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Organic greenhouse vegetable production: nutrient balances and effects on soil chemistry

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Organic greenhouse vegetable production is a highly intensive production system. High nutrient demands due to high yields require high nutrient inputs via different fertilizers. Actors in this system find totally different circumstances compared to organic systems outdoor. The typical “tools” used in organic farming like crop rotation or green manure which provide soil fertility are hardly used because the infrastructure is so expensive that it is simply uneconomic. To gain insight into nutrient flows in this kind of production system, area-related nutrient balances were calculated on five Austrian organic horticultural farms. To evaluate the effect of organic greenhouse vegetable production on soil chemistry, soil samples from inside and outside greenhouses were compared regarding soil pH, salinity, soil organic matter content and nutrient contents.
Nutrient flows on all farms showed strong imbalances with high average surpluses for all assessed nutrients except potassium. Many soil chemical traits in the greenhouses differed from the situation outside. The method “greenhouse vegetable production” led to an accumulation of soil organic matter and to a strong increase in soil salinity. Several nutrients (N, P, K, Ca, Mg, S) accumulated in the topsoil and appear in huge quantities in plant available form. Also the ratios among the nutrients changed in an unfavourable way. The results indicate that, within this intensive production method, it is very challenging to achieve a balanced fertilisation and to create a sustainable system, which is the point of organic philosophy.