Influence of P-status and hydrology on P-losses to surface waters on dairy farms in the Netherlands

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Agriculture contributes significantly (> 50%) to the P-emission to Dutch surface waters. Dairy farming is the largest producer of animal manure in the Netherlands but information on nutrient budgets and leaching of nutrients from dairy farms was limited. To mitigate this problem, phosphorous losses to ground- and surface waters were measured for a period of two to three years on a site with a heavy clay soil, a peat soil and a sandy soil. The three farms together represent the environmental conditions encountered in the Dutch dairy region.

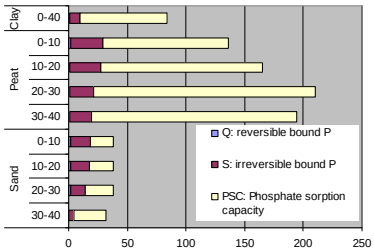
Monitoring sites

Sandy site

Peat site

Clay site

P-status



PSC: Peat > Clay >Sand
Q: Sand > Peat > Clay
S: Peat > Clay > Sand
DPS: Pox /PSC
Sand: 37 %
Peat: 15 %
Clay: 7%

figure 1 : Phosphorus status of the sites: reversible, irreversible bound P and P sorption capacity

Hydrological pathways

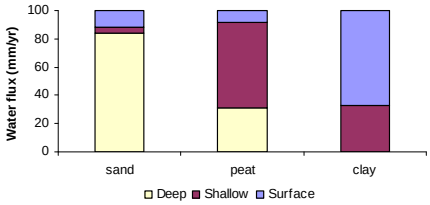


figure 2 : Drainage of the three sites : surface (0-10 cm depth), shallow (10-40 cm), deep > 40 cm deep

P balance

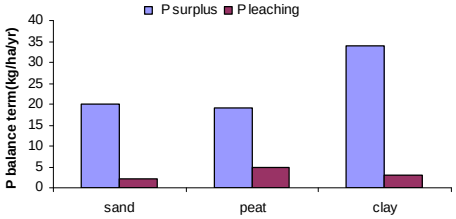


figure 3 : P surplus (application – uptake) and P leaching to ground- and surface water

Phosphorus losses in relation to P status

- Low but significant losses at the clay soil due to low DPS and surface drainage
- Sand intermediate losses despite high DPS due to deep drainage
- Peat highest losses due to intermediate DPS in combination with shallow drainage

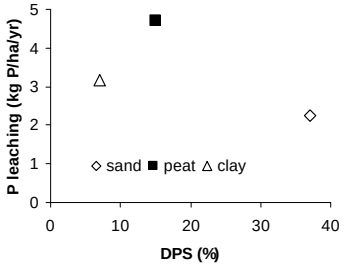


figure 4: Leaching of P in relation to DPS of 0-40 cm layer

Conclusions

In these level lowland sites phosphate losses are determined by combination of:

- Degree of phosphate sorption (depth of the phosphate front)
- Hydrological pathways

Leaching may be substantial despite low DPS values due to surface runoff and existence of cracks (clay site) on the other hand leaching can be limited despite high DPS values when deep drainage prevails (sandy site)

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