

Teagasc Signpost Series
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Managing nutrient runoff from farmyards

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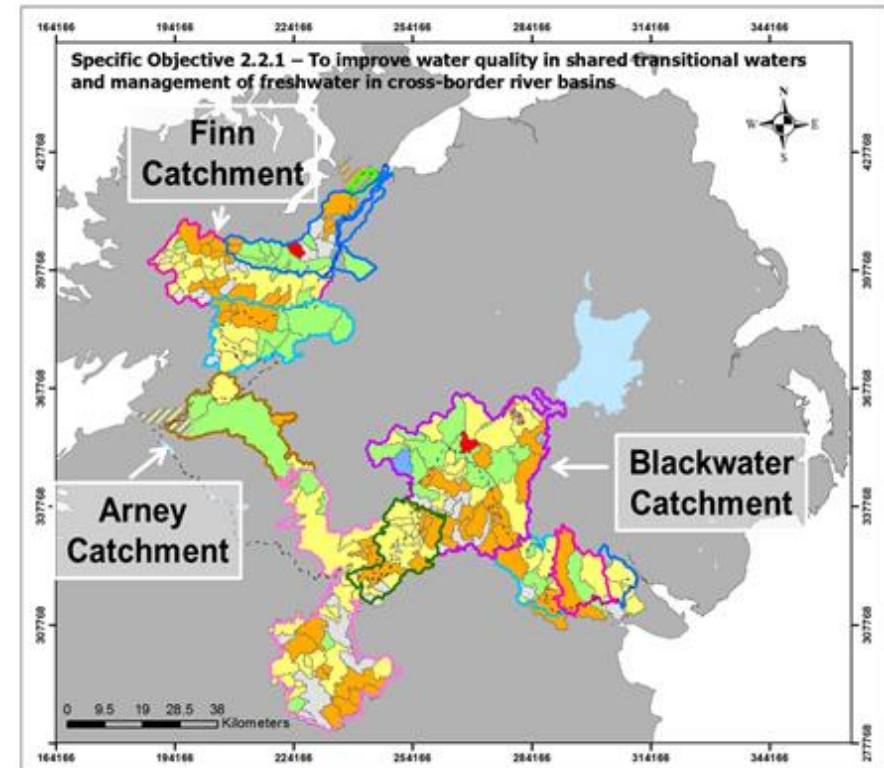


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CatchmentCARE: Overview

- Hydromorphology, Diffuse & Point Sources, Lake Sediments, Behavioural Change, Knowledge Exchange, Cost Benefit Analysis
- AFBI Funding – €2.9m
 - Biofiltration
 - Nutrient Management
 - WFD Phosphorus Targets

<https://www.catchmentcare.eu/>



Interreg 
Northern Ireland - Ireland - Scotland
European Regional Development Fund



afbi
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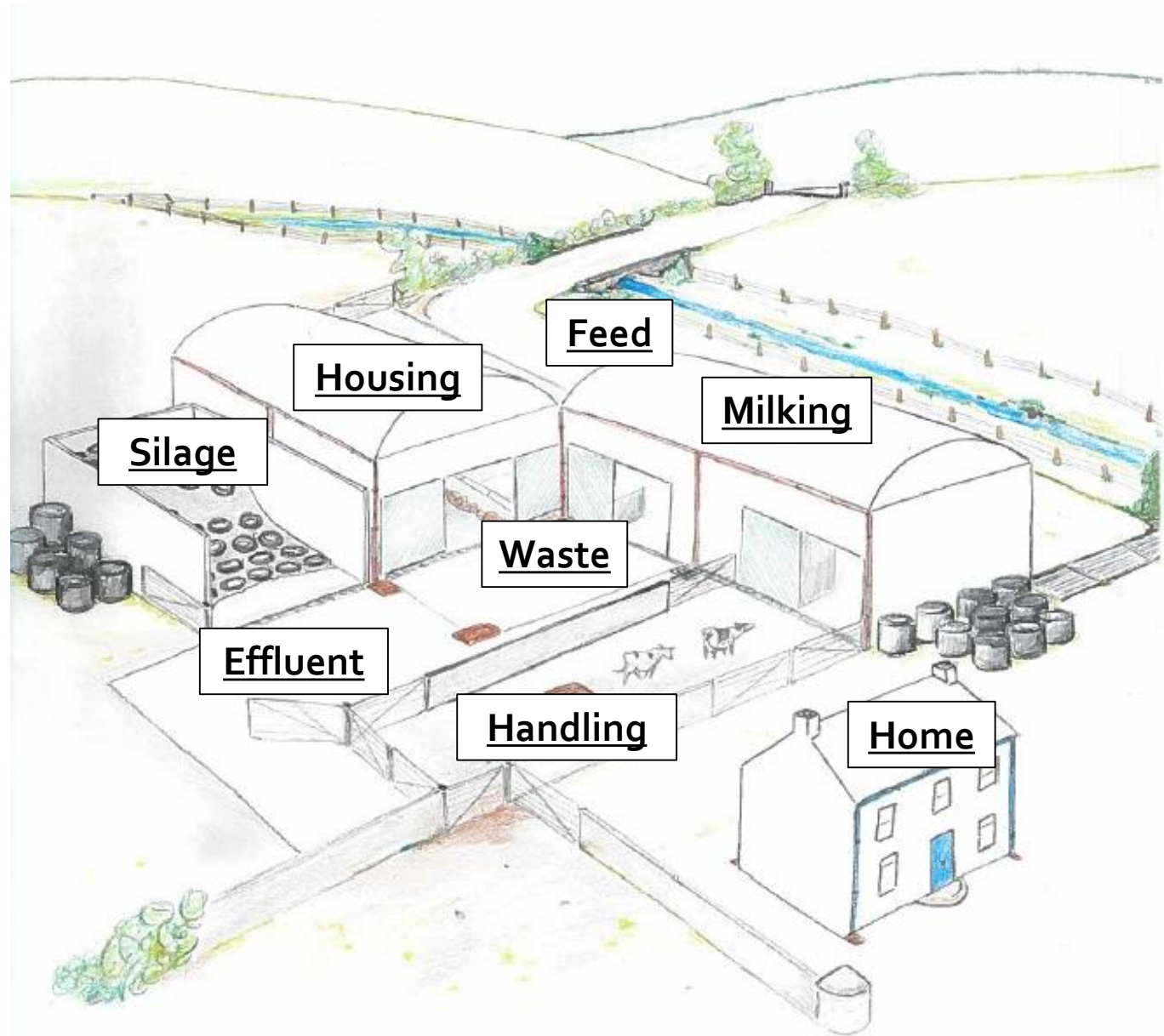


**British
Geological Survey**
NATURAL ENVIRONMENT RESEARCH COUNCIL



Loughs Agency

Farmyards: The hub of the farm



Do farmyards contribute to nutrient loss?

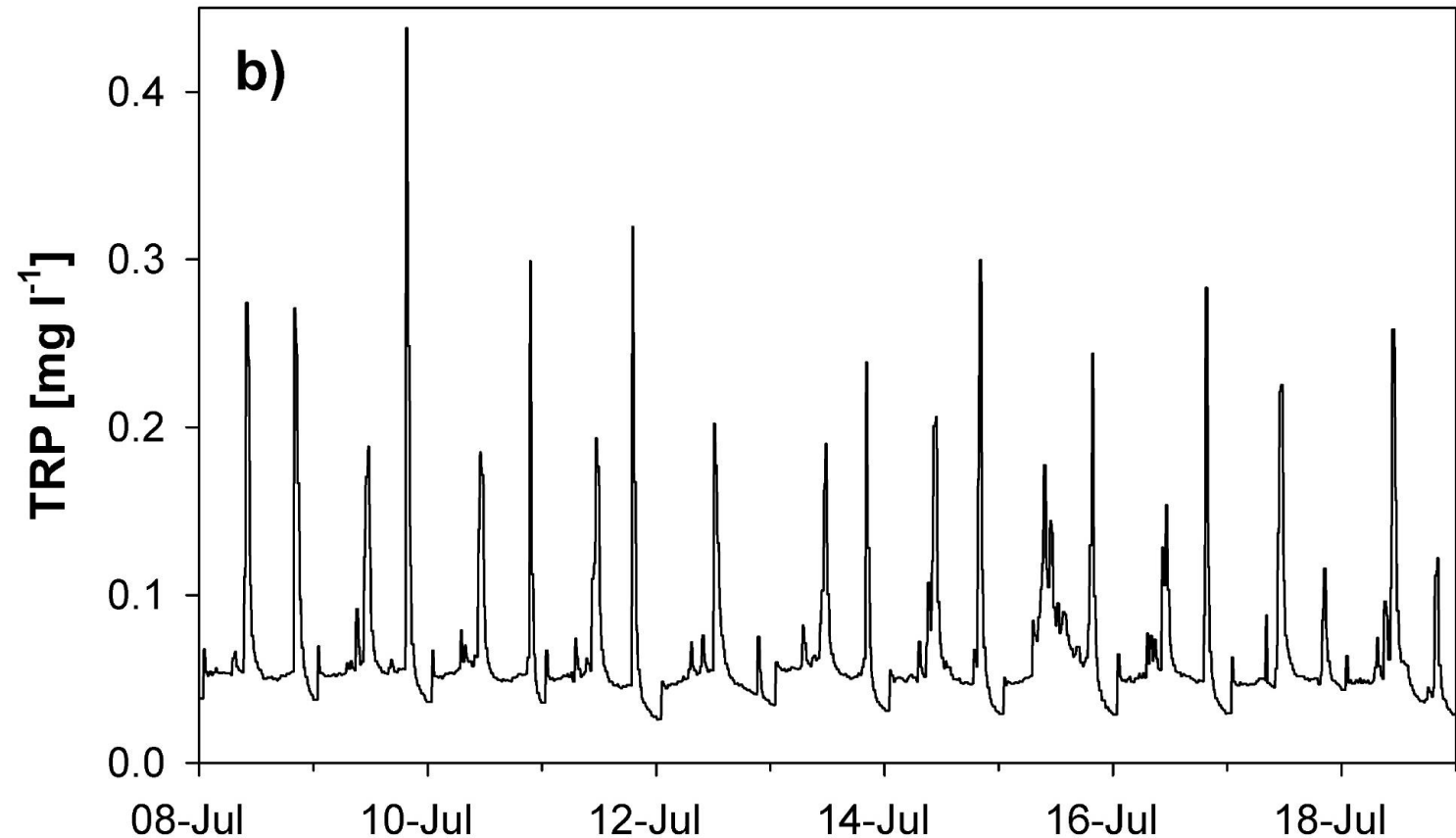
- 1. Elevated N & P in ditches connected to farmyards

	Water				Sediment	
	Mean Concentrations (mg l ⁻¹)				Mean Concentrations (mg kg ⁻¹)	
	DRP	TP	NO ₃ ⁻	NH ₄ ⁺	WSP	Mehlich-P
Moloney et al., 2019	0.018-342	0.084-325	0.481-380	0.051-379	1.16-175	15.51-429.5
Harrinson et al., 2019	0.019-2.43	0.053-4.68	0-8.68	0.016-14.03		
Ezzati et al., 2020*	0.047-0.61	0.031-2.29				13.81

Do farmyards
contribute to
nutrient loss?



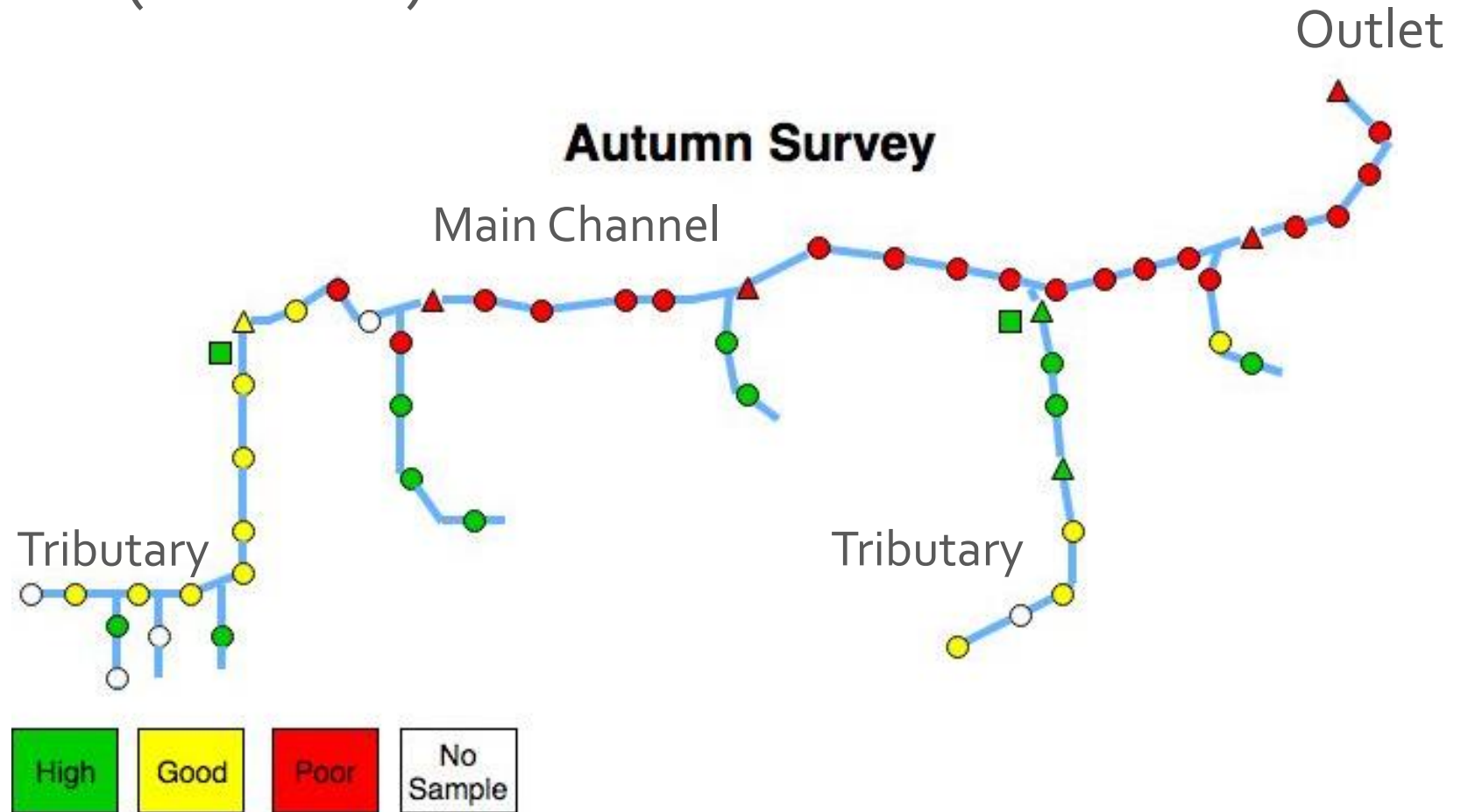
2. Diurnal discharge in dairy catchment



With permission from Mellander & Jordan, 2021. Charting a perfect storm of water quality pressures. *Science of the Total Environment*. 787

Do farmyards contribute to nutrient loss?

3. Cumulative loads across catchments (low flow)



Vero et al., 2019. Sources & mechanisms of low-flow river phosphorus elevations: A repeated synoptic survey approach. Water. 11

Farmyards as point sources

Runoff/discharge from farmyards to watercourses is prohibited

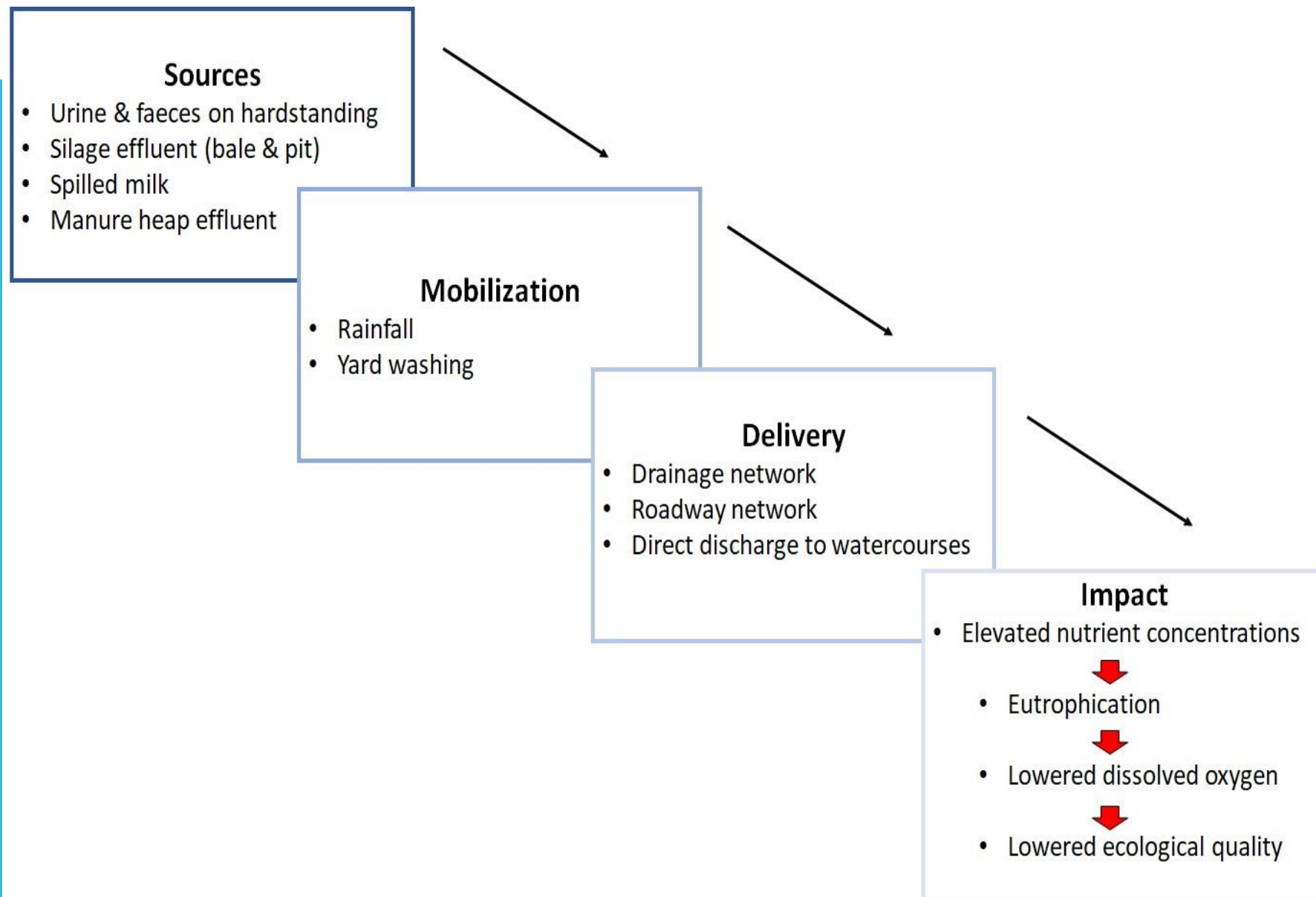
ROI: S.I. 605 2017. Code of good agricultural practice for the protection of waters

NI: Code of good practice for prevention of pollution of water, air and soil

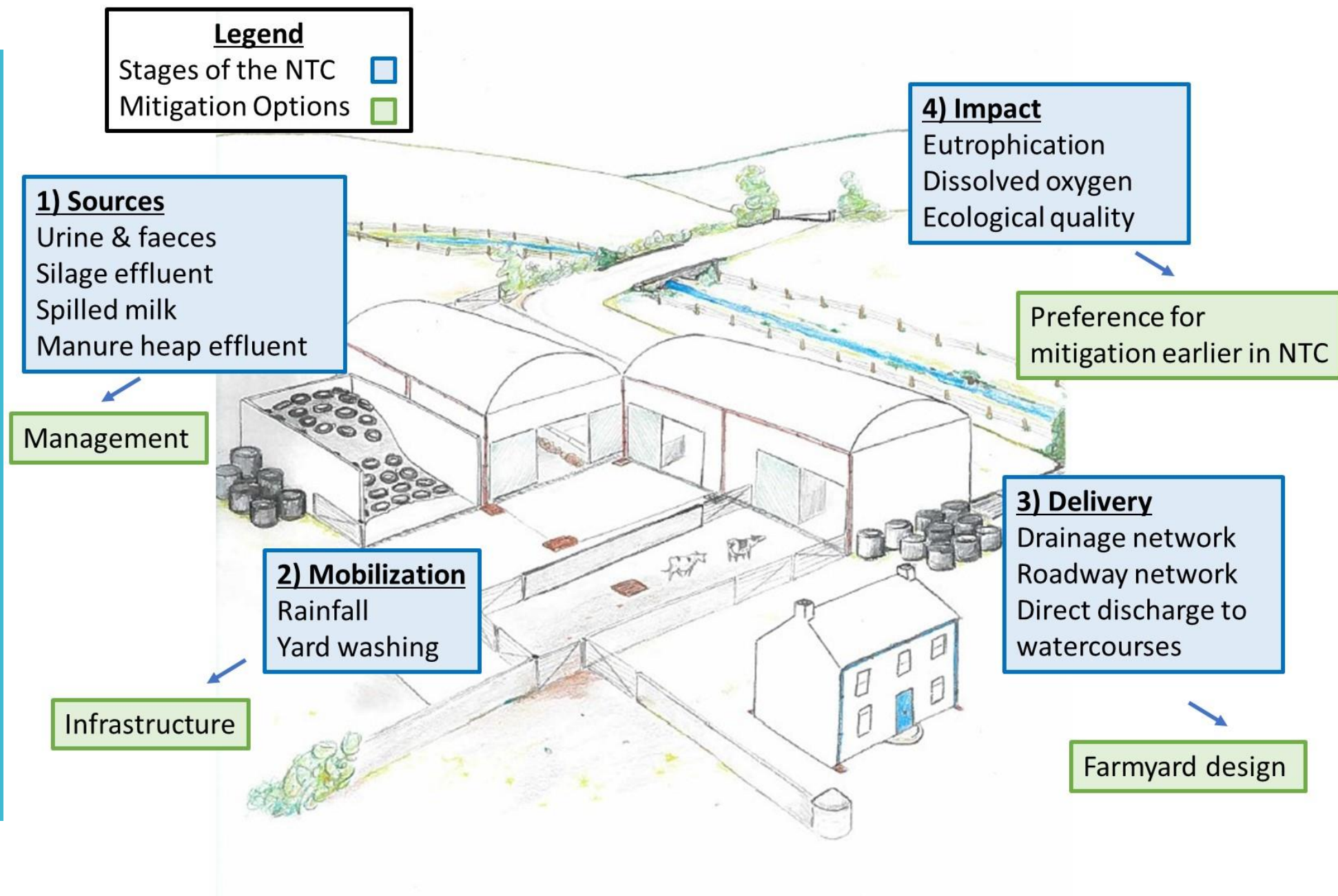
Farmyards are complicated

1. Using the nutrient transfer continuum in farmyards
2. Identifying risk factors for nutrient loss

The Nutrient Transfer Continuum



Nutrient Transport in the Farmyard



Sources: Urine & Faeces

Stored

- Slurry
 - High N & P
 - Must be stored & spread according to regulation
 - Prevent water ingress
- Farmyard Manure
 - Effluent must be collected



Hard Standing

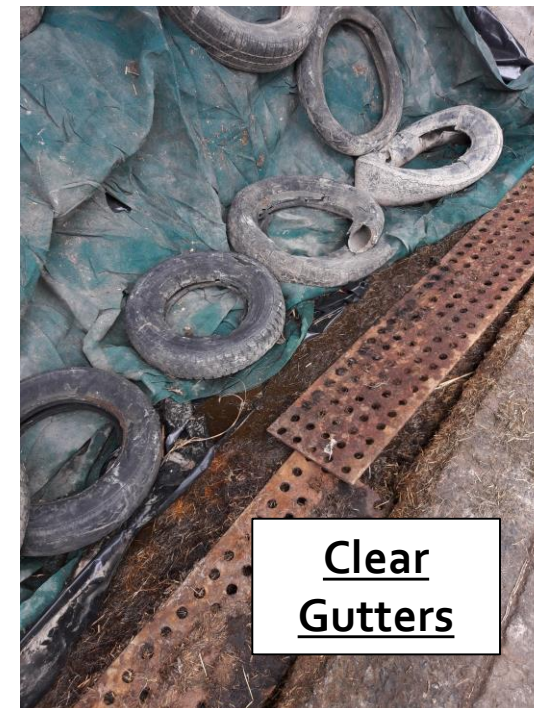
- Soiling during milking, handling, loading etc.
- Reduce time spent on yard
 - Good handling facilities
 - Adequate parlour size



Sources: Silage Effluent

Silage Effluent

- Produced in 1st 21 days of ensiling
- Lower DM = Greater effluent
- Very high biochemical oxygen demand



Sources: Soiled Wastewater

Parlour Washing Hardstanding Runoff Collection Yard

- Milking
- Handling
- Other causes of soiling



What else is in soiled water?

1. Detergents
2. Faecal bacteria
3. Trace metals (roof runoff)
4. Veterinary residues

Mobilization

Rainfall

- 150-225 wet days per yr
- Soiled yard = soiled runoff
- Diversion of runoff from gutters = reduction in vol.

Yard Washing

- Must be collected
- Increasing frequency of cleaning reduces loading
 - Scraping
 - Sweeping
 - Hosing
- Good quality hard standing allows cleaning & collection

'Fatal Flaw' may bypass mobilization and delivery
Magette et al., 2007

Delivery

Roadways



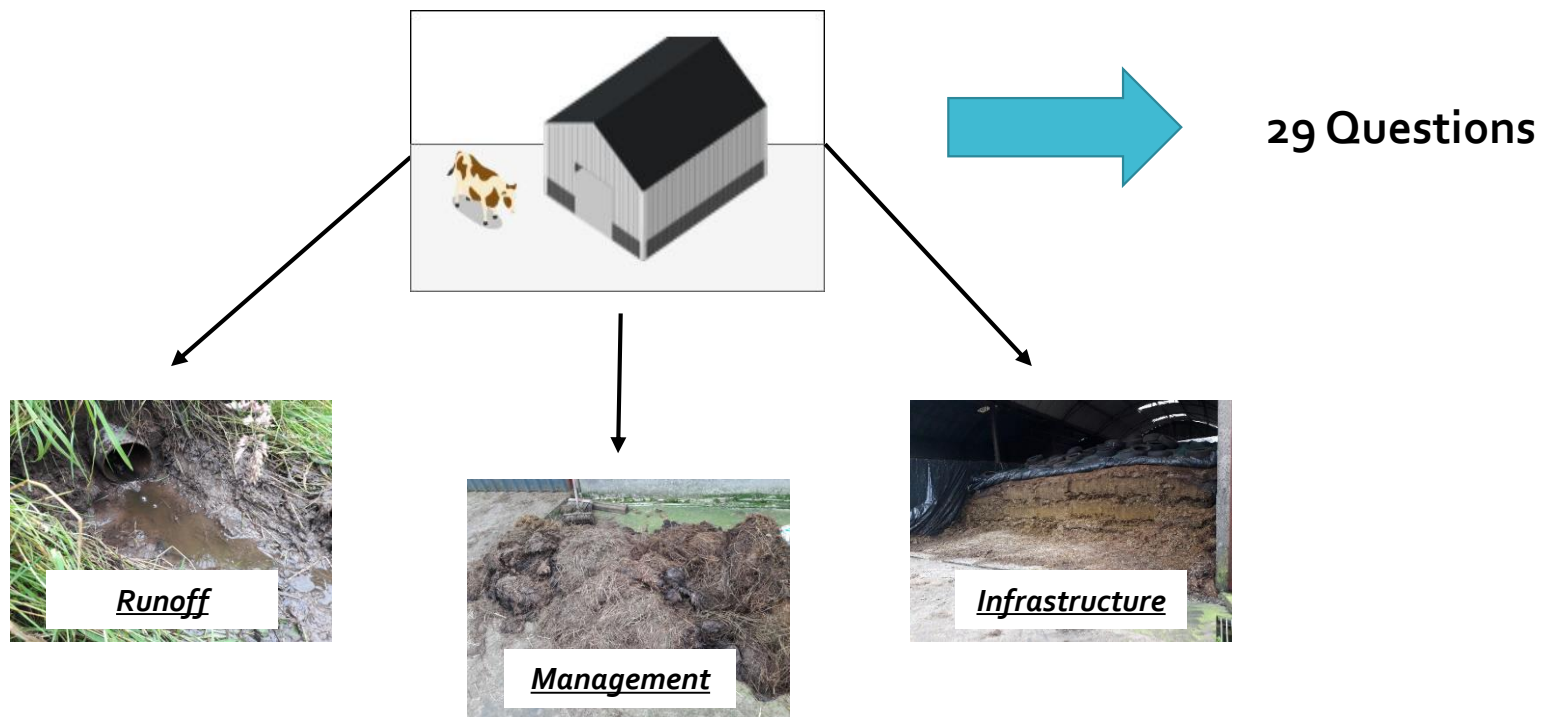
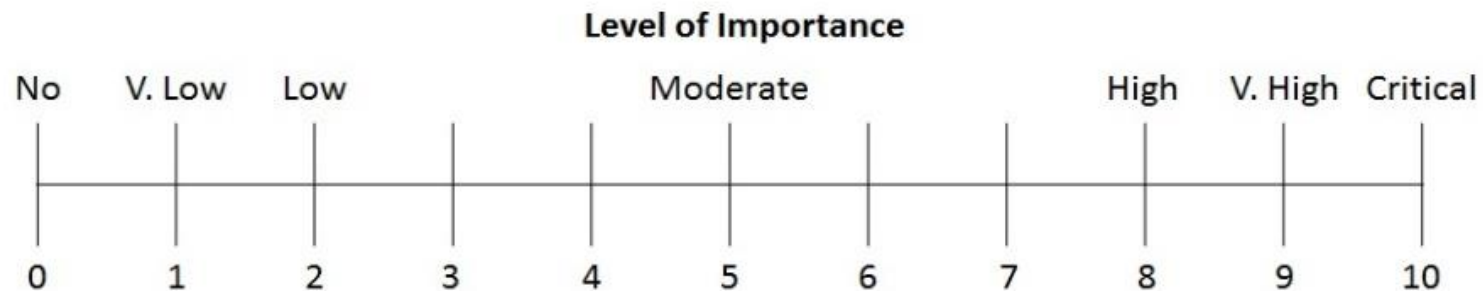
Drainage Network

- 70% yards connected to the drainage network (Moloney et al., 2019)
- Connected ditches have high P legacy and low binding ability
- Can transport P at a later date
- Should be cleaned regularly

Direct Discharge to Watercourses

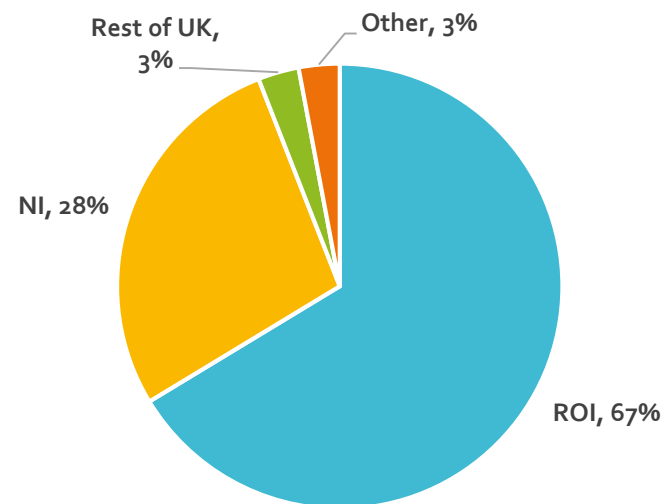
Prohibited

Risk Factors for Nutrient Loss

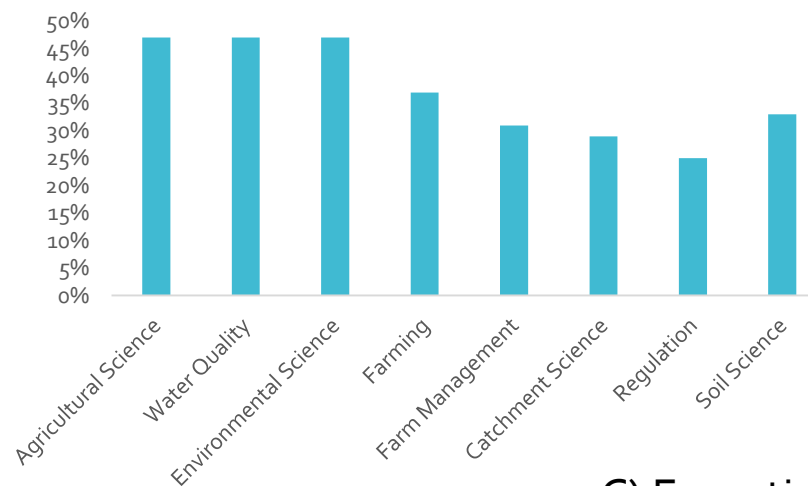
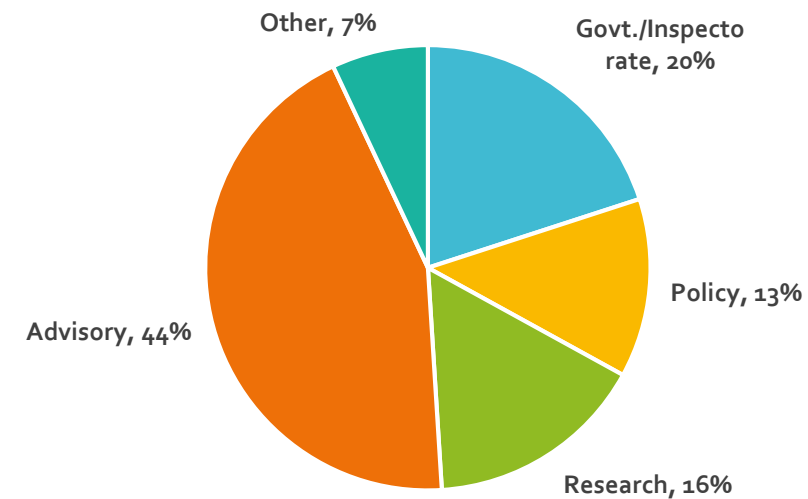


Results - Respondents

A) Geographic location



B) Primary employment



C) Expertise

Infrastructure Factors

Infrastructure Factors > Runoff Factors > Management Factors

Risk Factor	Mean	Within Category Ranking
Collection of silage pit effluent	8.97	1
Slurry storage capacity	8.91	1
Condition of silage pit	8.71	1
FYM storage capacity	8.52	2
Soiled water storage capacity	8.44	2
Cracks in hard standing	7.76	3
Collection of silage bale effluent	7.63	3
Roofing of silage pit/slurry tank/manure heap	7.34	3
Area of hard standing	7.32	4
Layout of farmyard	7.14	4
Quality of livestock handling facilities	5.86	5



Runoff Factors

Infrastructure Factors > Runoff Factors > Management Factors

Risk Factor	Mean	Within Category Ranking
Direct discharge to watercourse	8.74	1
Direct discharge to open drain/ditch	8.38	2
Runoff from paved area to watercourse	7.53	3
Slope of farmyard to watercourse	7.30	3
Runoff from paved area to open drain/ditch	7.20	3
Distance of farmyard to watercourse	7.04	4
Number of rainfall days per year	6.35	5
Average annual rainfall	6.26	5



Management Factors

Infrastructure Factors > Runoff Factors > Management Factors

Risk Factor	Mean	Within Category Ranking
Frequency of yard cleaning	7.63	1
Level of education of farmer	7.22	1
Membership of environmental schemes	6.90	2
Receipt of advisory services	6.79	2
Age of farmer	6.19	3
Duration of livestock housing	6.12	3
Membership of quality assurance schemes	5.81	3
Receipt of basic payment	5.76	4
Participation in off-farm employment	5.02	5
Compactness of calving/lambing	4.29	6



How do we manage these risk factors?

Infrastructure

- Engineered solutions
- Financial investment



Runoff

- Less control
- Break the pathway

Management

- Simple and cheap
- Requires time



Vero et al., 2020 Evidence and perception of phosphorus loss risk factors in farmyards. *Environmental Science & Policy*.

Take Home Messages

Nutrient Transfer Continuum

Sources

- Slurry & FYM stores
- Silage effluent
- Soiled hard standing
- Soiled wastewater

Mobilization

- Rainfall
- Yard washing

Delivery

- Drainage network
- Roadway network
- Direct discharge

Impacts

- Elevated N & P – Eutrophication
- Depleted O₂ – Fish kills

Risk Factors

Infrastructure

- Sufficient slurry storage
- Sufficient & sound silage storage

Runoff

- Prevent direct discharge
- Intercept runoff

Management

- Frequency of yard cleaning
- Keep gutters clean
- Empty tanks
- Education – think about your yard

Where can I get advice on my farmyard?

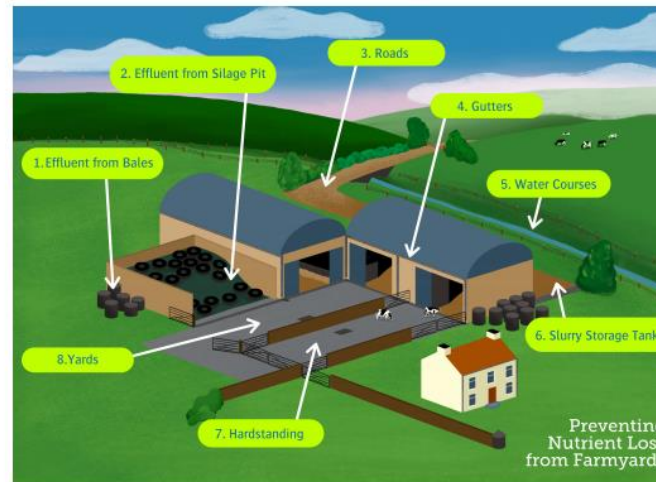
- Managing Farmyards to Reduce Soiled Water Losses (Teagasc Website)
- Farmyards and Water Quality (Teagasc Website)
- Preventing Nutrient Loss from Farmyards (CatchmentCARE)

Preventing Nutrient Loss from Farmyards Information Sheet

Catchment **CARE**
Community Actions for Resilient Ecosystems

Farmyards are a potential source of nutrient loss from agriculture to watercourses. Sources of nutrients from farmyards are effluent from silage pits/bales, manure and parlour washings that can be washed off the yard during rainfall events. If nutrients enter rivers, lakes and estuaries it causes eutrophication, which impacts on fisheries, recreational activities, biodiversity and drinking water quality.

Minimising nutrient loss is dependent on good farmyard management, the design and maintenance of the yard and minimising the amount of rainfall that runs off the yard. By taking a few simple steps farmers can help minimise the amount of nutrients being lost from their farmyard.



Further Information

Northern Ireland - Code of Good Agricultural Practice for the Prevention of Pollution of Water, Air and Soil
Republic of Ireland - Good Agricultural Practice for Protection of Waters Regulations 2018

Preventing Nutrient Loss from Farmyards - Key

1. EFFLUENT FROM BALES

Effluent from bales stored in the farmyard must be collected. Stacking bales in a single layer produces less effluent than multiple layers and should be preferred if you have sufficient space. Bales stored in fields should be kept more than 10m from a watercourse and the location moved each year.

2. EFFLUENT FROM SILAGE PIT

All effluent from the silage pit must be collected in a gully/pipe and routed to a storage tank.

3. ROADS

Roads should be cambered to direct runoff to the adjoining field.

4. GUTTERS

Gutters of farmyard houses should be intact and kept clear. Gutters and downpipes should direct rain water away from hard standing areas on the farmyard.

5. WATER COURSES

Regularly check any water courses adjacent to your farmyard.

6. SLURRY STORAGE TANKS

Ensure that slurry storage tanks are in good condition, with no cracks or faults. Manage and monitor regularly to ensure no overflow occurs.

7. HARDSTANDING

The hardstanding may become soiled by livestock. Rainfall that comes in contact with manure/urine is considered either dirty/soiled water or slurry so must be directed to the appropriate storage tank. To reduce this, scrape or sweep the hardstanding to remove manure before rainfall. On dairy farms, covered waiting areas in yards are recommended.

8. YARDS

Minimise soiled yard areas. Keep clean and dirty yards separate and don't let water from clean yards or surrounding fields flow onto dirty yards. Manholes and gullies should be kept clear.

CatchmentCARE

Thank you!



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