

# Phosphorus fertilization in field vegetable production



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# Why to focus on P fertilization?

- Eutrophication of Baltic Sea and inland waters has been a big issue in the Finnish media in summer 2018
  - Role of agriculture and phosphorus is continuously debated
- The use of P fertilizers has decreased, but in vegetable production high levels of P fertilization are still allowed and used



*Cyanobacteria in the lake water, photo from Luke's archive*

# P fertilization is limited in the Finnish agri-environmental programme

- 86% of all growers are involved in the programme
- No "official" P fertilization recommendations in horticulture; the P limits are often regarded as recommendations
- Below the allowed P fertilization (kg/ha) in different crops and different soil P classes

Species	P status in soil (the Finnish classification)					
	Poor	Tolerable	Satisfactory	Good	High	Very high
Cabbages and onion	110	80	60	40	25	10*
Root crops	100	75	55	35	30	10*
Peas and beans	50	35	25	20	15	10*
Other vegetables	100	60	50	40	20	10*
Herbs and other crops	28	20	12	8		

\* Allowed if sowing or planting is before 15 May (or in some areas before 15 June)

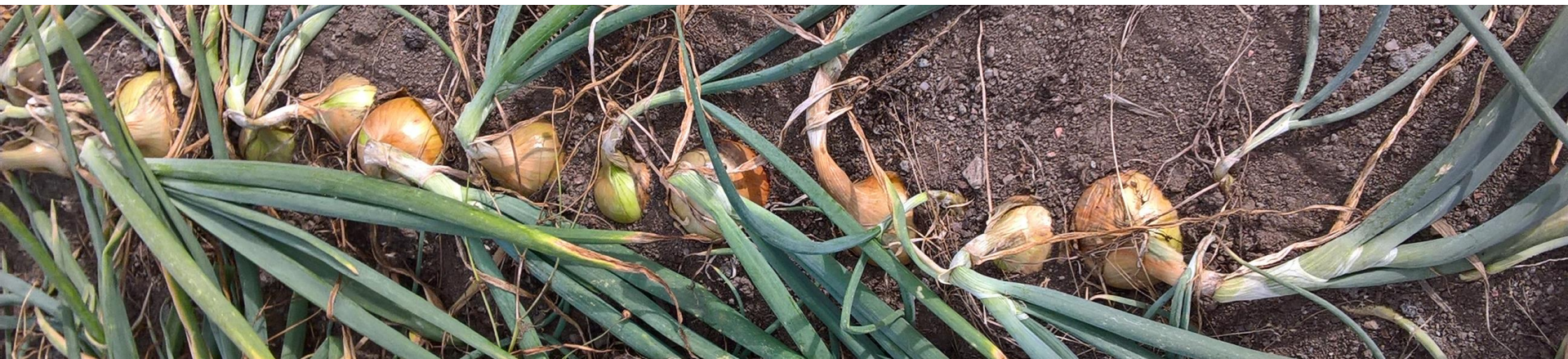
# Objectives

- To measure the yield response of different vegetable species to P fertilization (in soils of different P status)
- To deliver information on P cycles to growers, by means of
  - calculating P balances for vegetable fields
  - making some measurements of P leaching, both under controlled conditions and in fields



## Experimental work

- In 2014-2017, field experiments with **onion, white cabbage, carrot and celeriac**
  - Uusitalo, R., Suojala-Ahlfors, T., Kivijärvi, P., & Hurme, T. (2018). Yield responses to P fertilisation of onion (*Allium cepa* L.) and cabbage (*Brassica oleracea* Capitata Group L.) in Finland. *Agricultural and Food Science*, 27(1), 63–73. <https://doi.org/10.23986/afsci.67703>
- New projects started in 2017 and 2018, financed by the European Agricultural Fund for Rural Development
  - Experiments with **iceberg lettuce, pickling cucumber, swede** (*Brassica napus* ssp. *napobrassica*)
  - Farm experiments also with onion and white cabbage



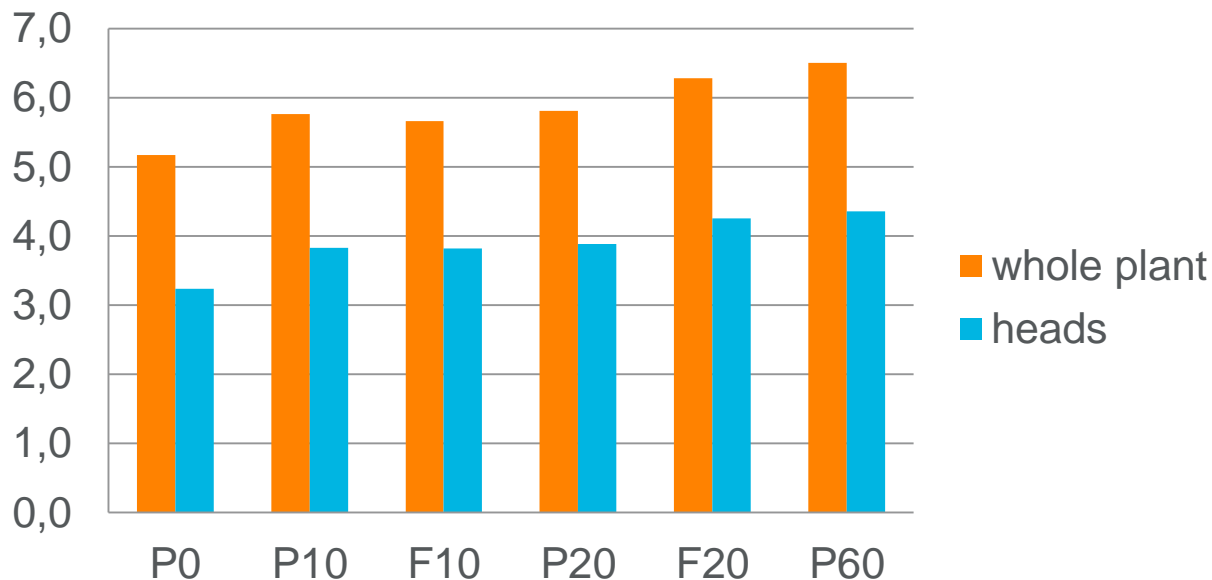
# Results

- **Onion and white cabbage:** three experiments in three years in both crops
  - Only on one site statistically significant effect of P fertilization was found
  - Even on that site (with low P in soil) 10–12 kg/ha of P was sufficient to produce 97% of the yield maxima (note: 80 kg/ha P is allowed)
- **Carrot:** no significant effect of P fertilization found in farm experiments, comparing the P fertilization of 0 and the "normal" amount used by the grower
  - Yield increase due to P fertilization was on average 4%

## Results, continued

- **Iceberg lettuce:** 4 experiments in 2017-2018, with P fertilization treatments 0, 10, 20 and 60 kg/ha (plus a liquid starter fertilizer (Flex) with P 10 or 20 kg/ha)
  - A trend of increasing yield with a higher P application

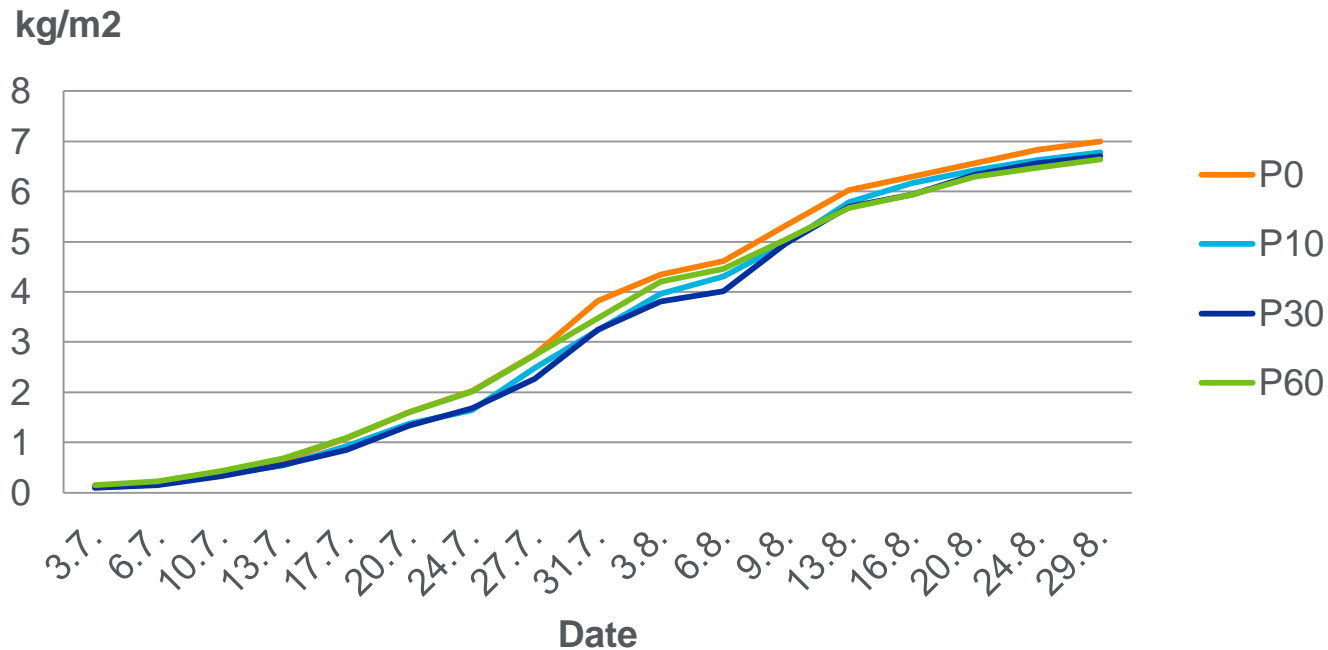
2017, 2<sup>nd</sup> planting, fresh biomass (kg/m<sup>2</sup>)



# Results, continued

- **Pickling cucumber in 2018**
  - no effect of P fertilization (0, 10, 30 or 60 kg/ha) on yield

Cumulative total yield of pickling cucumber in 2018





## Further plans

- Field and farm experiments on yield responses of different vegetables to P fertilization will be continued
  - P balances will be calculated for vegetable fields and P leaching will be measured from some soils (e.g. with the aid of rain simulations)
  - Information on the soil P reserves and P fertilization will be distributed to the growers in field days, seminars and media
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- New recommendations for P fertilization in vegetable production will be prepared in the future
  - Know-how of the growers will be improved

Thank you!