

Soil, Plant and Environmental Indicators to minimize Phosphate Inputs in permanent grasslands

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Abstract:

Phosphorus (P) is one of the essential nutrients for plant growth. However, P losses from over-fertilized grasslands especially in areas with high livestock density are still a major cause for eutrophication of surface waters. The overall aim of this project is to develop a set of soil, plant and environmental indicators to propose strategies to limit P inputs into permanent grasslands and to reduce the risk of P losses to the hydrosphere.

The project is divided into three sections which address the effect of P inputs and soil properties on 1) availability of soil and manure phosphate to plants, 2) risk of phosphate losses from grassland soils, and 3) yield, botanical composition of grasslands and plant P status. In a companion project, a method to trace the fate of P in the soil / manure / plant / water system is being developed which is based on the measurement of the natural abundance of ^{18}O in the PO_4 groups ($\delta^{18}\text{OP}$). Once this method is developed, it will be used to quantify the fraction of P in plants, grassland soils and water that is derived from animal manures.

Therefore we will study three grassland sites used previously in long term experiments or surveys, which differ mainly in use intensity, fertilization, soil type, altitude and local climate. They are located at Watt / Reckenholz (extensive use), Verrieres (semi intensive use) and Lake Baldegg (intensive use).

The work will be carried out in collaboration with the Department of Earth Sciences of the ETH, the Agricultural Research Stations ART Reckenholz and ACW Changins, and the canton Luzern. This project contributes directly to the objectives of the working group 3 "Mitigation options" of the COST action 869.