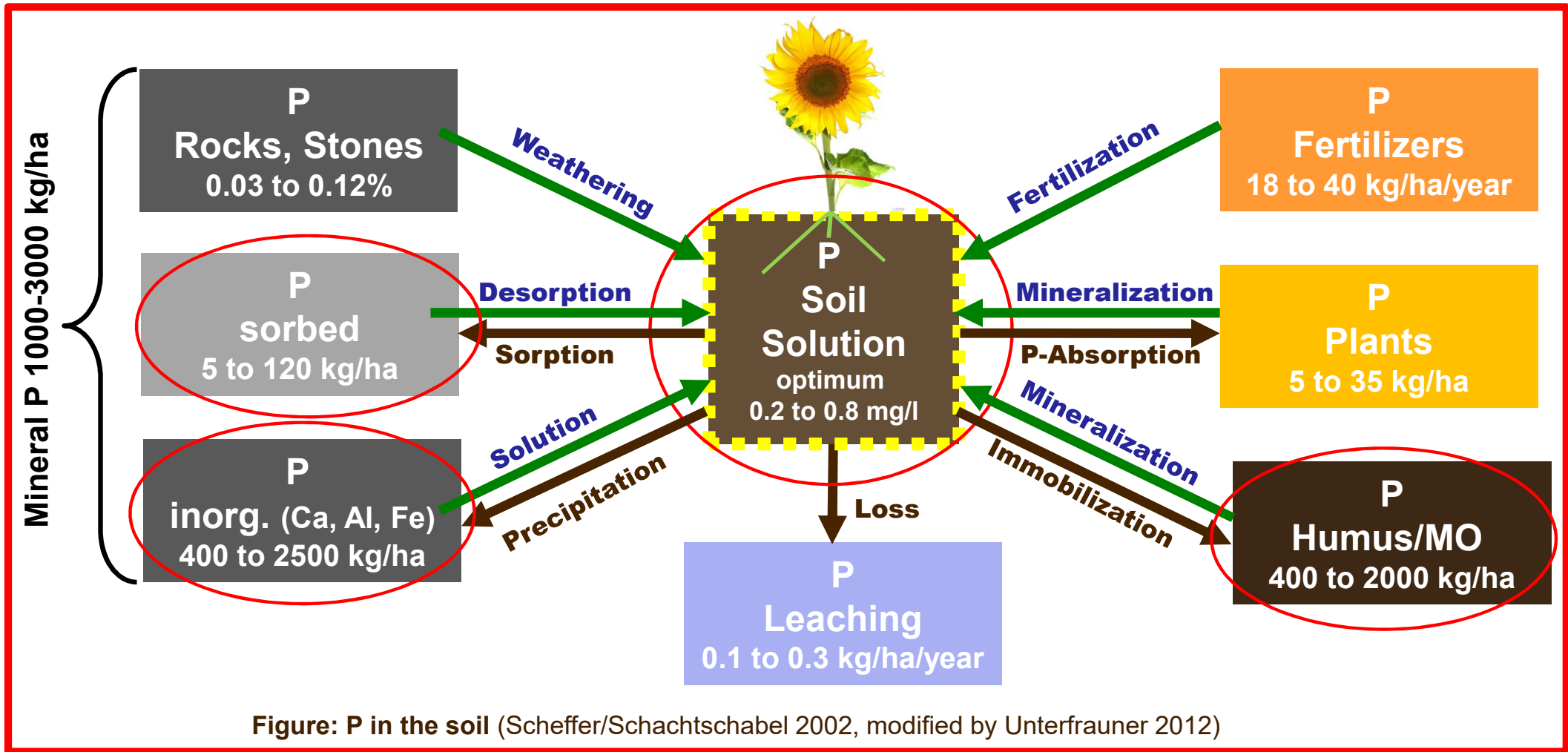


Phosphorus in the Soil

Information sheet by TB Unterfrauner (2012)



○ P-Pool analyzed by TB Unterfrauner

P	x 3,067 = PO ₄	P	x 2,291 = P ₂ O ₅	PO ₄	x 0,747 = P ₂ O ₅
PO ₄	x 0,326 = P	P ₂ O ₅	x 0,436 = P	P ₂ O ₅	x 1,334 = PO ₄

Phosphorus Pool

P Soil solution (optimum 0.2 to 0.8 mg/l = 1.5 to 2.5 kg/ha):
Plant absorbs P only in soluble form from the soil solution.

P Fertilizers mineral / organic (18 to 40 kg/ha/year):
Concentration in the soil solution is increasing. Momentary surplus can hinder the absorption of Zn, Fe, Mn, Cu. Quick immobilization (Triphosphate = P_{inorg}).

P Plants (removal 5 to 35 kg/ha): Plant roots absorb P, the concentration in the soil solution decreases. When plant residues become mineralized, P is released and the concentration in the soil solution is increasing.

P Humus (400 to 2000 kg/ha), **P Microorganisms** (60 to 120 kg/ha):
20 to 75% of P_{total} are present in organic binding forms, which can be partly transformed into plant-available forms.

P sorbed (5 to 120 kg/ha): the anion phosphate (PO_4) can adhere to oxides and hydroxides in an exchangeable manner.

P inorganic (400 to 2500 kg/ha):
Is a huge P-sink. P from different sources (e.g. fertilizers) is converted into stable Ca-, Fe-, and Al-phosphates, depending on the pH value. P can also be "absorbed" or "occluded" by mineral particles.

P Rocks, stones (0.03 to 0.12%): The parent material for soil formation can contain P-rich minerals. The natural processes of soil formation and weathering convert stable P into a soluble binding form.

P Total contents (1500 to 3000 kg/ha): From 1950 - 2000, much more P has been fertilized (around 1100kg/ha) than required (Köster and Nieder, 2007).

Mobilization/Remark:

Withing the pH range 6.5 to 7.5, P is present in a favorable form for plants.

Organic fertilizers contain P in the form of phytin, which has to be further processed by microorganisms to become plant-available P.

Removal rates are often too high.

- ✓ promote biological activity
- ✓ feed soil organisms
- ✓ optimize air / water conditions
- ✓ supply trace elements if required (e.g. Mo)
- ✓ P bacteria

✓ competing ions (e.g. silicic acid)

- ✓ optimize pH value (6.5 to 7.2)
- ✓ cultivate P-mobilizing plants (e.g. buckwheat, white lupine)
- ✓ cultivate catch crops

- ✓ apply acidifying fertilizers
- ✓ promote soil life

analyse P-pools, use and mobilize reserves, instead of fertilizing P!