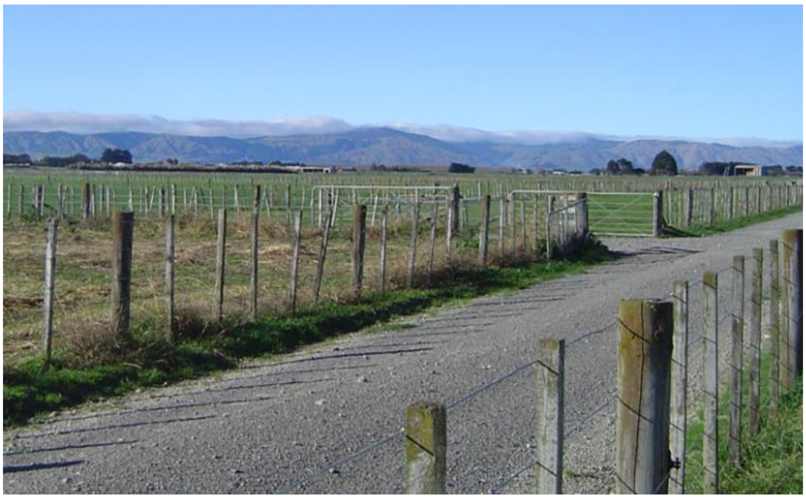
FindingPheno

December 02, 2021

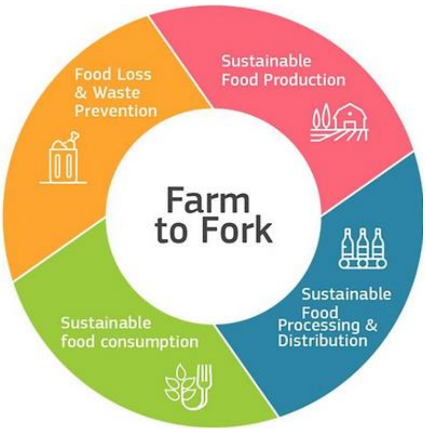
Big data down on the farm

Updated: Jan 4, 2024



Our need for food is growing, with global demand expected to increase by 70% by 2050 due to population growth and demographic change. Using our current farming methods to meet this extra demand would require new farmland covering twice the size of India. Meanwhile, the agricultural industry is the second highest greenhouse gas emitting industry, accounting for over 10 gigatons of CO_2 equivalents in 2014. Add in soil degradation, over-fertilization, pesticide residues, increasing water scarcity, and loss of biodiversity, and we are facing a sustainability challenge. **Based on this dilemma: how do we produce enough calories to feed everyone using land we have while reducing GHG outputs and environmental impacts?**

The EU is addressing this dilemma with the European Green Deal, and especially the Farm to Fork Strategy, providing funding and governmental support for the transition to more efficient and sustainable farming methods. This is supported by the EU Soil Mission focusing on the protection and restoration of healthy soils underpinning this green transition. Together, these policies have ambitious targets for reduced pesticide and antimicrobial use, reduced GHG emissions, and prevention of nutrient loss or over-fertilization. Technological innovation needed to meet these targets requires a deep understanding of how the ecology and biology of the entire farm ecosystem work together and data, lots and lots of data.



Agriculture 4.0

It is widely recognized that big data can revolutionize farming practices through precision farming, *i.e.* measuring and tracking many on-farm parameters in real-time to support decision-making. The idea is that gaining a precise picture of how farms are performing will allow farmers to continually optimize trade-offs between farm inputs (*i.e.* fertilizer, pesticide, water), food yields, GHG emissions, and profits. This movement is enabled by new technologies like autonomous vehicles, satellites, field sensors, and analytical testing methods, coupled with increased access to mobile devices and network connectivity. The importance of biological data is also being increasingly recognized, where nutrient conversion, disease resistance, climate resilience, yields and productivity are strongly influenced by the microbiome and genetic background of plants or animals being farmed.

So what is the problem?

Despite its potential, precision farming faces significant gaps in data generation or access. We lack fast, cheap and accurate methods to measure soil quality, plant nutrition or microbiome status. Moreover, the existing technology does not spread evenly across the globe and creates data deserts, and a lot of the data are hidden behind paywalls or locked in proprietary formats and lack of interoperability prevents data integration from various sources.

In addition, collecting and collating lots of data is not enough. This information needs to be made useful for farmers. The different data types need to be analyzed and interpreted in light of the relevant biological and agronomic context to find actionable insights within the data – giving farmers concrete advice or actions to manage their farms. Finding these insights requires sophisticated statistical tools and analysis frameworks like those being developed in **FindingPheno**. **By untangling the complex biological interactions underpinning different food production processes we aim to help enable this transition to more precise and sustainable farming practices.**

Written: Shelly Edmunds
Updated: Marie Sorivelle