



## **FEED GRAIN SECONDARY FEEDS UPDATE 2009**

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### **RESEARCH TARGETS GREATER PERFORMANCE FROM SECONDARY**

by KIERAN BRETT

**From canola meal to pulses to byproducts, farmer innovation and scientific inquiry are stretching the bounds of what these feeds can do.**

When it comes to feeding livestock in Western Canada, wheat and barley take center stage. With a substantial and focused research effort ongoing, these crops will deliver more yield and feeding value in the future.

As important as wheat and barley undoubtedly are, the feed complex also has an essential supporting cast that includes pulses, canola meal and the byproducts of food and fuel processing. In this edition of ACIDF's *Feed Grain Research Update*, we talk to researchers and producers about how far these secondary feeds can go.

Improving feed yield and quality is a priority for ACIDF, as seen in funding support for 12 projects spanning areas such as pulse crop development, mycotoxins, improved disease resistance in non-cereal feed crops and assessment technologies for DDGS.

Welcome to ACIDF's *Feed Grain Research Update*.

### **THE 25% SOLUTION**

**In the long run, pulse growers want to capture one in four seeded acres for their crops. Existing and emerging feed applications will play a crucial role.**

When nitrogen fertilizer prices hit record highs in 2008, Alberta's 4,500 pulse growers stood up and took notice. After all, planting nitrogen-fixing peas, faba beans and lentils is a proven way to reduce or eliminate the need for fertilizer. Sky-high nitrogen prices would surely cause a big jump in pulses, moving the market closer to the pulse industry's long-term goal of accounting for one in four seeded acres.

In Barrhead, Alta., seed grower and pulse producer Rick Mueller waited for the phone to ring. He's still waiting.

"I used to believe that nitrogen prices would drive pulse acres," says Mueller, President of the Alberta Pulse Growers Commission (APGC). "In 2008, we had very high nitrogen prices and \$10 per bushel peas, and it didn't matter."

Pulse growers aren't counting on high nitrogen fertilizer prices to boost planting of their crops. With producer checkoff dollars, they're directing and investing in research to make the most of what pulse crops can do, with livestock rations being a major target.

## **More pulses in the feed bunk**

According to APGC Executive Director Sheri Strydhorst, the feeding potential of pulse crops is still not fully understood.

“It is important to remember that with pulses, it is not just about the protein,” she says. “They are very energy dense as well. Field peas, for example, have higher energy than barley and are competitive with corn.”

With funding from APGC and the Agriculture and Food Council, University of Alberta scientist Ruurd Zijlstra is researching the use of pulse fractions in hog diets. This work is intended to provide evidence to back the assertion that pulses can improve intestinal health in swine, and thereby reduce the need for antibiotics. This would save hog producers money and provide food safety assurance to consumers.

In fact, as consumers' environmental awareness grows, Strydhorst can see the day when the use of pulse crops in feeding rations gives livestock producers more marketing options.

“We can see how producers could make environmental claims around feeding pulse crops,” she says. “They could say that because there was no nitrogen fertilizer added to the feed crop, there's a smaller carbon footprint.”

## **Faba beans get a closer look**

For all the agronomic benefits of pulses, Rick Mueller is the first to admit that a crop like field peas can be tricky for first-timers to grow. With one eye on expanding pulse acres and the other on the feed bunk, he sees faba beans as a rising star.

“The biggest knock on peas among potential growers is the issue of standability,” says Mueller. “Faba beans offer better standability than peas. They're like little trees out there in the field. Faba beans also give you 30% protein compared to 22% protein with field peas. They also, unlike peas, grow very well in areas of higher moisture.”

For now, the 770,000 acres of field peas in Alberta dwarfs the province's 5,000 acres of faba beans. As crop producers and hog producers learn more about the benefits of faba beans, however, the acreage gap could narrow significantly over time.

“You can feed faba beans to hogs quite well,” says Mueller, “so hopefully when things in the hog industry pick up, we can begin to make some progress with faba beans.”

## **CANOLA INDUSTRY SEEKS HIGHER FEED VALUE IN MEAL**

### **With North American dairy herds a core market, research is seeking ways to enhance canola meal to make it more attractive to other sectors.**

Among western Canadian farmers, canola continues to be a valuable cash crop, with hybrid technology and agronomic progress driving yields ever higher. Among buyers, the reputation of canola oil is well-established, and health-minded foodservice applications are embracing it. Some overseas markets, at times unreceptive to Canada's GMO canola, are slowly coming around. Meanwhile, new crushing and biofuel capacity is coming on stream in Western Canada and these facilities plan to be busy.

Taken together, these factors support the Canola Council of Canada's forecast that annual canola seed production will soar – from 9 million tonnes today to 15 million tonnes by 2015. This could result in 4 million tonnes per year of canola meal production by 2015, compared to 2 million tonnes today.

”Right now, the biggest export market for canola meal is dairy,” explains Ward Toma, General Manager of the Alberta Canola Producers Commission (ACPC). “A large portion of Western Canadian canola meal is exported to the U.S., mainly to dairy herds in California.”

Barring a short-term doubling of dairy production, how will the canola industry cope with a significant increase in the supply of canola meal? By improving the suitability of canola meal in livestock rations, so that more of it can be fed. With the dairy market secure, the primary focus is on swine.

### **More oil, better digestibility**

Canola meal, the portion of the seed that remains after the oil is extracted, is typically 21% to 23% protein and 3.5% oil. Dairy and beef cattle find the meal palatable, and consumption of high-protein canola meal is associated with increased milk quality. In swine, because of its comparatively low level of digestible energy, canola meal is included in feed rations mainly to provide amino acids. To Toma, there lies the opportunity.

“The Canola Council of Canada has set a goal of increasing by 10% the digestible energy component of canola meal, in order to add value to canola seed,” he says.

Processing considerations are key. Conventional pre-press solvent extraction is geared to removing the maximum amount of oil, thus leaving less in the meal. Another method, known as a cold-press crushing, results in the same amount of meal but much higher oil – between 8% and 11% oil content. That's a good thing.

“This higher oil content helps the energy from the meal to be digested by the pig,” says Toma. “This provides more value to the hog producer, but can negatively impact carcass quality in the pig. The industry is also working on reducing the fiber content, which could make canola meal a more competitive feed component.”

### **Removing fractions can add value**

ACPC and the Canola Council of Canada are funding research by ARD's Eduardo Beltranena into how to separate the various components of canola meal cost-effectively. This serves two purposes. First, the removed fractions could have worthwhile economic value of their own. Second, the absence of these fractions could improve the digestibility profile of what remains.

Says Toma: “If we can make that work, the result could be an increase in the use and the value of canola meal. It could also allow us to move beyond cattle and swine and make a bigger impact in the poultry market and potentially, address a significant opportunity in aquaculture.”

## **NEW-LOOK FEEDS OFFER NUTRITION FOR LESS**

**When feed prices rise, so does the creativity of livestock feeding. This scientist likes homemade canola cake and high-protein, high-yielding faba beans.**

How can livestock producers deal with high prices for feed grains? According to ARD feed scientist Eduardo Beltranena, these producers could do worse than plant some faba beans and buy a cheap canola press.

With grain prices higher than many buyers would like, such strategies offer the potential to maintain effective nutrition while keeping costs as low as possible. Research is helping producers make the most of the opportunity.

### **Fuel the tractor, feed the herd**

In Beltranena's view, capturing the feed benefit of increased canola meal supply will require different ways of processing.

“The big crushers are naturally focused on the oil and they care little about the quality of the meal,” he says. “They tend to over-toast the meal somewhat in evaporating the solvent used to remove the last bit of oil. If we could use a yellow, lower-fibre *Junceae*-type canola, and just give it a light toasting, the quality of the meal would be far superior for feed purposes and we could include even more in poultry and pig diets.”

Beltranena is currently working with the Canadian International Grains Institute and the Canola Council of Canada to explore the feeding value of lightly toasted meals and comparing meals from conventional black-seeded vs. novel yellow-seeded canola. He's also intrigued by the possibilities of smaller-scale, local canola processing. He predicts that more farmers will be buying inexpensive screw-type presses to produce two products on the cheap: a canola 'cake' with 10% to 15% residual oil content and do-it-yourself biodiesel. A similar approach can be taken with flax or linseed.

“This 10% to 15% cake is very attractive for feeding,” says Beltranena, “and there is not much cost or equipment involved. A Colony, for example, could use the biodiesel in their own tractors and feed the cake to dairy and beef.”

### **Research shines light on faba beans**

Field pea has become the standard pulse crop in rotation with canola and grains in Alberta, and has served producers well. Still, if Beltranena had his way, he'd likely plant zero-tannin faba beans instead.

For starters, faba beans provide one-half tonne to one full tonne *more* yield per hectare than field pea, and fix atmospheric nitrogen throughout their life cycle. One drawback, however, is that faba beans are much less tolerant to heat and drought than field pea and therefore have a tough time south of Highway #1.

As part of research funded by the Alberta and Saskatchewan Pulse Growers, Beltranena has done head-to-head comparisons of field pea and faba beans in swine rations. The two pulses performed equally. Ground up faba beans, including the hull, can form up to 40% of a pig's diet with no negative nutritional consequences from two weeks post-weaning through to market weight. In other research, Beltranena has explored swine feeding with faba bean and field pea protein and starch fractions and found them superior to imported soy protein concentrate and cornstarch, respectively.

Despite field pea's superior drought tolerance, Beltranena's view is clear. With higher yields than peas and excellent feeding qualities, low-tannin faba beans merit closer consideration from swine and broiler producers.

“If you produce more crop per acre,” says Beltranena, “that means you can produce more meat per planted acreage. So there's a lot to like about faba beans.”

## THE BEAUTY OF BYPRODUCTS

**This scientist is studying how to minimize feed costs while managing nutritional risk.**

When grain prices soared in 2008, the event served as a wake-up call for prairie livestock producers. No longer, it seemed, could producers take for granted an abundant supply of inexpensive, local wheat and barley. While grain prices have yet to regain those lofty levels, the growth in biofuel-driven demand suggests livestock feeders will continue to compete with other grain buyers.

What's the solution? According to Ruurd Zijlstra, livestock producers must increasingly consider the use of byproducts: the leftovers that occur once grains and oilseeds are processed for another purpose.

“Introducing new feedstuffs into a matrix is a risk,” says Zijlstra, Associate Professor of Agricultural, Food and Nutritional Science at the University of Alberta. “It can have a high payoff because you can dramatically reduce the cost of feed. But there can be unintended anti-nutritional factors that have to be managed correctly.”

Zijlstra is leading a research effort, supported in part by ACIDF, to capture the economic benefits of byproduct feeding while mitigating nutritional risks. He is focused on swine feeding, but the same knowledge should eventually enable more feeding of byproducts to other species.

### **The byproduct opportunity**

To some extent, feeding relatively high-quality grain to pigs is a North American phenomenon. About half of China's 500-million strong swine herd, Zijlstra points out, is fed household scraps in rural families' backyards. A typical European hog ration might contain 50 to 100 different byproducts.

To get a sense of the variety of byproducts available for swine feeding, Zijlstra recommends a stroll through your neighborhood supermarket.

“Most processed food products you see have associated byproducts,” he says. “That means fruit juices, dairy products, packaged foods and more. Generally, wherever there is a high density of food processing activity, there will be high availability of byproducts.”

Western Canada's relative lack of value-added food processing means the choice of feedable byproducts is more limited. In Zijlstra's view, the leading candidates are Dried Distillers' Grain with Solubles (DDGS) from ethanol production, millrun from flour mills and canola meal.

### **A better way to evaluate feed impacts**

Before byproducts can be fed more widely, the industry will need to get a better handle on what's in them and how different species will respond. Zijlstra explains that the feed evaluation system used in Western Canada focuses on Digestible Energy. The system is simple to use, but unsuited to byproduct evaluation.

The more robust system used in Europe – a Net Energy system – is better able to pinpoint highs and lows in protein, starch and fat. As part of his research, Zijlstra is exploring the adaptation of the European system to western Canadian needs.

The industry will also need to address feed formulation technology with byproducts in mind. Even then, it's unclear how byproducts would affect the palatability of feed, and whether mycotoxins or other anti-nutritional elements could find their way into the feedbunk. Byproducts also tend to be high in fiber, a fact that can be mitigated with the strategic use of enzymes, another subject of study.

All in all, with considerable work to be done, Zijlstra is optimistic about the future use of byproducts.

“A lot has to do with our mindset in relation to the feeding of animals,” says Zijlstra. “Here in Western Canada, we've had a very successful way of feeding pigs, but it is getting more expensive. Most of the barriers are in our head. When we look at the diet composition of pigs, it should be possible to introduce higher levels of byproducts and feed these animals at a lower cost.”

## **PARTNERS IN FEED IMPROVEMENT FOR THE FUTURE**

It takes many organizations and many disciplines to advance the yield, quality and performance of Alberta-grown feed grains. ACIDF recognizes and thanks the following organizations for their expertise and dedication to improving Alberta's feed grain crops.

- Agriculture and Agri-Food Canada
- Alberta Agricultural Research Institute
- Alberta Agriculture and Food Council
- Alberta Agriculture and Rural Development
- Alberta Canola Producers Commission
- Alberta Distillers
- Alberta Livestock and Meat Agency
- Alberta Milk
- Animal Nutrition Association of Canada
- Alberta Pork
- Alberta Pulse Growers Commission
- Husky Energy
- Permolex Ltd.
- Saskatchewan Agriculture Development Fund
- Saskatchewan Pulse Growers
- University of Alberta
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*This is the seventh in the series of articles that look in depth at specific solutions to feed competitiveness and will outline investments being made by private industry, farmers, research organizations, government and funding agencies in present and future feed grains research and development. Printed copies are available upon request or visit our website [www.acidf.ca](http://www.acidf.ca) for others issues.*