



STAKEHOLDER MEETING

Nitrates Action Programme 2019 - 2022

Scientific Research and Monitoring

John Bailey

Presentation Outline

- 1. EAA Soil Sampling and Analysis Scheme**
- 2. Derogation monitoring in Upper Bann Catchment**
- 3. Research to mitigate P run-off**
- 4. New (*provisional*) P recommendations for extensive grassland**



1. EAA Soil Sampling and Analysis Scheme

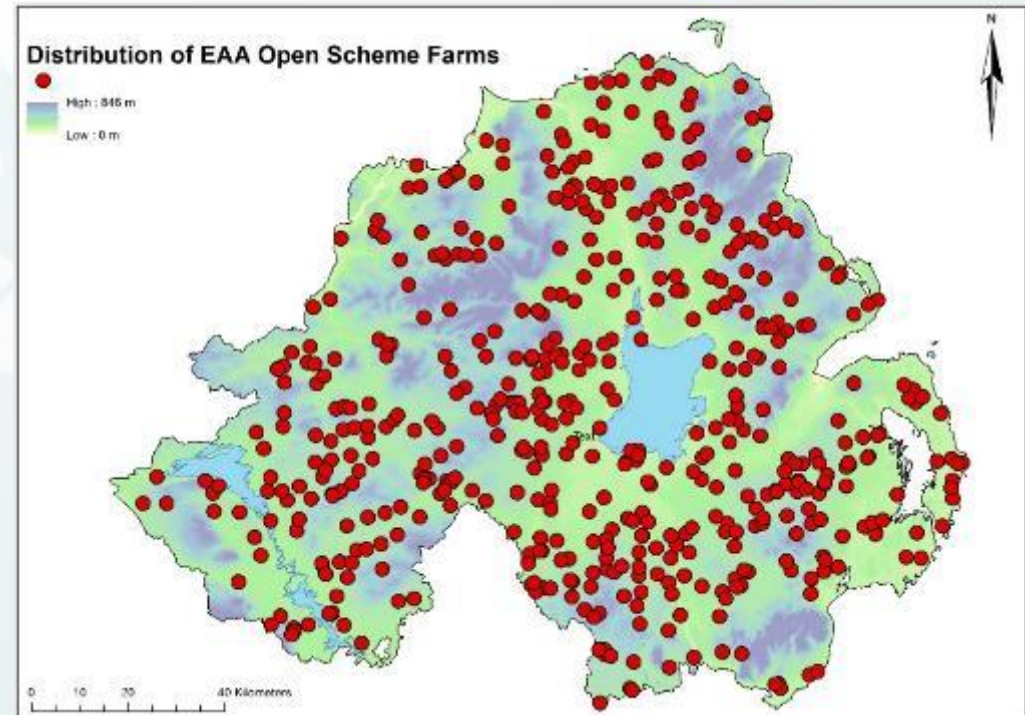
Scheme Components

(I) Open NI Scheme

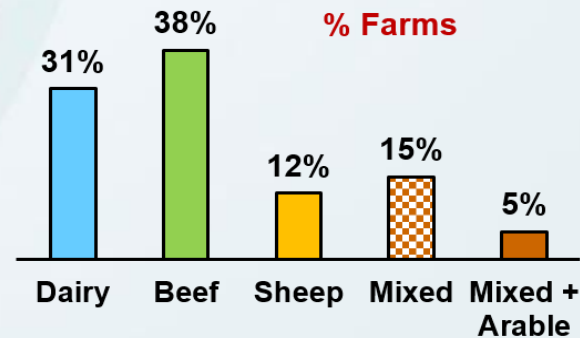
- 522 farms, 12,218 fields

(II) Catchment Scheme

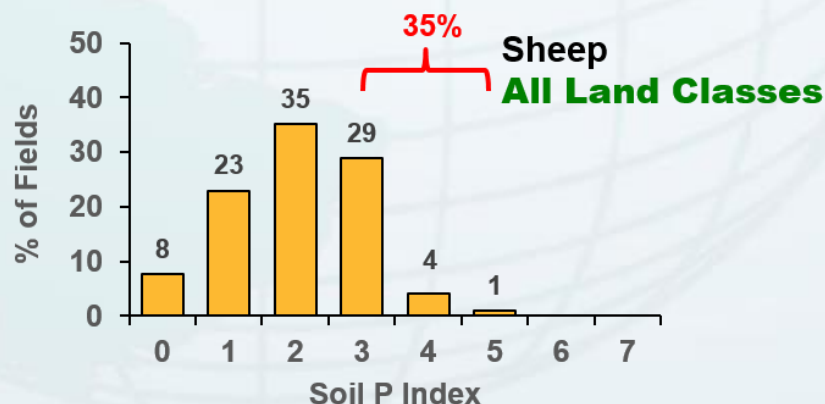
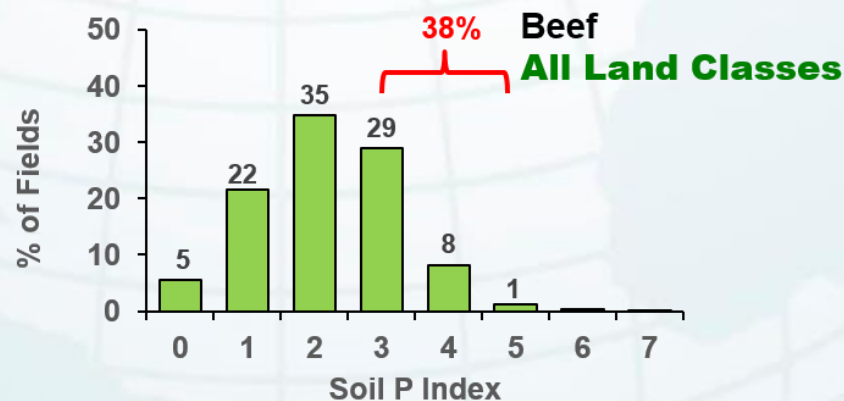
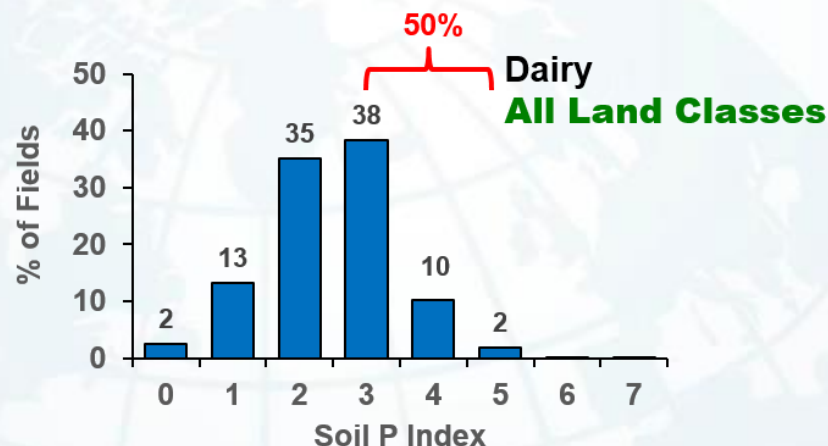
- 513 farms, 7,772 fields



(Points not indicative of specific farm locations)



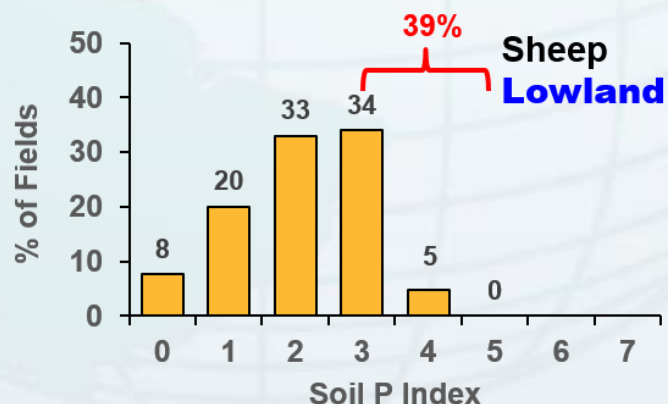
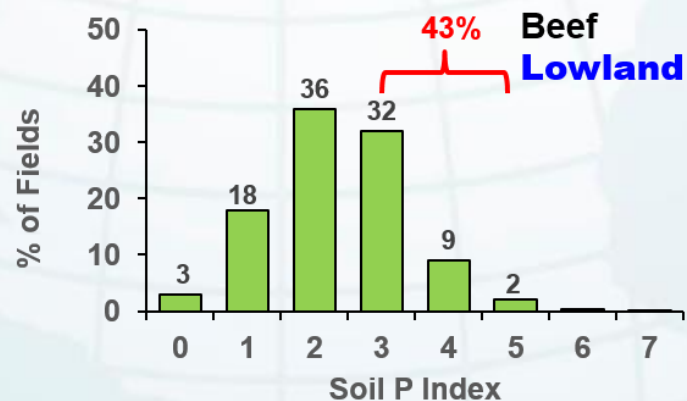
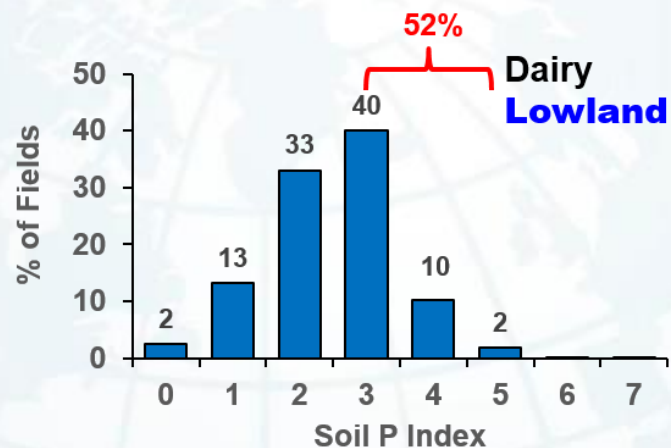
Soil P Status per Land Class per Farm Type



P Over-supply - All land classes

- 50% of fields on dairy farms > Index 2
- 38% of fields on beef farms > Index 2
- 35% of fields on sheep farms > Index 2

Soil P Status per Land Class per Farm Type



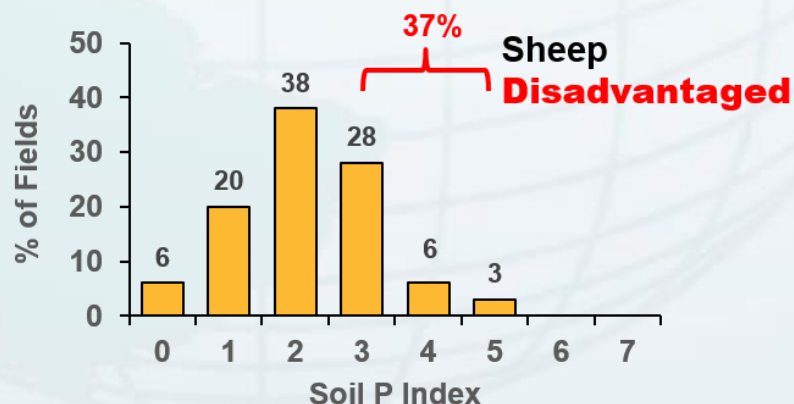
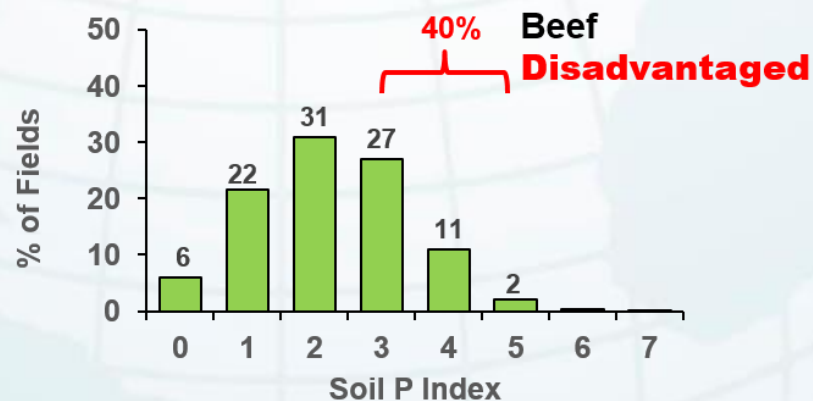
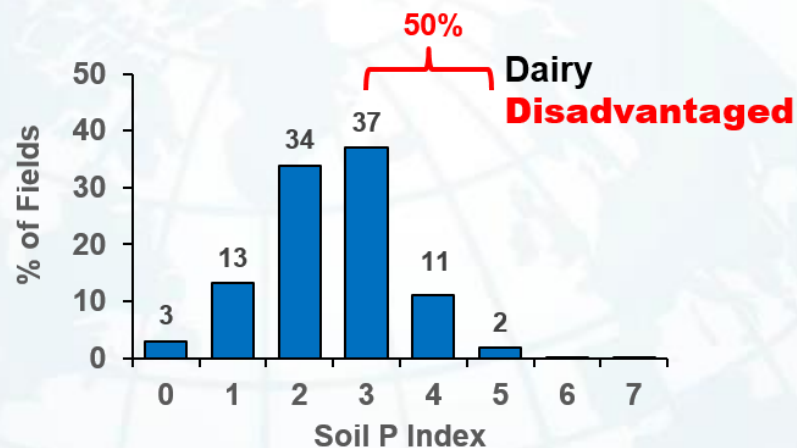
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P Over-supply - Lowland)

- ❑ 52% of fields on dairy farms > Index 2
- ❑ 41% of fields on beef farms > Index 2
- ❑ 40% of fields on sheep farms > Index 2

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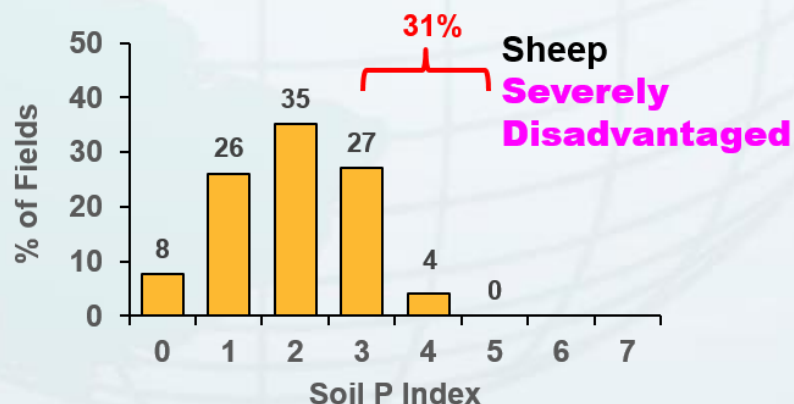
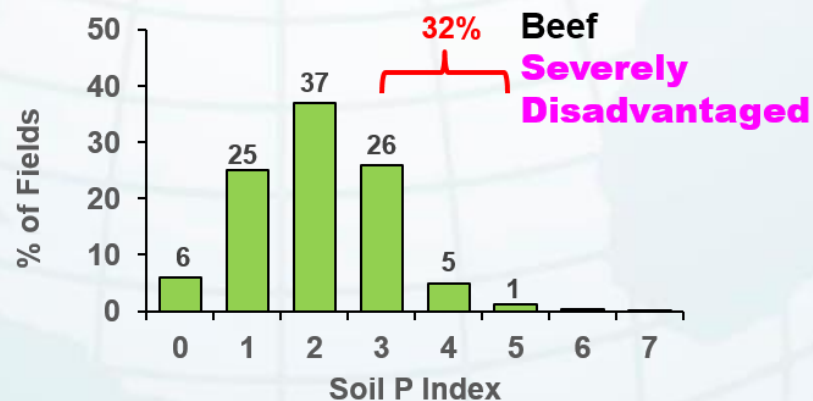
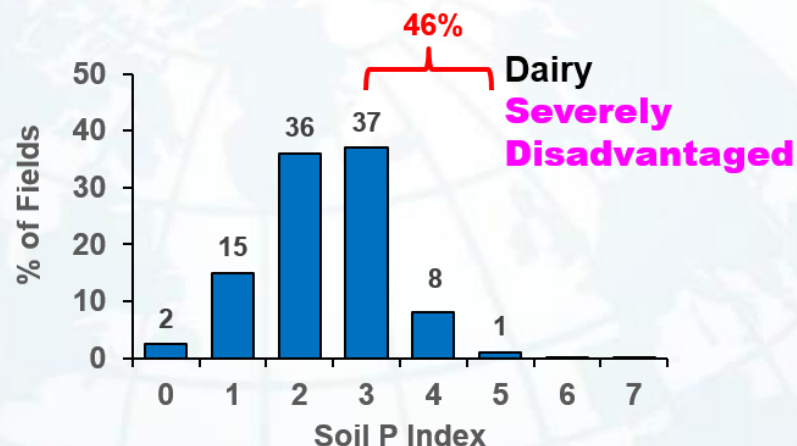
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P Over-supply - Disadvantaged

- ☐ 50% of fields on dairy farms > Index 2
- ☐ 39% of fields on beef farms > Index 2
- ☐ 37% of fields on sheep farms > Index 2

Soil P Status per Land Class per Farm Type



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P Over-supply - Disadvantaged

- ❑ 50% of fields on dairy farms > Index 2
- ❑ 39% of fields on beef farms > Index 2
- ❑ 37% of fields on sheep farms > Index 2

P Over-supply - Severely Disadv'd

- ❑ 46% of fields on dairy farms > Index 2
- ❑ 31% of fields on beef farms > Index 2
- ❑ 31% of fields on sheep farms > Index 2

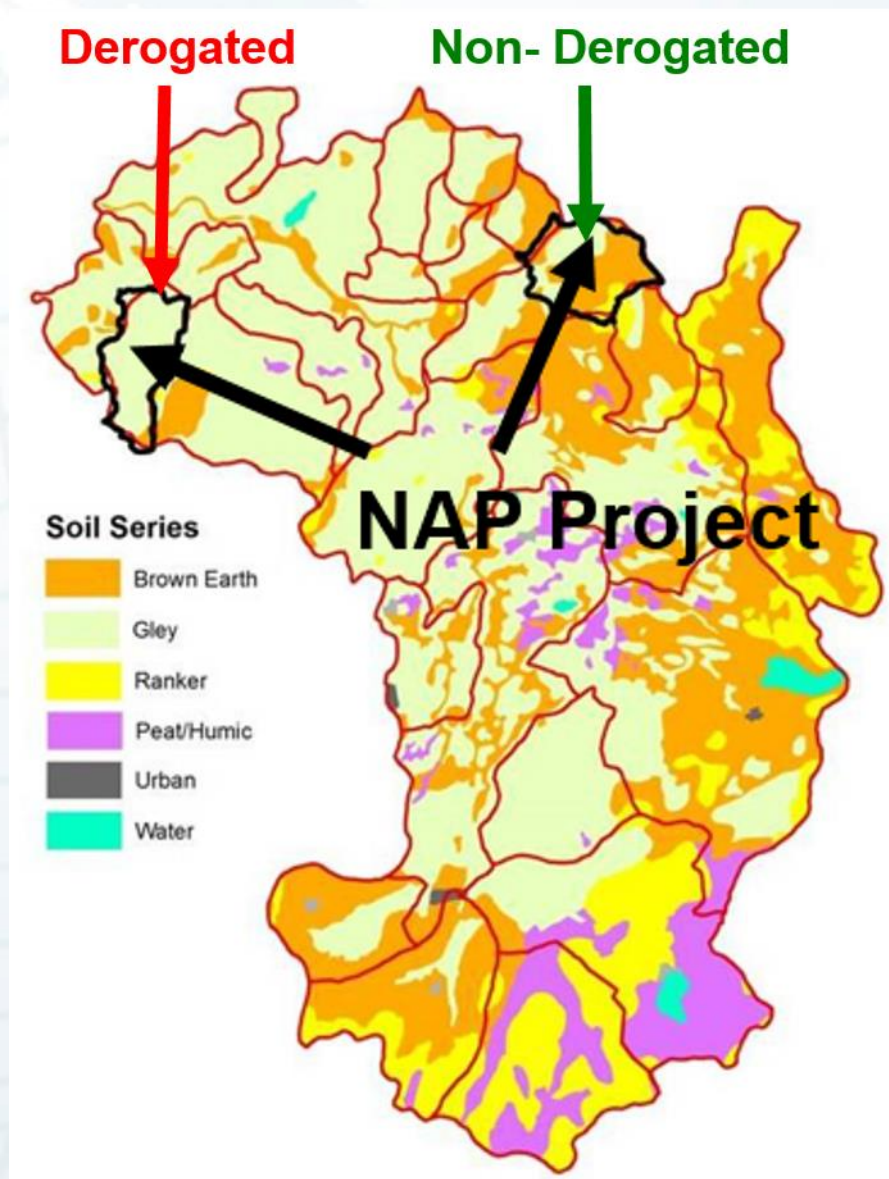
CONCLUSIONS

- ❑ The dairy sector has the most intensive P problem with 50% fields over-supplied on most Land classes
- ❑ Beef and sheep sectors also have significant P problems - and on a grassland platform 3 times larger than that used for dairy
- ❑ A key driver of P over-supply on Beef and Sheep farms is the unnecessary use of Chemical P, e.g. 20-10-10 and 25-5-5



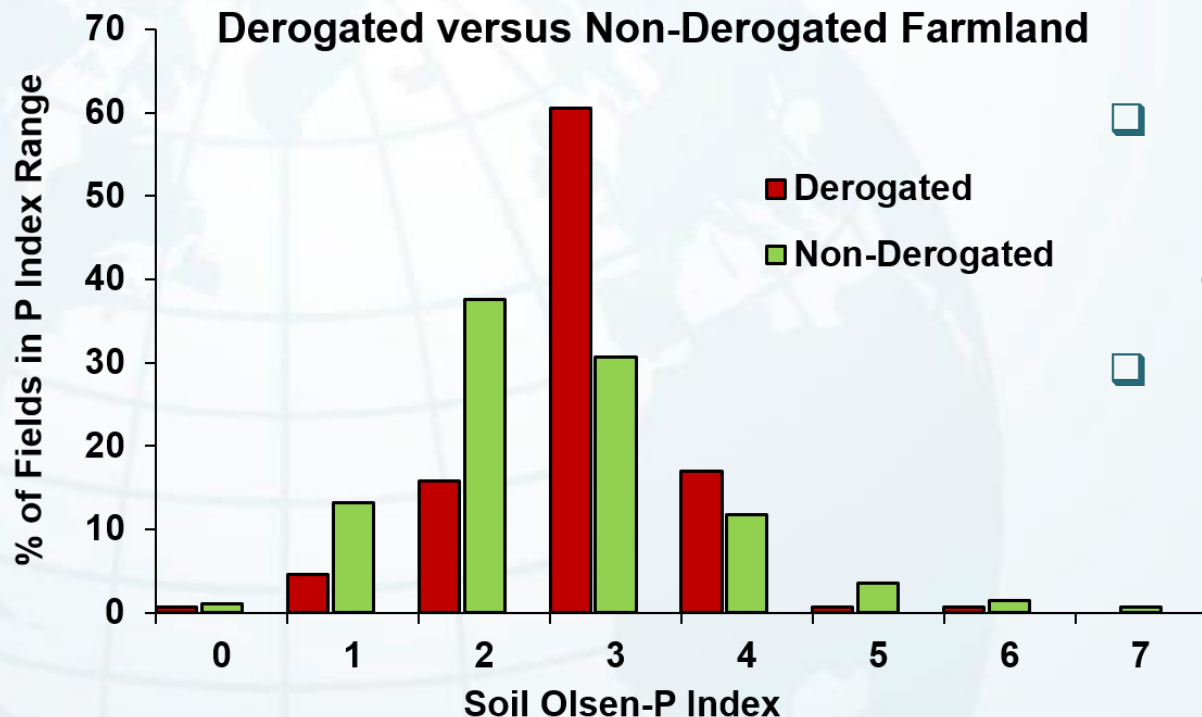
2. Derogation Monitoring in Upper Bann Catchment

Monitoring of Upper Bann Sub-catchments



Soil P Status of Derogated vs Non-Derogated Land

Soil P Index Distribution in Fields on
Derogated versus Non-Derogated Farmland



- 79% fields in the derogated catchment are > P Index 2, compared to 43% of fields in the non-derogated catchment.
- Proportion of fields with very high soil P (> Index 4) is greatest in the non-derogated (5%) c.f. the derogated (1%) sub-catchment

- This difference possibly indicates better nutrient management practices and soil testing on derogated farmland - which is helping to reduce the proportion of fields with very high soil P status
- Average farm-gate P balance for farms within the derogated sub-catchment was only -1 kg P/ha (*primarily as a result of manure-P export from derogated farms*), c.f. 8 kg P/ha for farms within the non-derogated sub-catchment

CONCLUSION

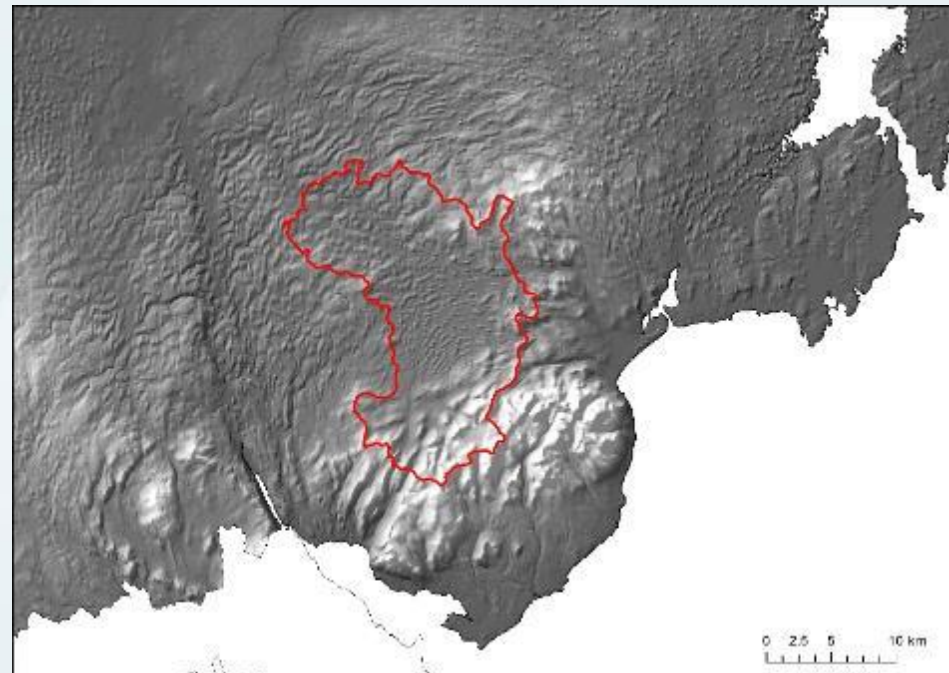
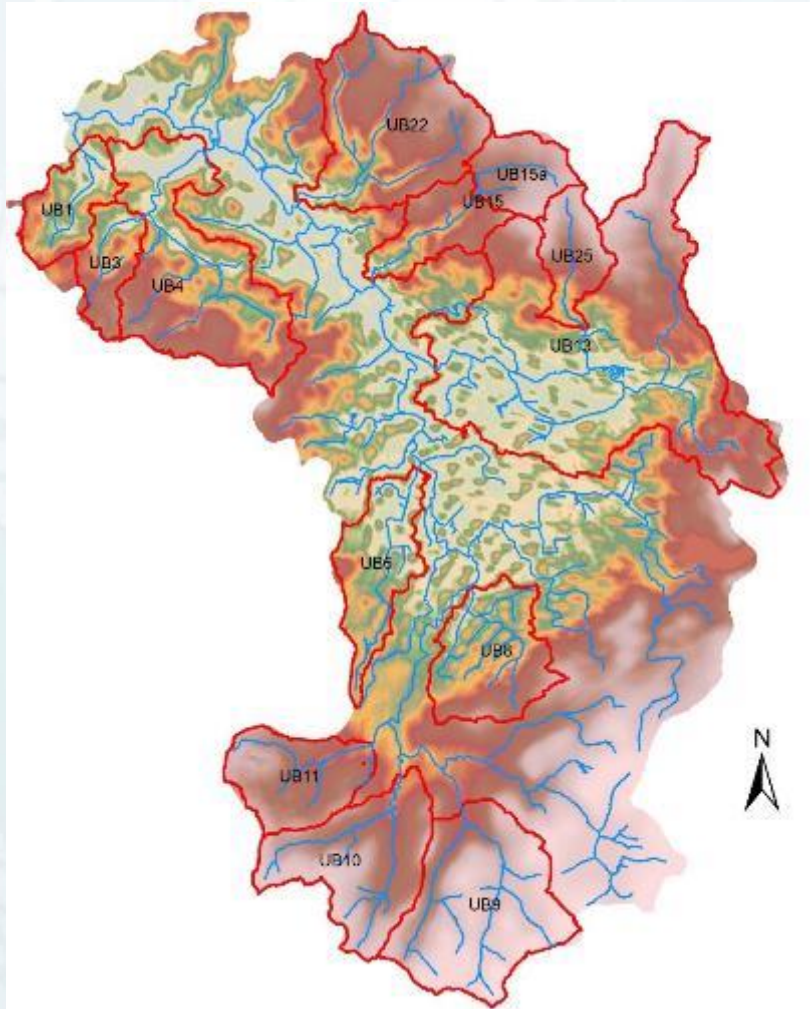
- ❑ While derogated farmland has currently the greatest proportion of fields with soil P indices $> 2^+$, corrective action is underway, including maintaining farm P balances below 10 kg P/ha/year - which has reduced P pressure



3. Research to Mitigate P Run-off

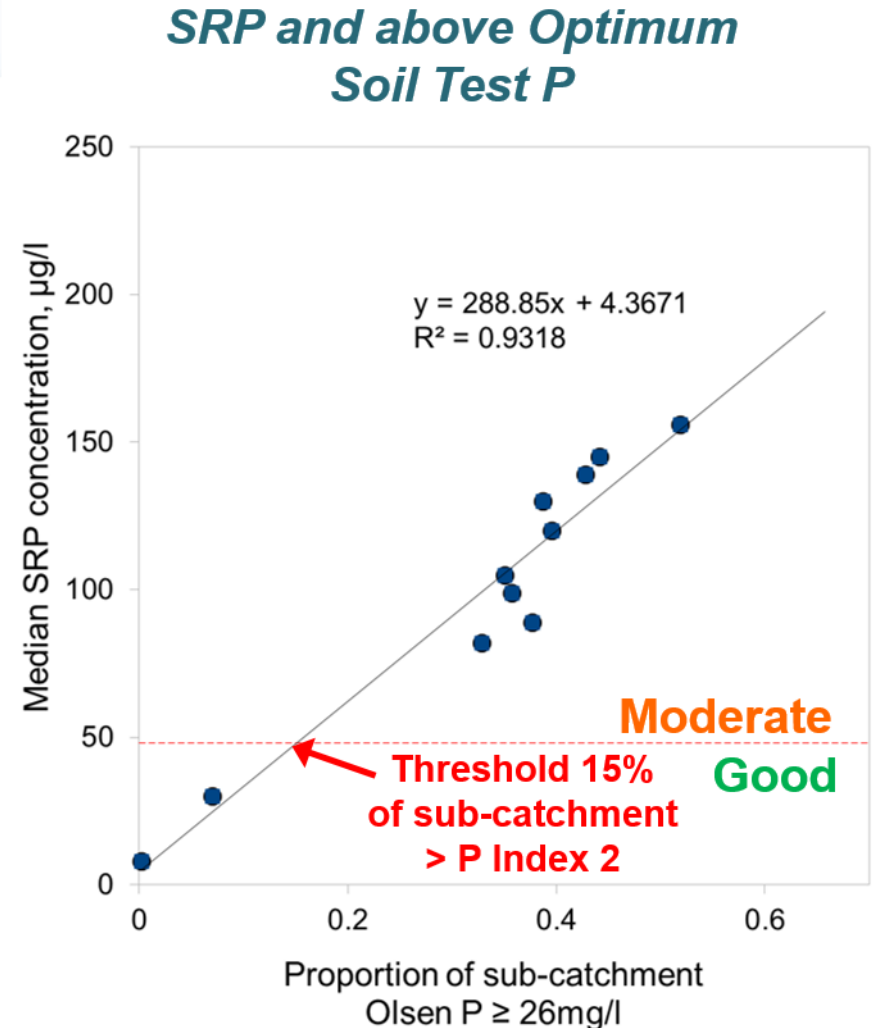
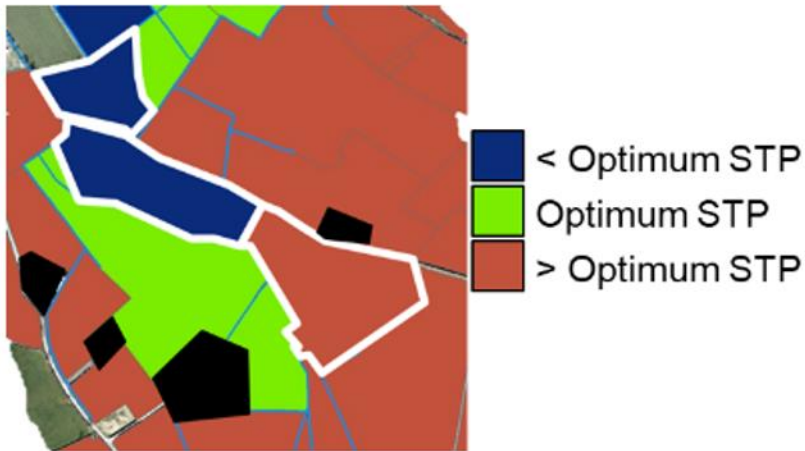
P runoff risk mapping (HSA) via LiDAR DTM

- Upper Bann catchment, Co. Down
- 13 sub-catchments; 151 km²



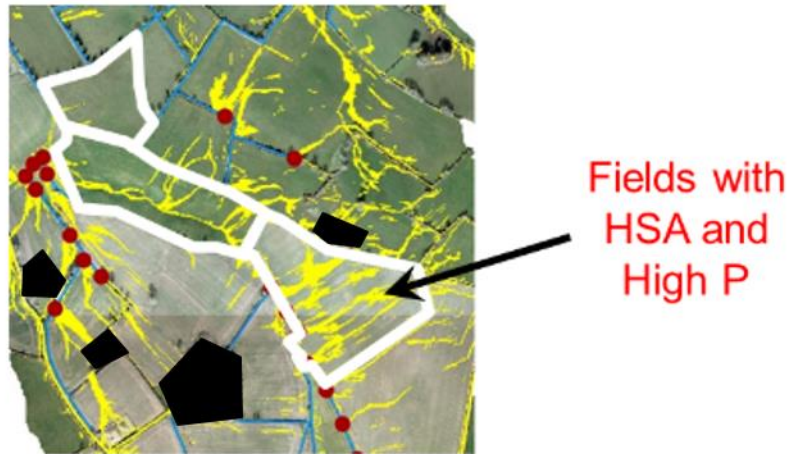
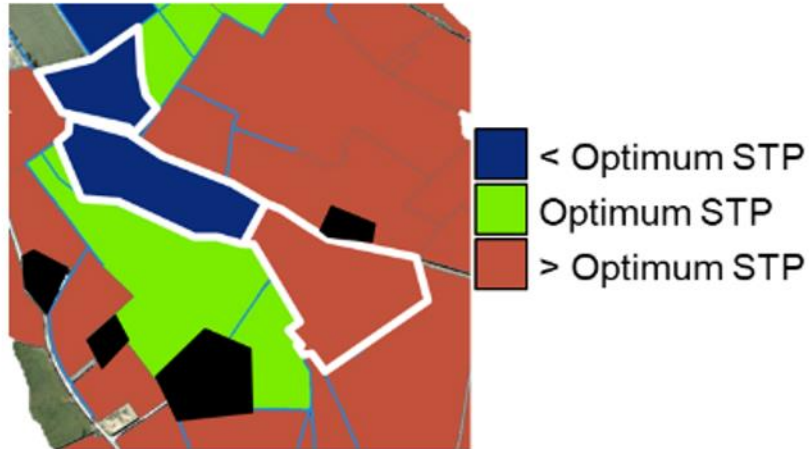
Water quality (P concentration) and soil P test

- ❑ To deliver 'Good' water quality, < 15% of catchment should have soil P levels exceeding the P Index 2+ range (> 26 mg P/l)



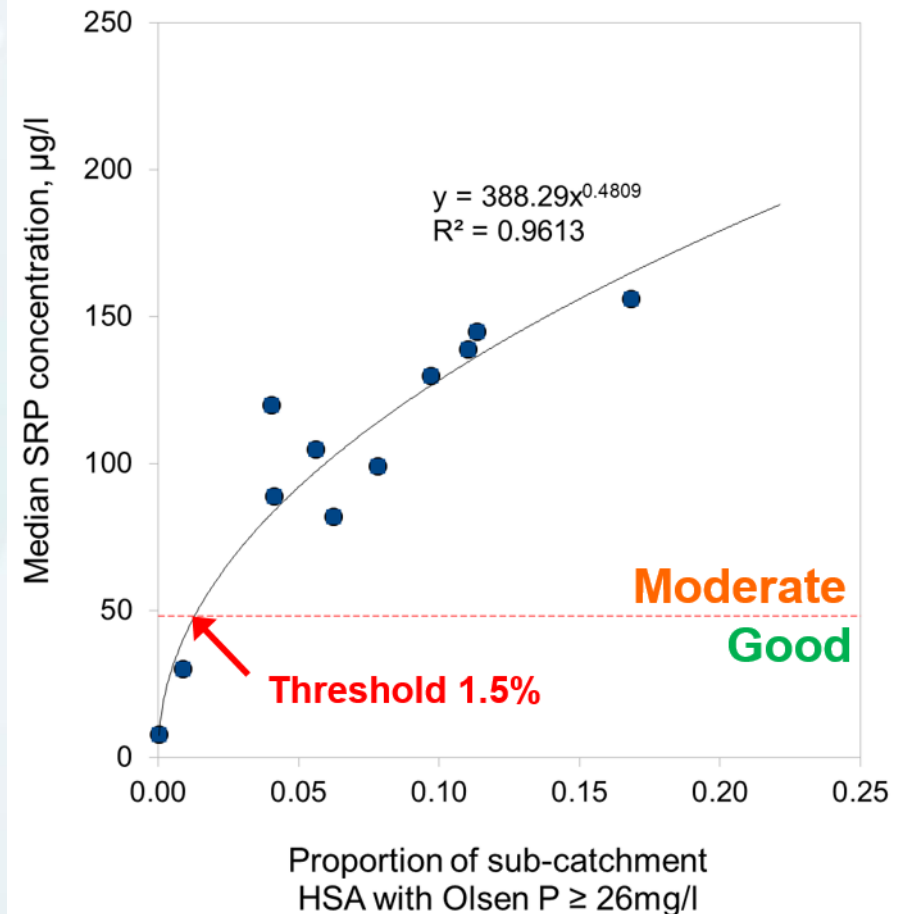
Water quality with soil P test and HSA runoff risk

- ❑ BUT - in addition, less than 1.5% of catchments should have soil P levels exceeding P index 2+ on land of high (HSA) runoff risk



- 25% highest HSA risk (Yellow)
- Drainage network (Blue line)

SRP and HSA with Above Optimum Soil Test P



CONCLUSIONS

Conditions for Good water quality:

- ☐ No more than 15% of catchment area with soil P Index > 2+
- ☐ No more than 1.5% of catchment with HSA and soil P Index > 2+

Mitigation Measures:

- ☐ Reduce Farm-Gate P balances
- ☐ Physical interception measures – riparian zones etc.



4. New (*provisional*) P Recommendations for Extensive Grassland

Phosphate Recommendations for Extensive Grassland

- ❑ Grassland managed 'extensively' with relatively low N inputs, should have lower P requirements and a lower target soil P level than grassland managed 'intensively' with high N inputs driving high levels of grass production and P removal
- ❑ It is proposed that for grassland managed extensively and receiving less than 60 kg N/ha/year as chemical N and with a manure N loading of less than 120 kg N/ha/year (*supporting grazing and one cut of silage or hay per season*), the target soil P index should be 2- (16-20 mg P/l), and the following P recommendations should apply:

Table 1. *Maximum phosphate fertiliser application limits (kg P₂O₅ per ha) for extensively managed grassland*

EXTENSIVE GRASSLAND	Soil P Index					
	0	1	2-	2+	3	4
Grass establishment (kg P ₂ O ₅ /ha)	80	65	50	30	0	0
Grazed grass (whole season) (kg P ₂ O ₅ /ha)	50	35	20	0	0	0
1 st cut silage (kg P ₂ O ₅ /ha)	70	55	40	0	0	0
Hay (kg P ₂ O ₅ /ha)	55	43	30	0	0	0

Definition of Extensive Grassland

*Nutrient Loadings and Surpluses on **Beef/Beef & Sheep/Sheep (BB&SS)** and **Dairy** Farms in the Upper Bann Catchment*

Beef/Beef & Sheep/Sheep Farms

Nutrient Loadings/Surpluses (kg/ha/year)

	Chem N	Manure N	Chem P	Manure P	Farm-gate P Balance	Predicted DM yield	Predicted P offtake	Soil Surface P balance
Mean	28	72	3.9	12	2.8	4.9	13	3.1
Range	4 - 58	33 - 113	0 – 10.5	4 - 18	-0.5 - 5.1	4.3 - 5.2	11 - 17	-0.5 – 6.4

Dairy Farms

Nutrient Loadings/Surpluses (kg/ha/year)

	Chem N	Manure N	Chem P	Manure P	Farm-gate P Balance	Predicted DM yield	Predicted P offtake	Soil Surface P balance
Mean	162	184	1.0	34	9.5	12.4	34	0.83
Range	64 - 215	152 - 250	0 – 3.8	28 - 43	2.7 – 19.6	10.2 – 13.5	31 - 41	-4.7 – 5.7

- ❑ Chemical N usage on BB&SS farms ranged from 4 to **58** kg N/ha/year
- ❑ Chemical N usage on dairy farms range from **64** to 215 kg N/ha/year

Extensive grassland receives < 60 kg Chemical N/ha/year

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- ❑ Manure-N loading on BB&SS farms ranged from 33 to **113** kg N/ha/year
- ❑ Manure-N loading on dairy farms ranged from **150** to 250 kg N/ha/year.

Extensive grassland has Manure-N loading < 120 kg N/ha/year

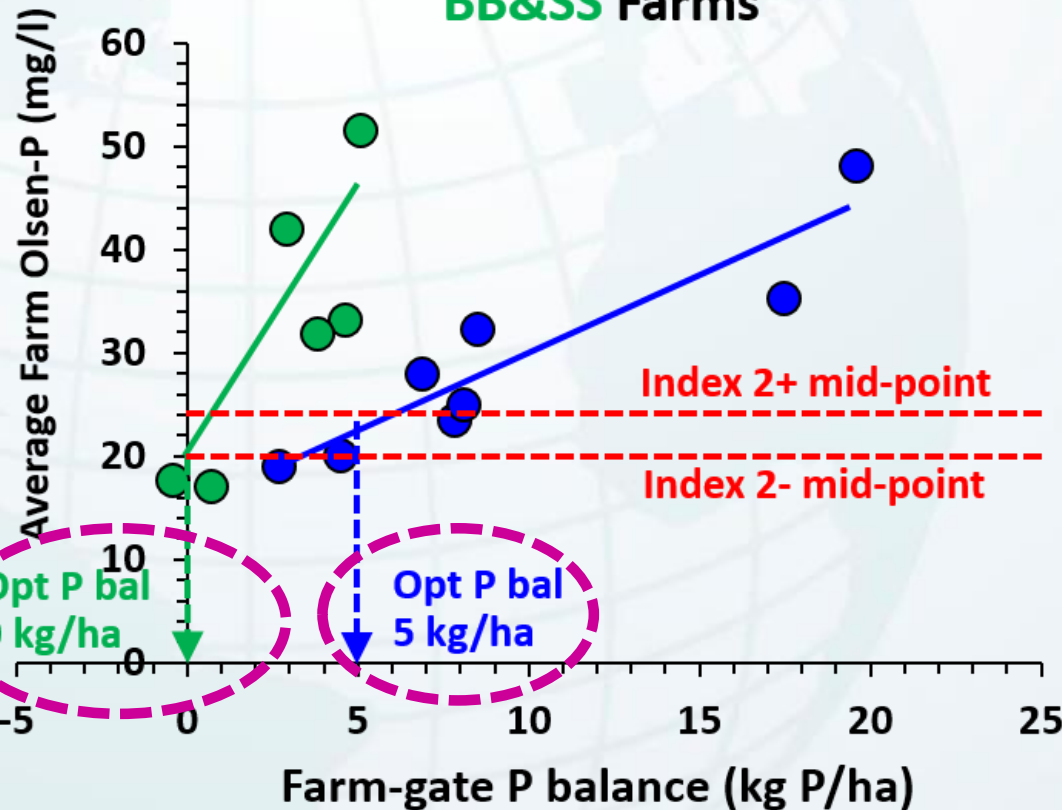
Target Soil P Index for Extensive Grassland

- ❑ Herbage analysis indicated that on Beef/Beef & Sheep/Sheep farms, P was not limiting to grass production, whereas N was – i.e. DRIS N indices were low or negative
- ❑ Herbage analysis indicated that at Soil P Index 2- (16-20 mg P/l) sufficient P was present in herbage to sustain normal levels of production

A Target Soil P Index of 2- is sufficient to sustain grass production on Extensively Managed Grassland

Farm-gate P Balance for Extensive vs Intensive Grassland

Average Farm soil Olsen-P versus
Farm-Gate P balance for **Dairy** and
BB&SS Farms



- ❑ For Intensively managed grassland on **dairy** farms, a farm-gate P balance of **5 kg P/ha/year** keeps soil Olsen-P within the optimum Index 2+ range
- ❑ For Extensively managed **BB&SS** farms, a farm-gate P balance of **0 kg P/ha/year** keeps soil Olsen-P within the optimum Index 2- range

CONCLUSIONS

- ❑ Grassland managed 'extensively' with relatively low N inputs and hence low DM yield and P offtake, (*provisionally*) can be managed at a target P index of 2- (16-20 mg/l)
- ❑ Extensively managed grassland is (*provisionally*) defined as receiving **< 60 kg Chemical N/ha/year**, and with a manure-N loading of **< 120 kg Manure N/ha/year**
- ❑ The optimum Farm-Gate P balance for **Extensive Grassland** is **0 kg P/ha/year**
- ❑ The optimum Farm-Gate P balance for **Intensive Grassland** is **5 kg P/ha/year**
- ❑ (*Provisional*) P recommendations for Extensive Grassland – have been derived – these will be validated and if necessary modified, once results from a 3-year series of field trials by AFBI become available