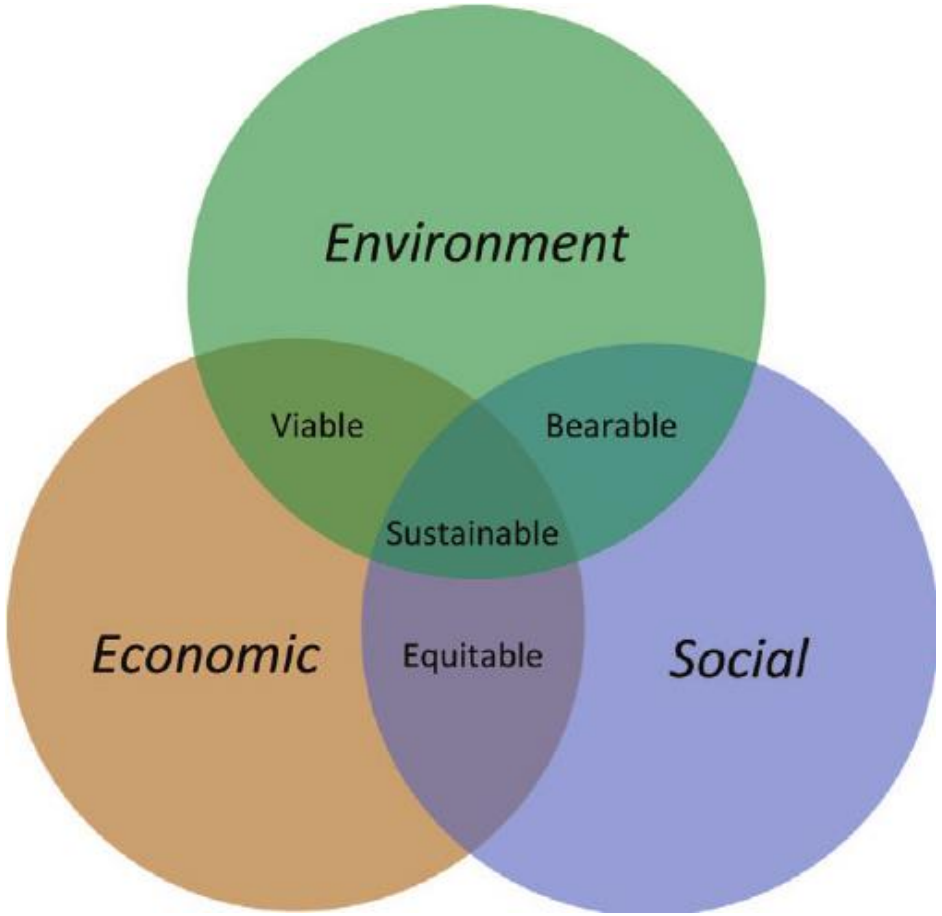
Poultry Manure as a Suitable Fertiliser for Tillage Production

Signpost Programme Poultry Event

Monasterboice Inn,
Monasterboice, Co. Louth

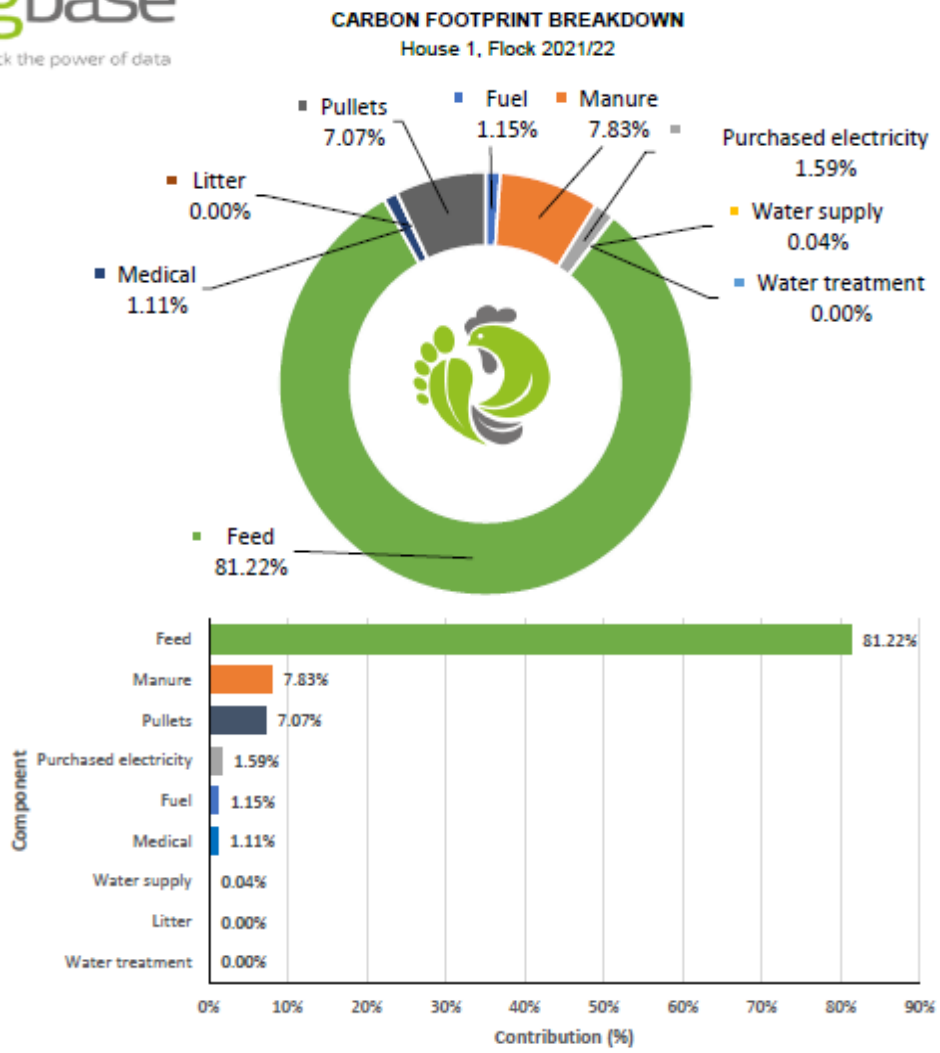
12th October 2023

Sustainability



Carbon footprint from Poultry Egg Production

Eggbase
Unlock the power of data



2022 GHG Emissions associated with egg production:

- 2.19 kg CO_2e/kg egg

Feed ≈ 80% of the carbon footprint of egg production

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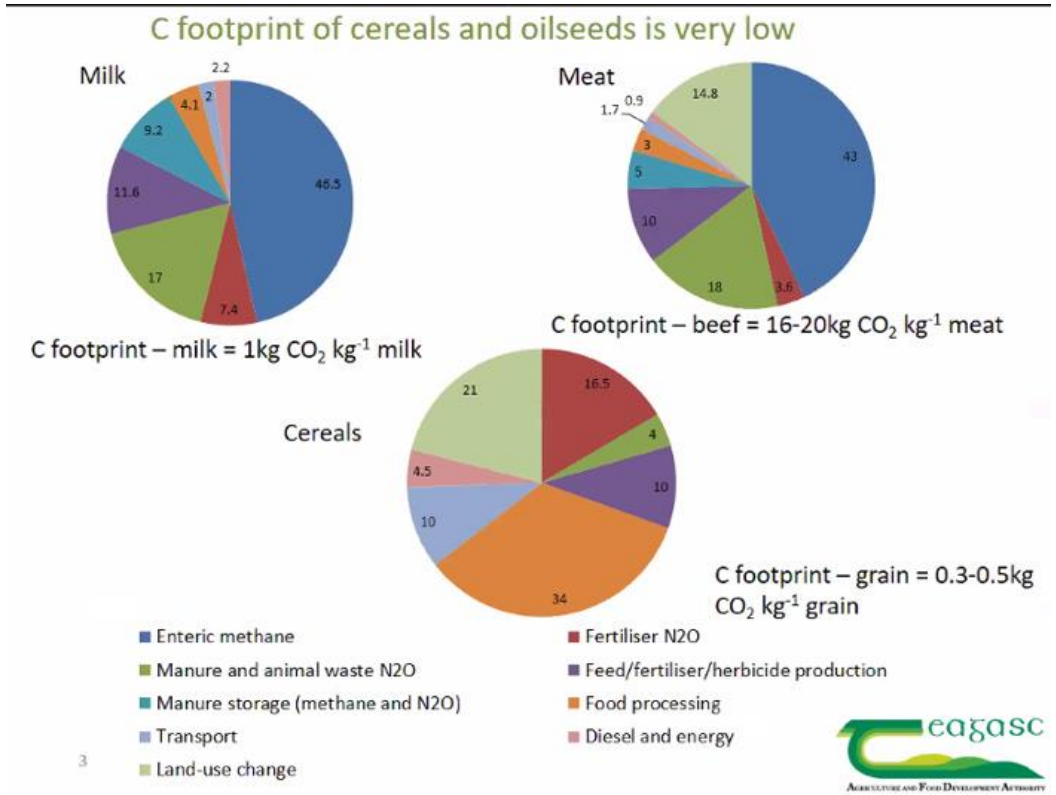
Carbon footprint from Irish Grain

Per unit of output:

- Carbon footprint of Irish grain: 0.3-0.5 kg CO_2/kg grain

Crop	Origin	Emission intensity Kg/CO_2 kg DM	Reference
Wheat	Ireland	0.27-0.33	Teagasc/CSO
	France	0.42	GFLI 2022
	UK	0.34-0.39	Carbon Trust Footprint Expert v3.3
Maize	Brazil	1.05	GFLI 2022
	Europe	0.45-0.47	Carbon Trust Footprint Expert v3.3
	USA	0.45-0.48	Ecoinvent & GFLI 2022
Barley	Ireland	0.25-0.33	Teagasc
	France	0.36	GFLI 2022

Crop	Origin	Emission intensity Kg/CO_2 kg DM	Reference
Field Beans	Ireland	0.19-0.27	Teagasc/CSO
	Switzerland	0.46	Ecoinvent V2.2
Soyabean	Argentina	6.94	Carbon Trust Footprint Expert v3.3
	Brazil	14.83	Carbon Trust Footprint Expert v3.3
	USA	0.39	Carbon Trust Footprint Expert v3.3



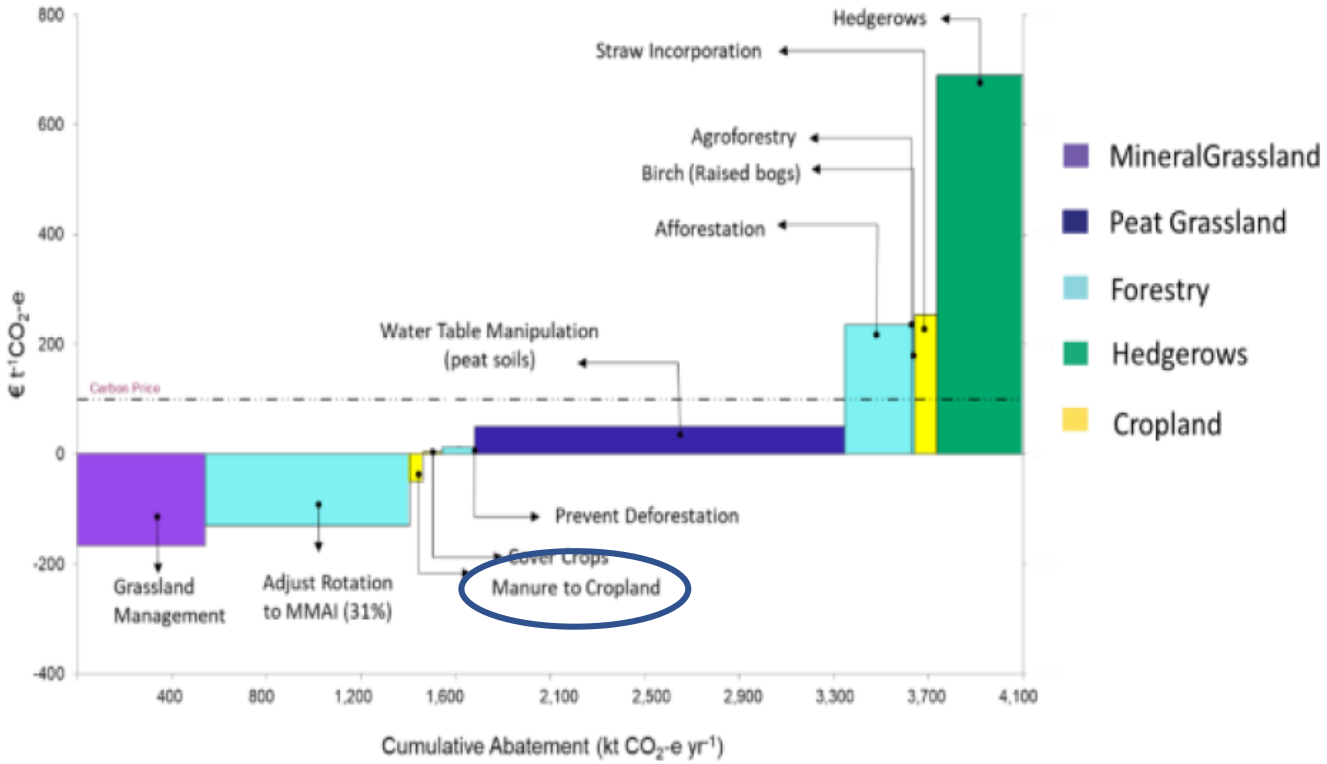
Source: Teagasc Farm Sustainability Report 2021

➢Irish grain has lower C footprint than most other countries worldwide

Carbon footprint from Irish Grain

- Circa 70% of tillage GHG emissions come from Nitrogen inputs
  - Manufacture of N (but outside the country)
  - Nitrate leaching
  - Nitrate losses to air

- Organic Manures
  - An excellent source of nutrients (including Nitrogen) & organic matter
  - An opportunity to reduce cost of N application
  - Help to reduce farm GHG emissions



Source: Teagasc MACC 2023

Opportunities for collaboration

Gains:

- Working partnerships
  - Circular economy – grain off farm / organic manure returned
- Environmental sustainability
  - Reduce the carbon footprint of both enterprises
- Promote credentials of Irish egg production & Irish grain
- Economic sustainability
  - Reduce costs
- Security of supply

Tillage farmer considerations for poultry manure

Logistics:

- Location
- Availability
- Time of year
- Storage facilities
- Method of transport

Tillage farmer considerations for poultry manure

When to apply:

- What crop for best response
- Recovery of N when autumn applied
- Establishment method & incorporation

Winter wheat	Autumn	Incorporation	High loss	Nitrate leaching ☹
Winter wheat	Spring	Surface spread	High loss	Ammonia volatilisation ☹
Spring barley	Spring	Incorporation	Low loss	☺☺☺☺

Source: SEGES, Denmark



Tillage farmer considerations for poultry manure

Variability:

- Analysis is essential
  - Correct & consistent sampling procedure

Potential contamination:

- Material
- Heavy metals & metalloids
  - e.g cobalt, copper, iron, selenium, zinc
- Antibiotic residue/Coccidiostats

southern scientific services ltd.

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Customer Sample Ref:		**Customer Sample Code:**	
Project:	Signpost Farms Slurry Prog Spring 2023	**Sampled By:**	Customer
Our Reference:		**Sample Matrix:**	Manure
Date Sampled:	D	**Time Sampled:**	:

Method:	Parameter:	Units	LOQ	Result
	Chemical Analysis: (F)			
	CMS 1 Compost/Manure (N, P, K (kg/T), pH & DM%)			
	Chemical Analysis: (F)			
SCP 112/027C	Total Phosphorus	kg/t AR	*0.10*	13.30
SSP 112/027A	Total Nitrogen	kg/t AR	*0.10*	23.20
SCP 112/053A	Total Potassium	kg/t AR	*0.10*	8.05
SCP 019	Dry Matter	%		64.20
SSP 021	pH	pH Units		8.9

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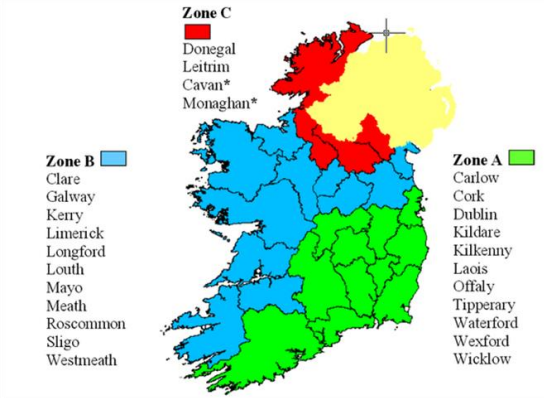
Tillage farmer considerations for poultry manure

Legislation:

- SI No. 113 of 2022, EU (Good Agricultural Practice for the Protection of Waters) Regulations 2022 (Nitrates Regulation)
  - Nutrient Management Plan (NMP)
  - Compulsory soil test on tillage ground
  - Application dates
  - Watercourse buffer zone changes
  - Incorporation within 24 hours

Changes in 2023 & Organic fertilisers

- Closed period starts on 1st Oct. 2023 (slurry)
- 3m buffer to protect water courses (slurry)
- Apply with LESS from 1st Jan 2023 (slurry)
- Soil P index 1 & 2: P in organic deemed 50% available (100% in P index 3)



Protection of Water

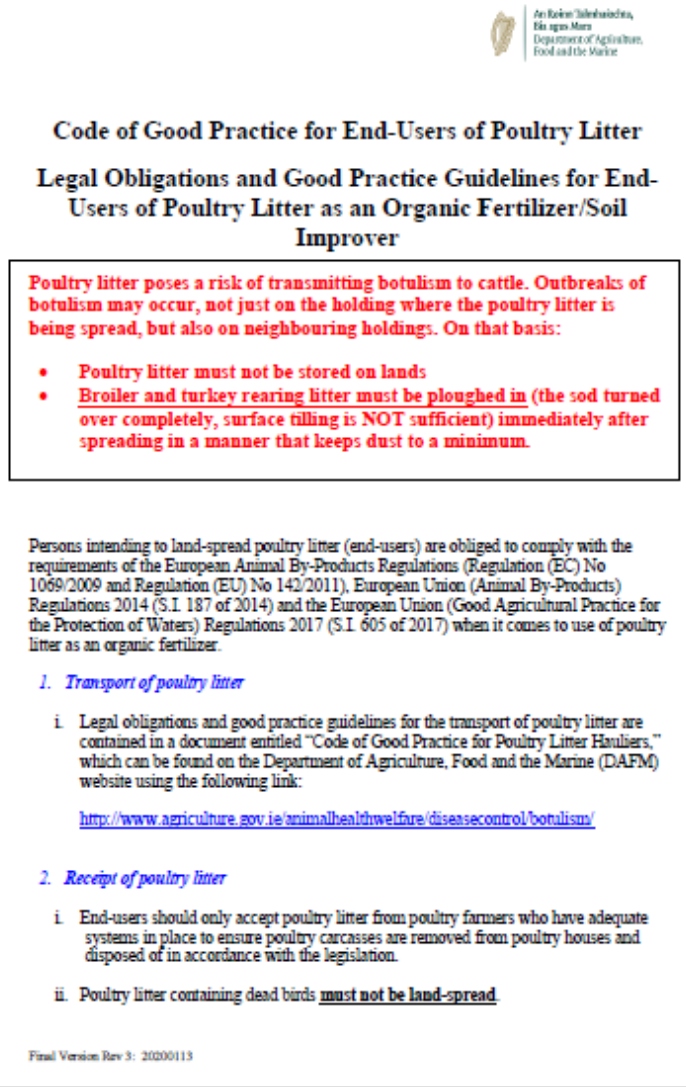
- 170kg Org N/ha/yr limit
- All farmers must comply
- Reviewed once every 2 yrs

- European Animal By-Products Regulations (Regulation (EC) No 1069/2009 and Regulation (EU) No 142/2011), European Union (Animal By-Products) Regulations 2014 (S.I. 187 of 2014)
  - Dead birds

Tillage farmer considerations for poultry manure

Code of Good Practice:

- Department of Agriculture, Food & the Marine's Code of Good Practice for End Users of Poultry Litter
  - Transport 'commercial document'
  - Storage
  - Spreading
    - Nitrates Directive rules
    - **Poultry Manure Buffer Zones** – 5m beside watercourse (10m for 2 weeks before & after closed period)
    - Incorporation
  - Records
    - 3 Years – 'commercial document'
    - 5 Years – Nitrates Directive SI No. 113 of 2022



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

Code of Good Practice for End-Users of Poultry Litter

Legal Obligations and Good Practice Guidelines for End-Users of Poultry Litter as an Organic Fertilizer/Soil Improver

Poultry litter poses a risk of transmitting botulism to cattle. Outbreaks of botulism may occur, not just on the holding where the poultry litter is being spread, but also on neighbouring holdings. On that basis:

- **Poultry litter must not be stored on lands**
- **Broiler and turkey rearing litter must be ploughed in (the sod turned over completely, surface tilling is NOT sufficient) immediately after spreading in a manner that keeps dust to a minimum.**

Persons intending to land-spread poultry litter (end-users) are obliged to comply with the requirements of the European Animal By-Products Regulations (Regulation (EC) No 1069/2009 and Regulation (EU) No 142/2011), European Union (Animal By-Products) Regulations 2014 (S.I. 187 of 2014) and the European Union (Good Agricultural Practice for the Protection of Waters) Regulations 2017 (S.I. 605 of 2017) when it comes to use of poultry litter as an organic fertilizer.

1. *Transport of poultry litter*

i. Legal obligations and good practice guidelines for the transport of poultry litter are contained in a document entitled "Code of Good Practice for Poultry Litter Hauliers," which can be found on the Department of Agriculture, Food and the Marine (DAFM) website using the following link:

http://www.agriculture.gov.ie/animalhealthwelfare/diseasecontrol/botulism/

2. *Receipt of poultry litter*

i. End-users should only accept poultry litter from poultry farmers who have adequate systems in place to ensure poultry carcasses are removed from poultry houses and disposed of in accordance with the legislation.

ii. Poultry litter containing dead birds **must not be land-spread**.

Final Version Rev 3: 20200113

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Tillage farmer considerations for poultry manure

What nutrients does poultry manure contain ?

Depends on dry matter % and type (layers v broilers)

Total Nutrient Content of Hen Layer Manure by Analysis										
Nutrient	N	P	K	S	Mg	Ca	Mn*	Zn*	Cu*	DM %
kg/ton or grams/ton	35[1]	6.8	17.5	4.5	1.2	39.2	317	225	22	89
kg/ton or grams/ton	34[1]	9.9	20	4.2	5.4	34	363	344	18.7	87

[1] The N in poultry manures is deemed to be 50% available. Therefore ~17kgN/ton is available for crop uptake during the growing season.

Tillage farmer considerations for poultry manure

Available Nutrient Content & Guide Value (€) of Organic Fertilisers 2023

Organic Fertiliser Type	N kg/m³ (units/1,000 gal)[6]	P kg/ m³ (units/1,000 gal)[5, 6]	K kg/ m³ (units/1,000 gal)[6]	Value €/ m³ Or (€/ 1,000 gal)[3,4]
Liquid Manures				
Cattle (6% DM)	1.0 (9)	0.5 (5)	3.5 (32)	9.7 (44)
Pig (4% DM)[2]	2.1 (19)	0.8 (7)	2.2 (20)	11 (50)
Soiled Water	0.48 (4)	0.08 (0.7)	0.6 (5)	2.2 (10)
Solid Manures	**N kg/t[1]** (units/t)	**P kg/t** (units/t)	**K kg/t** (units/t)	**Value €/ton**
Dungstead Manure	1.4 (3)	0.9 (2)	4.2 (8)	13
Farmyard Manure	1.35 (3)	1.2 (2)	6.0 (12)	17
Poultry[3]				
Broiler / deep litter	14 (28)	6.0 (12)	18.0 (36)	81
Layers (30% DM)	6.85 (14)	2.9 (6)	6.0 (12)	35
Layers (55% DM)	11.5(23)	5.5 (11)	12.0 (24)	65
Turkeys	14 (28)	13.8 (28)	12.0 (24)	104
Spent Mushroom Compost	1.6 (3)	1.5 (3)	8.0 (16)	22

[1] The value of N in Cattle slurry is 9 units/1,000 gallon (Based on total N of 2.4kgN/m³ @ 40% N availability by LESS application). Conversion - kg by 2 = units Spring application of organic manures is required to maximize N recovery. Manures should be tested to determine manure nutrient content.

[2] Incorporation of high N manures within 2 to 6hrs after application assume 50% N availability

[3] Value of N = €1.97/kg. P = €4.16/kg, K = €1.60/kg for 2023 (Nutrient values based on price / volume of range of fertiliser products).

[4] Cost of spreading & transport not included. [5] Reduce P availability to 50% on P index 1 & 2 soils.

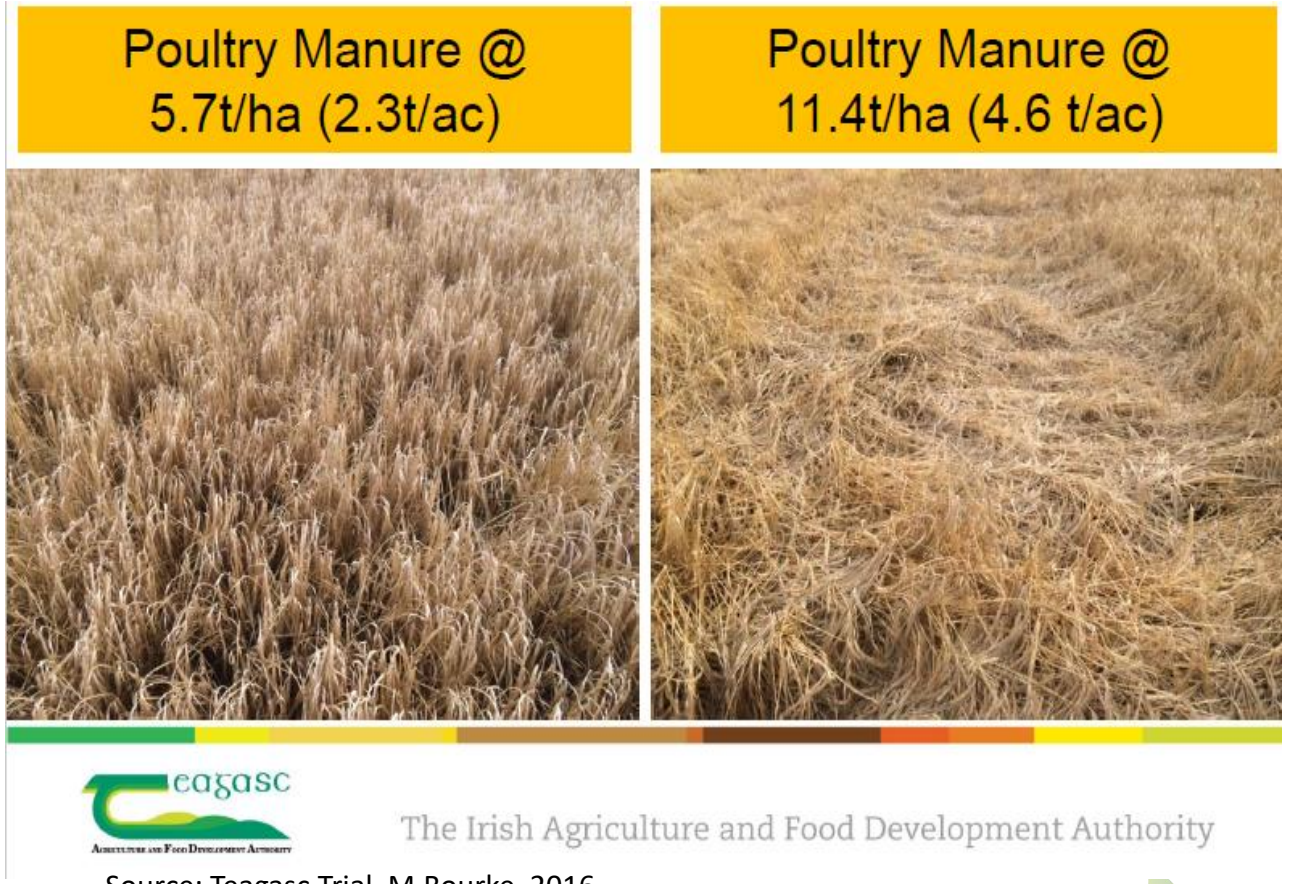
[6] Values under units/1,000gals or per ton have been rounded to closest unit.

Updated 1st April, 2023

Tillage farmer considerations for poultry manure

Spread Rate:

- Organic manure type
- Crop & time of year
- Growth conditions & uptake
- Nutrient Management Plan (NMP)
  - Field requirements
- ANALYSIS crucial
  - Dry Matter %
  - Nutrient content



Source: Teagasc Trial, M.Bourke, 2016

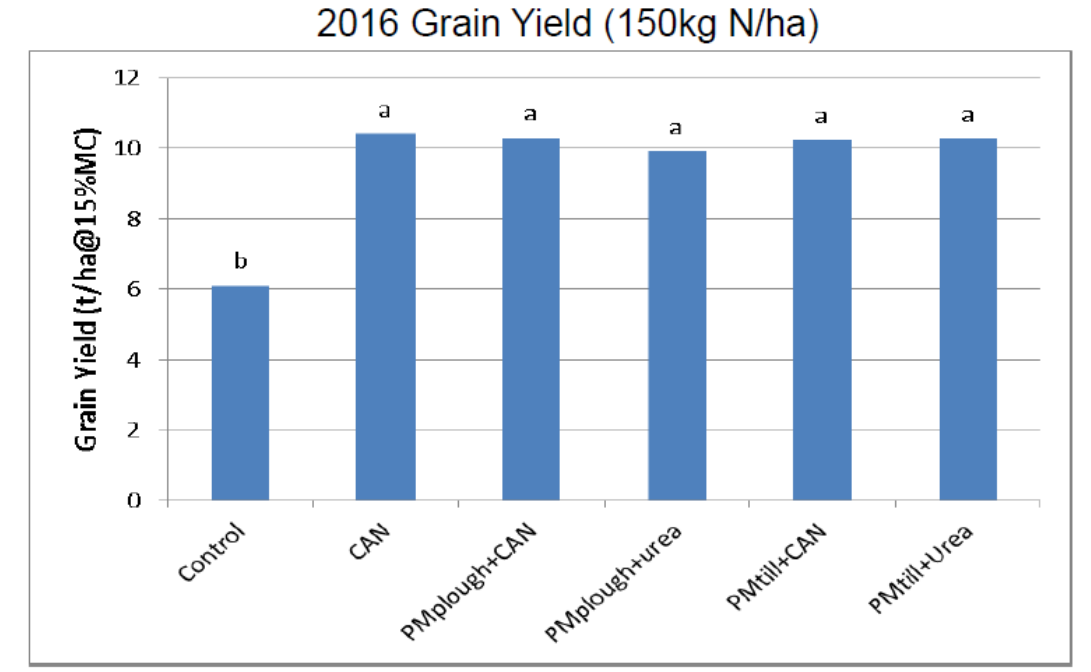
Tillage farmer considerations for poultry manure

Poultry Manure Trial:

Spring Barley, Co. Wicklow, 2015 & 2016

- Comparing incorporation method
- Comparing CAN vs Urea as chemical N source
- Replacing chemical with organic manure N

- Results
  - Effect on grain yield
  - Effect on grain protein %



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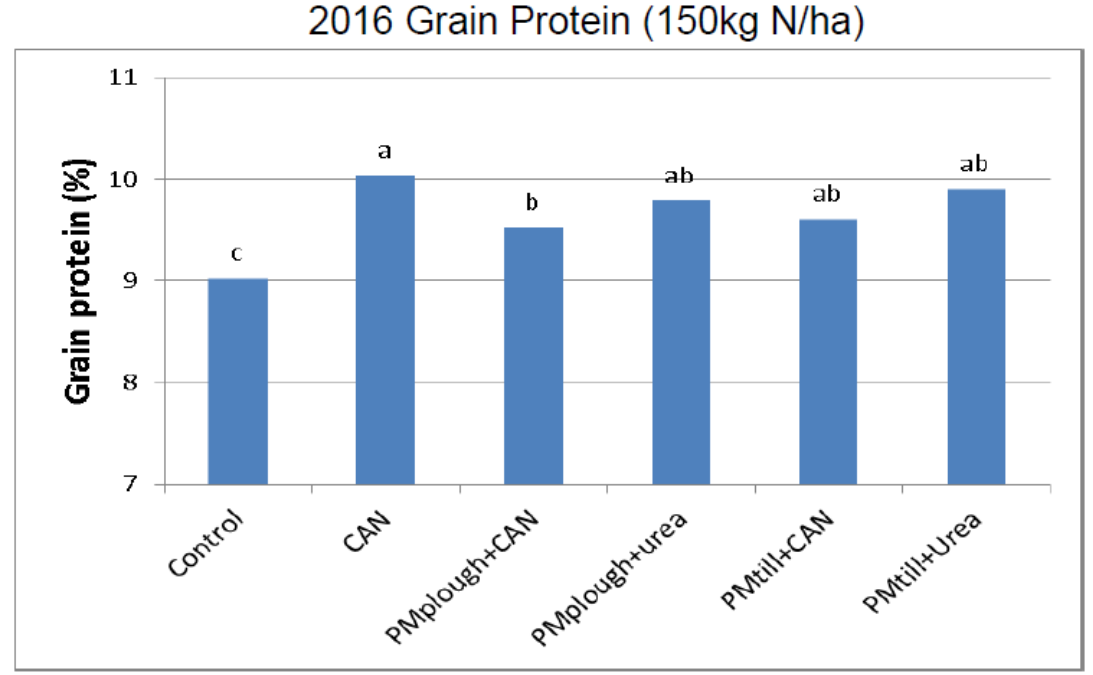

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Potential savings by using poultry manure

Fertiliser programme costs				
Fertiliser Programme	N (kg/ha)	P (kg/ha)	K (kg/ha)	Cost (€/ha)
4.27 t/ha PM (68kg N) + 82 kg N/ha (Urea)	150	42	85	163
420 kg 10-10-20/ha + 108 kg N/ha (CAN)	150	42	84	225

Note: Fertiliser costs Urea €320/t, CAN €195/ton, 10-10-20 €350/ton and poultry manure €25/ton (including spreading charge)

Source: Teagasc Trial, M.Bourke, 2016

At 2023 High Fertiliser Prices?

Assume Urea €810/t, CAN €750/t, 10:10:20 €850/t, poultry manure €40/t spread

€315/ha using poultry manure + urea vs €657/ha chemical fertiliser only

Tillage farmer considerations for poultry manure

Variables:

- Product
  - Dry Matter
  - Nutrient Content

  Consistency required

- Transport
  - Distance
  - Trailer vs articulated lorry
  - Time of the year
    - Storage facilities

Other Considerations:

- Nutrient release from organic manures vs chemical fertiliser
  - Soil temperature
  - Growth conditions
  - Biology in the soil
  - Soil structure

- Spreading opportunities - weather

Take home messages

- Viable alternative to replace crop chemical fertiliser requirements
  - Additional soil benefits
- Big cost savings if conditions are suitable
  - Distance
  - Storage facilities
  - Right crop & time of application
- Consistent, high DM% product is required
- Build stable, healthy relationship between poultry & tillage enterprises – Win/Win

Thank You for your attention

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