



FIRST Newsletter

Dec 2017, Issue 44

Portable Elemental Analysis Solutions for Agriculture

By Kimberley Russell, Business and Market Development, Bruker Nano Analytics, Kennewick, WA, USA

We all eat to satisfy hunger, acquire nutrients, and frequently for pleasure. But, do we really know if the food we eat is safe and nutritious? Bruker X-ray fluorescence (XRF) technologies help researchers, farmers and producers determine the presence of elemental nutrients and the absence of toxic metals in food and the land it's grown on.



Bruker's portable XRF (pXRF) customers monitor the composition of soils, fertilizers and irrigants in the field to optimize planting conditions for farming. Responsible use of fertilizers for macronutrients, such as phosphorus, sulfur, potassium and calcium, is of primary concern for

the health of crops and the environment. Fair Oaks Farm in Indiana, USA, is a large dairy farm with a sophisticated program to reduce their carbon footprint while practicing sustainable and profitable farming. Dairy cows generate a substantial amount of organic fertilizer containing a significant amount of phosphorus. Fair Oaks farming practices include [an organic manure nutrient recovery process](#) which results in reusable products – biofuel matter, irrigant water, starting material for high grade fertilizer and even animal bedding. Their on-farm fertilizer production plant uses Bruker's S1 TITAN

handheld XRF to help monitor optimal fertilizer mixes for final product.

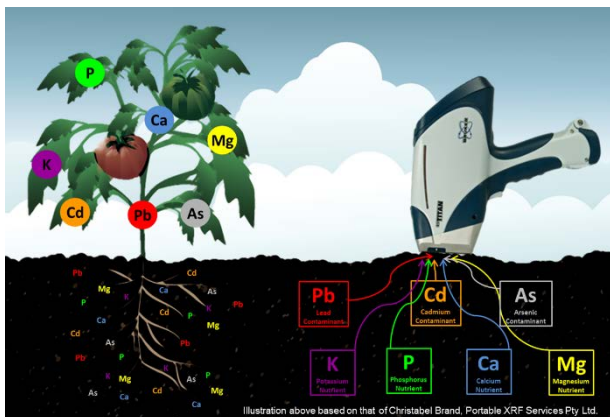


The World Agroforestry Centre in Kenya develops low-cost, portable methods to help small farm owners in developing countries improve nutrient management of their crops. Their [Soil-Plant Spectral Diagnostics Laboratory](#) provides services using Bruker's portable ALPHA Mid-Infra-Red analyzer and the TRACER handheld XRF to analyze soils, plants and fertilizers for productivity optimization. They geo-reference macro- and micro-nutrients, such as manganese, iron, copper, zinc and molybdenum, along with heavy metals to create soil maps of properties. These guides help farmers and the private sector, such as fertilizer suppliers, maintain best practices. Scientists at the Lab are currently working on a new project with their TRACER to understand more fully nutrient uptake of plants.

The Tree Fruit Research and Extension Center at Washington State University wanted to develop a non-destructive, low-cost and rapid method to determine the distribution of calcium and potassium on fruit. Calcium deficiencies can lead to loss of product from fruit trees, either during harvest or transportation to market. They [developed a semiquantitative method](#) using Bruker's TRACER handheld XRF to essentially map the surface of the fruit. Other researchers are also studying elemental distribution maps, such as for the efficient distribution of sulfur treatments on tomatoes.

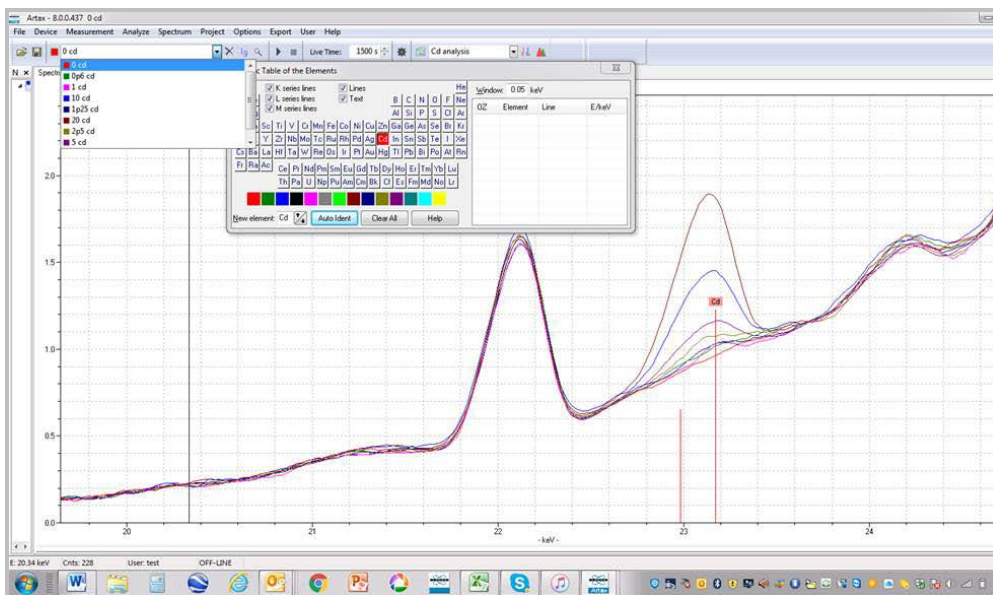


incorporate various programs to find more efficient and sustainable ways to grow crops, with special attention to extreme climates such as those suffering chronic drought conditions. Additionally, many of their outreach programs include helping local communities with urban agriculture. The Scripps Geosciences Research Division at the University of California in San Diego has expanded a citizen science program, [Soil Kitchen](#), to offer community members the opportunity to have their garden soil tested for toxic metals such as lead and cadmium.



Farming operations hope to start their growing season with nutrient rich soil, free of heavy metals or other deleterious elements. They try to plant seeds which grow best in native soil, but frequently must add liquid, powder or solid fertilizers to help optimize crop yields. Farmers need to ensure the plants grown absorb the nutrients and that the soil is sustainable for future growing seasons. Large corporate run farms aren't the only ones which require elemental analysis for precision agriculture programs. Small, rural and peri-urban farms supporting local communities also do. [Bruker portable XRF analyzers are used by researchers, farmers and producers to help achieve these goals.](#)

Emphasis on the need to feed an ever-growing population has led universities worldwide to expand their research into healthy soils and plants. They



Bruker **S1 TITAN** and **TRACER 5ⁱ** handheld pXRF analyzers provide multiple benefits including

- Analysis of soil, fertilizers and plants for elements from magnesium to uranium (TRACER 5ⁱ can also analyze sodium with its optional helium purge kit)
 - Measurement of elemental concentrations from PPM levels to 100%
 - Non-destructive measurement of sample material as-is or with minimal sample preparation
 - Battery operated and ruggedized analyzers, ideal for remote locations, at-harvest and in-situ tests
- Off-the-shelf pre-installed calibrations for point-and-shoot testing with no user adjustments necessary
 - Advanced data analysis software for qualitative analysis and user generated quantitative analysis
 - Low operation and maintenance costs with no hazardous waste disposal requirements
 - Powerful, green alternative to traditional ICP and AAS atomic spectroscopy methods

[For more information, contact Bruker's Handheld Elemental Analysis Group.](#)