

Soil fertility, nitrogen availability and plant growth in new vegetable production systems

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Vegetable production and consumption needs to increase in order to improve the sustainability of food systems¹. However, vegetable production faces several challenges:

- Intensive and frequent soil cultivation harms the soil.
- Traffic with heavy machinery under unfavourable conditions causes soil compaction.
- High fertilizer application poses a risk for nutrient leaching.

Therefore, alternative production solutions are needed to overcome these challenges. In this talk, three new production systems are presented: roller-crimping as a way to implement no-tillage under organic conditions^{2,3}, controlled traffic farming⁴ and inter-cropping. These systems have been investigated in field trials, where crop response, root growth, and nitrogen uptake were measured. Vegetable yields were improved under controlled traffic farming and in inter-cropping, whereas roller-crimping reduced yields. Positive effects on root growth and nitrogen dynamics were found for controlled traffic farming and inter-cropping. Results indicate a promising potential for implementation of some of the production systems, whereas others need to be further improved before applied in practice.

References

1. Willett, W., Rockstrom, J., Loken, B., 2019. Food in the Anthropocene: the EAT-Lancet Commission on healthy diets from sustainable food systems (vol 393, pg 447, 2018).
2. Hefner, M., Canali, S., Willekens, K., Lootens, P., Deltour, P., Beeckman, A., Arlotti, D., Tamm, K., Bender, I., Labouriau, R., Kristensen, H.L., 2020a. Termination method and time of agro-ecological service crops influence soil mineral nitrogen, cabbage yield and root growth across five locations in Northern and Western Europe. *Eur. J. Agron.* 120, 126144.
3. Hefner, M., Gebremikael, M.T., Canali, S., Sans Serra, F.X., Petersen, K.K., Sorensen, J.N., De Neve, S., Labouriau, R., Kristensen, H.L., 2020b. Cover crop composition mediates the constraints and benefits of roller-crimping and incorporation in organic white cabbage production. *Agric., Ecosyst. Environ.* 296, 106908.
4. Hefner, M., Labouriau, R., Nørremark, M., Kristensen, H.L., 2019. Controlled traffic farming increased crop yield, root growth, and nitrogen supply at two organic vegetable farms. *Soil Till. Res.* 191, 117-130.