



## Staff

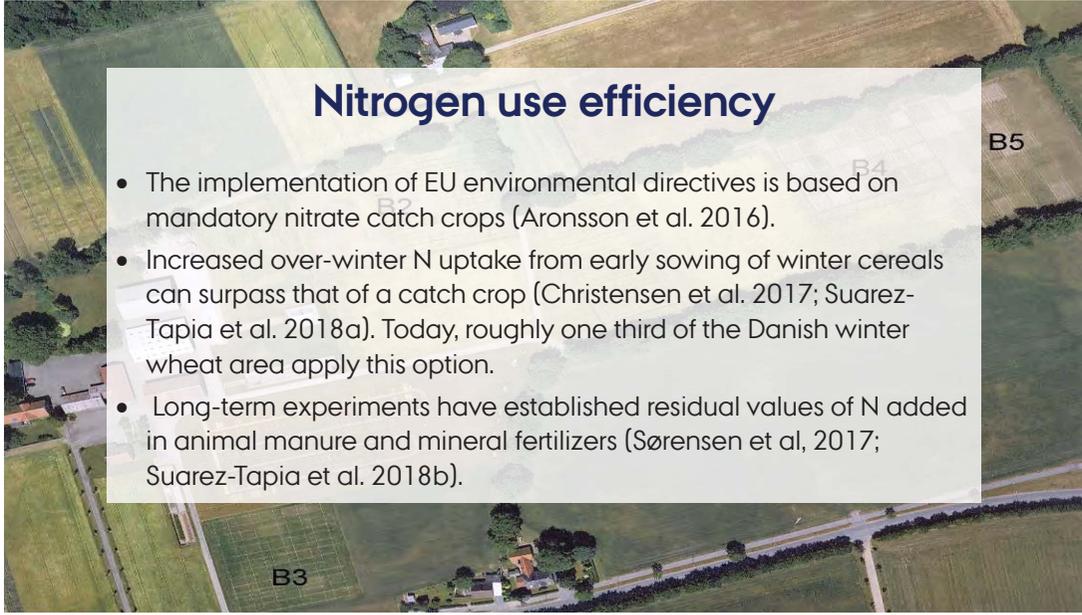
### Scientific staff:

Two professors and seven associate professors/senior scientists - teaching (6%), research (50%) and research-based policy support (44%)

### Technical staff:

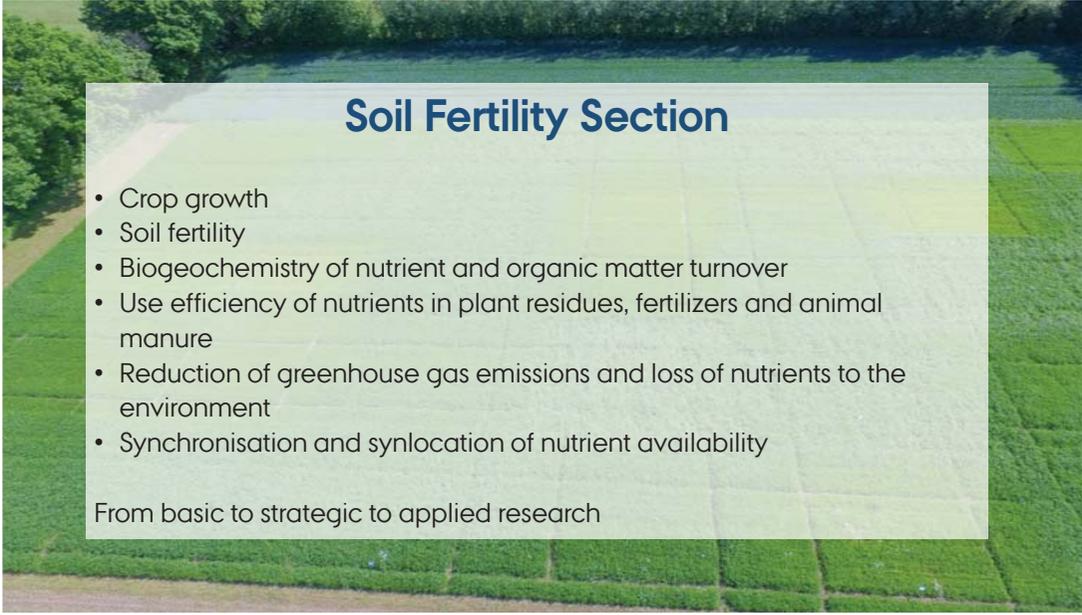
Ten lab technicians

# SOIL FERTILITY



## Nitrogen use efficiency

- The implementation of EU environmental directives is based on mandatory nitrate catch crops (Aronsson et al. 2016).
- Increased over-winter N uptake from early sowing of winter cereals can surpass that of a catch crop (Christensen et al. 2017; Suarez-Tapia et al. 2018a). Today, roughly one third of the Danish winter wheat area apply this option.
- Long-term experiments have established residual values of N added in animal manure and mineral fertilizers (Sørensen et al, 2017; Suarez-Tapia et al. 2018b).



## Soil Fertility Section

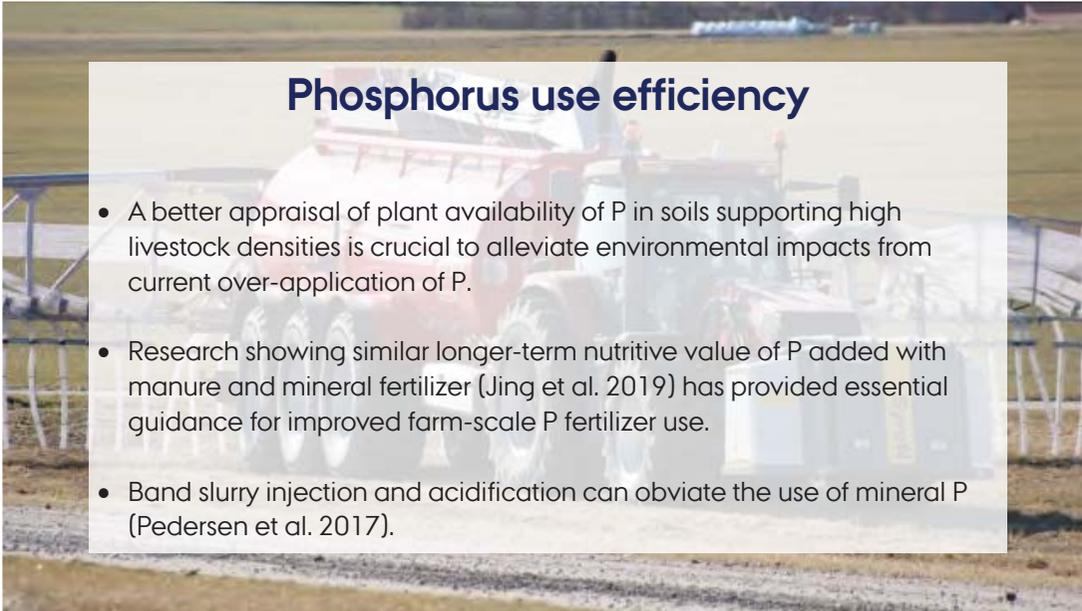
- Crop growth
- Soil fertility
- Biogeochemistry of nutrient and organic matter turnover
- Use efficiency of nutrients in plant residues, fertilizers and animal manure
- Reduction of greenhouse gas emissions and loss of nutrients to the environment
- Synchronisation and synlocation of nutrient availability

From basic to strategic to applied research



## Greenhouse gas emission

- Denmark was the first country to include anaerobic digestion in the national inventory of GHG emissions. Empirical models of methane and nitrous oxide emissions was recently evaluated and improved (Elsgaard et al. 2016; Petersen et al. 2016; Petersen 2018).
- This resulted in revisions of emissions from manure management and anaerobic digestion in the 2017 national communication to UNFCCC.



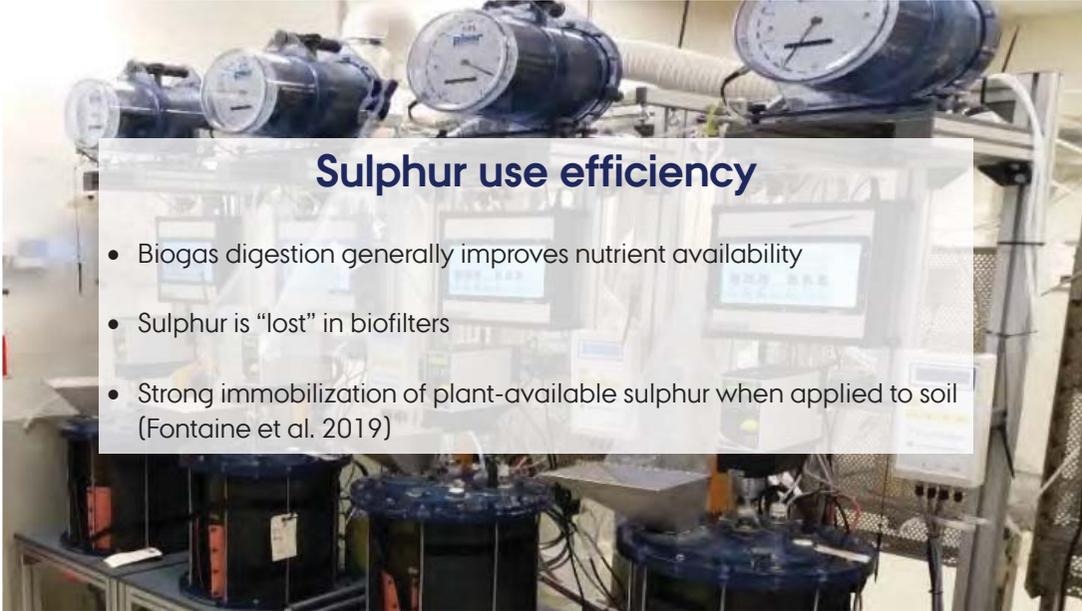
## Phosphorus use efficiency

- A better appraisal of plant availability of P in soils supporting high livestock densities is crucial to alleviate environmental impacts from current over-application of P.
- Research showing similar longer-term nutritive value of P added with manure and mineral fertilizer (Jing et al. 2019) has provided essential guidance for improved farm-scale P fertilizer use.
- Band slurry injection and acidification can obviate the use of mineral P (Pedersen et al. 2017).



## Grasslands

- Rotational and permanent grasslands show significant C sequestration (Cong et al. 2019; Hu et al. 2019).
- Multispecies grasslands with legumes and forbs show advantages in terms of yield stability (Jing et al. 2017; Cong et al. 2017; 2018), N use efficiency (Dhamala et al. 2017; 2018), and presence of soil fauna (Larsen et al. 2016; D'Annibale et al. 2017; Cong & Eriksen 2018).
- New automated image analysis to quantify clover content (Skovsen et al. 2017) that, when linked to decision support, allows for differentiated fertilizer application across the field.



## Sulphur use efficiency

- Biogas digestion generally improves nutrient availability
- Sulphur is "lost" in biofilters
- Strong immobilization of plant-available sulphur when applied to soil (Fontaine et al. 2019)

## Research funding – examples

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- Green Development and Demonstration Programme (VirK<sub>N</sub>, N-Tool-Precise, NutHY)
- Innovation Fund Denmark (SmartGrass)
- Danish Research Council (Mitigating N<sub>2</sub>O, Organic N leaching)
- EU (H2020-ITN FertiCycle, Facce ERA-Gas MAGGE-pH, FP7 AnimalChange, ReFertil)
- Villum Foundation (Deep Frontier)
- Danish Energy Agency (Sinks2)
- Danish Environmental Agency (1900)
- Danish Agriculture and Food Council ('Per mille' projects)