

The long-term P and K depletion trial at Taastrup, Denmark

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Field testing of crop response to P and K application generally requires an experimental site with low available soil P or K status. However, many arable soils are high in available P and K due to generous fertilisation with inorganic fertilisers and animal manures for decades. At the University of Copenhagen the Long-term Nutrient Depletion Trial was established back in 1964 by staff at the Department of Plant Nutrition on 8.5 ha of a sandy clay loam. The site did not receive any P or K containing fertilizers or manures in the period up to 1995 and in this period the field was managed with continuous cereal production. The available P and K levels decreased to relatively low values over these more than 30 years of depletion (Olsen-P of 11 mg kg⁻¹ and exch. K of 55 mg kg⁻¹). In 1996 a new experimental design was applied in the majority of the field, with two more varied crop rotations and seven nutrient application treatments, including both mineral fertilizers and animal manures. The overall objectives of the new experimental design were to study how soil biology, physics and chemistry and crop performance behaved when an arable soil low in P and K, receives moderate amounts of N, P and/or K in mineral fertilizers or animal manures. Specific objectives were to study soil ability to supply crops with N, P and K and crop uptake of N, P and K, physiological response and yield for different crop species and cultivars.

Table 2. Nutrient treatments, with application rates in kg ha⁻¹ y⁻¹ and source.

Treatment	N	P	K	S	Source
A	0	0	0	0	
B	60	0	60	25	Fertilizer
C	60	10	0	25	Fertilizer
D	60	10	60	25	Fertilizer
E	120	20	120	50	Fertilizer
F	75*	10	75		Animal slurry
G	150	20	150		Animal slurry

*: 75 kg of total N for the animal slurry treatments corresponds to approximately 60 kg NH₄-N

Crop biomass production, yield and nutrient uptake results are available for most years and will be summarized in the poster together with some of the data on crop nutrient uptake. The experiment has also accommodated related studies on e.g. the relationship of root hair promoted P uptake of selected barley genotypes to the grain yields in P limiting soil (Gahoonia and Nielsen, 2004) and the ability of different catch crop species to mobilise and take up P and K from soils of low availability, as well as their ability to deliver P and K to the subsequent main crop (Jensen et al., 2005).

Gahoonia, T. S.; Nielsen, N. E. 2004 Barley genotypes with long root hairs sustain high grain yields in low-P field. *Plant and Soil*. 262, 55-62

Jensen LS, Pedersen A, Magid J, Nielsen NE. 2005 Catch crops have little effect on P and K availability of depleted soils. *DARCOF e-news* 2, 1-7.