

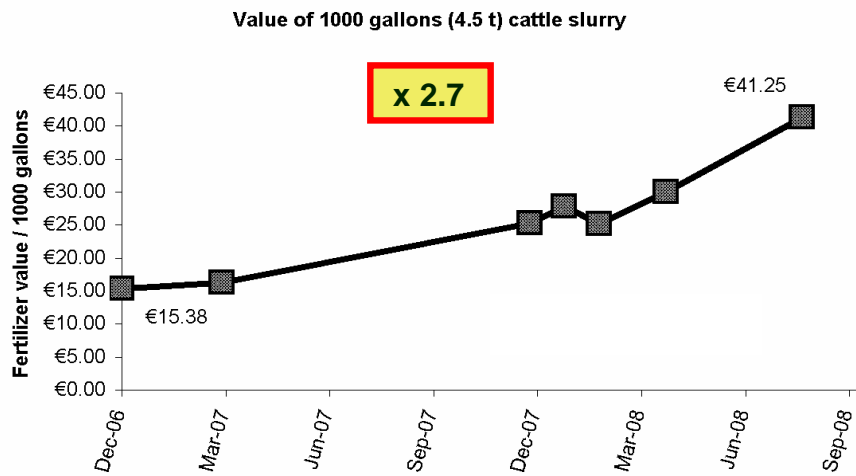
# Slurry application management for optimum fertilizer value



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## Fertilizer Prices & Slurry Value Dec 06 – Aug 08

SOURCE: Teagasc, 2008



## Nutrient content in cattle slurry

Mean contents	
Dry Matter	6.9 %
N	3.6 kg/m <sup>3</sup>
P	0.6 kg/m <sup>3</sup>
K	4.3 kg/m <sup>3</sup>

- Source: O'Brice 1991
  - High variation occurs around mean nutrient contents
    - Up to tenfold
      - Animal species, type, productivity,
      - Diet
      - Water dilution
- Analysis recommended, although not easy
  - Laboratory
  - On-farm
  - Well mixed, representative sample is crucial

## Nutrient content in cattle slurry

	Mean contents	Typical FRV %
Dry Matter	6.9 %	
N	3.6 kg/m <sup>3</sup>	30 %
P	0.6 kg/m <sup>3</sup>	100 %
K	4.3 kg/m <sup>3</sup>	100 %

- FRV % = Fertilizer replacement value  
= % of total slurry nutrients that can replace chemical fertilizer
- N
  - 30% = assumed with splash-plate in spring
  - Generally lower in summer
- P & K
  - Considered 100% in most cases

## Nutrient content in cattle slurry

	Mean contents	Typical FRV %	FRV / m <sup>3</sup>
Dry Matter	6.9 %		
N	3.6 kg/m <sup>3</sup>	30 %	0.9 kg
P	0.6 kg/m <sup>3</sup>	100 %	0.6 kg
K	4.3 kg/m <sup>3</sup>	100 %	4.3 kg

- FRV / m<sup>3</sup>

= reduction in chemical fertilizer application per **m<sup>3</sup>** of slurry applied

1 m<sup>3</sup> = 1 ton

## Components of Slurry Value

- N potential over-emphasised within total value
- P & K are the dominant components  
( 88% ≈ € 36 per 1000 gals)

	N	P	K	Total
Value / m <sup>3</sup>	€ 1.09	€ 2.39	€ 5.69	€ 9.17
Value / 1000 gallons	€ 4.88	€ 10.77	€ 25.60	€ 41.25
% of total value	12 %	26 %	62 %	

# Maximise P & K fertilizer replacement value

Unaffected by application method or timing

Target fields based on P & K requirements

- Land-use
  - Crop
  - Silage/grazing
  - Concentrates (P)
- Soil test
  - Soil test now to ensure fast return of results

Slurry worth nothing if no reduction in fertilizer application rates

Transport costs ???  
Worth more to transport further from farmyard ???

P & K value ~ Potential = € 36 / 1000 gals

No P & K required	1000 gals Slurry = € 0
P & K required Fertilizer applied	1000 gals Slurry = € 0
P & K required No Fertilizer	1000 gals Slurry = € 36

# Slurry for grassland

## Silage:

- Slurry on silage ground → closing nutrient cycle
  - P:K supply ratio of slurry ≈ 1:7
  - P:K requirement ratio for silage (Index 3) ≈ 1:6  
→ **Well balanced**
- (Index 3) → 33m<sup>3</sup>/ha (3000 gallons/acre) = P & K for one cut silage



## Grazing:

- P:K supply ratio of slurry ≈ 1:7
- P:K requirement ratio of grazing ≈ 1:3  
→ **Poorly balanced**
- Excess K
  - Luxury K uptake & Mg levels
  - K might be required elsewhere



## N fertilizer replacement value

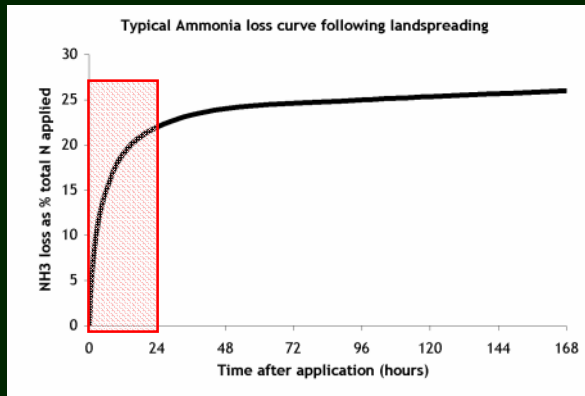
- 50% of slurry N = Ammonium
- $\text{NH}_3$  loss to air = principle pathway
- 24 hrs = critical

Weather = critical factor

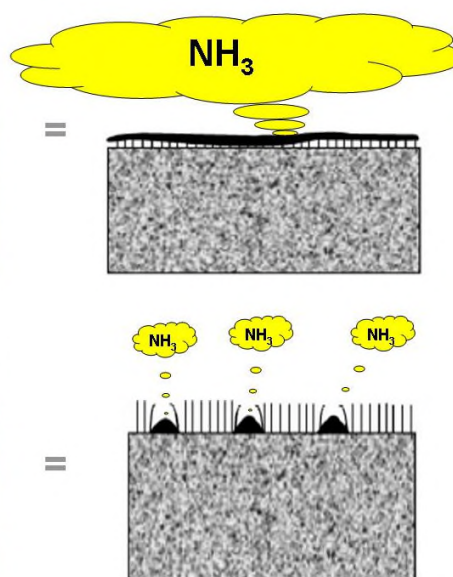
- Rainfall
- Humidity
- Soil moisture
- Temperature
- Sunshine
- Wind

→ Drying weather = high N loss = low NFRV

- Slurry application → weather generally more favourable



## Slurry Application methods – N loss



## Umbilical



- Splashplate or trailing shoe attachment
- Need land close to slurry store
- High output
- Low ground pressure – Spring application

## Bandspreader



- Simplest system
- Pipes above or drag along soil surface
- Slurry in lines approx 30-40cm apart
- Reduced  $\text{NH}_3$  emission and grass contamination

## Shallow injection

- Disc cuts slit in soil (5 cm deep)
- Highest  $\text{NH}_3$  reductions
- Reduced work rate
- More horsepower
- Soil variability

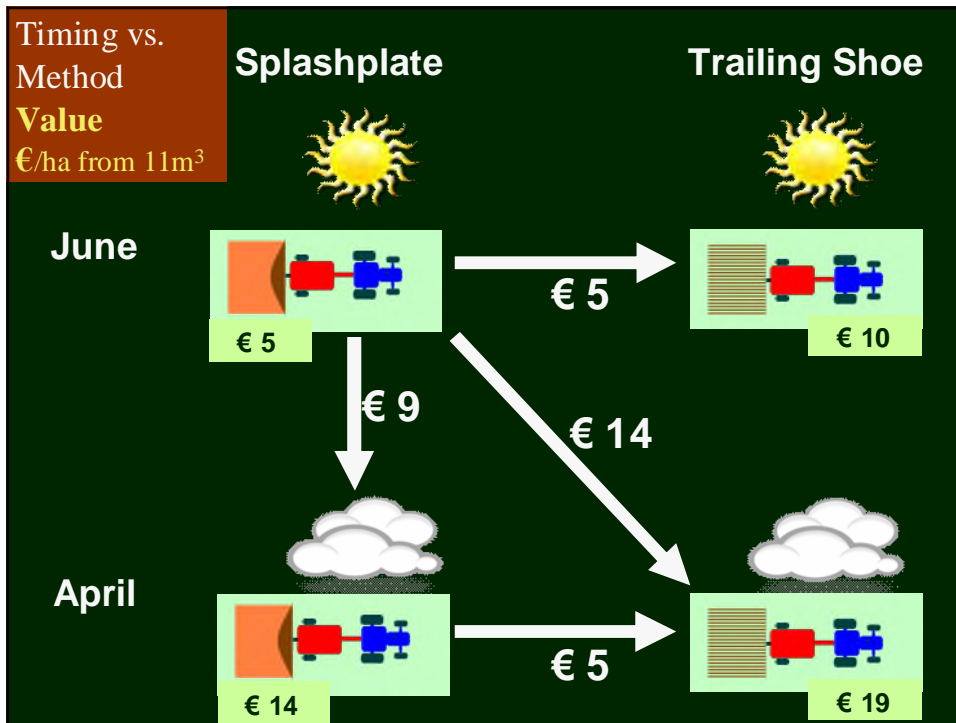
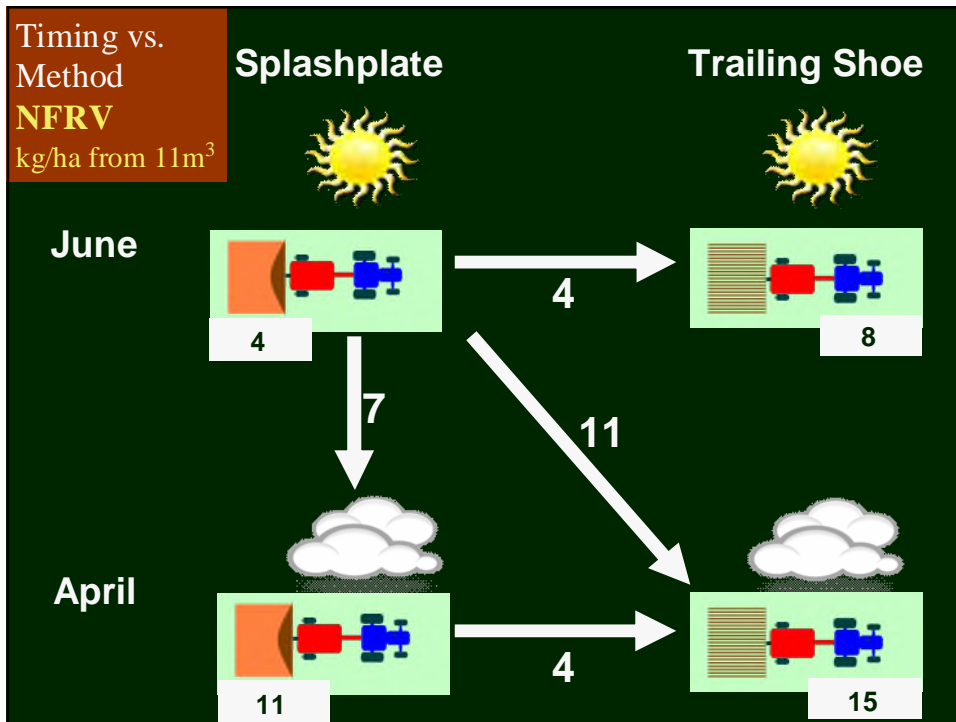


## Trailing Shoe

- In Theory: Above the soil; Below the sward
- In Practice: Similar to bandspreader at a practical level Especially when hoses are close to ground level
- Reduced  $\text{NH}_3$  loss to air → more N for grass
- Category 2 option in REPS
- Experiments 2006 & 2007
  - 3 sites
  - April vs. June
  - SP vs. Trailing Shoe
  - Average NFRV% observed



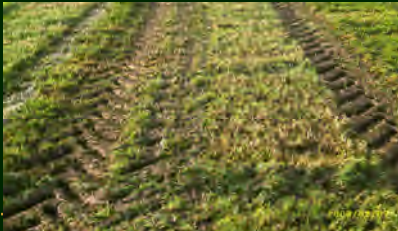
Application timing	NFRV %	
	SP	TS
April	29%	39%
June	10%	21%



# Towards Spring Application

## 2 main restrictions

- Sward contamination
  - Soil conditions
- Sward contamination is confounded by splashplate
  - Trailing shoe (or Bandsreader / Shallow injection) offers flexibility
  - Reduced herbage contamination
  - Application in taller swards
  - More area available on days when soil conditions are suitable
  - Application to grazed swards → P distribution where fertilizer P not allowed
- Other options → Umbilical system / tyre specification



# Cost / benefit

- Trailing shoe = expensive
  - Purchase → splashplate + ~ €20,000
  - Running costs (+ tractor, diesel, etc)
  - Contractor → splashplate + ~ €15-20 / hr
- Benefit
  - Farmer → 100 dairy cows → 600 m<sup>3</sup> slurry
- Other benefits → Odours

**1 – Timing**  
**2 – Method**

Change	Increase / m <sup>3</sup>	Total benefit	Extra Cost
Method only	~ € 0.44	€ 260	YES
Method + timing	€ 1.25	€ 750	YES
Timing only	~ € 0.80	€ 480	<b>NO</b>

## Conclusions

1. 1000 gallons slurry can be worth ~ €41  
Value only realised when chemical fertilizer rates are adjusted
2. P & K fertilizer value = largest component of value  
Target applications based on soil analysis & requirements
3. NFRV dependant on weather  
Overcast, dull, moist → SPRING
4. Spring application timing should be priority  
Cost effective (achievable with existing machinery)
5. Monetary benefit of trailing shoe based on fertilizer savings = marginal
6. Improved flexibility of application with trailing shoe (& bandsreader / injection)  
Reduced sward contamination  
More land available when soil conditions suitable
7. Largest benefit of trailing shoe is when more spring application is facilitated (double NFRV benefit)
8. Other benefits valuable in individual cases (e.g. Odours)
9. Umbilical systems / tyre specification may be more cost effective where applicable

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