Recent evolution and trends in the soil fertility of Flemish vegetable fields (1998-2011)

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In the last 23 years (1989 - 2011), the Soil Service of Belgium (SSB) determined the soil fertility of more than 65 000 soil samples from fields with typical vegetable rotations. The samples originated from the whole of Flanders, but especially from the sandy-loam and sandy soils in West-Flanders (the major vegetable-growing area in Flanders). Soil samples were taken in the ploughing layer (0-23 cm) in order to determine the overall soil fertility (pH, C, P, K, Mg, Ca, Na). Liming and fertilization recommendations were calculated by the BEMEX expert system.
In this contribution, the statistics and trends of the soil fertility are discussed for cauliflower and leek.

Table 1 - Number of soil samples taken in fields with cauliflower and leek in sandy and sandy-loam soils from 1989 to 2011

		1989-1991	1992-1995	1996-1999	2000-2003	2004-2007	2008-2011
cauliflower	sandy loam	547	960	1183	1779	1583	1519
	sandy	483	483	757	900	740	651
leek	sandy loam	355	708	1076	1589	1750	1643
	sandy	529	545	1124	1240	1421	1136

The soil samples presented were taken just before or just after planting, in the ploughing layer (0-23 cm). Soil texture is determined by palpation. pH is measured in a KCl-solution. C-content is determined with the modified Walkley & Black method and is expressed in %. The elements P, K and Mg are extracted in ammonium lactate extract and then determined by Inductively Coupled Plasma (ICP). They are expressed in mg/100 g dry soil.

Soil fertility in cauliflower and leek fields

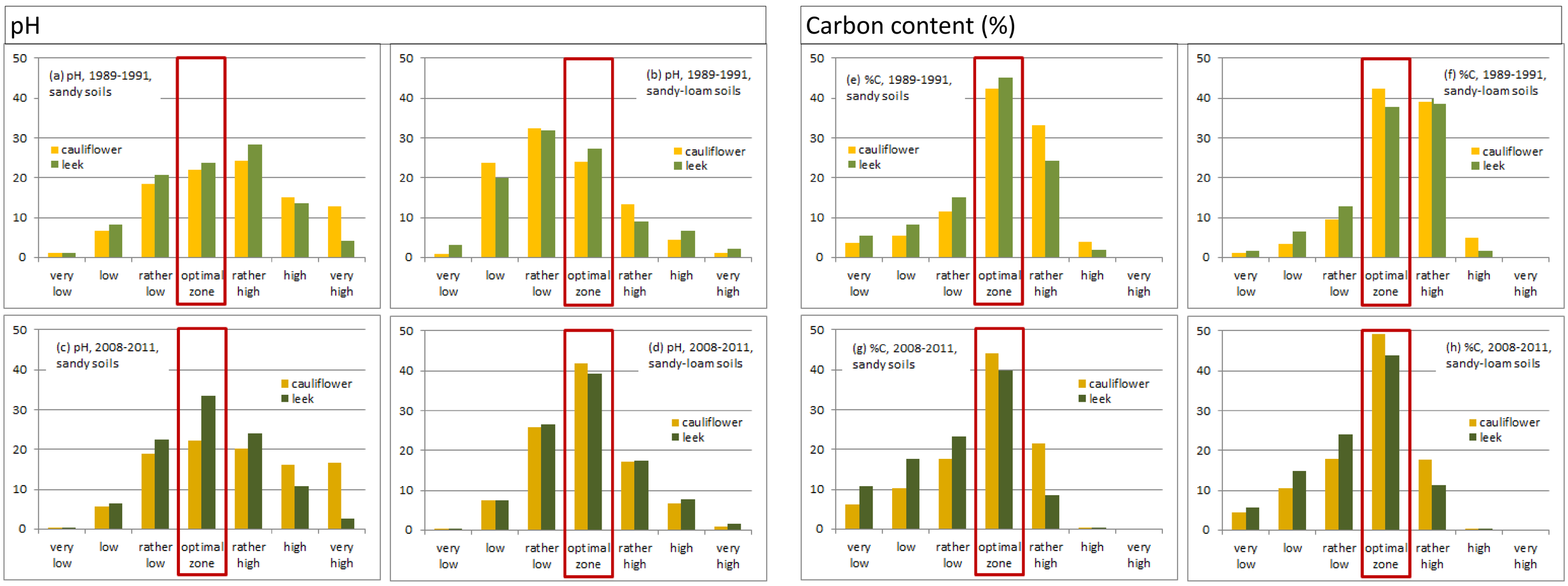

Figure 1 Soil fertility for cauliflower and leek in the periods 1989-1991 and 2008-2011, in the sandy and sandy-loam regions of Flanders. Soil fertility is expressed by the pH (a, b, c, d), %C (e, f, g, h) and P (I, j, k, l).

<u>Soil acidity (Fig. 1, a, b, c, d) and liming recommendations</u>

Both for cauliflower and leek, especially in the sandy-loam region, the pH improved considerably between 1989-1991 and 2008-2011. The percentage of parcels with a pH below the optimum range decreased from 57% to 33% for cauliflower and from 55% to 34% for leek.

Due to the observed improvement of the pH especially in the sandy-loam region, the average liming recommendations in this region decreased between 1989-1991 and 2008-2011 respectively from 1625 nv/ha to 942 nv/ha for cauliflower and from 1498 nv/ha to 938 nv/ha for leek.

<u>Carbon content (Fig. 1, e, f, g, h)</u>

Both for cauliflower and leek, in both regions, the C content of the soil decreased between 1989-1991 and 2008-2011. The percentage of parcels with a C content below the optimum range increased considerably between the two periods, from 14-21 to 33-34% in cauliflower and from 21-29 to 45-52% in leek parcels.

<u>Phosphorus content (Fig. 1, i, j, k, l) and fertilization recommendations</u>

Since 1989-1991, all cauliflower and leek parcels in both regions are very well supplied with P. Most of the parcels show a P content higher than the optimum range in 1989-1991, and this situation has not changed in 2008-2011, although it should be noticed that the historical enrichment of P in the soil has been stopped.

In parcels with a low P content, the P fertilization recommendations are higher than the crop uptake, in order to redress the P status of the soil and to guarantee a sufficient P supply for the crops. However, because of the high P content in most of the agricultural parcels, P recommendations are in general lower than the crop uptake and often zero applications are recommended.

<u>Conclusion</u>

Results of standard soil analyses in vegetable fields, performed by the SSB in the last 23 years (1989 - 2011), indicate an improved soil acidity (pH) for cauliflower and leek parcels in the main vegetable growing areas in Flanders. However, measures remain necessary because approximately 25 to 33% of the parcels still show a pH below the optimal range.

As for the soil organic matter content, the data show an unfavorable evolution between 1989 and 2012, with a significant increase of the percentage of parcels below the optimal zone of C-content. Especially in the vegetable growing region in Flanders, this evolution can be attributed to the frequent application of slurry, providing relatively high amounts of nutrients in combination with a low organic matter supply. To improve the situation, applications of organic fertilizers containing relatively more effective organic matter, such as litter manure or compost, should be recommended.

Finally, particular attention should be paid in the vegetable fields to the amounts and proportions of the different nutrient cations, in order to obtain an optimal plant nutrition. Accurate soil analyses are necessary in order to provide adequate fertilization recommendations and to fine-tune the overall fertilization.