Practice SQ n° 16

PREVENTING AND RESOLVING SOIL COMPACTION

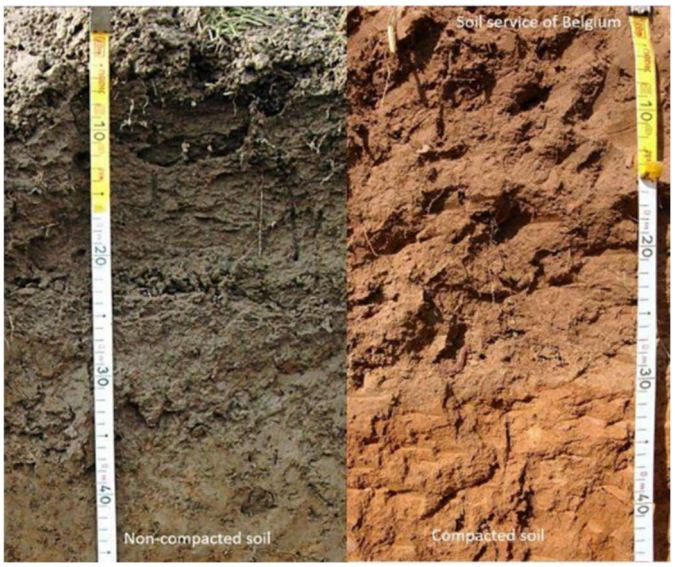
Introduction

Category: Good Practice (GP)

Practice identity card

#Soil compaction, tillage

#SQ, food, feed, industrial, fibre, oil, ornamental, Good Practice (GP), Belgium



Short description

- The prevention of soil compaction by reducing the load per cm² of soil and by taking care of the soil's carrying capacity is very important because the resolving of deep soil compaction (compaction just below the topsoil, 30-50 cm) is difficult. Resolving of deep soil compaction can be done by a combination of deep tilling, deep rooting crops and subsequent maximal prevention of re-compaction.
- Reducing the load per cm² of soil can be done by optimization of tyre size and pressure, by dividing the load over several wheels, by minimizing the total load as much as possible and by using semi-mounted machinery. In addition, the carrying capacity of the soil against compaction needs to be considered and this is much lower when the soil is wet and when it is freshly cultivated.
- Deep tilling to resolve soil compaction needs to be considered carefully. After deep tilling, deep rooted crops should be cultivated and measures that ensure maximal prevention for re-compaction need to be taken. Deep tilling, when done careless, can result in even deeper and stronger compaction. The use of deep rooting crops only is likely not sufficient to resolve deep compaction.
- Conservation tillage practices have less deep compaction.

➔ In some cases, use of fixed field pathways via RTK-GPS navigation can prevent compaction in the remaining field, often done in intensive vegetable production.

Implementation process

Which practice is considered as the standard in this region? none

What was the on-farm issue/challenge/opportunity that led to the implementation of the practice? Reduced crop yield in compacted areas.

How long did it take to implement the practice, and which are the measures needed to monitor: Farmers need to be aware of the risks of soil compaction when going into their fields when the soil is too wet and with too heavy loads. There is need for a mentality shift but there is also the need for adaptions on the tractors and the rest of their machinery. We estimate it will take 3-5 seasons to implement the practise with a new farmer.
Farmers often know their "bad spots" in the field. In those spots, during wintertime, using a penetrometer (either digital or manual) can help investigate whether these bad spots are due to deep soil compaction. Deep soil compaction = compaction just below the top soil (30-50 cm). Use of a penetrometer should be done when soil is at field capacity, penetration of soil should be very easy then. Resistance against penetration can indicate soil compaction.

Logistics

- **Logistic aspects to consider:** Prevention of soil compaction is a very logistic measure, e.g., tyre pressure needs to be adapted when entering the field, total loads need to be minimized as much as possible and when the soil's carrying capacity is too low (e.g. wet soil) it can be better to move soil cultivation or other farm activities until drier periods. This is not always possible (e.g. harvest of late crops, fertilizing nearby or past critical sowing periods), then minimizing of the load per cm^2 is critical. This can even be achieved by use of a smaller harvest trailers on the field in combination with bigger ones next to the field or by only half-filling manure tanks.
- **Skill/education level required:** rather high

Agronomical traits

- **Can the practice be applied to a multitude of cultivation techniques?** Must be applied to a multitude of cultivation techniques, from fertilizer application to soil cultivation, sowing and harvesting.
- **Targeted crop categories:** food, feed, industrial, fibre, oil, ornamental
- **Soil types suitable for the practice:** sandy, clay, loamy, silty
- **Expected effect on crop yield**: increase
- **Expected effect on crop yield variation**: decrease
- **Expected effect on crop quality:** increase
- **Expected effect on crop quality variation:** decrease
- **Which costs may increase due to the practice?** unskilled labour, skilled labour, equipment, transportation
- **Which costs may decrease due to the practice?** fuel
- **Expected long-term/indirect economic benefits of the practice:** Prevention (and resolving) of soil compaction will lead to higher yields.
- **Expected effect on the leaching of nutrients:** Not clear. In theory, better root development of

crops in non-compacted soil should increase nutrient uptake, thus lower leaching losses. But at the moment there is not sufficient proof of that.

Administrative context

- **Does the practice qualify for subsidies?** Some parts of this practise qualify for subsidies. For example, the Flemish government provides partial financing of pressure exchange systems and low-pressure tyres.
- **Are there any policy barriers complicating the practice's application?** Yes, policy related to influencing timing of land practices decreases the flexibility of the farmers to plan the work according to the day by day climatic conditions, which is necessary when taking the soil's carrying capacity maximally into account.
- **Does the practice involve the use of hazardous substances?** No
- **Is the practice compliant with EU organic farming practices?** Yes
- **Is the practice supported by Eco-schemes?** Yes, some specific applications. For example, sowing a multi-annual alfalfa could help protect the soil against re-compaction after deep drilling and is part of the CAP ecoschemes. In addition, practising no-till could prevent deep compaction to worsen or even improve over time.
- **Are there any gaseous emissions to be considered upon application of the practice?** No
- **Greenhouse gas (GHG) reduction potential of the practice:** substantial
- **Expected effects from the practice on the time occupation of the farmer?** moderate increase
- **May the practice contribute to a better public image of agriculture?** It should. When farmers take care of the soil, this has positive effects beyond their production, e.g., towards water management.
- **May the practice improve the farmer's self-image?** Yes, taking care for the soil is taking care for the future.

Contact

Name of the FIN (Fertilization Innovation Network) partner submitting the information: Soil Service of Belgium/ILVO
Contact information of the FIN partner: mverbeeck@bdb.be
Eu member state: Belgium

Find out more

Source of information Practical research, published in written sources.

Additional info/links:

Elsen F., Beckers V., Diels J., Van Orshoven J., Wauters S., Huybrechts M. (2014). Praktijkonderzoek naar de toepassing van preventieve en remediërende maatregelen tegen bodemaantasting door bodemverdichting. Studie uitgevoerd in opdracht van de Vlaamse Overheid, Dep. Leefmilieu, Natuur en Energie, Afd. Land en Bodembescherming, Ondergrond, Natuurlijke Rijkdommen, door

de Bodemkundige Dienst van België, het Departement Aard- en Omgevingswetenschappen (KU Leuven) en Thomas More (KU Leuven Associatie). 314 pp. (https://archief.algemeen.omgeving.vlaanderen.be/xmlui/handle/acd/450128)

Vanderhasselt, A., Cool, S., D'Hose, T., & Cornelis, W. (2023). How tine characteristics of subsoilers affect fuel consumption, penetration resistance and potato yield of a sandy loam soil. Soil and Tillage Research, 228. https://doi.org/10.1016/j.still.2022.105631

Vanderhasselt, A., D'Hose, T., Sneyders, M., & Cornelis, W. (2024). Effects of road- vs. field-recommended tyre inflation pressures and small variations in soil moisture content on traffic-induced soil compaction during seedbed preparation. Soil and Tillage Research, 241. https://doi.org/10.1016/j.still.2024.106109

Vanderhasselt, A., Euben, R., D'hose, T., & Cornelis, W. (2022). Slurry Spreading on a Silt Loam Soil: Influence of Tyre Inflation Pressure, Number of Passages, Machinery Choice and Tillage Method on Physical Soil Quality and Sugar Beet Growth. Land, 11(6). https://doi.org/10.3390/land11060913

Vanderhasselt, A., Steinwidder, L., D'Hose, T., & Cornelis, W. (2024). Opening up the subsoil: Subsoiling and bio-subsoilers to remediate subsoil compaction in three fodder crop rotations on a sandy loam soil. Soil and Tillage Research, 237. https://doi.org/10.1016/j.still.2023.105956