AARI Alberta Agricultural Research Institute

the LINK

2004 • VOLUME IV • ISSUE 1 WE BELIEVE IN GROWING ALBERTA'S ECONOMY

Beyond the Bench

Looking past the bench in the science lab, Alberta researchers are discovering a world of practical applications for food science. The development of Agri-Food Discovery Place will fill a critical gap in agricultural research and development infrastructure. Equipped with small-scale processing capabilities, plus bio-containment and explosion-proof facilities, Agri-Food Discovery Place will offer the opportunity to examine a large number of processing parameters previously not feasible in the province.

Once completed, Agri-Food Discovery Place (AFDP) will allow researchers to take what happens in a beaker and apply it to small-scale industrial equipment in order to better understand how processing affects the properties of various crop components and meats. The R&D focus of this facility will be food and bioproducts.

Dr. Lynn McMullen, of the University of Alberta (U of A), has been involved with the development of AFDP since its early beginnings over five years ago. She helped put the concept together, find funds, and ensure that the project would succeed. McMullen is also responsible for leading the Meat Safety and Processing Research Centre at the AFDP which will house a Level 2 bio-containment processing facility designed for the study of food borne pathogens and novel treatments.

Save That Steak

This first phase of research at AFDP builds directly on McMullen's research, which includes the influence of food packaging on food microbiology, the use of lactic acid bacteria as biopreservatives in food systems, microbial ecology and its effects on the sensory quality of foods, and the development of objective methods for the detection of spoilage. The facilities will include capabilities for raw meat handling, production of processed meats, and mock display counters to look at the growth of pathogens under retail conditions.

What makes the Centre unique, says McMullen, is the Level 2 bio-containment facility which will allow pathogens such as *E. coli* or *Salmonella* to be brought into the building and put into meat products. McMullen and her team will be able to assess the ability of novel processes to either kill or stop the growth of these pathogens. "What we do in a test tube does not translate well to what happens in a meat product in a processing environment," McMullen explains. "Agri-Food Discovery Place will allow us to fill that gap and ensure the continued safety of our meat supply as a result."

The Meat Safety and Processing Research Centre will complement places like Agriculture and Agri-Food Canada's slaughter facility at Lacombe, the Food Processing Development Centre at Leduc, and the Alberta Poultry Research Centre at the U of A. "As a result of Agri-Food Discovery Place, we hope to develop technology that might provide better interventions for processors or risk reductions for food borne pathogens for consumers," says McMullen. "It would be up to places like the Food Processing Development Center in Leduc to then scale up the technology."

Extracting and Converting

Dr. Feral Temelli, also of the U of A, is one of the lead researchers involved in the development of the Crop Utilization Research Centre, a second phase of AFDP. This Centre will focus on using crop components, such as those taken from barley and oats for example, in order to maximize their value-added capabilities. "We will be taking any of those crop fractions in their native or converted form and looking at how we can develop food and non-food industrial applications," explains Temelli.

The three stages of Temelli's current work will be transferred to the Centre: dry fractionation, or processing of a crop to split the bran from the flour; wet separation, where the crop is split into components including starch, lipids, protein, and fibre; and, conversion, or reaction – the stage at which the crop components are converted into high-value ingredients or products.

Temelli feels AFDP will fill large gaps in Alberta's research infrastructure. Though the university labs currently have the

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capability to do chemical analyses, physical and microbiological characterizations, and nutritional and sensory evaluations, there are no pre-pilot scale labs. "What we are lacking is small-scale processing capabilities where we can research a large number of processing parameters," says Temelli. "One of the key components of the new Centre is the inclusion of an explosion-proof facility that will allow for processing that involves the use of volatile organic solvents and gases."

Beyond the Bench

The Olds College Centre for Innovation, involved with smaller processing companies on production issues, is set to benefit from AFDP. The equipment that Olds uses is similar to that which will be in AFDP, only larger in scale. "Agri-Food Discovery Place will look at how to put beta-glucan into various products, for example," notes Rick Tofani, senior Vice-President of Business Development at the Centre. "We could then optimize formulations and scale up those products here at Olds, as well as conduct quality control checks."

Ron Pettitt, Director of the Processing Development Division (PDD) at Leduc, shares in Tofani's excitement, calling AFDP "one step beyond the bench top". The Leduc facility, a registered meat, dairy, and food plant with organic certification, is not equipped to handle pathogens or volatile solvent extractions. Pettitt believes this is where AFDP will really be an asset. "The bio-containment and explosion-proof facilities will allow us to proceed on research that we can't do at Leduc," he points out. As a direct result of AFDP, the PDD will have an opportunity to take Alberta-grown products and commercialize them through their facilities.

Fractionation for the Future

The work that Temelli is doing on fractionation and component extraction has implications for both food and non-food products; functional foods, nutraceuticals, value-added processing, and bioproducts all of which have been identified as strategic priority areas for the Centre. Temelli's work is the first step before any of these products can be developed. "The key thing is that regardless of whatever end product application we're targeting, we need this initial capability of being able to fractionate and convert the different crop components," she says. "By taking this approach, we are really creating lots of opportunity."

Ian Morrison, Dean of the Faculty of Agriculture, Forestry and Home Economics at the U of A, agrees with Temelli. "As well as identifying novel ways to suppress harmful pathogenic organisms associated with raw meat products," he says, "AFDP will also give us the opportunity to find novel ways of adding value to products that are normally disposed of in a waste stream with little cost recovery."

The nearly $22 million project is expected to be completed by June of 2005. The project has been funded by a variety of sources including the Canada Foundation for Innovation, Alberta Science and Research Investments Program, Alberta Agriculture, Food and Rural Development, Western Economic Diversification Canada, University of Alberta, Alberta Barley Commission and other industry partners. All those involved expect Agri-Food Discovery Place will attract world class researchers, foster international collaborations and exchanges, and serve as a centre of activity for students to come to Alberta and utilize resources and expertise. "Not only will Agri-Food Discovery Place be a source of novel research results, but it will serve as a hub of training for people who themselves add substantial value to Alberta's agri-food industry," says Morrison.

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> Dr. Feral Temelli
> Researcher
> University of Alberta

Discovering Agri-Food Discovery Place

Facilities

- $22 million facility
- University of Alberta campus location
- Level 2 bio-containment facilities
- Explosion-proof pre-pilot processing facilities

Areas of Focus

- Processing parameters for meat products
- Crop component fractionation and extraction
- Bioproduct research and development

A Hive of Activity

Dr. Medhat Nasr, the province's new apiculturist, arrived in Alberta just over a year ago. With an impressive history of honeybee research and extension expertise behind him, he has already identified several priorities for the industry. From honeybee health and integrated pest management, to market security through high quality and value-added products, Nasr hopes to generate even more buzz about Alberta bees.

Dr. Medhat Nasr and AARI's Freda Molenkamp.

Dr. Medhat Nasr, the province's new apiculturist has a proven track record of bringing bees into the spotlight, and is as busy as a bee in his quest to make Alberta's already thriving beekeeping industry that much more prosperous. Nasr has broadened the scope of apiculture in a variety of North American locales, from California, to New Jersey, to Guelph, for over 20 years since completing his Ph.D. in honeybee research at the University of California, Davis.

For the last 15 years honeybees have come under increased pressure from parasitic trachea and varroa mites as well as diseases like American Foul Brood (AFB). In Ontario, Nasr was instrumental in establishing the first program ever to work directly with industry to help beekeepers there accept new management techniques. He was responsible for breeding tracheal mite-resistant bees, producing hygienic bees – bees that detect the presence of pathogens in a hive and remove them naturally – and introducing Russian bees for varroa resistance to Canada. In any given bee population, 10-15 per cent of the bees are hygienic. Nasr increased the hygienic trait in Ontario up to 55 per cent.

Now Nasr is trying to do much the same for Alberta's beekeeping industry. In Alberta, however, to date there has been no program to address the need for mite-resistant breeding stock. Nasr has begun the work to outline an integrated pest management program for parasitic mite control that would decrease the amount of pesticides used through the use of hygienic and mite resistant bees, organic acids, and essential oils, to improve honey quality and bee health as a result. "It is not about reinventing the wheel in Alberta," he says. "It is about taking the results from the laboratory and applying them to the field in a simple and easy way so that the technology is appealing and easy to accept." According to Nasr, despite the need for new management techniques to address an increasingly food-safety conscious environment, Alberta's beekeeping industry is very progressive. There are 230,000 colonies in Alberta, which represents 40 per cent of the bee colonies in Canada, and nearly $320 million in value of Alberta's pollinated crops. "We have a major need for honeybees here in Alberta in order to meet the demands of hybrid canola seed production," he explains. "There are about 40,000 hives making a direct contribution to agriculture in Alberta."

With the recent discovery of antibiotic residues in Chinese honey and the subsequent collapse of that country's industry, the safekeeping of Alberta's own honey industry, 90 per cent of which is exported, has never been more pressing. China is responsible for 40 per cent of the world's honey supply, and the subsequent trade embargos have caused a honey shortage felt globally and a 250 per cent increase in price. As a result, Nasr is set to improve bee productivity and honey quality and safety. "How do we keep bees healthy in terms of winter mortality which will reduce production costs? And, secondly, how can we produce quality honey without residues in order to stay competitive on the world market? These are the priorities," Nasr stresses.

In addition to new integrated pest management techniques, increased product safety and quality, and better extension services for producers, Nasr would like to see more creative marketing for the industry. Most of Alberta's honey is exported without any processing. He would like to see the introduction of other value-added products including packaging, honey beer, and mead (honey wine).

Nasr has already boosted the profile of the beekeeping community through education and training workshops. He hopes to introduce beekeeping to new generations of farmers as a way of ensuring the future viability of the industry. "The industry is very supportive of what I'm doing. I am challenging them and they are challenging me." Nasr's work is vital in poising an already humming industry on the brink of even greater success.

Swine Savvy

PHOTO COURTESY PRAIRIE SWINE CENTRE

Understanding a problem or system is necessary before a solution or improvement can be found, and that savvy is what swine nutrition research is trying to attain at the University of Alberta. Drs. Ron Ball, George Foxcroft, and Willem Sauer are each working to solve riddles of swine nutrition as they relate to the environment, production, and reproduction. Ball's work will make selecting for efficient eaters easier, Sauer's additions or manipulations of diets can make feeding pigs cheaper with less impact on the environment, and Foxcroft is discovering the reasons behind those energy efficient pigs right from the start.

Roughly 3.5 million hogs call Alberta home, making swine production an integral part of Alberta's rural economy and accounting for approximately $355 million worth of farm cash receipts annually. In the continual attempt to increase efficiency in production as well as decrease negative impacts on the environment, work is being done at the University of Alberta (U of A) to understand the roles of feed components in meat production and in eventual phosphorus levels in manure, as well as how feed and genetics play a role in piglet health in the womb and beyond.

The environmental aspect of pig production often garners negative attention from the public, including concerns about water safety since manure is high in phosphorus (P). Dr. Willem Sauer has undertaken research to try and minimize the amount of P in the manure through various means. His AARI and Alberta Livestock Industry Development Fund-funded research has evaluated the use of low-phytate barley, the use of phytase, and a combination of both to decrease phosphorus excretion by pigs. He is now looking to take on decreasing nitrogen excretion as well.

Phosphorus exists in many feedstuffs in the form of phytate – a form that monogastrics, like pigs and chickens, cannot readily absorb. Barley is a common ingredient in swine diets, but is also high in phytate. Usually, producers add an expensive synthetic form of P, dicalcium phosphate, to meet the pig's needs, which results in much of the barley's original P ending up in manure.

> "We're ahead of where we planned to be at this point in the research, so we're pushing forward on the next phase."
>
> Dr. Willem Sauer
> Researcher
> University of Alberta

There are at least two options to reduce P in manure, and Sauer is exploring both. The nemesis of phytate is phytase, an enzyme that releases P from phytate making it available for the pig to digest. The other solution is using barley with lower phytate content but the same levels of P as regular barley to meet the pig's dietary needs.

Sauer's work has had success on both fronts: using low-phytate lines of barley developed by Dr. Jim Helm in Lacombe and also adding phytase to swine diets. "It's important to understand phytate's efficacy in diets, because barley isn't the only feedstuff used," Sauer explains. Other common ration ingredients contain phytate-bound P, like canola or peas. His work has also evaluated whether or not there were any additional benefits to using phytase beyond the decreased or eliminated use of dicalcium phosphate and decreased P excretion. "The theory was that phytase, in the process of breaking up phytate, would free up some amino acids (protein) for the pig to use, but that wasn't the case," Sauer says.

Undaunted, Sauer is now looking at the addition of specific amino acids to swine diets in hopes of replacing a portion of high-protein ingredients and

"The addition of amino acids to feed increases the carbon efficiency of the pig, meaning less methane is produced, and more importantly, less nitrous oxide – a greenhouse gas 310-times more noxious than carbon dioxide."

Dr. Ron Ball
Researcher
University of Alberta

therefore decreasing the nitrogen excretion of the pig. "We're ahead of where we planned to be at this point in the research, so we're pushing forward on to the next phase," Sauer says.

Womb Studies

While Sauer's work deals with efficiency in the later stages of a pig's life, Dr. George Foxcroft's work deals with nutrition and eventual performance right from day one – in the womb. His work is looking into the effects of nutrition on piglets in the womb and how, if compromised early, those piglets will have less muscle fibre and therefore poorer performance later in life.

A sow has what is called a uterine capacity, meaning her uterus can provide for, on average, 11-14 piglets per gestation. What Foxcroft's work has found is that some genetic lines have sows that will actually begin with 20-25 embryos in the uterus, but by day 50 of the pregnancy, uterine capacity exerts itself and eliminates the extra embryos.

"The concern is that when a sow starts 25 embryos they each begin to develop with a much smaller placenta than if there were 14. My work, with graduate student Susanna Town, has found that the development of muscle fibres is compromised early on because of such a high original population in the womb," Foxcroft explains. This means that although all 14 piglets will be born normal, healthy, and the same weight as other piglets, there are invisible differences in their inherent performance that has been a mystery until now.

This work explains the variance in growth performance later in life, even between piglets of similar genetics. The next step is to continue to understand post-natal growth and to discover a solution to avoid the problem. "We've got to the bottom of what is happening in the womb. Now we have to work with genetic companies to more closely match ovulation rate and embryo survival with uterine capacity and still maintain a large litter size," Foxcroft says. "It's a huge undertaking, but I think it can be done."

Digesting Findings

Dr. Ron Ball's work seeks to understand the pig's digestive tract in minute detail. "Protein is a major cost to swine production, so it's important to know an animal's exact protein requirements," Ball explains. His team discovered that the intestine does much more than digest and absorb nutrients – it actually uses 30-60 per cent of amino acids (the building blocks of protein) itself. This information has helped to refine amino acid requirements of the pig. For example, barley-based diets require more threonine, not just because barley is deficient, but because digestion of the cereal uses that amino acid.

In addition, the research can be used to assess animals. "We were the first ones to have a reliable, efficient way to determine true amino acid requirements on an individual animal basis," Ball explains. "This means we can now genetically select for animals that are more metabolically efficient."

Ball's work also has environmental benefits. "The addition of amino acids to feed increases the carbon efficiency of the pig, meaning less methane is produced, and more importantly, less nitrous oxide – a greenhouse gas 310-times more noxious than carbon dioxide." In this way, neighbours, the environment, and the producer will all benefit from this work.

All in all, these three researchers are proving to be pretty swine savvy, and their combined efforts could have huge implications for producers and consumers alike.

Board Profile


Dr. Francis Yeh

As the Associate Dean of Research of the Faculty of Agriculture, Forestry and Home Economics (AFHE) at the University of Alberta, Dr. Francis Yeh is responsible for developing the Strategic Research Plan for the Faculty and ensuring that the goal of excellence in teaching and research is met.

Yeh holds a B.Sc. in Biology and a Ph.D. in Genetics from the University of Calgary. His research record has garnered him a number of national and international awards, including the International Union of Forest Research Institute Gold Medal for Scientific Achievement. His work has been published extensively in journals, books, conference proceedings, and special scientific publications. He has also been a keynote or invited speaker at conferences around the world. Yeh is the creator of POPGENE, the premier genetic analysis software used by scientists around the world.

Through his roles at the University and on the AARI Board of Directors, Yeh wants to "ensure that our excellent group of scientists in Alberta delivers leading-edge research to better serve the agricultural sector and the people of Alberta."

DID YOU KNOW...

Alberta exports 90 per cent of its honey – 70 per cent to the U.S. and 20 per cent to Japan and Europe. Known for its white colour and high quality, Alberta honey is often blended with other honeys to improve their colour.

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The average bee makes only one twelfth of a teaspoon of honey in its lifetime. The average yield of a hive in Canada is 134 pounds or 60 kilograms of honey.

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It takes four pounds of nectar to produce one pound of honey. To gather four pounds of nectar, bees need to visit two million blossoms. In one trip, a honeybee will visit between 50 and 100 flower blooms. Bees from one hive can visit 225,000 flower blooms in one day.

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During the winters in Canada, bees thermo-regulate their hives to maintain a temperature of 32°C.

Profiling our Partners – ALIDF

The Alberta Livestock Industry Development Fund (ALIDF) is one of seven organizations which form the Alberta Agriculture Funding Consortium, the one-window service which fosters research and development in Alberta's agriculture industry. As a multi-commodity livestock fund, ALIDF focuses on the projects which will enhance the development of an innovative, profitable, and socially responsible livestock sector.

Initiated in 2001, with an $11 million commitment from the provincial government, the Alberta Livestock Industry Development Fund (ALIDF) is funding research and development that is helping Alberta producers and processors address priority needs. ALIDF is interested in projects that contribute to an economically and socially responsive livestock industry, specifically through:

- environmental sustainability;
- food safety and quality assurance;
- animal welfare;
- value-added development; and
- education and communication of the above.

With representation from nine major livestock groups including the beef, dairy, poultry, and pork sectors, the Fund has an overarching but well-defined mandate. According to Bob Christie, Board Chair, ALIDF has encouraged a collaborative approach for all research and development, and thus has maximized funding, leveraged value, and allowed for more projects to be funded. "Cooperative effort means everyone is learning from each other," he says. "This is a very important aspect of our work. It ensures not only efficiency, but big picture thinking."

ALIDF Director Don Sundgaard explains that there are four key questions to be answered when considering the selection of projects for funding:

1) Does the project address an industry priority?
2) Is there industry support ($ or in-kind)?
3) What is the likelihood of success?
4) Is there value for the cost?

Although it is too early to tell the outcome on many of the long-term individual projects, Sundgaard and Christie feel that ALIDF is having a positive impact. Christie says industry-driven proposals are now coming forward because of the Fund, and that these proposals supported by ALIDF have helped to develop new products found in the retail meat case; increased public awareness in regards to industry activities; and supported high standards for food safety and animal care on farms across Alberta.

> "Cooperative effort means everyone is learning from each other."
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> Bob Christie
> Board Chair
> ALIDF

A critical component of the ALIDF mandate is to get results of research into the hands of those who need the information. Sundgaard says that this is an area where there is much to be done. Still, he says that the new magazine published by members of the Alberta Agriculture Funding Consortium, *Reach & Discover*, is a positive step forward and will help to get the word out. In the future, Sundgaard believes that greater partnerships between the industry, research providers, and funding groups will help to improve this tech transfer need while targeting priorities.

What about building the reputation of the Alberta livestock industry outside the province's borders? Sundgaard says that in a time of increased global trade this goal has increased importance. Alberta needs to be the "supplier of choice", known for high quality, safe products, produced in an environmentally sustainable manner – an ALIDF goal critical to the success of the industry and Alberta.

ALBERTA LIVESTOCK
INDUSTRY DEVELOPMENT FUND

Extracting Value

Ten years ago, researcher Dr. Feral Temelli discovered a gap in the area of high-value component extraction in crops. Today, this revelation has made her a leader in value-added processing of agricultural commodities. Through teaching, research, and, now, entrepreneurism, Temelli has helped put Alberta on the map in her quest for a proven method of increasing good-for-you components, like beta-glucan, in our diets.

In 1992, the newly formed Alberta Barley Commission put out a call for research projects. Though she had little experience with barley, Dr. Feral Temelli saw an opportunity. She did an extensive literature review on the crop, finding some studies on the health effects of beta-glucan but none on how to extract and characterize it. "I questioned what properties might be important from a food perspective so that beta-glucan could be used as an ingredient," she says. With those thoughts in mind, she submitted a proposal. For the last ten years the Barley Commission, AARI, and more recently the Alberta Crop Industry Development Fund, have been funding her grain fractionation program focusing on barley beta-glucan. She has also seen her supercritical fluid processing research receive funding from the Natural Sciences and Engineering Research Council of Canada and more recently AARI and AVAC Ltd. The more projects Temelli takes on, the more value she brings to all levels of crop processing in Alberta.

Temelli completed both her undergraduate degree and Masters in Chemical Engineering at the Middle East Technical University in Turkey. At that time, Food Engineering was a new option under the Chemical Engineering program. "After four years of dealing mainly with petroleum," explains Temelli, "food products and the components that go into them sounded very appealing." Encouraged to go abroad for her Ph.D., she left for the University of Florida, trading ancient Ankara for Alachua County, U.S.A.

Since leaving Florida for Edmonton in 1988, Temelli has been garnering respect from academia and industry alike for her research efforts with the University of Alberta's Department of Agricultural, Food, and Nutritional Science. She has made enormous contributions to the province's value-added industry with her work on dry and wet separation processes of barley and oats to obtain valuable soluble fibre. As well, her work with supercritical fluid extraction and fractionation of food components, especially lipids, using CO_2 under high pressure in canola, flax, seaweed, mackerel, carrots, and a variety of spices has made a significant contribution to this industry.

> "Finally, major investments are being made in whole crop utilization, so it is really exciting to think that I can actually contribute to the various initiatives and make a difference."
>
> Dr. Feral Temelli
> Researcher
> University of Alberta

Temelli is continually challenged by the complexity of the processes which she studies. "The functionality, chemistry, and processing of crops are such complicated systems," she says. "That is why I enjoy dealing with them so much." Over the 15 years since her arrival at the University, she has seen, and been inspired by, an incredible amount of change, growth, and initiative in Alberta agricultural research and development.

To add to her extensive resume, Temelli will now be leading the Crop Utilization Research Centre at Agri-Food Discovery Place (also known as Phase Two). Alberta's latest proposed pre-pilot plant for small-scale processing research builds directly on work done by her and others. "Finally, major investments are being made in whole crop utilization, so it is really exciting to think that I can actually contribute to the various initiatives and make a difference," she says.

As if her research, teaching, and family life weren't enough, Temelli, along with fellow researcher Dr. Thava Vasanthan, has recently formed a private enterprise named Cevena Bioproducts Inc. The new company will focus on fractionating barley and oats into high-value components such as beta-glucan. "Soon," Temelli notes with excitement, "we will be partnering with other food manufacturers to put beta-glucan as an ingredient into a variety of products."

Temelli admits that it is a challenge to juggle all the activities that go on in her life, including a daughter who recently left for Toronto to pursue a degree in biomedical engineering – but it is this full life on which she thrives. Clearly the old adage of "If you want something done, give it to a busy person" rings true in the case of Feral Temelli.

Director's Corner

Alan Hall, Managing Director of AARI, maps the path taken by the Funding Consortium to arrive at funding decisions.


Alan Hall

Members of the Funding Consortium are once again engaged in reviewing Research Proposals and making funding decisions. The process is no longer new, and in fact it has been refined so that it works efficiently and effectively to direct support to sound proposals that fit within Alberta's Agricultural Research and Innovation Strategic Framework.

The annual call for Research Proposals, issued every autumn, is actually the beginning of the funding cycle. Although the Call for Proposals is not limited to areas identified in the Framework, it does function as our "guiding light" as we look at the big picture. We start by inviting Pre-Proposals, which provide a brief overview of what the project is, why it should be undertaken, and the benefits which would result, and each year we receive anywhere from 150-350. All the Pre-Proposals are shared among the members of the Funding Consortium (unless the applicant requests that it is not), and this often results in interest from different members of the Consortium and ultimately, joint investment in the proposal. Each member organization in the Consortium reviews all the Pre-Proposals using seven set criteria. Once each group has determined those that they are interested in, the Funding Consortium spends a day together reviewing all the Pre-Proposals. As part of that meeting, decisions are made to either decline the Pre-Proposal or to seek more information.

Declined submissions are notified immediately by letter, while the others – usually around 40-50 – move to the next stage, a request to submit a Full Proposal. This process has assisted applicants by reducing the amount of time invested in Proposals which are not going to move past the first stage of review.

The full Proposals are due in December and AARI staff undertake the critical task of managing the process. The Proposals are sent to industry leaders, scientists, and other key stakeholders for their review. These individuals are drawn from Alberta, other parts of Canada, and also many other parts of the world including the U.S., Europe, Australia, and Asia. The reviewers are asked to provide both a scientific and strategic assessment of the proposed work. The critiqued Proposals are returned to the Consortium where the Review Committees, which include representatives from industry, science, government, and producers, consider the comments and provide a final consensus score for each one, using nine set criteria. This information is then provided to the Boards of each member of the Consortium for them to use in making their funding decisions.

Working as a Consortium has resulted in many jointly funded projects. If two funders have a willingness to support a project, by splitting the funding they can use the money saved to invest in another project.

The next step in the process is referred to as the "Round Table Funding Meeting" and at this point the Consortium members come together and determine the final funding allocations.

There are several key factors that drive these decisions:

- high value of the project, i.e. it will produce a significant return to the industry and the economy, or it will fix a problem
- calibre of the science, i.e. leading edge, scientifically sound, clear objectives, correct methodology, etc.
- expertise of the research team, including the holistic thinking which forges partnerships
- significant private sector support, endorsement and/or involvement

Working as a Consortium has resulted in many jointly funded projects. If two funders have a willingness to support a project, by splitting the funding they can use the money saved to invest in another project. Usually about 60 per cent of the Full Proposals receive funding, typically for the duration of the project (between one and five years).

The members of the Funding Consortium are investors. Their payback comes from economic benefit, resolving problems and barriers to industry profitability and growth, and resolving issues that the public are concerned with. Hence it is critical that a rigorous assessment and review of all Proposals is done to ensure the investment decisions are made that will generate the greatest benefit.

Alan Hall
Managing Director, AARI

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The Link is a quarterly newsletter published by the Alberta Agricultural Research Institute (AARI) that communicates with Alberta's agriculture and research communities.

AARI is an institute established by the *Alberta Science and Research Authority Act.*

Submissions and feedback are welcome.