

Isotope Ratio Mass Spectrometry (IRMS) at Monsanto Company

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The demands on world agriculture are greater than ever and continue to grow. At Monsanto, we are working to meet the world's growing food needs while protecting the environment and conserving natural resources. In June 2008, we issued this three-fold commitment that we call our Commitment to Sustainable Yield. We use breeding, biotechnology, and improved agronomic practices to meet our pledge of doubling yield, reducing inputs, and improving farmer's lives. Specifically, we will double the yields of corn, soy, cotton, and canola crops while reducing the aggregate use of key resources (land, irrigation water, and energy) by 1/3 per unit of output over the 30 year interval from 2000-2030.

The scientists at Monsanto realize that achieving all three of these commitments will be challenging, however, it is our premise that all of these must be accomplished to create sustainable agriculture. We use every applicable technique for solving these problems, one of which is stable isotope measurements using IRMS. Our current focus for this technology is natural abundance discrimination. This is a powerful tool for determining time averaged transpiration efficiency and transpiration rates by measuring ^{13}C and ^{18}O discrimination respectively. These traits can then be integrated with other environmental, physiological, metabolite, and genetic data to identify plants with better water-use efficiency and higher yield potential. This technique has already been successfully applied as a selection tool for breeding drought tolerant wheat at CSIRO Plant Industry, and we are working towards expansion of this approach for other crops. Last year, we switched from outsourcing our analyses at the UC Davis Stable Isotope Facility and installed a Thermo Delta V plus IRMS for in-house analysis. Bringing the analysis in-house has dramatically improved our understanding of the importance of proper sample preparation and has given us the flexibility to prioritize and re-prioritize the analyses on a real time basis. With this facility we continue to produce meaningful results in studies on both soy and maize.