### Problem:
Our planet is at risk to enter “Hothouse Earth” conditions [1]. This means that the earth climate will in the long-term stabilize at a global average of 4-5°C above pre-industrial temperatures and with sea levels of 10-60 m higher than today.

### Solution:
Avoiding a “Hothouse Earth” requires not only reduction of carbon dioxide and other greenhouse gas emissions, but also enhancement and/or creation of new biological carbon stores [2]. The US planted 91 Million acre of corn in 2017 that assimilate ~ 815 Million Metric tons of CO$_2$. It is estimated that soil carbon content can be increased by ~1 Gt per year with deeper rooting maize varieties.

### Challenge:
Root traits linked to deeper rooting such as whorl number, distance and number of roots per whorl are hidden inside the root architecture [3]. However, automated high-throughput phenotyping of these traits is needed to identify genes controlling deeper rooting and therefore the release of CO$_2$ into deeper soil levels.

---

**Validation of sample root system**

- Root number
- Whorl number
- Number of brace/crown roots
- Root system max/min width
- Root system max/min width
- Root angle

**Validation of individual root traits**

- Average diameter of brace root

**Automatic root trait measurement**

- Manual measurement
- Automatic measurement

**Conclusion**

1. Our 3D root reconstruction and trait measurement algorithms allow for the first time to automatically measure root system and individual root traits for field grown plants.
2. Our phenotyping pipeline enables the discovery of genes associated with deeper rooting by molecular biologists and pave the way to increase soil carbon sequestration in crops.