Summary of ADF Projects, 2014
Crops Research Funding

46 crop-related research projects	$6,996,983

Breakdown by Commodity

Pulses	$1,472,264
Oilseeds	$1,447,461
Bees	$1,028,800
Cereals	$774,559
Fruit and Vegetable	$172,500
Other/General	$2,101,399
	$6,996,983

Breakdown by Organization

University of Saskatchewan	$2,360,878
Agriculture and Agri-Food Canada	$944,204
Saskatchewan Beekeepers Association	$499,000
Meadow Ridge Enterprises Ltd.	$346,800
Canaryseed Development Commission of Saskatchewan	$343,315
Saskatchewan Research Council	$322,472
Agrisoma Biosciences	$315,000
Canadian Light Source Inc.	$250,000

Prairie Oat Growers Association	$233,772
Indian Head Agricultural Research Foundation	$206,911
National Research Council	$189,001
Friends of the Royal Saskatchewan Museum	$183,000
Prairie Berries	$172,500
Alberta Invasive Species Council	$120,000
University of Regina	$104,500
Alliance Grain Traders	$100,000
Saskatchewan Food Industry Development Centre	$97,000
101221667 Saskatchewan Ltd.	$62,200
Mustard 21 Canada	$60,000
Sask Flax Development Commission	$50,000
Irrigation Crop Diversification Corp.	$36,430
	$6,996,983

Pulses

Nutrient Content and Release From Soybean Residues in Comparison to Other Pulse Crops in Saskatchewan

Objectives:

- The objective of this project is to determine the plant nutrient content, uptake and composition of the residue of soybean grown under Saskatchewan conditions and the contribution that the residue makes to nutrition and yield of a following cereal crop in comparison to pea and lentil. Three different cultivars of each of the three crops will be utilized at two sites to provide an indication of differences among cultivars and how environmental conditions affect the nutrient uptake and release. An incubation experiment will provide more detailed information on nutrient release dynamics and microbial activity under controlled conditions.

Funding: $56,900
Organization: University of Saskatchewan
Contact: Jeff Schoenau, Soil Science, (306) 966-6844

A Reverse-Introgression and Genomics Strategy to Develop and Characterize Chickpea Germplasm for Yield and Climate-Resilience Traits

Objectives:

- The proposed research activities at CDC will address the specific objectives as follow: 1) introduce wild diversity into phenology-normalized backgrounds suitable to western Canadian environment so that it is amenable for trait assessment and use in breeding for western Canada; 2) characterize the material by systematic phenotyping under western Canadian environment, and 3) develop a predictive network of genotype-phenotype associations that explicitly identifies and quantifies the contributions of agronomically useful alleles.

Funding: $171,465
Organization: University of Saskatchewan
Contact: Bunyamin Taran, (306) 966-2130

Agronomic Investigations of Irrigated Soybean

Objectives:

- Determine optimal seeding date ranges for soybean and their effect on grain yield and quality.
- Assess the impact of soybean seed treatment and possible benefits, particularly under less than optimal soil temperature seeding conditions.
- Determine optimal soybean seeding rates for both solid seeded (25 cm) and row cropped (50 cm) production.
- Examine the impact and determine the economic feasibility of combination inoculant applications.

Funding: $36,430
Organization: Irrigation Crop Diversification Corp.
Contact: Garry Hnatowich, (306) 867-5405

Management of volunteer glyphosate-resistant canola in glyphosate-resistant soybean crops
Objectives:

- The first objective of the proposed research is to provide herbicide options for soybean growers to manage GR canola volunteers in GR soybean crops.
- The second objective of the proposed research is to determine the effectiveness of seeding date and seeding rate in managing GR canola volunteers in GR soybean crops.

Funding: $80,883
Organization: University of Saskatchewan
Contact: Christian Willenborg, Plant Sciences, (306) 966-8354

Cool Pea Leaves: Leaf Traits to Improve Yield Stability in Stress
Objectives:

- To first accurately characterize precise air and canopy temperatures using infra red thermometry that cause reductions in yield in pea. Such information on the canopy versus air temperature is not yet known for pea, and it will explain why pea genotypes varying in canopy architecture and life-cycle length have different amounts of heat stress and different amounts of flower and pod abortion.
- To quantify the effect of leaf types (normal, semi-leafless), leaf size (leaflet size, leaf basal bract size), cuticular wax thickness, stem and tendril thickness, and leaf color (chlorophyll and other pigments) in mitigating heat and drought stress.

Funding: $135,342
Organization: University of Saskatchewan
Contact: Rosalind Bueckert, Plant Sciences, (306) 966-8826

Direct Assessment of the Release of Fixed N in the Rhizosphere of Pea, Lentil, Chickpea and Faba Bean
Objectives:

- The primary goal of this project is to examine the beneficial role that pulse crop residues have in improving the N supply to a subsequent cereal crop and in mitigating N2O emissions relative to fertilized wheat.
- Specific objectives are to: determine N2 fixation in lentil, pea, chickpea, and faba bean using continuous 15N2 labelling;
- determine the release of fixed-N into the rhizosphere of mature lentil, pea, chickpea, and faba bean;
- quantify the supply of fixed-N from the pulse crop residues to the N uptake of a subsequent cereal crop (wheat); and
- assess N2O emissions from soils containing pulse vs. wheat residues and identify the source of soil-emitted N2O (i.e., residue/fertilizer/SOM).

Funding: $61,118
Organization: University of Saskatchewan
Contact: Richard Farrell, Soil Science, (306) 966-2772

Steps Toward Breeding for Improved Nitrogen Fixation in Pea

Objectives:

- Collecting nodulation mutants of pea from the world gene banks and researchers.
- Evaluating the collected nodulation mutants for BNF, biomass, and yield production in symbiosis with different rhizobia strains.
- Crossing the most promising mutants with the best Saskatchewan pea cultivar(s), and evaluating the progenies for BNF and productivity.

Funding: $187,775
Organization: University of Saskatchewan
Contact: Tom Warkentin, Crop Development Centre, (306) 966-2371

Metabolic Profiling of Wild Lentils for Improving Lentil Varieties

Objectives:

- To perform metabolomic profiling on strategically selected genotypes of wild lentils and to determine the diversity in metabolites (most notably polyphenols) that exists among them.
- To combine data from objective 1 with ongoing studies that are investigating the effects of polyphenols on nutrition to determine which wild lentil varieties should be selected for future breeding studies. The determination will be made on key differences in metabolite levels for both desirable and undesirable metabolites.
- To combine data from objective 1 with phenotypic and genotypic analysis of root pathogen interactions in selected genetic resources to identify relevant pathways.

Funding: $189,001
Organization: National Research Council
Contact: Randall Purves, (306) 975-6173

Genetics and Agronomy of Lentil Dehulling

Objectives: Hypothesis 1 - Agronomic practice affects de-hulling efficiency

- Determine the extent to which pre-harvest aids (desiccation) and methods affect red lentil seed plumpness and dehulling efficiency.
- Determine if fungicide application affects seed plumpness and de-hulling efficiency.
- Determine if soil fertility (such as soil micronutrient content) affect seed plumpness and de-hulling efficiency.

Hypothesis 2 - Genetics affects de-hulling efficiency

- Determine de-hullling efficiency of the six (current) major commercial seed coat colours of lentil.
- Construct a genetic map for de-hulling efficiency (in terms of seed plumpness, seed shape, cotyledon-seed coat bond, etc.) to identify major QTLs.

Funding: $198,000
Organization: University of Saskatchewan
Contact: Albert Vandenberg, Crop Development Centre, (306) 966-8786

Feasibility and Profitability of Iron Fortification of Lentil and Chickpea Dal Through Origin-based Processing in Saskatchewan

Objectives: Hypothesis 1 - It is possible to fortify iron in de-hulled pulses in a biologically and culturally meaningful way.

- Determine the suitable iron fortificant for de-hulled lentil and chickpea based on cost and sensory acceptability.
- Determine the optimal processing technology to fortify iron in de-hulled lentils and chickpeas based on current processing practices.
- Determine the iron concentation and bioavailability of fortified lentils and chickpeas under relevant meal preparation methods.

Hypothesis 2- It is possible to fortify pulses in a manner that is cost-effective and economically beneficial to SK producers and processors.

- Estimate the costs for incorporating iron fortification as part of the pulse de-hulling systems in SK
- Determine the costs for developing an international brand associated with the iron fortified pulses
- Provide a cost-benefit analysis associated with iron fortification of de-hulled lentils and chickpeas

Funding: $169,250
Organization: University of Saskatchewan
Contact: Albert Vandenberg, Crop Development Centre, (306) 966-8786

Characterization, Modification and Commercialization of Lentil Bran as a Food Ingredient

Objectives:

- Investigate the utilization, modification and commercialization of lentil bran as a fibre and antioxidant rich food ingredient.
- Develop the lab scale extraction and processing technology to isolate the tannins, phenolics and fibre portion of lentil bran.
- Characterize and evaluate the functional properties of tannins, phenolics and fibre of lentil brans in small scale lipid based food systems.
- Develop the commercial processing and extraction technology for lentil bran extract and dry lentil bran ingredient for commercialization
- Test the lentil bran extract and dry lentil bran ingredients in model food systems and validate the product quality.

Funding: $100,000
Organization: Alliance Grain Traders
Contact: Mehmet Tulbek, (306) 244-5622

Virus Induced Gene Silencing (VIGS) to Test Gene Function in Pulse Crops

Objectives:

- Develop improved VIGS vectors to reliably infect and suppress gene expression in common bean, faba bean, chickpea, field peas and lentils.
- Improve protocols for introduction of VIGS constructs into pulse crops.
- Quantify the effectiveness of gene suppression in different tissues using diverse germplasm.
- Employ VIGS to silence candidate genes linked to traits of interest.

Funding: $86,100
Organization: University of Saskatchewan
Contact: Christopher Todd, Biology, (306) 966-4497

Oilseeds

The Association of Lodging and Pasmo Disease, and Their Effect on the Seed Yield of Flax
Objectives:

- Further research the association of disease and lodging in flax, and their impact on seed yield.
- Study the action and benefit of fungicide application in the control of disease and lodging in flax.
- Compare the benefit of pyraclostrobin fungicide in controlling pasmo disease as well as lodging in flax, in comparison to fungicides with different mode of action available in the market.

Funding: $80,000
Organization: Agriculture and Agri-Food Canada
Contact: Cecil Vera, Science and Technology Branch, (306) 752-2776 x 229

Development of a Registration System for Mustard Cultivars in Saskatchewan
Objectives:

- To help fast track mustard varieties by generating the field Co-op data needed for registration of better cultivars based on the present merit system of PGDC.
- To establish long-term (3 to 5 years) contracts with research providers / collaborators: Westwind Ag. Research, IHARF, HyTech, Wheatland, to secure 6-8 statistically valid Co-op sites per year.
- To generate merit data to identify new cultivars with improved yield, seed quality, and disease resistance based on 2 years of field data from key eco-zones.
- Assist M21 and AAFC breeding efforts to identify new cultivars with at least a 15% improvement in yield potential starting in the next two years. Please see Mustard Product Concept document attached that clearly defines the stretched goals for the breeding program and for variety registration.
- To fast track to market new innovative mustard cultivars through the rapid identification and registration of elite genotypes, i.e. 2 years in field evaluation plus one additional year to complete seed increase.
- To provide robust field data for mustard growers to help make their selection of mustard varieties for their farm, i.e. which cultivars best suit their rotational requirements and their opportunity for best return.

Organization: Mustard 21 Canada Inc.
Funding: $60,000
Contact: Daryl Males, (306) 290-3850

Development of Brassica carinata varieties with low meal glucosinolate levels
Objectives:

- Introgress the juncea mustard low glucosinolate trait (obtained through licence from AAFC) into our current elite varieties of Brassica carinata.
- Determine the extent of glucosinolate reduction in progeny seed grown in field conditions and demonstrate reduction of overall meal glucosinolate to levels at or less than 30-40 µmol/g of defatted meal, with no concomitant change in oil or meal protein quality or quantity.
- 3. Demonstrate the ability to develop a commercial quality variety with significantly decreased glucosinolate levels (30-40 µmol/g or less) using interspecies transfer technology. This would be considered a critical step, achievable within the time frame of this ADF proposal, towards our longer term goal of developing of carinata varieties with true canola quality glucosinolate levels (<< 30 µmol/g).

Funding: $315,000
Organization: Agrisoma Biosciences Inc.
Contact: Michael Lindenbaum, (306) 384-2604

Canola Oil based Green Surfactants for Enhanced Oil Recovery
Objectives:

- Develop a hydrolysis process for producing fatty acids from canola oil.
- Develop an efficient catalytic reduction process for the conversion of fatty acids to fatty alcohols.
- Develop a synthesis process for the fatty alcohol based anionic surfactant that is especially effective in lowering interfacial tension (IFT), and also overcome other obstacles such as high temperatures, high salinities and high divalent cation (Ca and Mg) concentrations.
- Evaluate the suitability of a canola oil based surfactant for EOR processes using well established services that SRC has been providing to industry for screening chemicals.
- Provide recommendations for the development and commercialization of canola based surfactant for CEOR formulation.

Funding: $190,000
Organization: Saskatchewan Research Council
Contact: Sundaramurthy Vedachalam, Process Development, (306) 933-7373

Using of non-host species to identify novel genes for durable clubroot resistance in canola
Objectives:

- The primary objective of this proposal is to identify genes from non-host plant species, that can be used to develop novel canola varieties with durable resistance to as wide a range as possible of P. brassicae.
- Specifically, the study aims to: verify the susceptibility of the model grass species B. distachyon to P. brassicae. B. distachyon is more amenable to genetic studies and there are more genetic resources available than for L. perenne.;
- express the pathogen protein PRO1, under a constitutive promoter, in B. distachyon and/or L. perenne, and to infect roots of B. distachyon and/or L. perenne with the pathogen, to identify expressed sequence tags (ESTs) produced specifically in response to PRO1 expression and root infection, and that are likely involved in the mechanism of disease prevention in non-host plants; and
- examine, in B. napus, the contribution of select non-host PRO1-responsive genes and genes responsive to root infection, to resistance to clubroot disease through genetic transformation and phenotypic analysis.

Funding: $116,250
Organization: University of Saskatchewan
Contact: Peta Bonham-Smith, Biology, (306) 966-4400

Developing Near-Isogenic Brassica napus Lines for Differentiating Pathotypes of Plasmodiophora brassicae

Objectives:

- To develop a set of differential lines of spring type B. napus with single genes for identification of pathotypes of P. brassicae and for durable resistance to clubroot.
- To identify pathogen isolates which can be used to identify resistance genes in B. napus cultivars.
- To validate DNA markers which can be used to identify resistance genes in B. napus cultivars.

Funding: $80,000
Organization: Agriculture and Agri-Food Canada
Contact: Fengqun Yu, (306) 956-7622

Development and Application of Rapidly Deployable In-field Molecular Diagnostics for Plant Diseases

Objectives:

- Development of molecular assays that are capable of rapidly and specifically detecting various strains of P. brassicae (clubroot); Phytoplasma spp. (e.g. Aster Yellows); and L. maculans (blackleg).
- Development and testing of in-field DNA extraction and testing methodologies.

Funding: $ 34,300
Organization: Agriculture and Agri-Food Canada
Contact: Tim Dumonceaux, (306) 956-7653

Development of Herbicide Resistant Camelina sativa Through Gene Targeting

Objectives:

- The overall objective of this project is to develop herbicide resistance in Camelina sativa by implementing gene targeting technologies to enable specific and predictable editing of the plant genome.

Funding: $ 315,000
Organization: Agriculture and Agri-Food Canada
Contact: Kevin Rozwadowski, Molecular Genetics, (306) 956-7692

Western Canadian Oilseed Flax Cooperative Trials

Objectives:

- Maintain the cooperative testing system throughout the federal government consultation period on varietal registration to ensure that oilseed flax varietal registration continues, and new varieties are released within the shortest time frame feasible.
- Continue to have a robust registration effort for Canada's oilseed flax industry (grow the industry).
- Continue to create successful, profitable oilseed flax varieties for Prairie farmers, providing cooperative field data (agronomic) to allow farmers to select varieties with the most information possible.

Funding: $50,000
Organization: Sask Flax Development Commission
Contact: Linda Braun, (306) 664-1901

Canola Direct-Cut Harvest System Development

Objectives:

- The overall goal of this project is to produce comparative system performance, economics, and producer recommendations on the performance of selected commercial direct-cut headers, a modified direct-cut header, and a conventional swath-based harvest system. A secondary goal is to develop a set of practise guidelines for those intending to direct-cut canola, and communicate all results effectively to the producer community.

Funding: $ 206,911
Organization: Indian Head Agricultural Research Foundation
Contact: Jim Wassermann, (306) 682-5033

Bees

The Saskatraz Project:The Saskatchewan Honey Bee Breeding and Selection Program

Objectives:

- The objective of this project is (i) to propagate, maintain and improve productive and varroa tolerant Saskatraz families. This will be approached by selecting for Varroa Sensitive Hygiene traits in Saskatraz stock selected for honey production and varroa resistance using recurrent natural selection and new close population mating procedures (single colony mating apiaries) combined with instrumental insemination.
- Newly discovered biomarker tools will be used; (ii) to identify and validate biomarkers for increased honey production, varroa tolerance and virus resistance (immune) lines.
- The third objective is to continue investigations into managing varroa population growth with varroa tolerant Saskatraz stock and selective treatment strategies, using naturally occuring miticides. This objective will also include work on the effects of synthetic miticides and agricultural pesticides on bee health (immune response, detoxification enzymes, etc.),

Funding: $346,800
Organization: Meadow Ridge Enterprises Ltd.
Contact: Albert Robertson, (306) 739-9140

Increased Fruit Quality, Quantity and Marketability of Saskatchewan Crops through Wild Bee Pollination

Objectives:

- To provide the Saskatchewan agriculture industry with a better understanding of the diversity and biology of wild bee species in the province through extensive faunistic surveys of the province's bees, with partial focus on agricultural landscapes.
- To develop Saskatchewan-specific guidelines for conserving, encouraging, and managing wild bees for pollination through detailed analysis of bee community diversity and abundance in relation to land use patterns, floral communities, etc.
- To determine the contributions of wild bee species to crop production of selected crops in Saskatchewan.
- To develop methods for increasing/managing some of the most promising wild bee species for crop pollination in Saskatchewan, including bumble bees and cavity-nesting species.
- To increase the quality, thus marketability of Saskatchewan-grown fruit crops through reliable pollination services.

Funding: $183,000
Organization: Friends of the Royal Saskatchewan Museum
Contact: Cory Sheffield, (306) 787-2850

Honey Bee Health: Management of Varroa mites and Viruses

Objectives:

- Developing alternative new acaricides to enhance the rotation system for the sustainable control of varroa mites and vectored viruses in honey bee colonies.
- Assess and determine the level of virulence of different strains of viruses found in bee colonies that are varroa infested, mite free, and winterkilled within the Province of Saskatchewan.
- Evaluation of virus presence and concentration in bee colonies throughout the year to establish their relation to varroa populations, treatment time impacts on bee population growth and colony mortality.
- Developing best management practices for production of healthy nucleus bee colony (3-10 frames of bees) with acaricides' rotation strategies to replace dead colonies.

Overall the objective of this project is to enhance the varroa control and associated viruses options, reducing the risks of developing resistance, increased bee kill and honey contamination with chemical resides. The interrelationship between varroa, viruses, level of virulence of viruses, treatment time, and their impacts on bee health and colony survivorship under Saskatchewan conditions will be assessed. Thus, effective sustainable methods for varroa control will be developed. Consequently, beekeepers will be able to address their daily challenges with bee health and failing industry economics.

Funding: $499,000
Organization: Saskatchewan Beekeepers Association
Contact: Graham Parsons, (306) 314-9571

Cereals

Occurrence and Fate of Toxigenic Fungi and Their Associated Mycotoxins in Saskatchewan-grown Oats and Oat Milling Products

Objectives:

- Investigation into (1) the occurrence and (2) the fate of toxigenic fungi and their associated mycotoxins on Saskatchewan and western Canadian oats.
- The objective of the first activity is to investigate the occurrence of toxigenic Fusarium and Penicillium fungi and their associated mycotoxins (including DON and OTA) in oats grown in different regions across the Canadian Prairies, with a focus on oats grown in Saskatchewan.
- The objectives of the second activity are to investigate the effect of sample processing on fungal and mycotoxin measurements, particularly for OTA, and identify an optimum method that produces the most precise results without negatively affecting accuracy, and investigate effects of de-hulling, steaming, kilning, and milling on concentrations of mycotoxigenic fungi and mycotoxins in oats and oat milling products.

Funding: $ 233,772
Organization: Prairie Oat Growers Association
Contact: Shawna Mathieson, (306) 530-8545

Glabrous Canary Seed for Human Consumption: Grain Constituent Benchmarking and Innovative Product Development
Objectives:
- Benchmarking glabrous canary seed cultivars and elite breeding lines for grain constituents.
- Development and demonstration of innovative products and technology with canary seed flours and fractions.

Funding: $ 343,315
Organization: Canaryseed Development Commission of Saskatchewan
Contact: Kevin Hursh, (306) 933-0138

Protecting Saskatchewan Agriculture – Characterization of New Sources of FHB Resistance
Objectives:
- Improve the disease resistance traits (with emphases on FHB and WSMV) of contemporary elite wheat germplasm and cultivars that are already adapted for Saskatchewan.
- Identify the major loci/alleles responsible for the enhanced FHB and WSMV resistance and tightly associate these loci with robust molecular markers.
- Identify, and where possible, characterize the additional traits of de novo resistance to leafspots and stripe rust that arise in a subset of descendant sublines that responded to WSMV in earlier generations.

Funding: $ 65,000
Organization: Agriculture and Agri-Food Canada
Contact: Steve Haber, CRC, (204) 983-1467

Molecular Diagnostics Strategies for Fusarium Species Detection and Quantification in Wheat
Objectives:
- The main objective of this project is to develop rapid, quantitative real-time PCR assays for identifying and monitoring Fusarium species from infected seeds and tissues of wheat.

Funding: $132,472
Organization: Saskatchewan Research Council
Contact: Pooba Ganeshan, Genserve Laboratories, (306) 933-5605

Fruit and Vegetable

Research into cholesterol-lowering properties of extracts from Saskatoon berries and development of a functional food ingredient
Objectives:
- Create the scientific base for a functional food product with cholesterol-lowering effect.
- Optimize extract from Saskatoon berry mash for the abundance of bioactive hydroxylated triterpene acids and other hypocholesterolemic substances.
- Achieve proof of concept in vivo for the optimized extract in the field of cholesterol management.
- Demonstrate safety of the extract for subsequent use in humans.

Funding: $172,500
Organization: Prairie Berries
Contact: Sandra Purdy, (306) 788-2018

Other/General

Development of rapid assays for determination of Group 1 and 2 herbicide resistance in weeds
Objectives:

- Develop a rapid soilless assay for wild oat resistance to pinoxaden and for wild oat and green foxtail resistance to clethodim.
- Develop rapid assays for wild mustard and wild oat resistance to various ALS-inhibiting herbicides.

Funding: $26,667
Organization: Agriculture and Agri-Food Canada
Contact: Hugh Beckie, (306) 956-7251

Proof of Concept - Synchrotron Light for Crop Improvement
This project will undertake a series of proof-of-concept experiments utilizing synchrotron light over the next 12 months, designed to demonstrate potential plant visualization methods in some of the areas currently least well served, including: imaging various components of the plant including stem, leaf, root growth and nodulation in natural soils and detecting microbial presence in situ in the rhizosphere and characterizing fungal mode of infection for economically important crop fungal diseases.
Objectives:

- To image the stem, leaves, and roots of pulses, cereals and Canola under normal and stress conditions.
- To image pulse root nodulation.
- To study the application of various synchrotron imaging techniques to better understand fungal/host interactions.

Funding: $250,000
Organization: Canadian Light Source Inc.
Contact: Royal Hinther, (306) 657-3603

Biology and host specificity of potential biological control agents for common tansy
Objectives:

- To complete the host-specificity testing of the stem-mining weevil Microplontus millefolii, with particular attention to the native North American tansy species Tanacetum huronense and T. camphoratum.
- To collect the stem-mining moth Platyptilia ochrodactyla, develop methods for rearing and initiate host-specificity testing.
- To collect the gall midge Rhopalomyia tanaceticola, develop methods for rearing, and initiate host-specificity testing.

Funding: $120,000
Organization: Alberta Invasive Species Council
Contact: Barry Gibbs, (403) 850-5977

Determining the environmental optimum rate of fertilizer N for irrigated crops in the semiarid prairies

The primary goal of this project is to identify the environmental optimum rate of fertilizer N (i.e., the rate that provides the greatest yield increase with the lowest FIE) for irrigated crops.

Objectives:

- Evaluate 4R-based BMPs for irrigated canola.
- Identify and demonstrate the environmental optimum fertilizer N rate.
- Assess the occurrence and importance of diurnal variations in N2O emissions on seasonal estimates of total GHG emissions.

Funding: $160,490
Organization: University of Saskatchewan
Contact: Richard Farrell, Soil Science, (306) 966-2772

Starch from Saskatchewan crops modified using reactive extrusion

The goal of this project is to develop modified starches from Saskatchewan-grown ingredients where the starch may be underutilized, using food ingredients as the modifying agents and extrusion as the reactor.

Objectives:

- To find new uses for underutilized Saskatchewan-grown starches.
- To determine extrusion conditions required for the production of naturally-modified starches.
- To determine which food ingredients are best suited as modifying agents in starch extrusion.
- To expand the level of expertise in Saskatchewan in starch modification and extrusion.

Funding: $97,000
Organization: Saskatchewan Food Industry Development Centre
Contact: Shannon Hood-Niefer, (306) 964-1819

Nutrient dynamics in drained agricultural soils and drainage ditches

Objectives:

- Determine whether drained wet soils eventually become more similar to upland soils in terms of their properties and nutrient dynamics/storage.
- Measure nutrient dynamics/storage along drainage ditches.
- Determine whether nutrient uptake and fate differs between upland vs. drained wet soils under different moisture scenarios.

Funding: $80,755
Organization: University of Saskatchewan
Contact: Angela Bedard-Haughn, Soil Science, (306) 966-4291

Industrial products from vegetable oils
Overall objective: Explore methods for improving both physical and chemical properties of vegetable oil based consumer and industrial non-food products and lower the cost of production of these products.
Sub-objectives:
- Development of a method to produce commercial lithium grease using sustainable polyol base catalyzed green fuel production approach. (working with licensee)
- Improve oxidative stability and pour point of biolubricants made from Brassica rapa biodiesel. Extend technology to Brassica carinata and Camelina sativa.
- Development of a method to convert recycled glycerin to monoglyceride.
- Development of a method to produce flax super drying oil.
- Development of a method to convert Canola, Camelina sative and Brassica carinata oils to high quality drop in fuels and additives for drop in fuels.

All research is paired with Industry funded research programs. The goals of these proposals are not included in this proposal.
Funding: $388,800
Organization: University of Saskatchewan
Contact: Martin Reaney, Plant Sciences, (306) 966-5027

Prototyping an online radio frequency (RF) disinfestation unit: a step towards industrial applications
Objectives:
- To prototype a 50 Ω technology RF heating system at a power level of 15 kW at 27.12 MHz.
- To test the technique assessing the mortality rates of the rusty grain beetle in Lillian wheat, and the red flour beetle in canola, considering the different life stages of the insects, and the ranges of temperature and moisture contents.
- To simulate applicators with different shapes and sizes to be used with auger, bin-to-bin, and bin-to-chute transportation systems, etc., using a real-time 3D simulation platform (COMSOL Multiphysics) for its in-house fabrication and implementation.
- To measure electrical and physical properties of canola and its insect pest(s), and to determine insect mortality rates.
- To assess the physicochemical properties of canola before and after RF treatment.

Funding: $80,750
Organization: University of Saskatchewan
Contact: Oon-Doo Baik, Agricultural & Bioresource Engineering, (306) 966-5320

Drying Fuel Alcohols and Natural Gas with Biosorbents Based on Agricultural By-products
Objectives:
- Formulate high performance biosorbents from agricultural by-products for drying fuel alcohols, and natural gas in a pressure swing adsorption (PSA) process.

Funding: $140,400
Organization: University of Saskatchewan
Contact: Catherine Niu, Chemical Engineering, (306) 966-2174

Irrigation and Fertilization Practices for Irrigated Production Systems in Saskatchewan
The project will support current and future irrigators in Saskatchewan with improved crop production information, to help them to better contribute to the economic and environmental sustainability of irrigated agriculture in the Province.
Objectives:

- To continue to assess, and recommend modification as needed for Saskatchewan conditions, to the Alberta Irrigation Management Model (AIMM), and thus provide SK irrigators with irrigation scheduling information that is specific to their conditions and aids in better management of the water resource. (Project initiated in 2012, to continue through 2016)
- To evaluate N fertilizer needs (N rate) and efficacy of selected management options (N timing and placement) for irrigated canola production in Saskatchewan.
- To determine by survey the minor nutrient status of selected major irrigated crops in Saskatchewan, and determine through field experimentation if growth-limiting deficiencies are occurring.

Funding: $139,572
Organization: Agriculture and Agri-Food Canada
Contact: Dale Tomasiewicz, (306) 867-5412

Crop Cultivars for Irrigation in Saskatchewan
Objectives:
This project will continue the conduct of the six ongoing studies annually, to produce cultivar performance data relevant to the intensive management and high-yield conditions of irrigated Saskatchewan farms.
Specifically:

- -Trials will include newer germplasm and registered varieties with characteristics that may be suitable to irrigated conditions, along with established "check" varieties to serve as a reference for comparison across site-years.
- Intensive and attentive management (including irrigation) practices will be used to ensure results are relevant to high-yield irrigated conditions.
- Results will be reported annually, and also incorporated into the long-term irrigated cultivar performance database to show variety performance over all available irrigated Saskatchewan site-years.
- Long-term variety performance will be updated annually and reported/circulated to industry in the annual "Crop Varieties for Irrigation" guide, or other suitable format.
- Cultivar performance data will be provided to AAFC dry bean and potato breeding programs, so that varieties most suitable for irrigated Saskatchewan conditions can be identified and retained in the programs for potential commercialization.

Funding: $103,665
Organization: Agriculture and Agri-Food Canada
Contact: Dale Tomasiewicz, (306) 867-5412

2014 Saskatchewan Weed Survey
Objectives:
- Complete the fifth set of weed surveys in Saskatchewan since the series of provincial surveys began in the mid-1970s.
- Measure the species compositions and population densities of the weed communities in the major summer annual crops and identify changes in weed communities that have occurred since previous surveys.
- Document abundance and distribution of resistant weed species.
- Document agronomic and weed control practices used on surveyed fields and relate to floristic composition of weed communities.

Funding: $100,000
Organization: Agriculture and Agri-Food Canada
Contact: Julia Leeson, (306) 956-7270

Enhancing quality and value of meat ingredients for further processing
Objectives:
- To determine susceptibility of mechanically separated meats (MSM) and finelly textured meats (FTM) to myoglobin and lipid oxidation as a function of current meat recovery system.
- To determine oxidative stability (over a period of refrigerated storage) of fresh MSM or previously frozen MSM when treated with micronized lentil flour or with other natural or synthetic antioxidants.
- To evaluate the physicochemical and sensory characteristics of frozen processed products made with MSM/FT meats treated with antioxidants during simulated retail frozen storage.
- To evaluate physicochemical, processing and organoleptic properties of micronized lentil flour-treated MSM/FT meats processed into products with and without sodium nitrite.

Funding: $67,500
Organization: University of Saskatchewan
Contact: Phyllis Shand, Food and Bioproduct Sciences, (306) 966-8842

Optimizing Pesticide Efficacy: A Study of Spray Deposition into Canopies
Objectives:
- To identify the factors that govern the deposition and penetration of fungicide sprays in a variety of crop canopies.
- To discover optimal application methods for placing fungicide sprays into broadleaf and grass canopies.
- To validate promising new application methods with field efficacy results under commercial conditions.

Funding: $62,200
Organization: 101221667 Saskatchewan Ltd.
Contact: Tom Wolf, Research & Training, (306) 241-1795

Biocomposite Commercial Initiative with Crop Residue (Straw) and Agricultural Waste Products (Grain Bags) for Shercom Industries

Objectives:

The scope encompasses developing an innovative biocomposite material consisting of agricultural crop residue (straw: primarily, a bast fibre straw of flax or hemp), reclaimed tire crumb and plastics from used grain bags to design a commercially successful product. The anticipated manufacturing process will involve compression moulding and/or extrusion with compression or injection moulding. The timeframe for the project is three years. The end products being considered are non-structural, construction products, such as a modular, landscape product. The stages of the project include compiling information, completing and validating data through lab scale testing, developing a mathematical model, design of consumer product and utilizing the model and test protocol for assessing commercial-ready prototypes with our commercial partner, Shercom.

Funding: $104,500

Organization: University of Regina

Contact: Denise Stilling, Faculty of Engineering, (306) 337-2696

Purification of crude glycerol and its conversion to bio-chemicals

Objectives:

- Design and selection of ceramic membrane with suitable pore size, to be used in highly efficient membrane reactor system for purification of crude glycerol.
- Optimization of the glycerol purification process that can be operated in a batch, semi-continuous and continuous flow system.
- Utilization of purified glycerol to prepare value added chemicals such as glycerol carbonate, and glycerol ethers by using novel heterogeneous catalysts.

Funding: $179,100

Organization: University of Saskatchewan

Contact: Ajay K. Dalai, Chemical Engineering, (306) 966-4771