



BBioNets

Boosting the adoption
of Bio-Based Technologies

Cross-Fertilisation Meetings

Bio-Based Practices on Farms & Forests

“Innovations in Nutrient Recovery”

The effect of displacing mineral fertiliser with bio-based fertilisers in cropping systems

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Rationale behind the study

- A long-term arable rotation trial set up to assess the relationships between bio-based fertiliser (BBF) incorporation with:
 1. Crop yield
 2. Nutrient uptake
 3. Soil nutrient and carbon levels
- 7 years of crop & soil data collected – ongoing
- BBFs balanced with chemical fertiliser to meet plant requirements
- Most BBFs easy to acquire for farmers

Site Location & Experimental Layout

- Trial located at a location in Arklow, Co. Wicklow, Ireland – East coast
- The experimental design is a randomized block design with four replicates of 7 treatments.





Poultry Manure

- Poultry manure in its raw form – used for first 6 crops in the rotation
- Poultry pellets used in most recent crops
- Excellent source of nutrients, especially N & K.
- Raw form manure spread using dung spreader -> Pellets by a Bredal-type spreader
- Savings can be achieved if conditions are suitable (distance from farm of origin, storage facilities available & applying the manure to the right crop at the right time)



			Kg/tonne Fresh Weight			
	pH	DM%	N	P	K	S
Poultry manure	7.5	85	30.7	10	17.4	6
Poultry Pellets	-	100	40	15	25	6.1

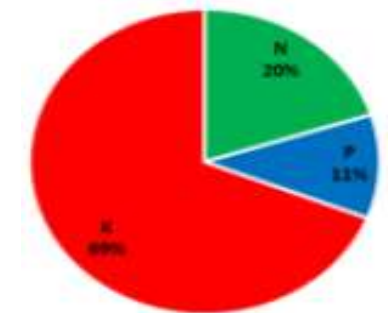
Cattle Slurry

- Cattle slurry is a valuable source of nutrients which is produced by cattle and stored on-farm.
- Under Nitrates regulations, the available nutrient content of 1000 gallons of cattle slurry (6% DM + LESS) to a fertile soil in spring is equivalent to a bagged compound fertiliser of 9:5:32.
- Using LESS techniques helps decrease ammonia and nitrous oxide emission -> better air quality + reduced greenhouse gas
- Timing -> Spring app. up to 50% more N recovery than Summer app.



Cattle Slurry

			Kg/tonne Fresh Weight			
	pH	DM%	N	P	K	S
Slurry	6.5	10	3.7	1.02	5.43	0.4



Separated Slurry Solids

- Fibrous, solid fraction which remains post-mechanical separation of raw slurry
- Can be dried and used for animal bedding, used in biogas production or spread on land as slow release fertiliser
- Separating solid fraction allows for ease of storage, transport and precise application
- The process allows for up to 20% extra storage tank space
- Liquid fraction easier to spread using LESS equipment -> no solids



			Kg/tonne Fresh Weight			
	pH	DM%	N	P	K	S
LTPSS	12.6	78	1.7	19.1	77.3	8.2
SCSS	7.3	27	4.58	1.18	4.65	-



Ca-DPS

- Byproduct from the wastewater treatment of dairy plants where calcium compounds, often lime, are used to remove phosphorus
- Generated by a dissolved air flotation technique (DAF) – dairy wastewater rich in fats, oils & greases are floated to surface – lime is added ($\text{Ca}(\text{OH})_2$ or CaO) -> Ca and P rich sludge produced
- Cheese-texture - can be spread using Bredal-type spreader



			Kg/tonne Fresh Weight			
	pH	DM%	N	P	K	S
Ca-DPS	7.4	24	5.3	23.8	1.2	0.7



Al-DPS

- This activated sludge is generated using aeration and a biological floc formation including the dosing of aluminium flocculent to remove P.
- Common across dairy wastewater processing facilities -> aerobic secondary treatment (activated sludge aeration) -> removes organic material / suspended solids -> removal of P in tertiary treatment phase using ferric sulphate or aluminium chloride.
- Liquid texture – can be applied using slurry tanker (dribble bar onto growing crop etc.)

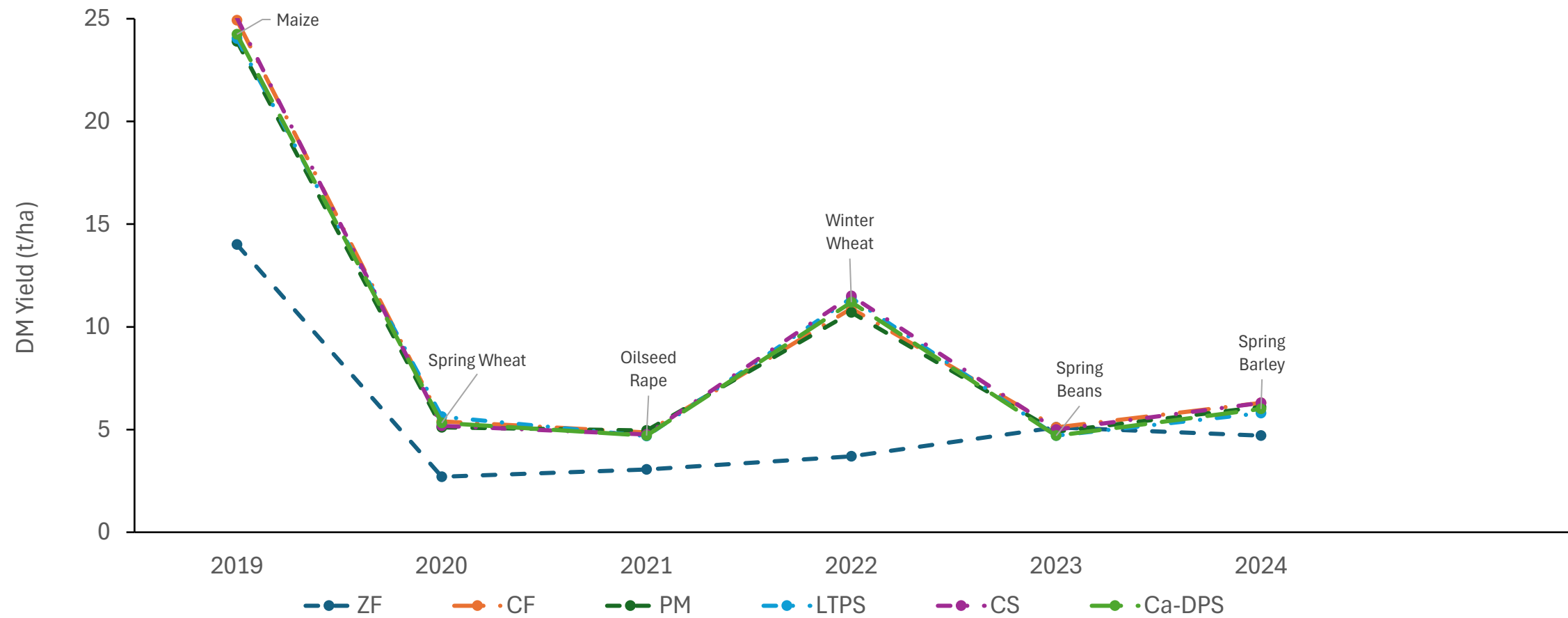


			Kg/tonne Fresh Weight			
	pH	DM%	N	P	K	S
Al-DPS	7	10	6.1	4.9	1.6	0.6



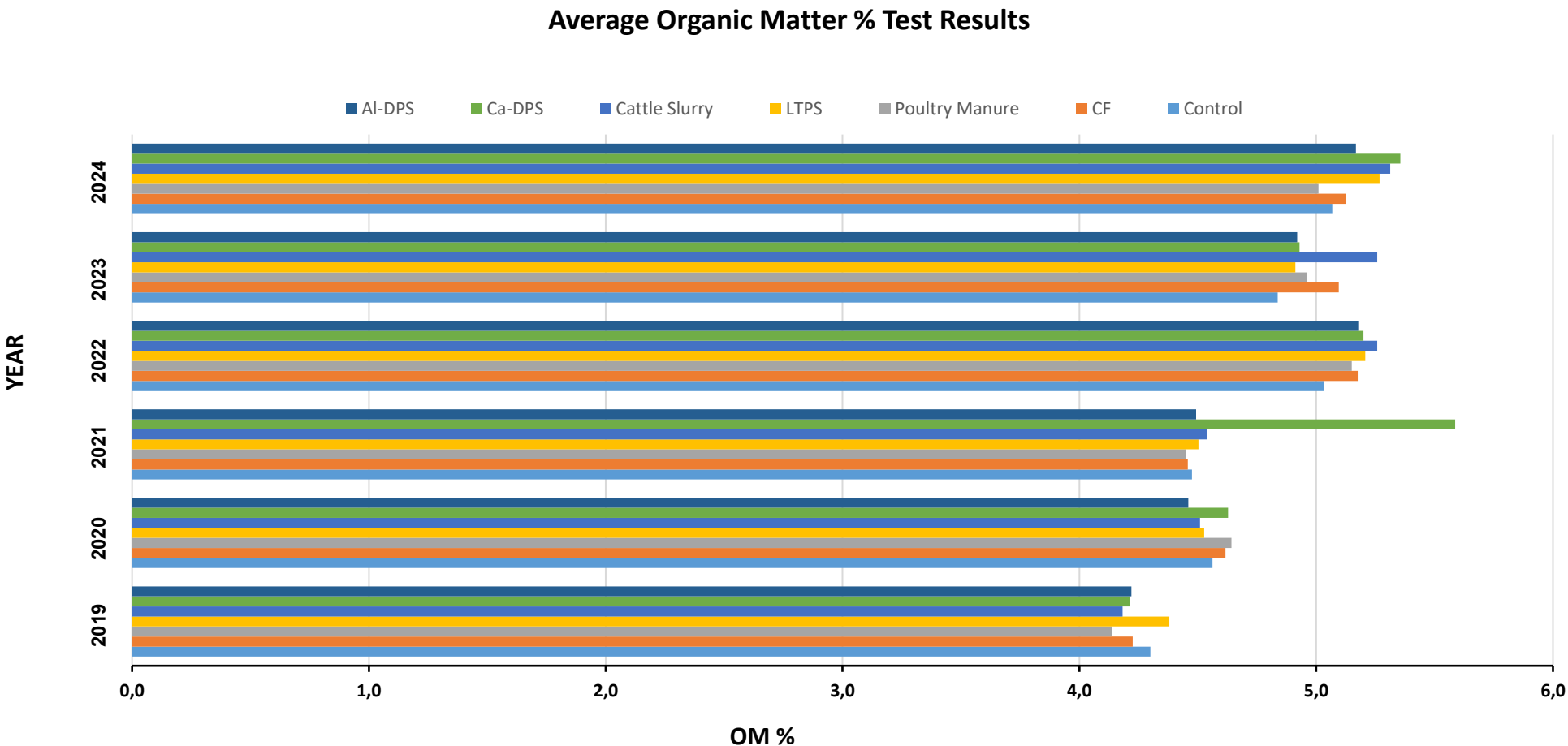
Yield Trend

Average Yield of Treatments by Year





Organic Matter Trend



- Average soil organic matter levels of the seven treatments across six site-years

Relevance of research

Ability of BBFs to displace a portion of synthetic fertiliser need – opens up avenues to:

1. Reduce the use of synthetic fertilisers (legislation)
2. Reduce mineral fertiliser costs + optimise profitability
3. Maintain crop yields & agronomic performance
4. Build and maintain good soil health + soil nutrient & carbon stocks
5. Supply soil organic matter over time – healthier soils
6. Promote earthworm numbers – biologically friendly + soil structure



Thank you!

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