

Soil testing: what it does and where is it going?



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Teagasc

Soil Fertility Conference, 19th October 2016.

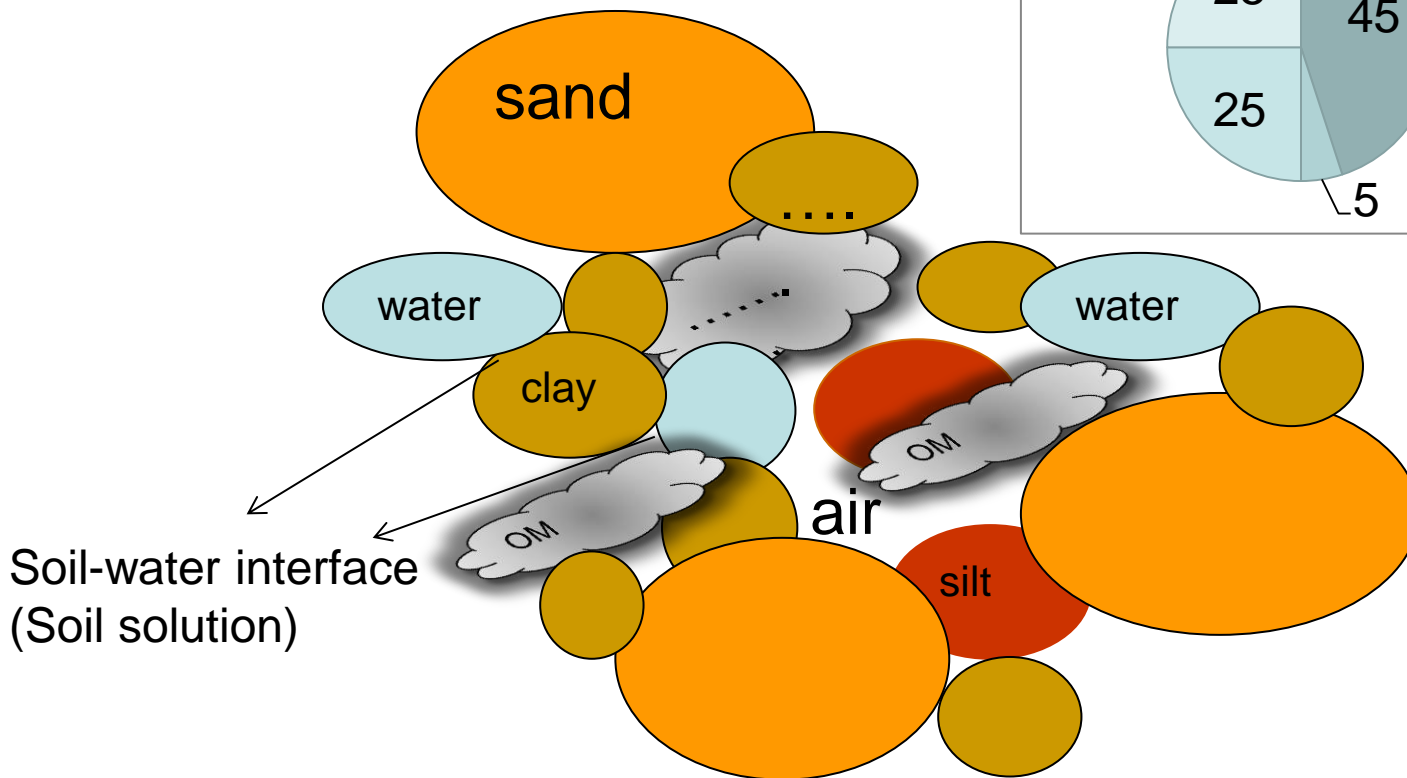
Lyrath Co. Kilkenny

Soil testing: what it does & where is it going?

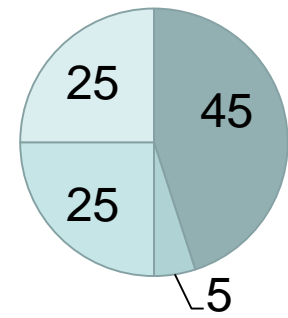
- What are we testing?
- Why we test:
- Major nutrients in soils we have to keep an eye on: Phosphorus
- Soil type effects
- Bringing more soil information into to testing
- New methods in development at Teagasc

Soil: a complex medium

Microbial communities



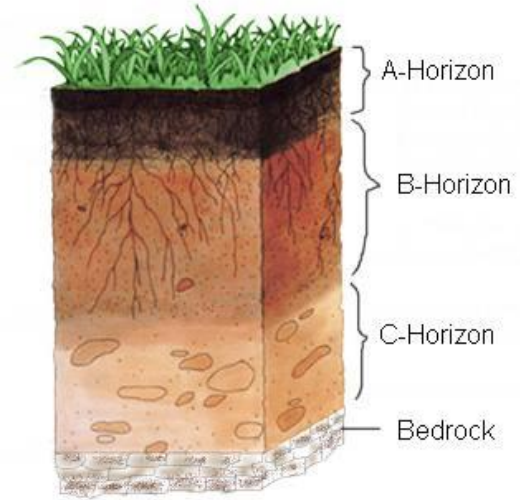
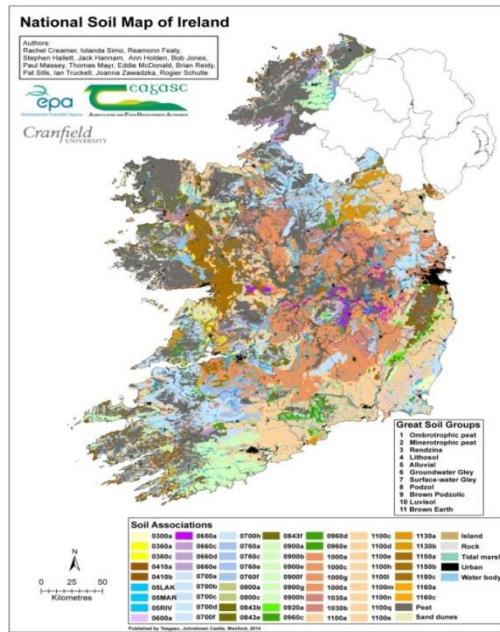
Composition of mineral soil (%)



- Minerals
- OM
- water
- air

Soil-water interface
(Soil solution)

What are we testing?



SOIL PROFILE



Doonbeg



Kishkeam



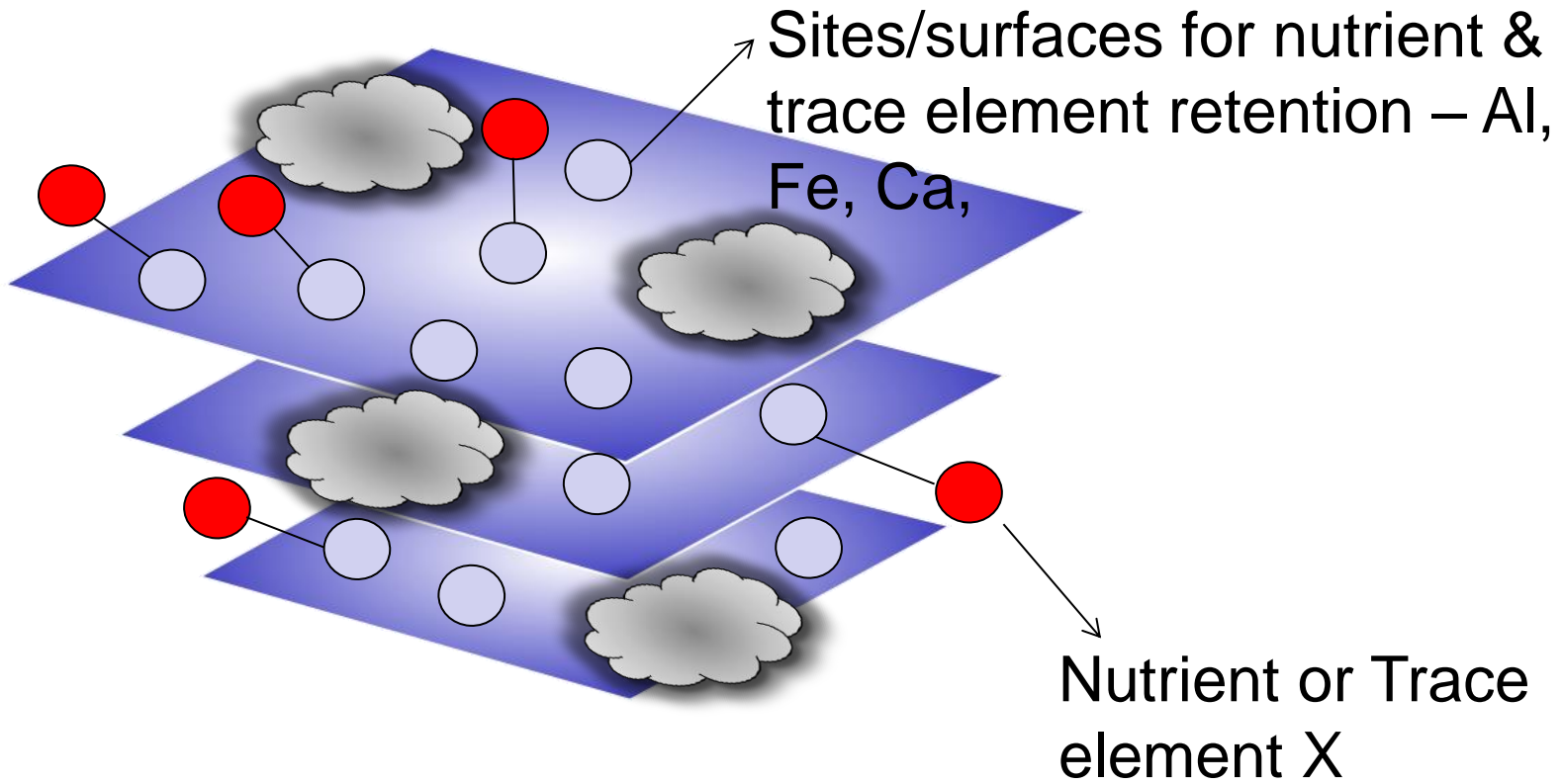
Rossmore



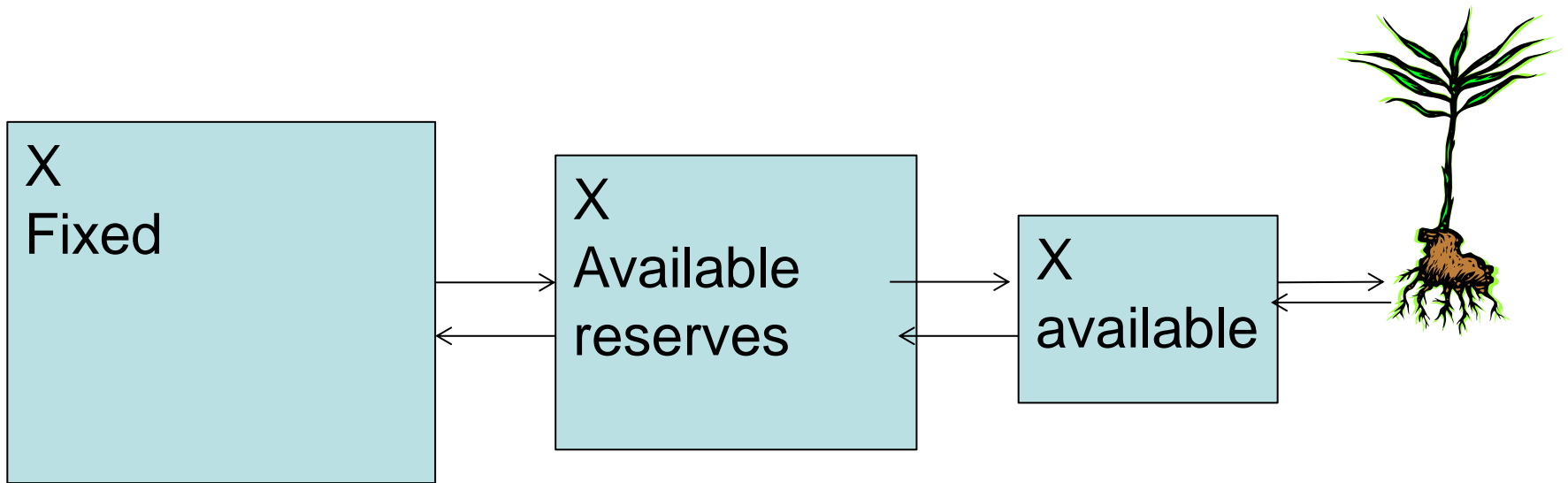
Castleisland



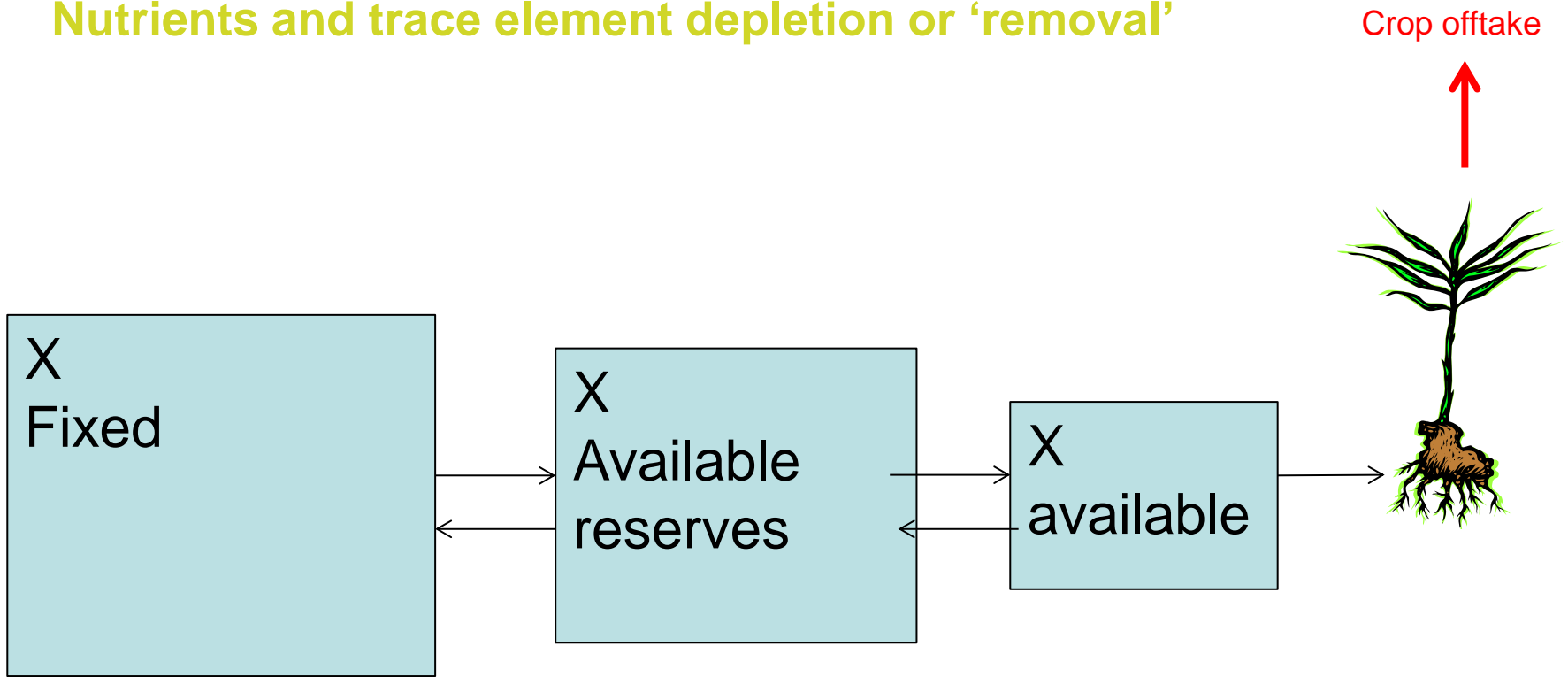
Athea



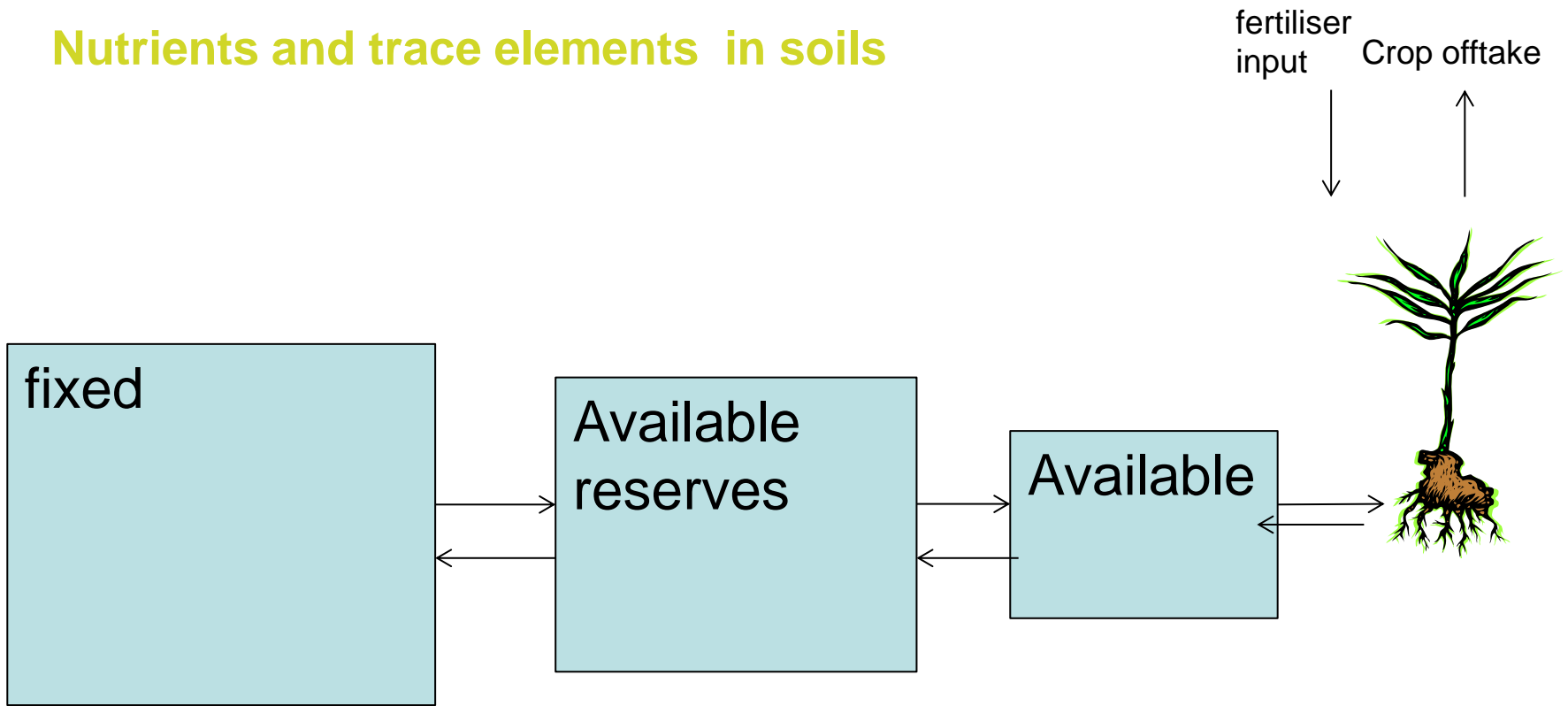
Nutrients and trace elements in soils 'removal'



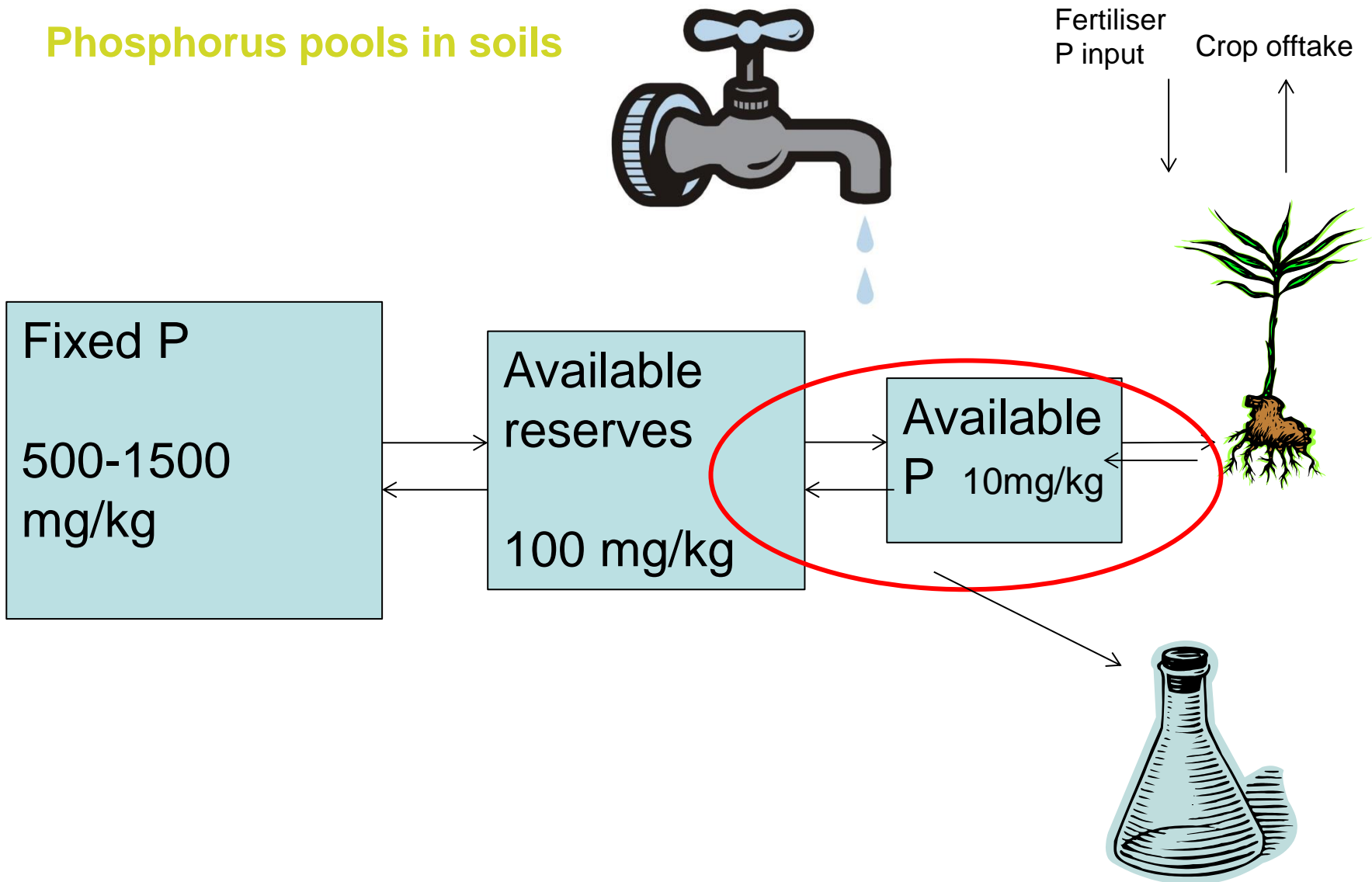
Nutrients and trace element depletion or 'removal'



Nutrients and trace elements in soils



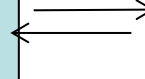
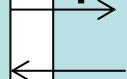
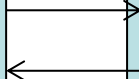
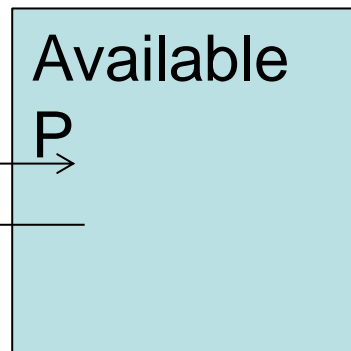
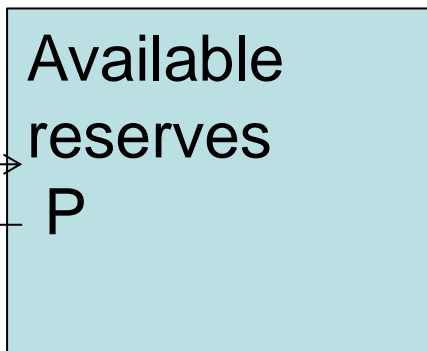
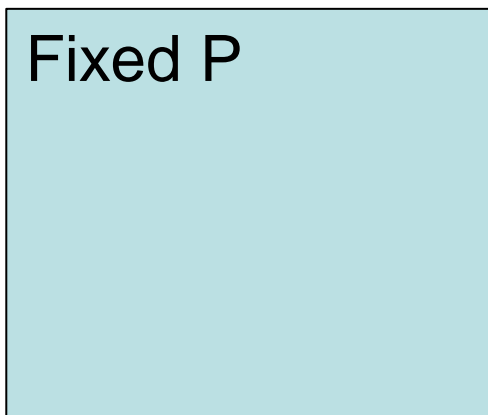
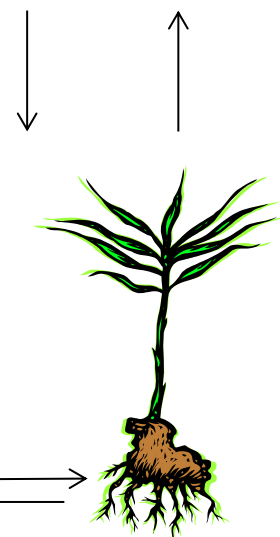
Phosphorus pools in soils



Interpreting soil test P results: excessive Index 4



Fertiliser P input Crop offtake

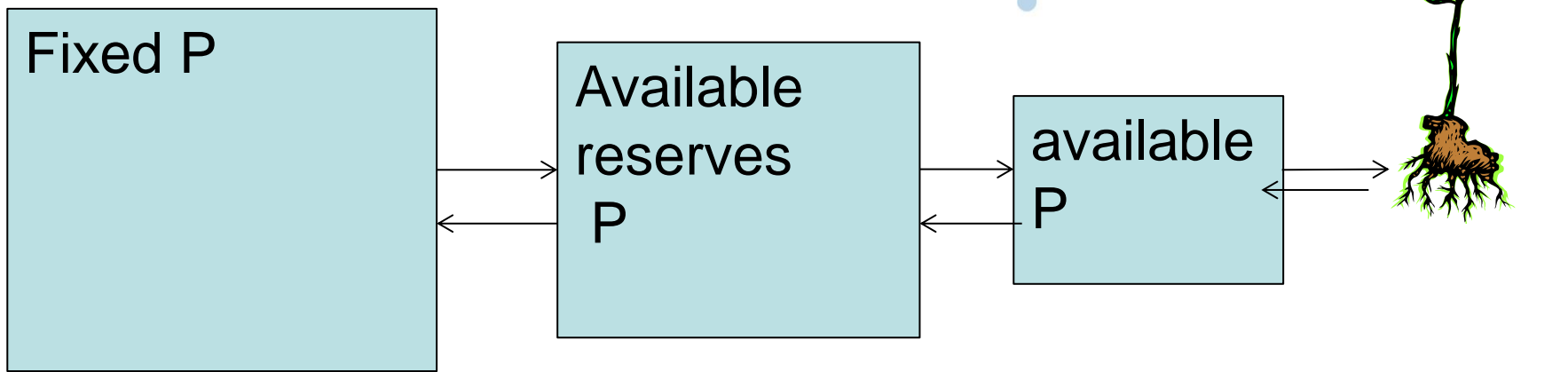


Tap in on full – oversupply.

Interpreting soil test P results - optimum



Fertiliser P input
↓
Crop offtake
↑



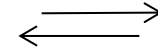
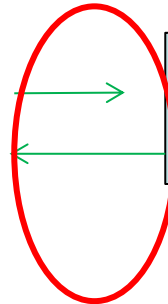
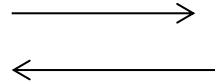
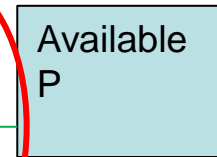
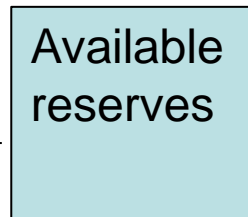
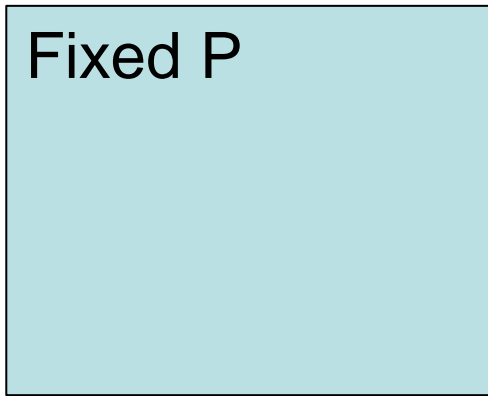
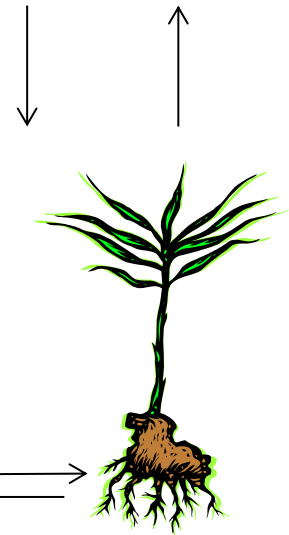
Index 3 = Good supply only when needed by crop

Interpreting soil test P results:

build up rates need to build up reserves



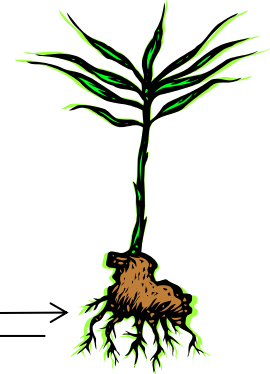
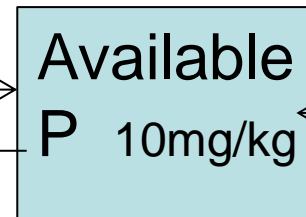
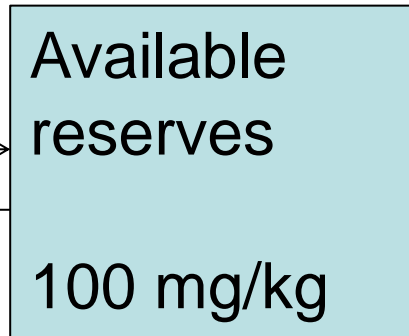
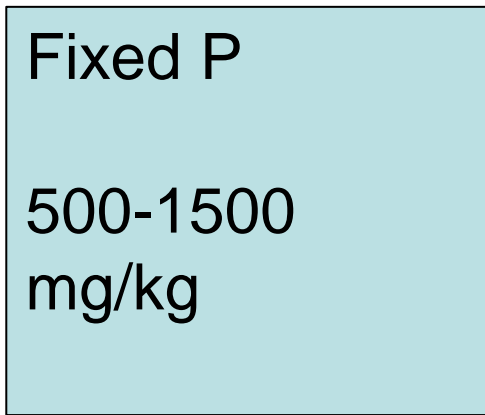
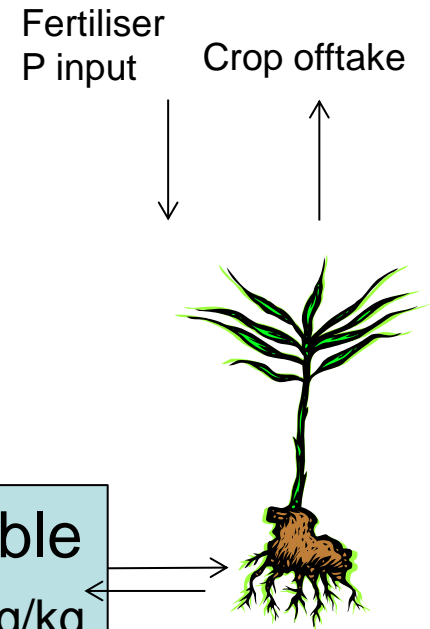
fertiliser input Crop offtake



not enough nutrient in reserve to supply to solution



Phosphorus: think in terms of supply

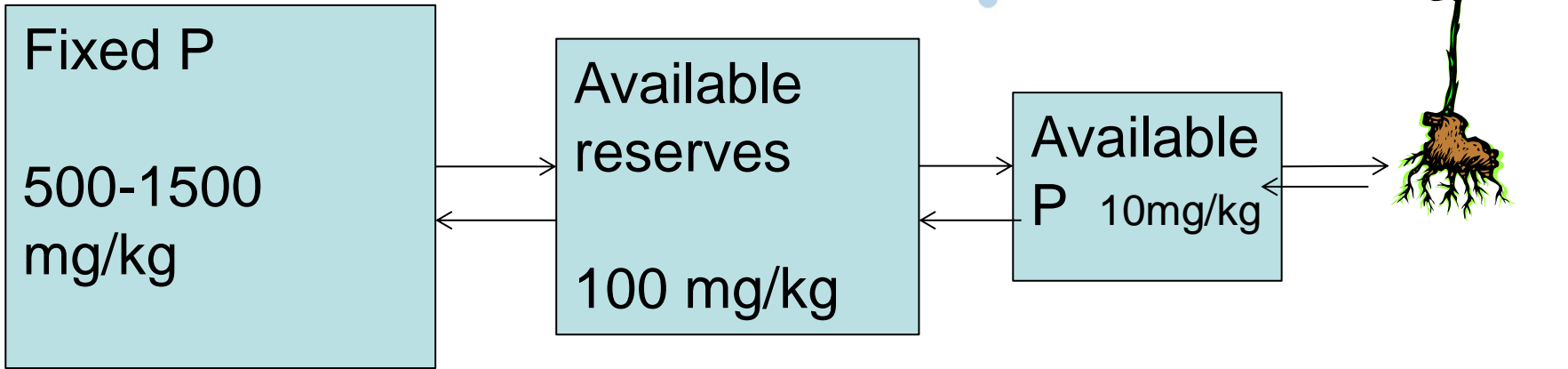


Build back up labile P reserves to keep supply going.

Phosphorus: think in terms of supply



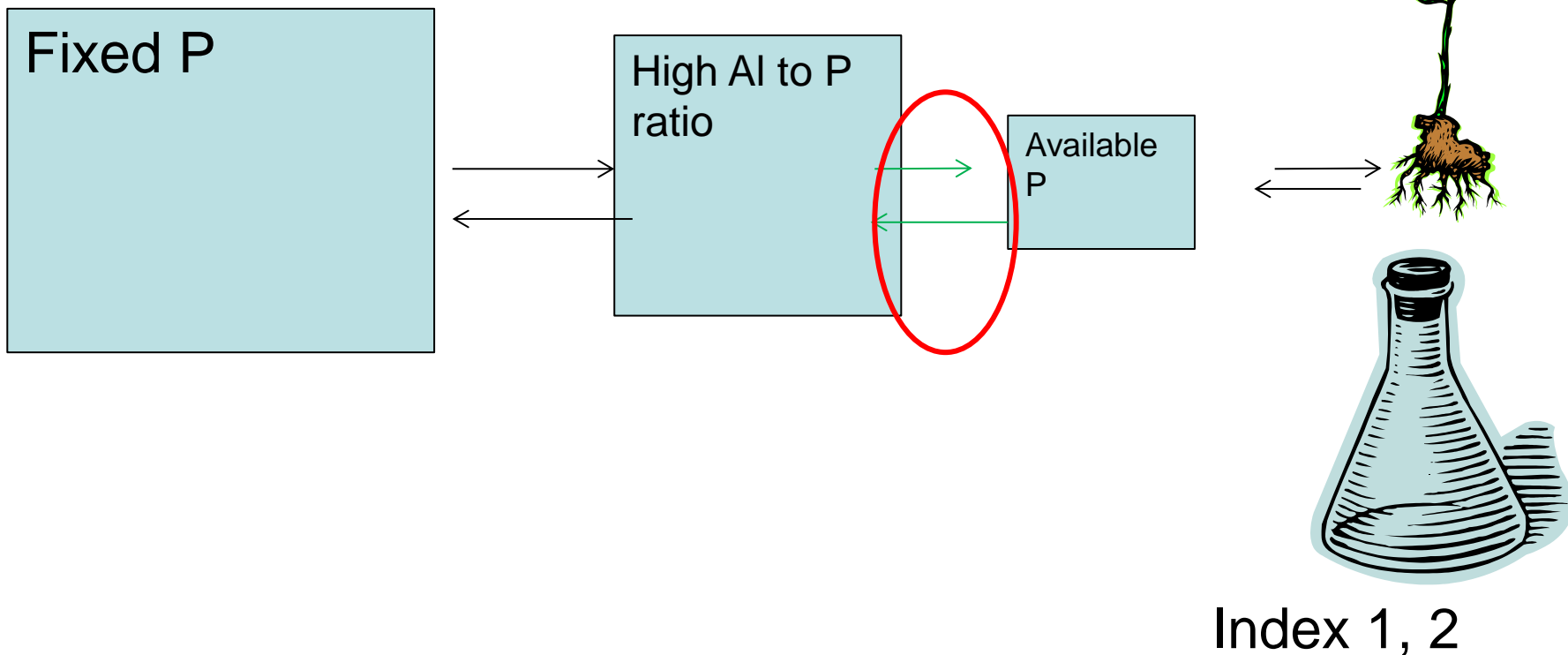
Fertiliser P input
Crop offtake



Build back up available P reserves to keep supply going.

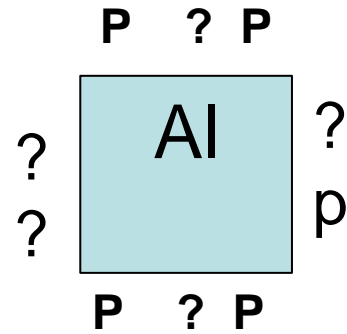
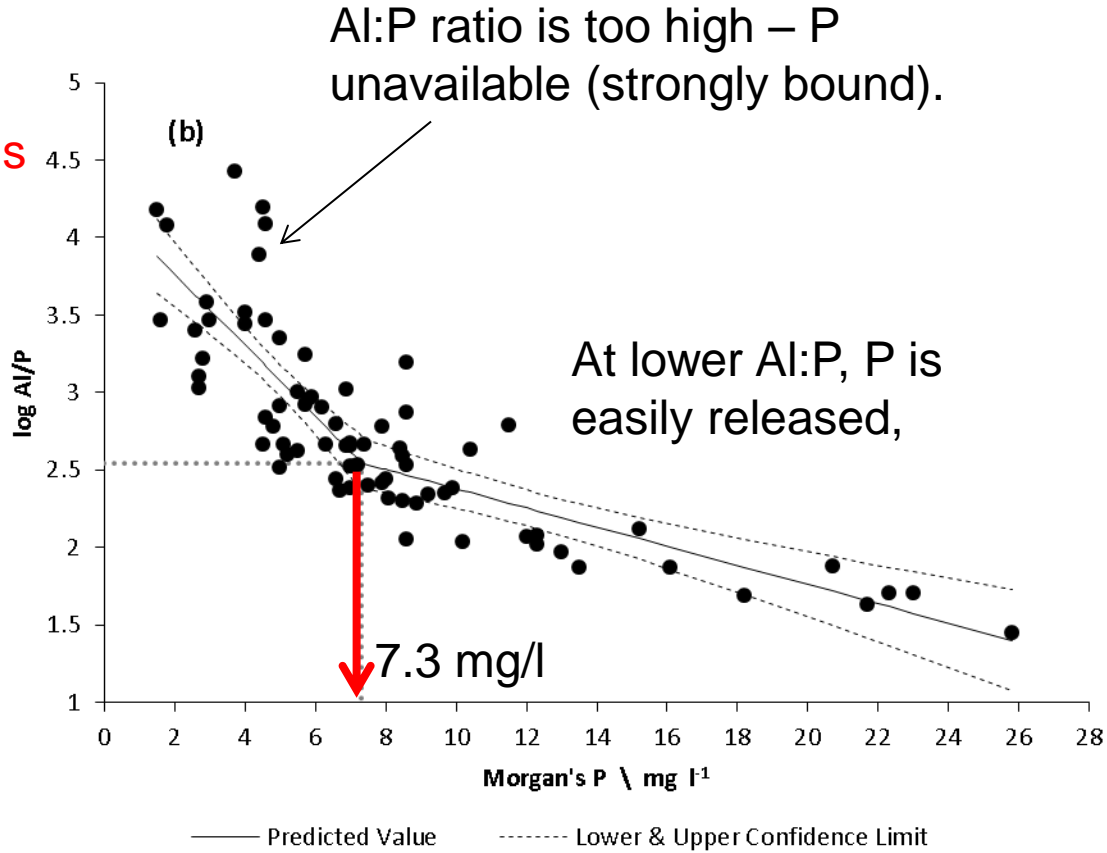
Index 3 = good supply

Build up influenced by soil type



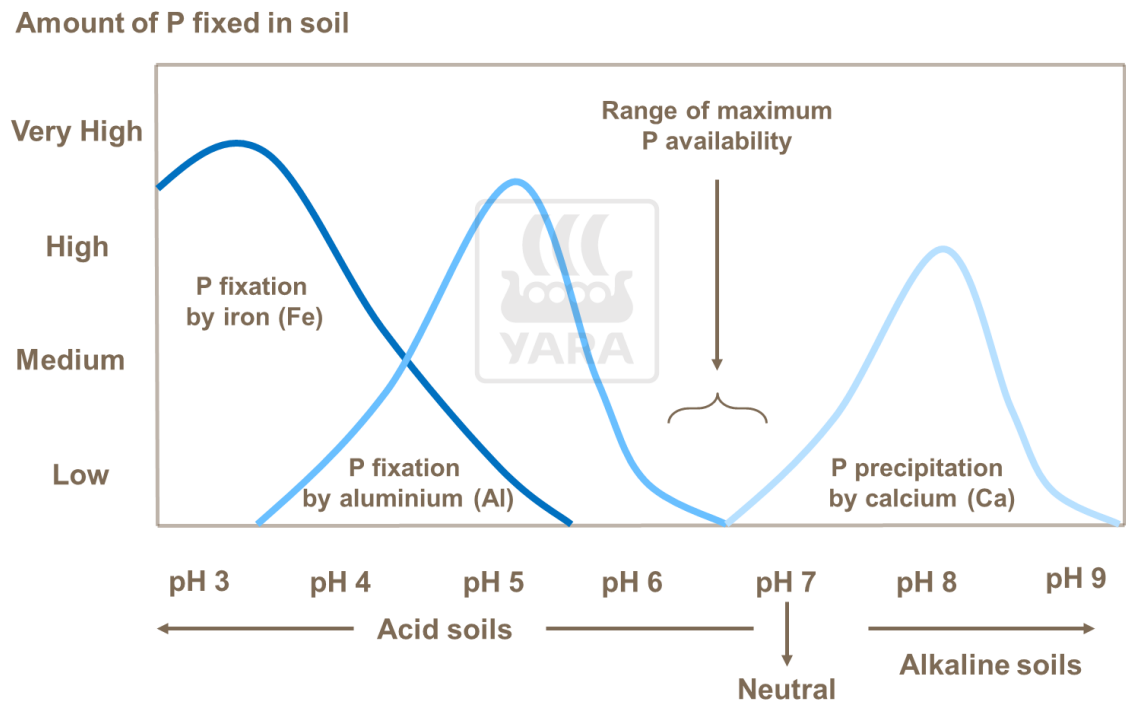
High Al influence P supply

High P fixing soils



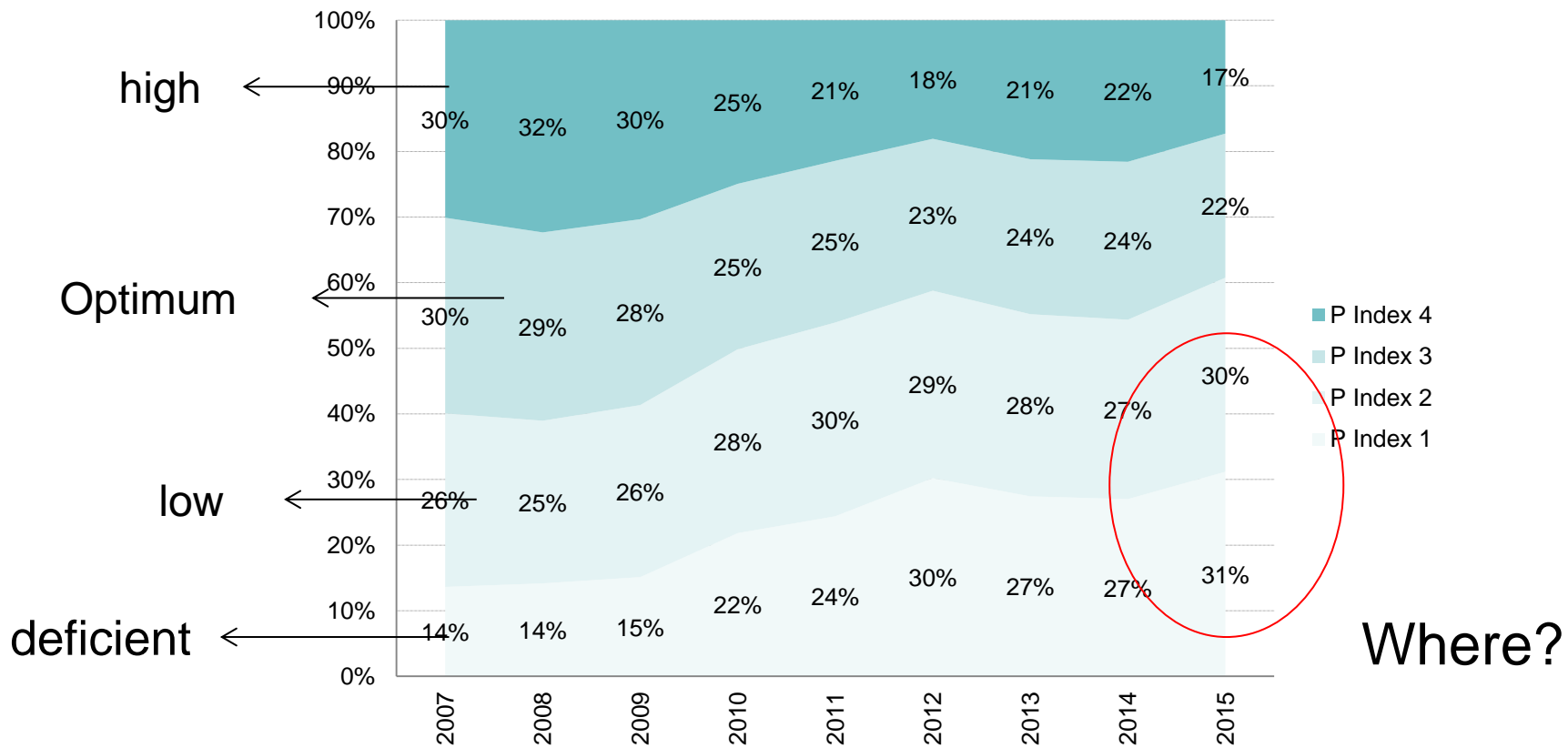
Phosphorus availability is influenced by soil properties

Influence of soil pH on the soil P availability



Current trends in soil P fertility

Trend in Soil P Index



Where?

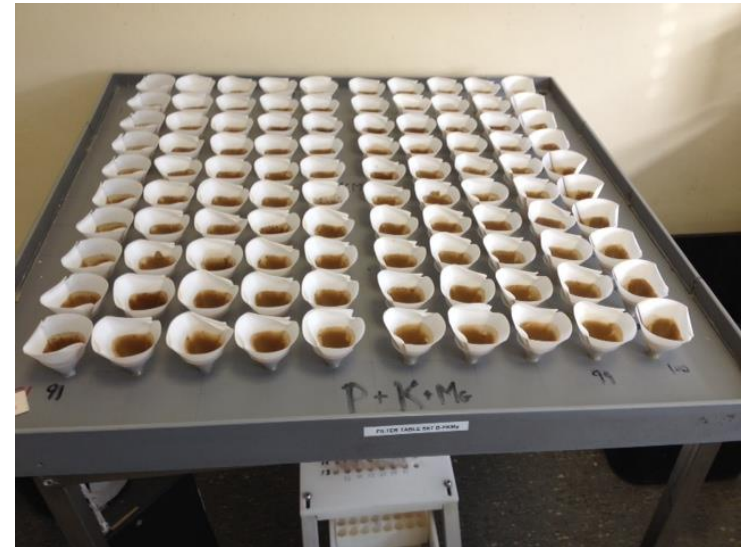
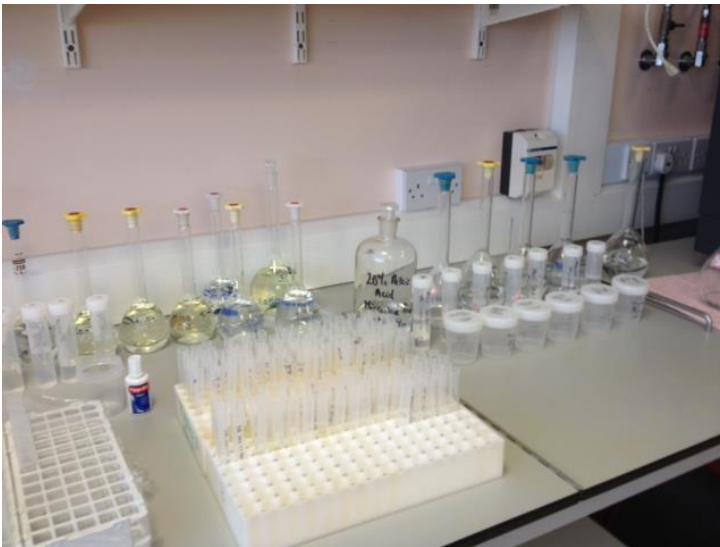


Current methods:

Soil sampling typically every 2- 4 ha,
once in 5 years.

Limited to small number of elements:
P, K, Mg, LR.

Almost never for texture, organic
matter & other soil attributes



Phosphorus soil test and what they measure?

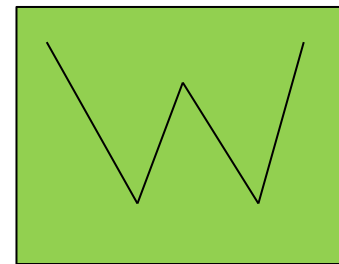
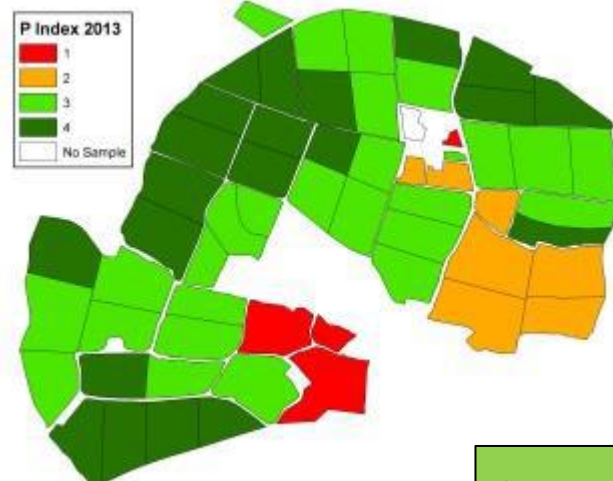
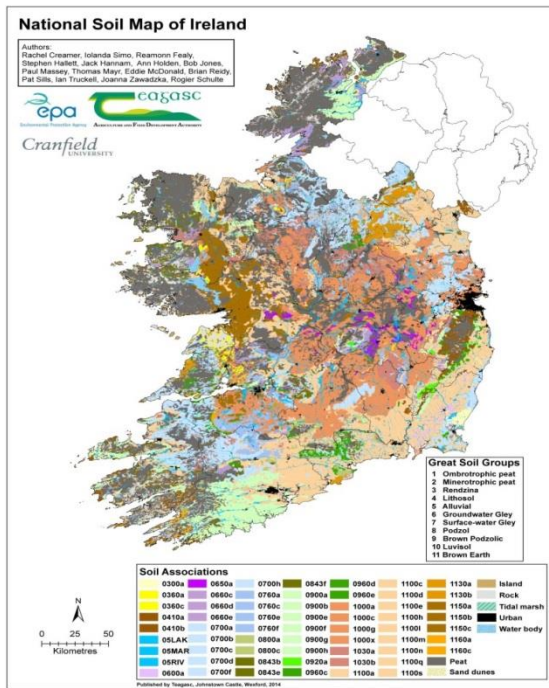
- There are many different tests out there.
- Amount of P extracted by any one test depends on the soil pools that are responsive to that test
(e.g. Mehlich3>Olsen>Morgan-P)
- A soil P test must access the same pools that the plant can,



No soil test is universal

Soil properties of soils mapped at landscape scale

Manage soil fertility at field or paddock scale



Soil testing:



Good idea to know the soil as well as test it.

Is it acidic in nature?

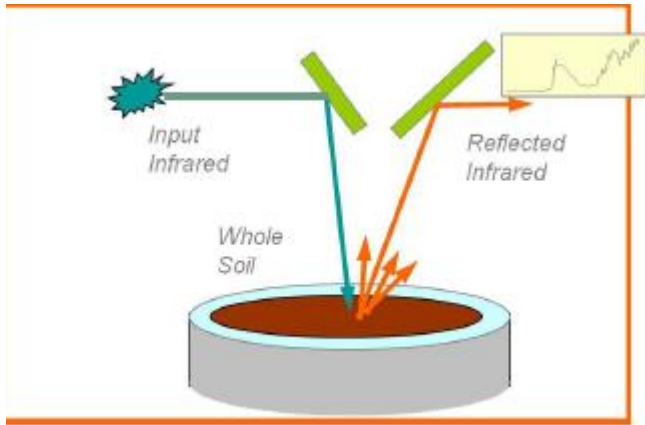
Al?

Clay?



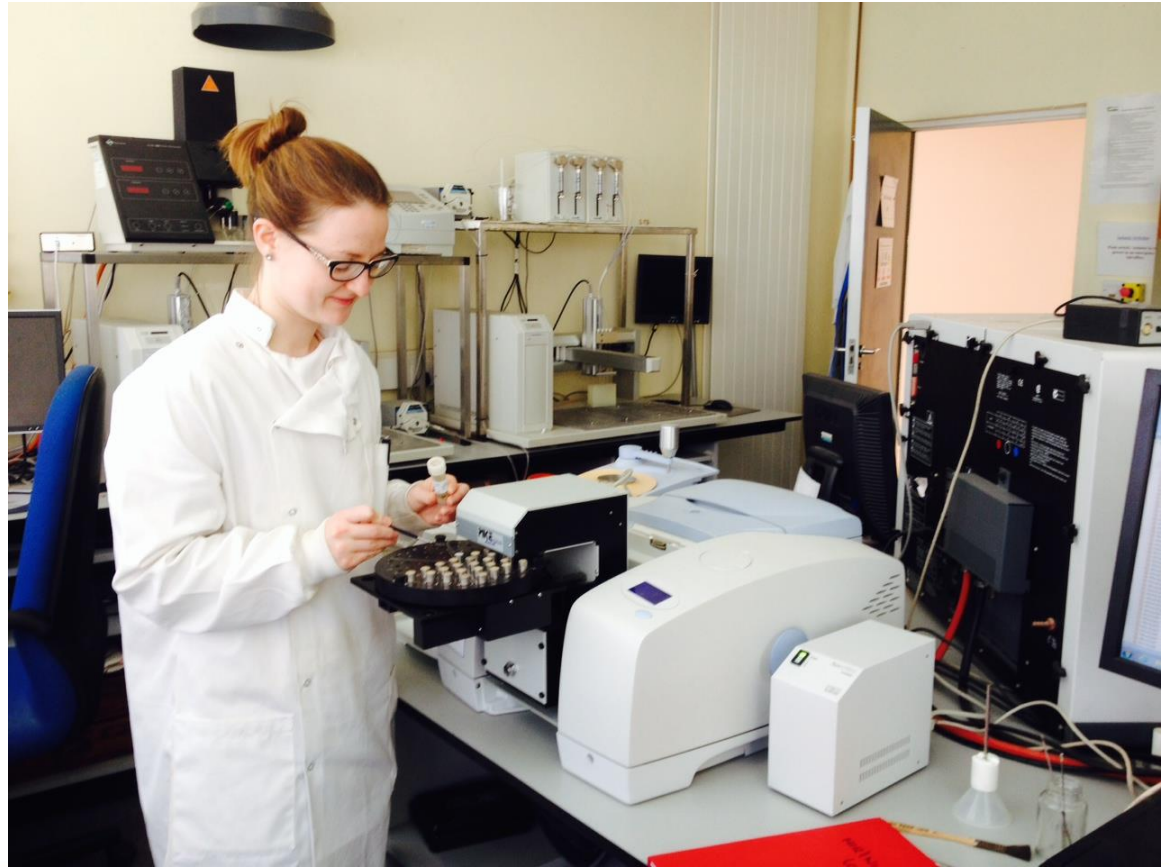
Important soil properties to consider: pH, Al, Ca, %OM

Emerging techniques: New methods for soil testing capture more soil properties

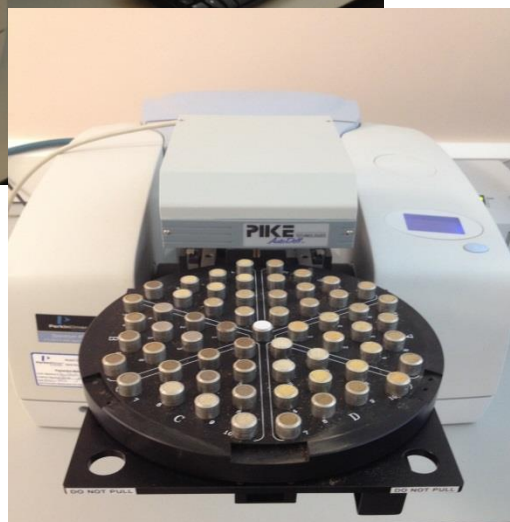
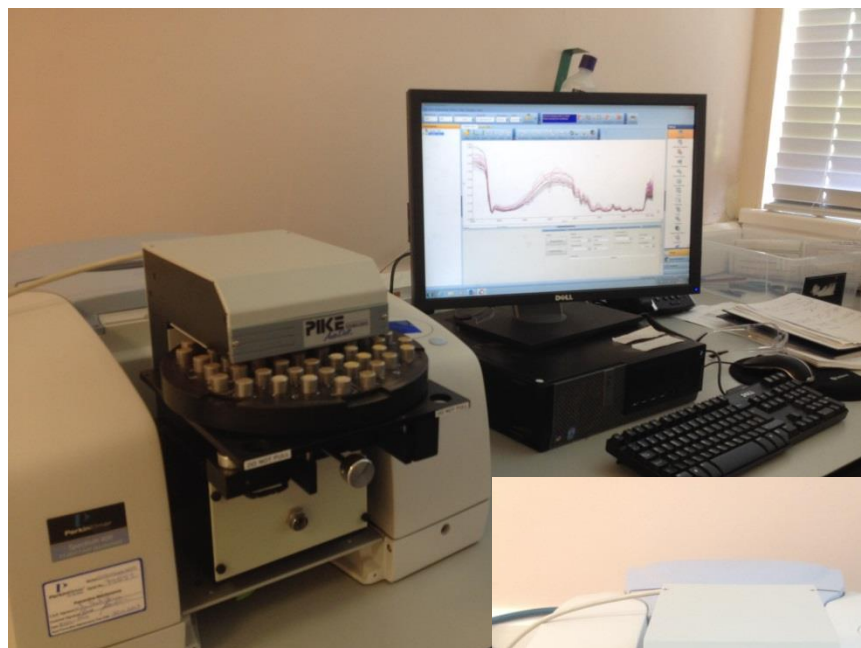


No chemical extraction,
lower cost & rapid results.

One scan gives info about
soil pH, OM, Al, Fe, Ca,
texture etc.

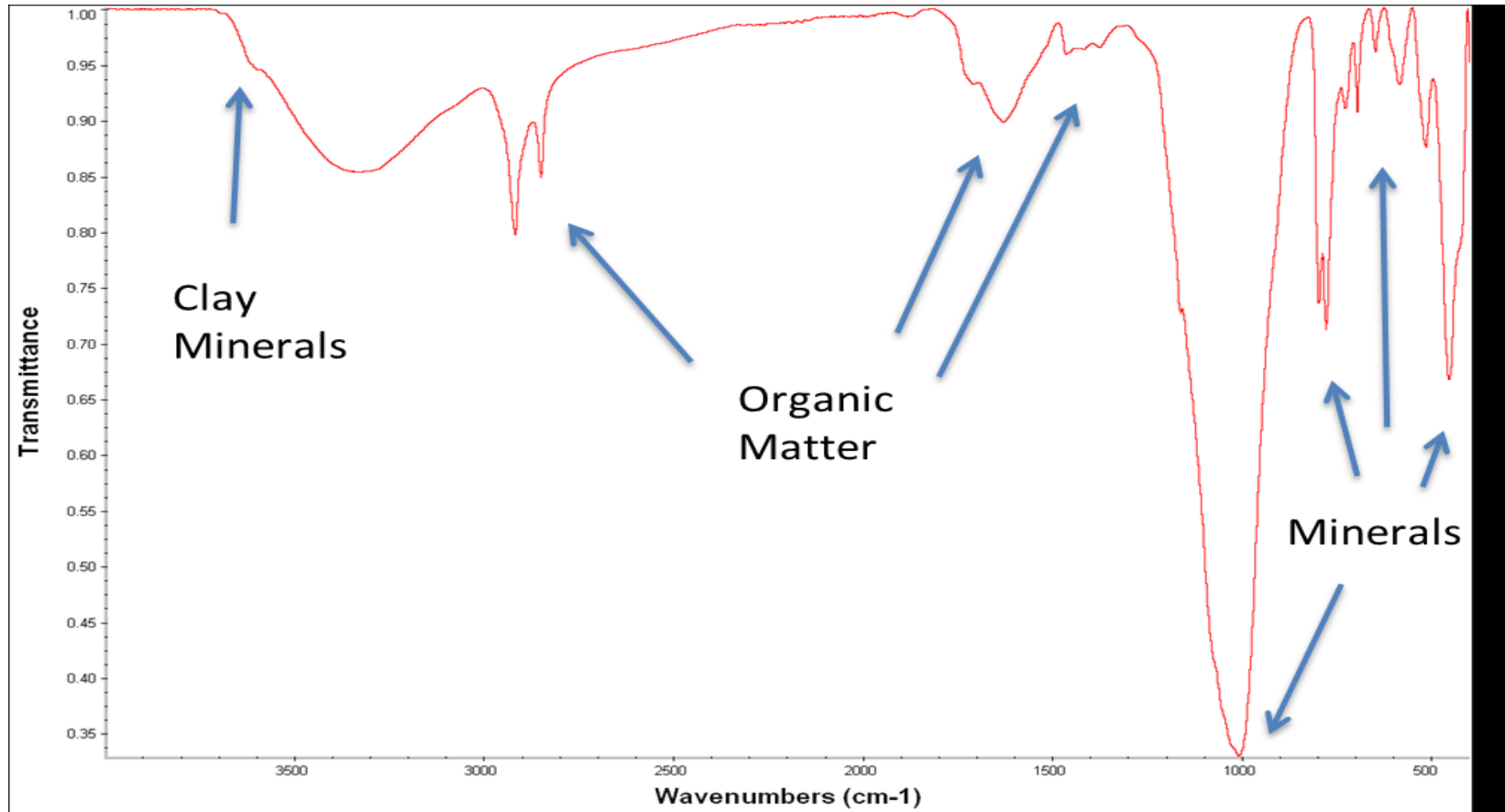


NIR / MIR



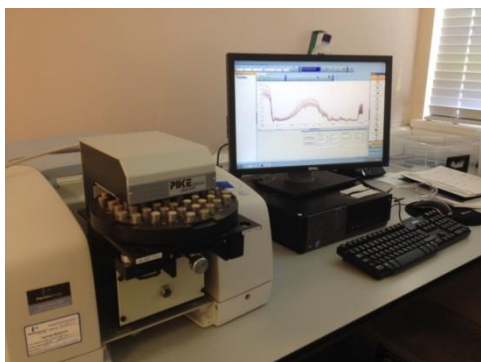
- Sample interacts with light source
- Get spectral information on the chemical makeup of the sample.

Spectra produced when infrared is absorbed by a soil sample gives the overall chemical profile of the soil



A H Jean Robertson, H Rachael Hill, Angela M Main. 2013. Soil spectroscopy workshop. FAO. Rome.

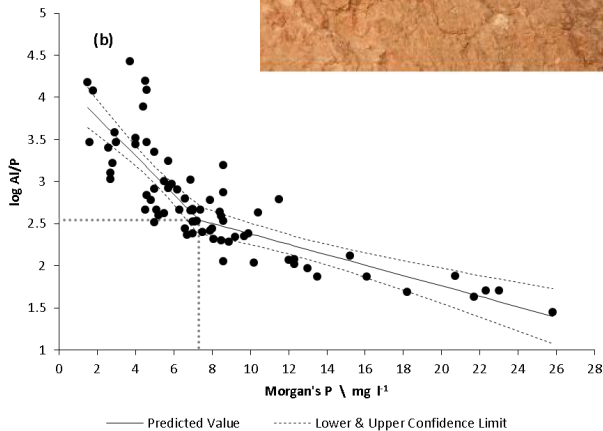
IR applications - collect multi-parameter data from a single scan



- % OM at surface horizon
- % sand, silt, clay along profile
- extractable Al, Fe, Ca in each horizon
- pH, CEC, TN, TOC,

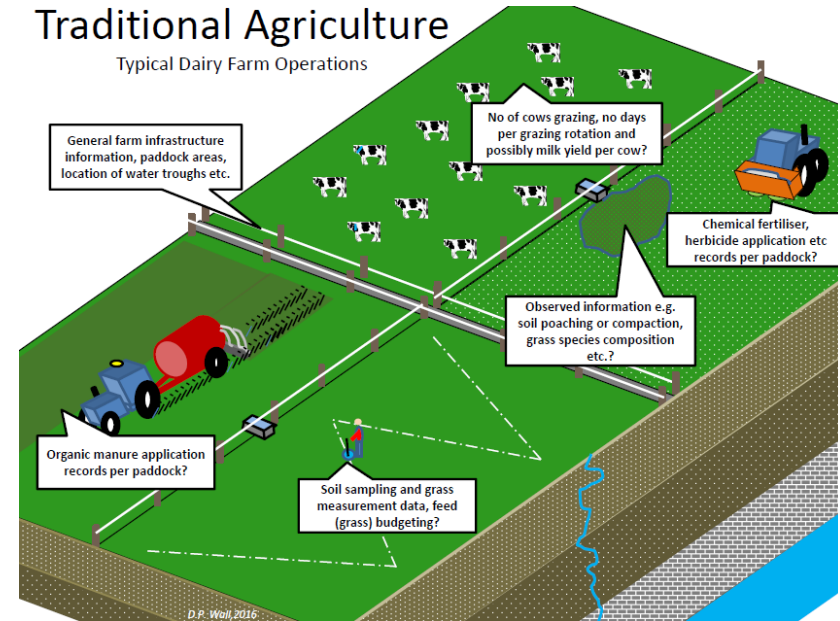


Multi-parameter: Soil attributes affecting soil fertility – not captured by current methods



Traditional Agriculture

Typical Dairy Farm Operations



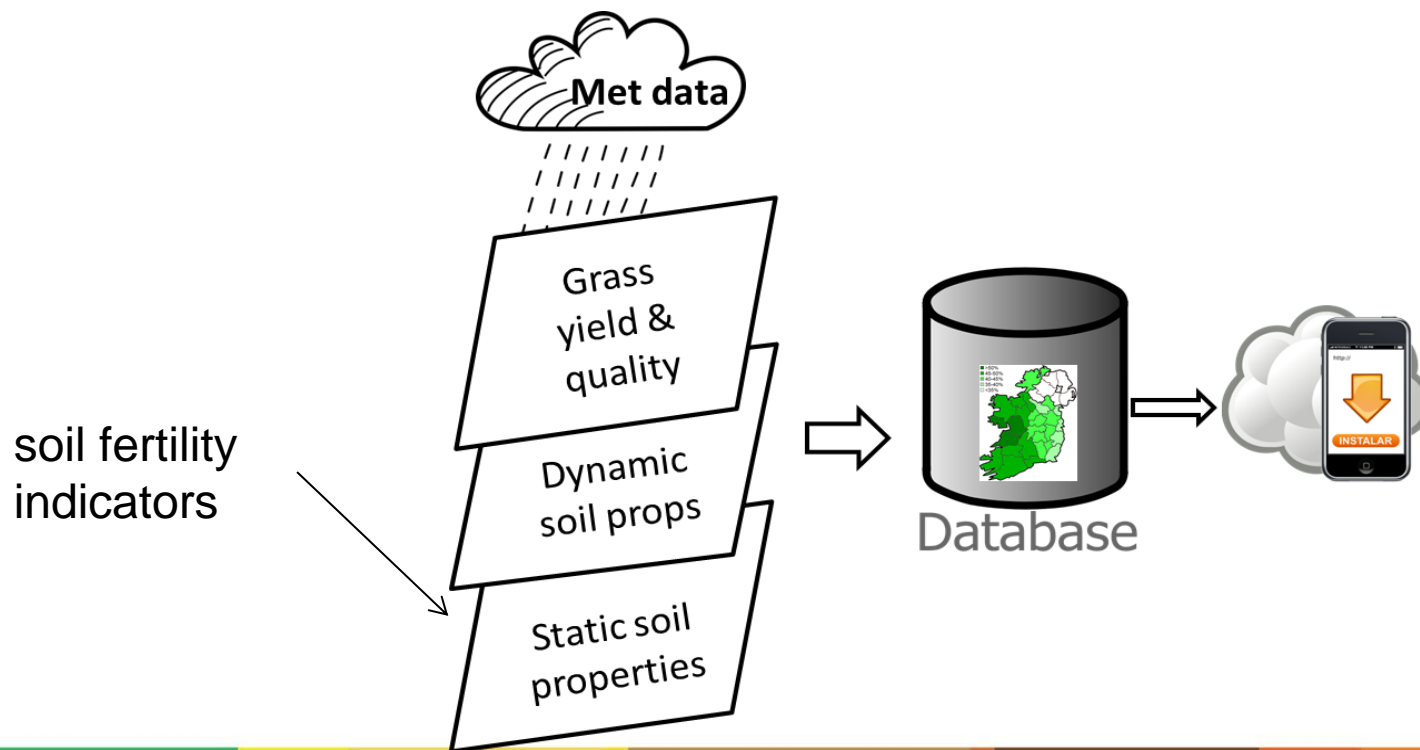
What does this mean for soil testing?

Spatial scales

Temporal scales

Multi-parameter data

Model/forecast



Thank you for your attention



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