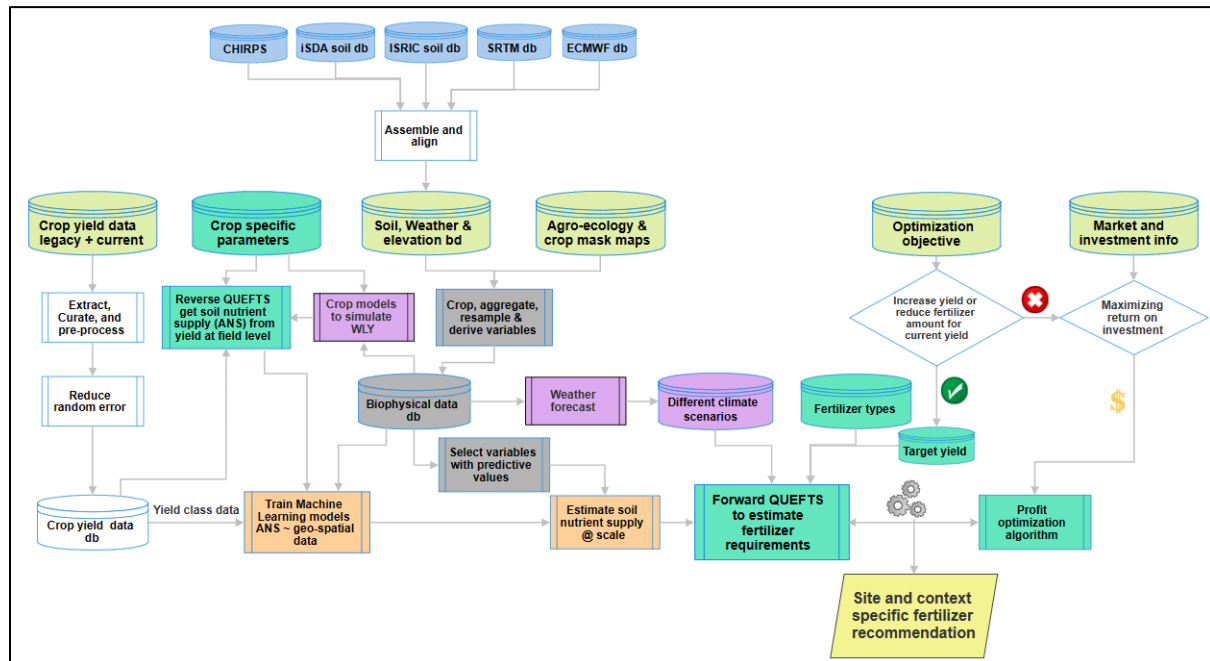# Tailored fertilizer advice analytical methods

Integrated approach: QUEFTS, Machine Learning and Crop models

This is the most advanced approach of AgWise whereby use of crop simulation models such as DSSAT, APSIM, LINTUL and Oryza is integrated with the QUEFTS plus machine learning approach. One the limitations of the previous two approaches where QUEFTS is used is how the attainable yield is defined. The key limitation of the previous QUEFTS-based approaches is how the attainable yield which is a requirement of QUEFTS is set. So far, the attainable yield was set at the yield obtained from the highest NPK treatment plus 20%. The additional 20% was a deliberate choice to mitigate the influence of management practices on the observed yield at the highest fertilizer rates, and secondly, to acknowledge that the nutrient rates utilized in most of the field rials data are not sufficiently high enough to mitigate all nutrient limitations. This approach however can still lead to an underestimation of the attainable yield at a location especially when the highest rate is still in the linear zone of the yield response curve and /or when the yield from such plots is low due to biotic and/or abiotic factors. This limitation was addressed by using the water limited yield estimated using crop simulation models as attainable yield. In addition, this integration enables AgWise to assess and account for the effect of weather on yield gap both in terms of climate scenarios and effect of panting dates and cultivar selection and provide climate smart tailored fertilizer advisory.

Data Needs: In addition to the data requirement outlined in the third approach, this method needs daily weather data spanning several years and crop management information for running crop simulation models. The sourcing of geo-spatial data and the procedures for

running crop models are semi-automated within AgWise streamlining processes for efficient and timely response.

Complexity: With the highest complexity among the four approaches, this method demands advanced skills in utilizing crop simulation models and conducting extensive data analytics. However, the integration of these advanced techniques enables AgWise to offer unparalleled precision and insight in delivering tailored fertilizer advisory, thereby maximizing agricultural productivity and sustainability.

Application: This integrated approach is successfully deployed in developing tailored fertilizer for cassava in Nigeria, Tanzania, Rwanda and Ghana