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Wirtschaft, Bildung und Forschung WBF
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Estimation of nitrate leaching in field vegetable production

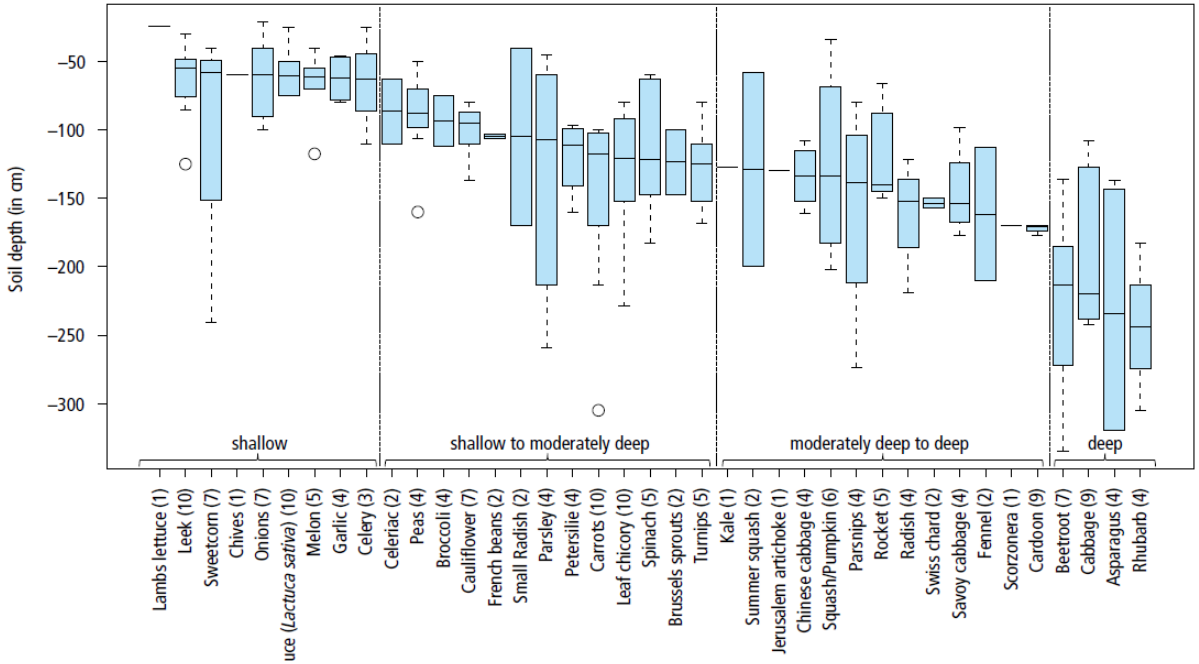
Ernst Spiess, Frank Liebisch, Reto Neuweiler and Oliver Zemek

13 April 2021

Initial situation

- Field vegetables are often grown in nitrate vulnerable zones in Switzerland.
- Data from literature show high N leaching losses from field vegetables.
- Published results are not suitable for differentiating nitrate leaching by vegetable species because experimental conditions (soil, climate, farming practices, measurement methods [lysimeters, suction cups, SMN]) differ widely.

Methods



- Data from literature on three parameters
  (i) crop N demand,
  (ii) amount of N in crop residues and
  (iii) rooting depth
  were compiled for 40 vegetable species

- For each parameter, a score from 1 (low) to 4 (very high contribution to leaching potential) was assigned to the vegetable species.

- Nitrate leaching potential = sum of the scores (minimum of 3 and a maximum of 12)

Results

- Some cabbage species (e.g. cauliflower, broccoli and Brussels sprouts) have a high nitrate leaching potential, due to the high N fertilizer use and high quantities of N in the crop residues.
- Leafy vegetables (e.g. lettuces, spinach), most of which are shallow rooting, show a low to medium potential due to the lower N fertilizer requirement and the smaller amount of N in the crop residues.

Vegetable	N-Target Value	Amount of N in Crop Residues	Rooting Depth	Total Score	Potential
Cauliflower	4	4	3	11	high
Broccoli	4	4	3	11	
Brussels sprouts	4	4	3	11	
Leeks	3	3	4	10	
Savoy cabbage	4	4	2	10	
Courgettes	3	4	2	9	Mod-erate
Sweetcorn	2	3	4	9	
Cabbage	4	4	1	9	
Celery	3	2	4	9	
French beans	2	3	3	8	
Chinese cabbage	3	3	2	8	
Peas	2	3	3	8	
Kale	4	2	2	8	
Kohlrabi	3	2	3	8	
Chives	3	1	4	8	
Celeriac	3	2	3	8	
Beetroot	3	3	1	7	
Onions	1	2	4	7	
Carrots	2	2	3	7	
Lettuce (*Lactuca sativa*)	2	1	4	7	
Fennel	2	2	2	6	Low
Squash, Pumpkins	2	2	2	6	
Parsnips	2	2	2	6	
Lamb's lettuce	1	1	4	6	
Turnips	2	1	3	6	
Leaf chicory (*Cichorium*)	2	1	3	6	
Scorzonera	2	1	2	5	
Spinach	1	1	3	5	
Swiss chard	2	1	2	5	
Parsley	1	1	3	5	
Radishes	1	1	3	5	
Mooli	2	1	2	5	
Rocket	2	1	2	5	

Conclusions

- The approach presented here for differentiating vegetables according to their nitrate leaching potential can be further developed with the help of modelling.
- Instead of individual species of vegetables, crop rotations that are typical for Switzerland should be assessed.
- The modelled data could be verified by means of measured values obtained from new experiments.