NIAB world-class experience, skills and resources

IMPROVING PHENOTYPING METHODS IN CROP RESEARCH

The platform for hyperspectral seed imaging and automated seed quality analysis

NIAB has established a high-throughput and hyperspectral seed imaging system, Videometer and Autofeeder device, which can be used to assess seed quality with a throughput of over 100 seeds per minute (Figure 1).

NIAB has also developed a computer vision and machine learning system (SeedGerm) to automate the analysis of spectral wavebands (375–970 nm) of wheat and other crop seeds together with the quantification of seed size/shape, germination rate, protein content, and hydration state (Figure 2).

Using this platform, NIAB is collaborating with Royal Botanic Gardens Kew and the University of Cambridge to study and classify seed health, variety separation, seed vigour and quality, as well as the relationship between seed quality and yield impacts.

Figure 1. High-throughput and hyperspectral seed imaging

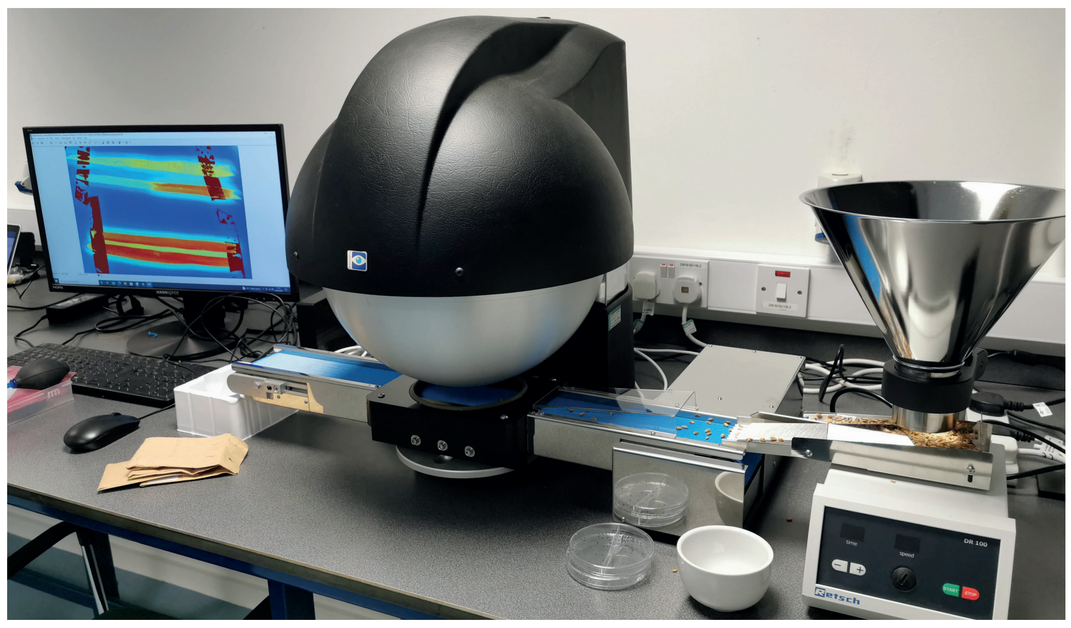


Figure 2. Automated analysis of wheat seeds

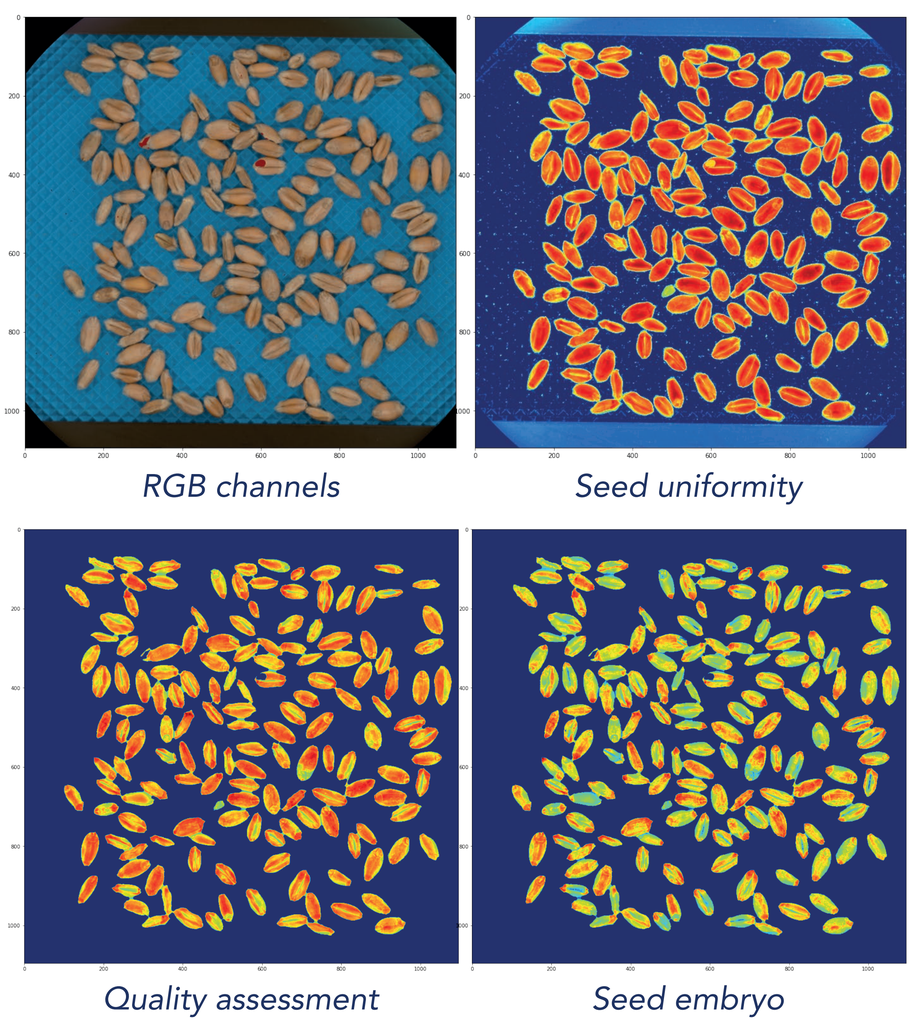
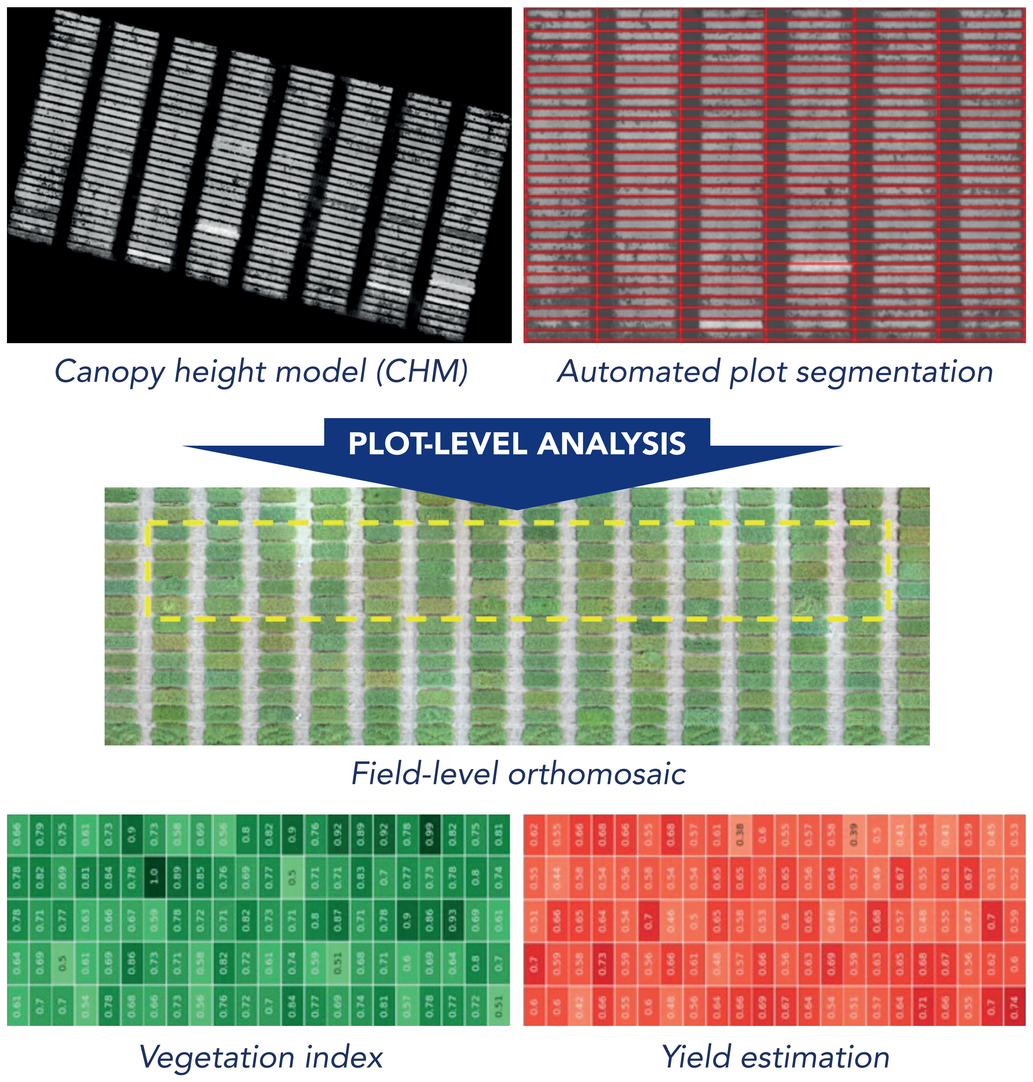


Figure 3. RGB & multispectral drone (450-840 nm)

Figure 4. AirMeasurer system



Field phenotyping using cost-effective UAVs and the AirMeasurer trait analysis software

NIAB has aerial phenotyping and unmanned aerial vehicle (UAV) pilots, with four drones, including RGB and multispectral, which have been utilised in both academic research and industrial trials (Figure 3).

To analyse big agridata effectively, NIAB has developed the AirMeasurer system to analyse spectral signatures, phenotypes, vegetative indices, pre and asymptomatic stages for wheat diseases (Figure 4).

This includes building AI-driven modelling using wheat varieties, key environment factors and UAV phenotyping datasets (e.g. growth rate, plant height, canopy coverage, and vegetative indices), through which yield production could be predicted dynamically.

Phenotype – the observable characteristics of a plant, resulting from the interaction of its genes with the growing environment