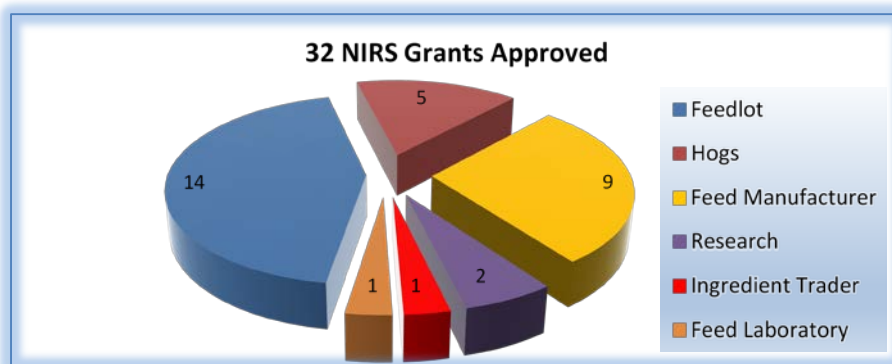
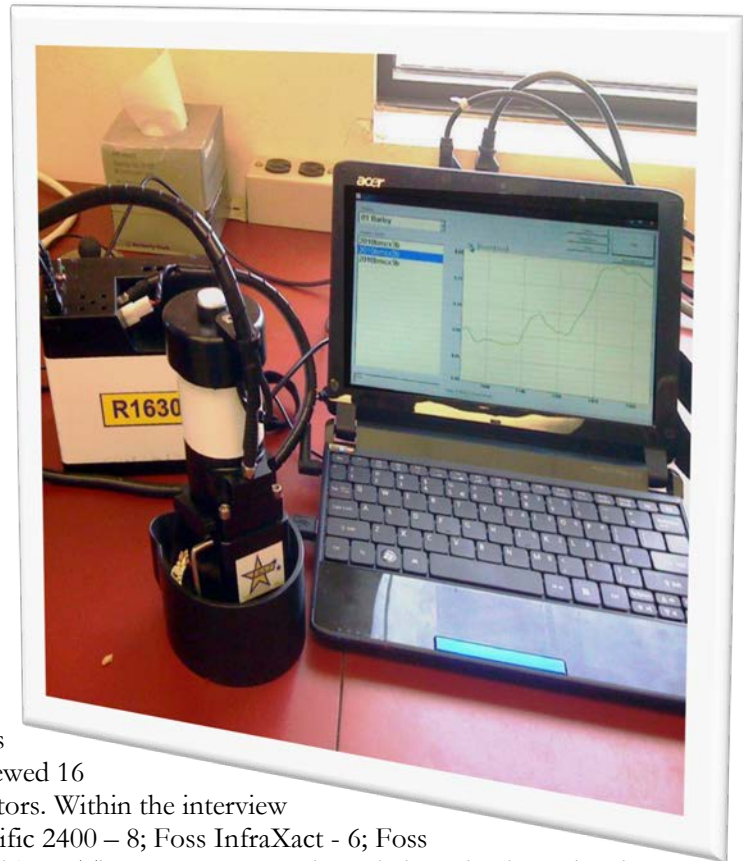


## NIRS Equipment Grant – User Survey, 2014

### Overview:

The near infrared spectroscopy (NIRS) equipment grant was established in 2011 with the objective to encourage placement of NIRS equipment that supports Alberta's grain and feeding sectors. The grant provides up to 50% of eligible NIRS equipment costs to a maximum of \$20,000 per package. It will end in March 2016 or when funds are depleted. Preference is given to those applicants that can have impact, share technology development, that enhance calibrations and that are strategic to all sectors of the grain and feeding sectors. The grant funds of \$750,000 came from the Alberta Livestock and Meat Agency (ALMA). The Alberta Crop Industry Development Fund (ACIDF) administers the fund.

To date, 32 NIRS grants have been approved; 24 of which have been using their NIRS equipment for greater than one year. As part of program due diligence, ACIDF interviewed 16 operations in the feedlot, pig and feed mill sectors. Within the interview group the manufacturer split was: Unity Scientific 2400 – 8; Foss InfraXact - 6; Foss DS 2500 – 3 and AgriNIR (Dinaminica generale) - 1. The purpose was to hear their evaluation related to start-up issues, present uses and confidence in the calibrations.



### Summary:

- This effort has involved farms, livestock feeders, feed mills, consultants, researchers and ARD expertise. Those that have come together are accomplishing results - new thinking, new partners, and new investments. Those who appear to have had the highest initial success have discussed their plan with others internal and external to their operation and involved ARD support.

- We know much more than one year ago but are not there yet. There is more to learn in incorporating NIRS use in financial decision making.
- NIRS uses can include identifying trends, quality control, ration formulation and/or pricing. Of these potential uses, its predominant use to date has been in a quality control function.
- NIRS use has been different at different locations, even if both are feedlots. Many users are participating in project work with ARD or consultants to update or develop calibrations – i.e. complete feeds, fecal starch, barley grain evaluation, and grain screenings.
- Calibration accuracy and its confidence remain the weakest link.
- The program has been good to get NIRS technology in use. Program support and any success includes Dr. Mary Lou Swift, ARD's expertise working with the individuals or thru the consulting/feedmill companies in providing objective, independent oversight; hands-on evaluation, development and refinement of calibrations; and in managing database development i.e. comparison of wet chemistry lab work for NIRS.
- For most users, the machine has not yet paid for itself, but several user comments are encouraging: worth the money; gaining confidence in machine; difficult to work without it now; expect can see long term changes in practice; view NIRS as longer term project; learning as we go; seeing value on some items; not sufficient confidence to use in buying or selling product but learning and need to be patient; at this time used for quality control; has probably paid for itself thru feed discounts and animal performance; predominant use is for some additional aspect of quality control – re: purchasers or formulation.
- Feed grain NIRS measurements that explain livestock performance remain elusive and as such feed grain pricing in relation to animal value is not presently possible.
- Private operations have developed new calibrations and are considering its sale to other local users.

**The individual comments have been combined and organized within the following headings:**

**What was said:**

- NIRS can be a valuable tool for commonly used feeds that are sampled routinely. NIRS is not of immediate value if the user is not familiar with the calibration i.e. for such ingredients as commodities that are infrequently used. Mixed forages and total mixed rations (TMR) are difficult but possible with expert user knowledge of calibration development.
- For purchased commodity feeds or by-products such as DDGS or screenings, NIRS allows user to know if product delivered is close to meeting specifications; and to identify and categorize different suppliers and different production plants which can be helpful to the purchase decision. Feed manufacturers have been notified when specifications are not met and understand they are being monitored.
- Useful in assessing trends of new crops grown; price is not part of process; bought to make better decisions – one more tool to help improve results.
- NIRS machine expectations were high at time of purchase but are finding that the logistics of incorporating NIRS into a livestock operations practices are difficult. Expectations of a practical, economic use for NIRS to identify high or low animal performance grain at the feedlot have diminished in the past year; are disappointed in not seeing value; NIRS viewed as unrepeatable outside of network.
- Cattle industry needs by-products and way to put a value on by-products such as DDGS, pulse or grain screenings, etc. NIRS allows for ability to reference incoming products but want the ability to stitch a realistic value to wheat, barley or by-products by comparing energy value back to barley at 84% TDN as base. To date, this is not possible.
- Operations considering NIRS need to have a business plan for use of machine, its updating and understanding its confidence levels and risks. It takes time and commitment (wet chemistry, training, planning) to incorporate NIRS machine into operations.

- Training is important. Machines are easy to use but understanding the limitations in the calibration are not fully realized. Need responsible person for database and monitoring calibration value.
- Objective in purchasing NIRS machine was to be more accurate in formulations; have the ability to differentiate between ingredient suppliers; eventually segregate if needed; ready to take next steps to increase machine use; quality control being considered but at this time monitoring repeatability of samples.
- NIRS machines have been relatively maintenance free other than calibration updates and for some, lamps burning out. Sample analysis is fast and sample cost is cheap.
- This is an ideal time period for introduction and evaluation of NIRS. New feedstuffs such as expeller and extruded canola meal, Prairie grown soybeans, wheat and corn DDGS exist and are being considered in our livestock diets. The analysis and discussion generated has provided value in understanding nutrient variability.

### Issues/Challenges:

- Need to stay on top of calibrations. Initial calibration verification is important given that calibrations provided by manufacture may or may not be accurate for our feeds. Operations that have no time or commitment to the calibration will not be satisfied in the NIRS machine's use.
- ARD and some feed companies have assisted with NIRS database management to date but commercial consultants capable of managing individual NIRS databases do not exist in Alberta. Cannot rely on NIRS manufacturers to manage calibrations or database. Continuing support from ARD is needed i.e. calibrations, maintaining database and distribution.
- Machines were purchased to determine value of barley grain as a feed ingredient for feedlot cattle. Not sure we are any closer in understanding what to measure in order to differentiate feed grain energy and livestock performance value. Fecal starch may work better for wheat than barley grain; malting characteristics may provide partial answer, as does processing method which confounds value.
- Individual operations need manpower in place and personality to understand calibration limitations to use. For example, predicted moisture may not be accurate when a dry barley calibration is used for high moisture barley.
- Confidence level is increasing but consistency between ingredient sampling is not acceptable. Need accurate calibrations for barley and wheat, canola meal, corn and alfalfa. Mixed hays and silages are of continuing interest.
- NIRS requires accurate wet chemistry analysis. Individual lab results can be questionable. Identifying reference labs is important.
- When calibrations were updated by manufacturer, user in some cases did not understand which calibrations were updated, or the implications. ARD has provided calibration updates. Will ARD have continuing involvement in calibration development and distribution for Alberta feedstuffs? What is the system to receive updated Alberta developed calibrations?

### Uses:

- Identifying trends has been an extensive use so far. i.e. new analyses is relative to past analysis to quickly show trends. Examples – annual crop harvest values; different manufacturing plants and their numbers for DDGS and/or expeller canola meal; expeller canola meal can be 9.5% CP from one plant and 12-20% for other plants.
- Most common calibrations used are barley, canola meal, canola seed, DDGS.
- Most operations have an interest in only one calibration. i.e.
  - Feedlot A – purchased DDGS: DM and fat level to ensure product delivered was what expected.
  - Feedlot B – purchased High Energy pellet: DM, Fat, CP to ensure product delivered was what expected.
  - Feedlot C – interest is dry matter of grain, ingredients and silage – for billing purposes.
  - Farm A – purchased canola seed: DM, CP and oil re: cold press or extrude

- Farm B – farm grown canola seed: DM, CP and oil – re: cold press
- Calibrations have been developed for corn silage, high energy canola screenings and pulse screenings. A complete feed, expeller canola meal and a raw un-acidified soap stock (by-product of canola crush) calibration is being developed.
- Feedlots tempering barley have monitored moisture content in tempering process.
- On pig side, am getting more confident with wheat than barley analysis such that wheat analysis is considered in formulation.
- Where supplier and purchaser both agree, NIRS has been used to re-price that delivered.
- Barley grain has been tested for CP content with low CP barley being assigned to hogs and higher CP barley sold.
- Individual grain bags of own grain analysed and tagged but not seeing much variation on same farm
- Purchase split and chipped peas and monitored variability with NIRS.
- To differentiate whether high energy screening load goes to growing calves or to finishing stock
- Did adjust pellet intake down based on variability but are not routinely using NIRS to change diets
- As indicator to assess the calibration, have checked duplicate grain samples with local elevator's NIRS machine.



#### Other Interest:

- Forage sampling, soil analysis; liquid manure application to crop land ; compost analysis; plant tissue work in the growing season; as marketing tool for identifying what would grade malt barley.
- When more confident in machine, want NIRS machine certified as Weights and Measures certifies a weigh scale.
- Forage and new crop uses – i.e. alfalfa hay, starch value in corn silage, formula for both raw silage and fermented silage, prairie grown soybeans / soybean meal, steam rolled grain, feedlot TMR (silage and grain together).
- Some interest in assessing market or sharing for new calibrations developed;
- Interest in sharing wet chemistry and sample scans between companies and other industry users for the purpose of getting better calibrations and with enhanced confidence. i.e. cooperation between feed mills.
- Suggest webinars and/or some type of NIRS user forum be organized to discuss NIRS issues as a group.
- On farm NIRS use could reach into many aspects of farm decision making i.e. from growing crops, livestock utilization and thru manure application.