



## SOIL DEGRADATION SPECIAL

### What is Compaction?

Soil compaction occurs in instances when the soil is too weak to withstand the external forces applied for example due to (high) wheel loads from cars or lorries or tilling machinery. It is estimated that in Europe alone more than 32 million hectares of soil has been degraded irreversibly as a result too heavy machinery and a not site adjusted site management during the year. As consequences root growth and root penetration, nutrient and water uptake but also water logging and reduced aeration as well as anoxic gas emission like  $N_2O$  and  $CH_4$  have to be considered as a consequence of soil compaction.

**Previous editions of Geijkt Nieuws have already discussed our new laboratory equipment for research in soil mechanics. This equipment was developed in close collaboration with Kiel University in Germany, a leading institution in soil compaction research, so it is high time for an interview with Prof. Horn, project leader and vice dean at the Agricultural and Nutritional Sciences faculty of the university.**

To begin, Prof. Horn introduces the university: "Kiel University, Christian-Albrechts-Universität (CAU) was founded in 1665 and currently has about 22,000 students. It has a variety of educational fields, spread over eight faculties. The Faculty of Agricultural and Nutritional Sciences is one of the smaller faculties. In this field, students can choose from four specialisations at both the bachelor's and master's level: plants, animals, agricultural economics and environmental sciences. There are 28 professors in total, as well as 70 research assistants and 90 non-academic staff members (such as technical assistants) working in the faculty. Every year between 40 and 50 students graduate with a PHD Thesis in this field, which the German assessment standard has rated very highly for both educational and scientific activities."



Photograph: L.Stroosnijder

"Personally, I work as a professor of soil sciences. Together with three research assistants I teach classes in all relevant soil sciences related subjects. In 1988 I was appointed professor of soil protection and since 1998 I have also been a dean at the CAU. Before I joined the university, I worked in Bayreuth for five years as a professor of soil sciences."

Prof. Horn then explains why soil deformation is such a hot topic these days. "It's a growing problem. The deformation causes irreversible degradation of the soil. In agriculture, for example, an increase in the use of tilling machines also means that the wheel load increases (from a tractor wheel which in additional repeatedly drives over the same ground). These still increasing machine masses and increasing wheel loads create even at the same contact area pressure but increasing contact area changes in the physical, physicochemical and biological properties of the soil. In addition, these changes expand ever deeper into the soil and there are hardly any natural processes that work to counter this."

"The storage capacity for air and water changes, there is less root growth, the flux density of nutrients, gas and water change, and there is an increasing chance of degradation due to water erosion. These are all visible and observable consequences of maladjusted land use and soil management. Add to that the increasing  $N_2O$  emissions and a decrease in carbon storage in the soil and you can see that it is of the utmost importance to take soil deformation seriously. Ongoing research into this complex subject is therefore critical because, as I said before, there are now more than 32 million hectares of European soil permanently degraded."

"When I was still a PhD student with Prof. Hartge, we started to develop special soil mechanics research equipment. We did this simply because this kind of equipment was either not available, far too expensive or it could only partly be used for our research objectives. Because the identification and analysis of soil deformation processes (compaction/slipping) and their consequences required more extensive determination of solidity parameters, we focused on this during development. Actually, even if I had had the financial resources to buy suitable equipment, I still would have had to add important aspects (distortion stress and other stress-related changes in hydraulic and pneumatic aspects) in order to get an answer for our research questions."



Together with Eijkelkamp Agrisearch Equipment, new soil mechanics equipment was developed. Prof. Horn explains how this came about: "My collaboration with Eijkelkamp Agrisearch Equipment has existed for about 30 years already. That's why I approached Eijkelkamp about further optimising our existing soil mechanics equipment and distributing it worldwide. In our eyes, the unique properties of the products deserve attention and I am also convinced that there is a large market for them. We, the university, are still sometimes reproached for being able to use special research technology. Though, we always were happy to contribute to projects, for example for the European Union, where our equipment was required. But from now on, anyone can buy the equipment."

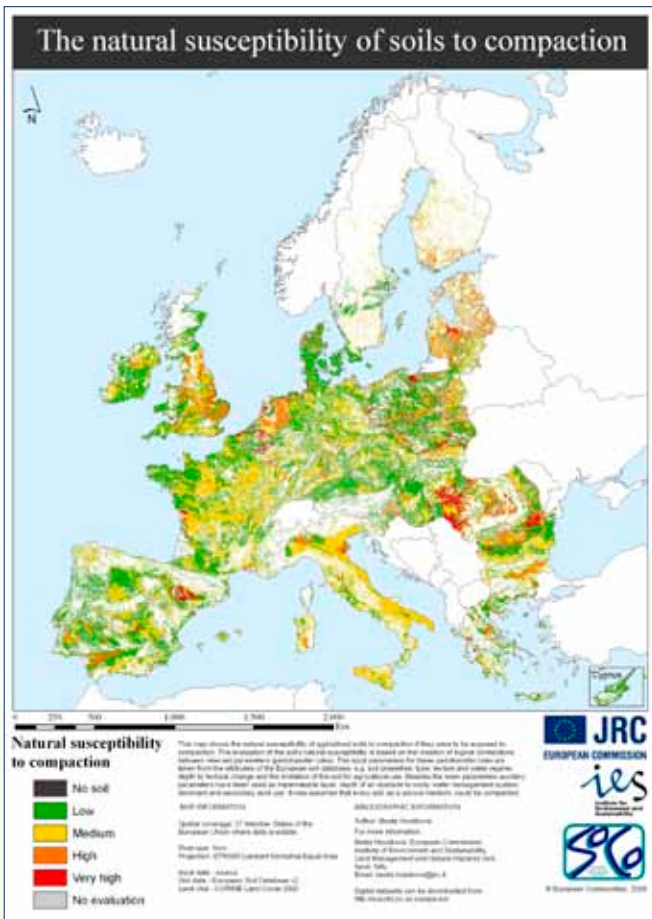
"For universities (those with agricultural, forestry, geological and environmental departments), research institutes, consultants and engineering firms, the equipment will absolutely come in handy. Questions about the physical and physicochemical properties of a soil can all be answered with these instruments."

"The collaboration with Eijkelkamp was very effective. We provided the scientific knowledge and background and Eijkelkamp handled the technical aspects and development."



The new designs were tested, analysed and adjusted as necessary in both Kiel and Giesbeek. The final testing rounds took place in Germany. The results attained could then be optimally compared with the results given by the 'old' machines. The different machines each have their own specific properties. However, they are all very user friendly, have an excellent price/quality ratio, meet the relevant ISO standards and are durable."

The professor can definitely see new partnerships in the future: "At our university there are always ideas for equipment to be developed. And I am convinced that we will work with Eijkelkamp again someday, which will result in excellent equipment, just like it did this time."



The different laboratory equipment is described in detail in our brochure **Laboratory Equipment for Soil Mechanical Measurements**, which is in English. You can download it from [www.eijkelkamp.com](http://www.eijkelkamp.com) or request a copy via [info@eijkelkamp.com](mailto:info@eijkelkamp.com) or +31 313 88 02 00.

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