

P INDEX - A TOOL TO EVALUATE RISK OF P RUNOFF

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Description

The phosphorus index is a risk assessment tool to rank the potential for P loss from agricultural fields. The P Index identifies areas where sources of P coincide with a high risk of P transfer and ranks the risk on a scale from low to high.

Rationale, mechanism of action

Implementation of the Water Framework Directive (WFD) increases the need for a reduction of nutrient runoff from anthropogenic sources to water bodies. Phosphorus is one important source to focus on because of water eutrophication. The most cost effective reduction in P losses is achieved by focusing mitigation options on areas with highest P runoff risk. The premise for the P Index is the observation that most P from agricultural catchments comes from only a small but well defined area of the landscape, where zones of active runoff-generation coincide with high soil P concentration and/or frequent fertilizer or manure applications [1]. The framework of the P Index is empirical but considers the general processes of controlling nonpoint source P loss from agricultural fields. This simple model is using information on transport factors (soil erosion, surface runoff, subsurface drainage, contribution distance and connectivity) and source factors (soil test P, fertilizer and manure rate, fertilizer application method and manure P availability) on field level to calculate the risk of P runoff [2,3,4,5,6].

Applicability

The P Index is a practical tool to rank agricultural fields according their risk of P runoff. It is based on knowledge on simple processes which sums up to a joint risk on field level. The P Index is based on easily available information used for fertilization planning or information from maps and statistics. This is a great advantage with the P Index tool compare to other models. For each field on the farm the P Index merges factors for the P content in the soil (plant available P, fertilization etc.) with factors for risk of P transport (erosion, connectivity etc.). The P content is multiplied with the P transport to get a ranking of fields according to risk of P runoff. The P Index and the fertilization plan are based on almost the same parameters. When a fertilization plan is calculated for a field a P Index is available for the same area. The P Index has to be adjusted for each country or region and to different management practices.

Effectiveness, including certainty

A high P Index indicates a need for changing management practice to reduce P runoff by e.g. reduce erosion, reduce fertilizer use etc. The effectiveness of the index depends on the farmers will to reduce the source or transport factors. A change in these factors will reduce the P Index and thereby the P runoff risk. If the P fertilization is reduced from 30 to 0 kg P/ha on fields with a high content of plant available P a reduction in the P Index of 25% has been achieved using the Norwegian version of the index [7]. In the same way may reduced tillage on high erosion risk areas reduce the P Index because of reduced erosion risk. The P Index has to be calibrated for the region and management practices to be used. Because of some uncertainties in the input factors the P Index has to be interpreted based on classes from low to high.

Time frame

The effect of the P Index will appear as soon as the farmer changes management practices according to the index level. For a catchment the positive effect on P runoff will increase with time and with the implementation rate on farm level.

Environmental side effect

No negative environmental side effects are known. Positive side effect: the P Index tool teaches farmers and advisers in Best Management Practices and how different factors have positive and negative effects on P runoff.

Relevance, potential for targeting, administrative handling, control

The P Index tool is relevant for all agricultural systems and for all climatic conditions. When calibrated it is easy to handle and use, especially when implemented in fertilization plans on field level for common use of source and soil factors.

Costs: investments, labour

The costs for using the P Index is small. A computer and the program to use the tool is all equipment needed.

References

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