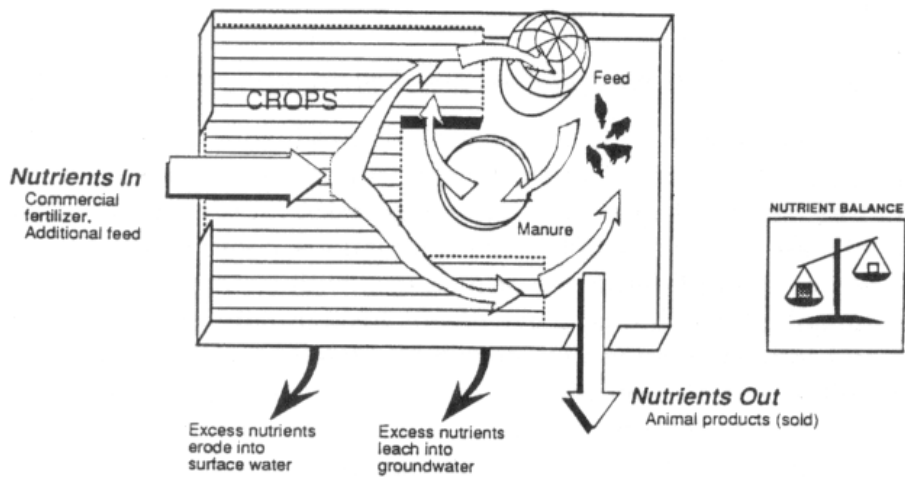
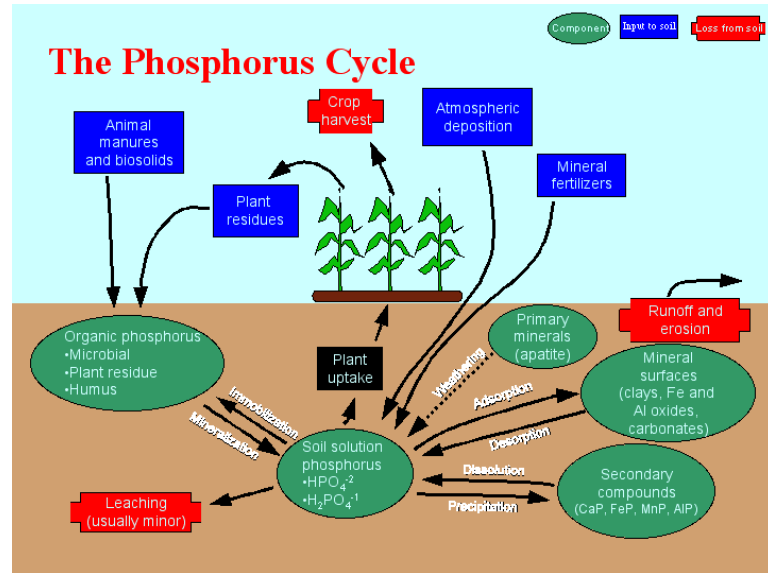


Nutrient Management

SBL – 31806



Department of Soil Biology
www.sbl.wur.nl



Nutrient Management

SBL-31806

| | |
|-------------------------|---|
| Coordinator/examiner | Ellis Hoffland |
| Language of instruction | English |
| Learning Outcomes | <p>Knowledge At the end of the course you</p> <ul style="list-style-type: none">• know the processes and their interactions that play a role in soil nutrient cycles in (agro)ecosystems• have insight in the ways nutrient cycles in agro-ecosystems can be managed• are able to evaluate consequences of the above-mentioned interventions for nutrient cycling <p>Skills You will be trained in skills needed to do research and/or to function in a professional environment. These include:</p> <ul style="list-style-type: none">• writing of a project proposal• data processing• use and evaluation of models• evaluation of research data• scientific writing• evaluation of policy measures <p>Attitude At the end of the course you will be able to</p> <ul style="list-style-type: none">• critically use scientific literature for various purposes• reflect on options and consequences of policy measures regarding nutrient management |
| Period/time | 5 (March/April) |
| ECTS | 6 |
| Activities | <p>Lectures ± 1.5 ects. About 14 lectures.</p> <p>Assignments ± 4 ects. Six large exercises will be done to introduce the student to various, current subjects in nutrient management and to train skills.</p> <p>Excursion 1 Afternoon. To a prototype of a mixed farm, "De Marke" (1 afternoon + preparation + evaluation).</p> |
| Learning Material | Reader (StudyStore) |
| Examination | Will be based on performance of the student during the assignments, and on the quality of the product of the exercises. Attendance of the excursion and group discussions is compulsory. |
| Assumed knowledge | <ul style="list-style-type: none">• Soil and Water II (AEW-21306) or Soil-Plant Interactions (CWE-20306) or comparable• Advised but not compulsory: Soil Quality (SBL-21806) or Soil Pollution and Soil Protection (SOC-21306) or comparable |
| Continuation | MSc thesis work |
| Teachers | prof.dr. Ellis Hoffland (±70%), prof. dr. ir. Jan Willem van Groenigen (± 15%), prof. dr. ir. Oene Oenema (± 15%) |

Profile of the Course

Any ecosystem that is managed in order to produce output for human ends, needs nutrient management. This is because nutrient cycles become unbalanced by extraction of products. Nutrient managers must keep nutrient cycles in balance in order **(1) to maintain the soil's capacity to supply the nutritional needs of crops** and **(2) to reduce environmental problems caused by loss of excess nutrients**. This course deals with these two goals of nutrient management and the tools that can help achieve these goals. It covers a range of agro-ecosystems, including low-input tropical systems, organic farming systems and highly productive conventional European systems. It deals with situations of both limited nutrient availability and excess.

Each topic dealt with in this course comes with an exercise designed to prepare you for MSc thesis research or for a professional career in research, management or policy in the field of nutrient management. This holds both for the contents of the exercise and for the skills that are trained. Each exercise provides you with in-depth information on the topic, and trains skills necessary in your near-future career.

Principle themes of the course

Basically, the course has six major components:

I. Nutrient cycles in (agro)ecosystems (about 1 week)

You will be introduced into the physical/chemical/biological transformations of nutrients that play a role in soil nutrient cycling. This is to understand the options for nutrient management and their consequences. Teaching and learning methods include lectures, studying a text, and an exercise in which you will learn how stable isotopes can be used in nutrient cycling studies. You will process data from a recent field experiment carried out to quantify nutrient losses to the environment from a Dutch agro-ecosystem.

II. Options for efficient management of nutrient cycles

This includes a set of 5 topics (each about 1 week).

- a. Nutrient balances, budgets and flows. You will learn how nutrient budgets and balances on farm and field level can be used as a diagnostic tool to improve nutrient management. You will make a budget for a small scale Indonesian mixed farm yourself, and evaluate scenarios for improvement. You will visit a Dutch mixed prototype farm, designed to balance nutrient inputs and outputs.
- b. Quantitative Evaluation of the Fertility of Tropical Soils (QUEFTS). QUEFTS is a model and a computer programme that evaluates nutrient management strategies for tropical soils. You will be introduced into the basic principles of QUEFTS and learn how to use the programme. This implies that you will learn about the relationships between soil characteristics, fertiliser application, nutrient availability, nutrient uptake and yield. It will again make you aware of the nutrient balance that should be taken into account in any fertiliser study, independent of the type of ecosystem you are studying.

- c. Organic matter decomposition. This theme is increasingly important in both organic and conventional farming systems because farmers need to make optimal use of the nutrients released during organic matter decomposition. You will learn how organic matter decomposition can be modelled and validate a new model using a data set from primary scientific literature. Subsequently you will be trained in writing a proposal for a research project that should validate this model for field conditions.
- d. Trace metal nutrient management for food quality. Producing crops of sufficient quality to meet consumer's needs is an important aim of nutrient management. Currently, about one third of the world's population, mainly in developing countries, is suffering from zinc deficiency. This chapter addresses management options for this micronutrient. You will read and interpret results of recent research on this topic, and you will learn how to write a Discussion section of a manuscript describing this research.
- e. Policy measures. In this week you will learn what tools authorities have to make farmers improve their nutrient management at farm level. You will evaluate these tools and are stimulated to develop your own opinion on current regulations in The Netherlands and its alternatives during a group discussion.

Assessment Strategy

| | Ch2 | Ch3* | Ch4 | Ch5 | Ch6 | Ch7 |
|--|------------------------------|------------------|--------|-------------------|-------|--------|
| Learning outcomes \ where assessed | ¹⁵ N tracing exp. | Nutrient balance | QUEFTS | Research proposal | Paper | Policy |
| Design management options for nutrient cycles in agroecosystems | | x | x | x | | x |
| Evaluate consequences of the above-mentioned interventions for nutrient cycling | | x | x | x | | x |
| Processing data from field experiments | x | | | | | |
| Use, design and evaluate models | | x | x | x | | |
| Evaluate research data | x | | | | | |
| Write components of a scientific research proposal and paper | | | | x | x | |
| Evaluate policy measures | | | x | | | x |
| Debate on interventions on nutrient management | | | | | | x |
| Evaluate the merits of scientific literature for various purposes | | | | (x) | (x) | |
| Reflect on options and consequences of policy measures regarding nutrient management | | | x | | | x |
| Contribution to final mark (%) | 16.7 | 16.7 | 16.7 | 16.7 | 16.7 | 16.7 |
| *Participation in excursion compulsory | | | | | | |
| | | | | | | |

Assessment Strategy

| | Ch2 | Ch3* | Ch4 | Ch5 | Ch6 | Ch7 |
|--|------------------------------|------------------|--------|-------------------|-------|--------|
| Learning outcomes \ where assessed | ¹⁵ N tracing exp. | Nutrient balance | QUEFTS | Research proposal | Paper | Policy |
| Design management options for nutrient cycles in agroecosystems | x | x | x | x | | x |
| Evaluate consequences of the above-mentioned interventions for nutrient cycling | x | x | x | x | | x |
| Processing data from field experiments | x | | | | | |
| Use, design and evaluate models | | x | x | x | | |
| Evaluate research data | x | | | | | |
| Write components of a scientific research proposal and paper | | | | x | x | |
| Evaluate policy measures | | | x | | | x |
| Debate on interventions on nutrient management | | | | | | x |
| Evaluate the merits of scientific literature for various purposes | | | | (x) | (x) | |
| Reflect on options and consequences of policy measures regarding nutrient management | | | x | | | x |
| Contribution to final mark (%) | 16.7 | 16.7 | 16.7 | 16.7 | 16.7 | 16.7 |
| *Participation in excursion compulsory | | | | | | |
| | | | | | | |