

Introduction: Soil health is key to providing balanced nutrients for optimal plant growth and for quality of produce. Growing more than one crop species or integration of trees in agroforestry improved soil health.

Objective: To investigate the soil health in the alley-cropped winter wheat in agroforestry system compared to the monoculture winter wheat in Denmark with AgroCares nutrient scanner.

Keywords: agroforestry, monoculture, soil health

Methods & Materials

At the experimental farm of the University of Copenhagen in Denmark, a combined food and energy (CFE) system, viz. alley-crop agroforestry system was established in 1995 with food and fodder crops in crop alleys and the biomass belts of alder, common hazel and willow. Soil health assessment was carried out on monoculture winter wheat and on the alley-cropped winter wheat under agroforestry system during the cropping season in 2023. The CFE system is managed as organic farm without using chemicals and fertilizer inputs.

1. Collect composite soil samples (5 augurs) with the help of augur, from a depth of 30cm and mix in a container, making sure there are no roots or stones in the sample. The depth of 30cm was chosen because it represents the plough depth. 3 replicates of soil samples were collected from monoculture and agroforestry cropping system.
2. AgroCares nutrient scanner is a portable handheld tool with a near-infrared (NIR) sensor used to measure soil properties. Scanner was calibrated as per the guidelines provided by the company. The guideline includes scanning the yellow side (standard sample) and white side (background) of calibration cap provided by the company. The equipment is connected to a mobile-app through bluetooth connection. Scan was carried out on fresh soil samples from the field.

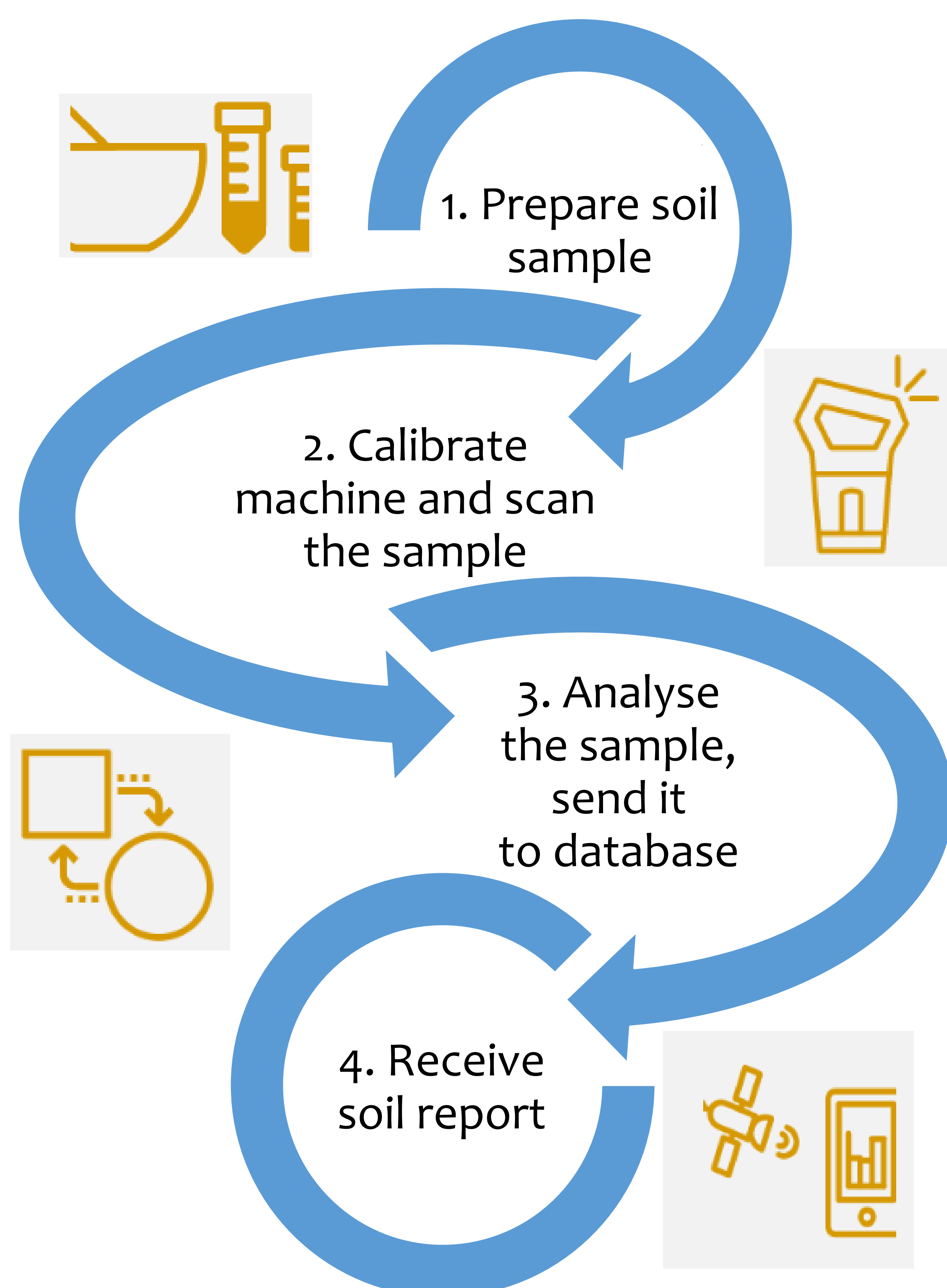


Figure 1: Soil analysis workflow in AgroCares Nutrient Scanner



Figure 2: Advantages of AgroCares Nutrient Scanner

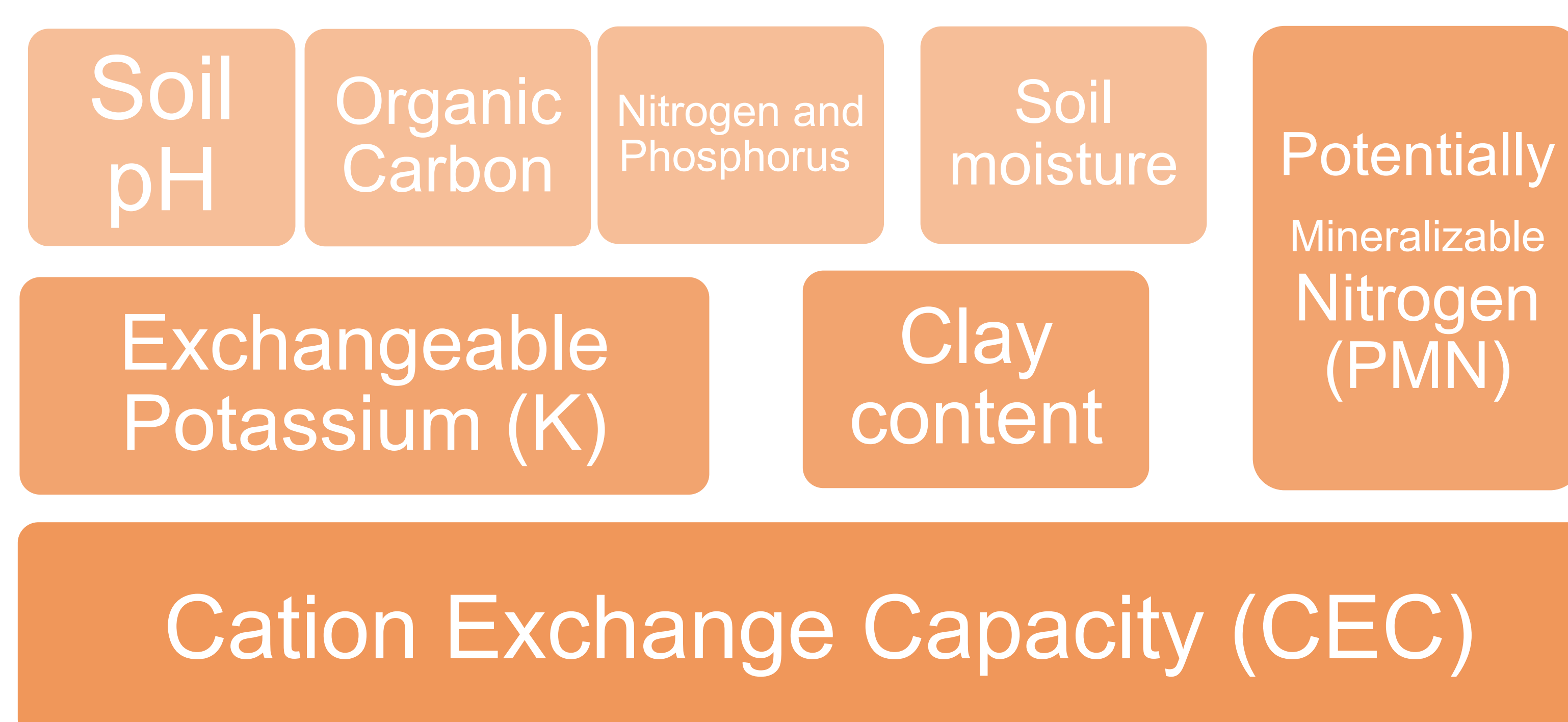


Figure 3: Soil properties analyzed by AgroCares nutrient scanner

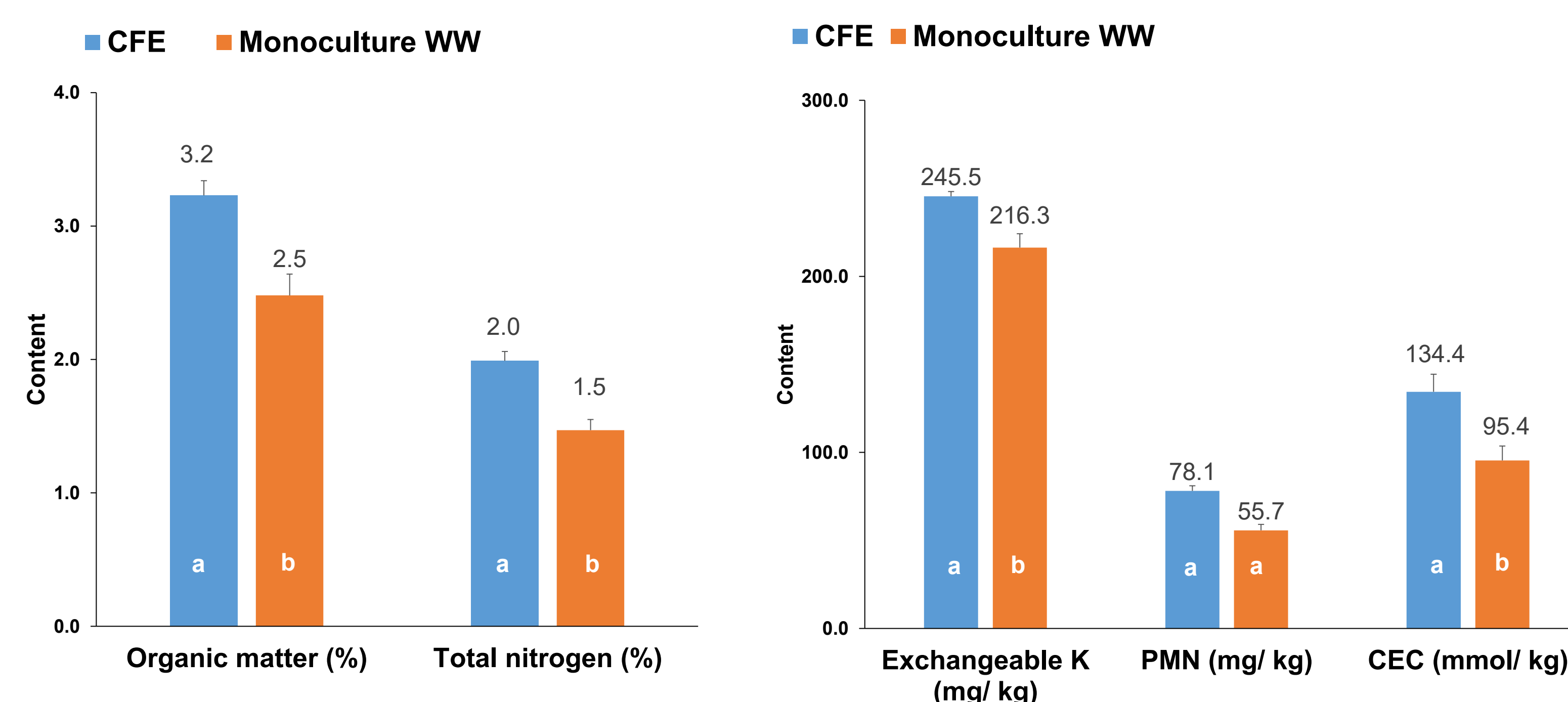


Figure 4: Key soil health parameters in CFE (agroforestry) and monoculture winter wheat (monoculture WW) cropping systems. Source: Chaudhary and Ghaley, 2025

Conclusions:

1. Organic matter, total nitrogen, exchangeable potassium, potentially mineralizable nitrogen (PMN) and cation exchange capacity (CEC) were higher in alley-cropped winter wheat in CFE (agroforestry system) compared to winter wheat in monoculture
2. The higher soil nutrient profile and organic matter in alley-cropped winter wheat (agroforestry system) compared to monoculture winter wheat, demonstrated that the agroforestry system had beneficial effects on soil health.

Reference:

Chaudhary, Vaibhav Pradip, and Bhim Bahadur Ghaley. 2025. "Insights into Beneficial Effects of an Agroforestry System on Soil Properties and Crop Yields: A Case Study from the Experimental Farm at University of Copenhagen, Denmark" Sustainability 17, no. 4: 1466. <https://doi.org/10.3390/su17041466>