mean Time
Start AM	07:23
Finish AM	08:55
Start PM	17:14
Finish PM	18:43
Total hours spent milking (hrs)	02:58
Milking Interval (hrs)	09:48
Average herd size	118

Relationship between milking interval and milk kg/cow/day

Milking interval is defined as the time from when the first cluster goes on in the morning to the time the first cluster goes on again in the evening. To reduce the length of the working day in a twice daily milking scenario, previous research has shown a 16:8 hour interval split is feasible, for example morning milking

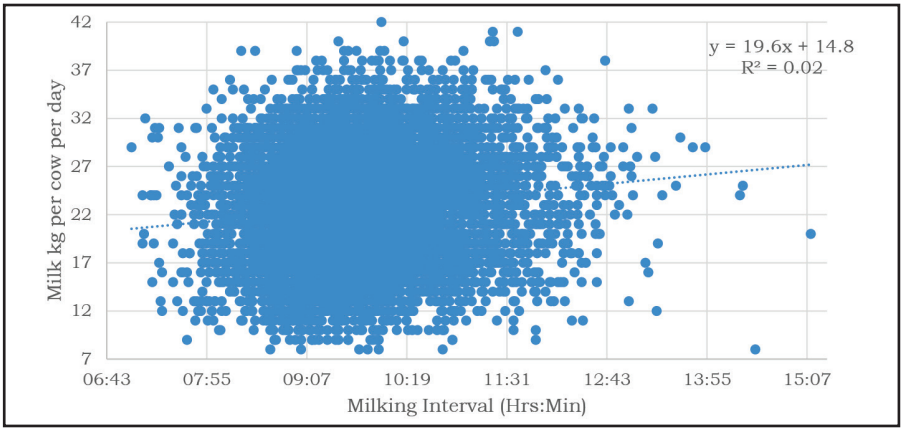

Figure 1. Relationship between milking interval and milk kg per day

start time of 07:00 and 15:00. However, in this study the mean milking interval was closer to 10 hours (Table 1). One of the reasons for having a longer milking interval in the evening is the legitimate concern of reducing milk kg per cow. However, data collected on commercial herds for the current study showed no relationship between milking interval and daily milk yield (Figure 1). Milking interval had no effect on SCC.

Seasonal variation in milking time

A demanding daily workload is understandably cited as a reason why milking times cannot be changed on many dairy farms. Previous labour studies have shown that spring is the busiest time of the year for spring-calving herds. With this in mind one might conclude that milking intervals could potentially be shortened later in the season. However, our analysis found that there is very little change in mean milking interval by season; averaging 09:48 in spring, 09:51 in summer, 09:46 in autumn and 09:45 in winter. This suggests that longer milking intervals are fixed and habitual on many farms, rather than being dictated by workload.

Practical Implications

Regardless of herd size, some adaptations to work routine may need to be made to ensure a good quality of life for both farmers and employees. A long milking interval is a driver of late PM milking finish time and long working days. Reducing milking interval in line with the 16:8 target interval has no effect on milk kg per cow per day. This provides an opportunity to shorten the standard working day on farms with no milk yield loss. This has benefits for the farmer and potential employee alike. Reviewing how work is organised and executed on the farm is crucial to changing milking interval.

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