2011-2012 Seed and Foliar Treatment Trial Final Report

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2011-2012 Seed and Foliar Treatment Trial

Final Report

This is the final report, summarizing the results of over 930 plots planted on three locations over two years. Winterbourne (Waterloo Region) and Conn (Grey County) were again the locations representing medium soils and medium and short growing seasons respectively. This year, to streamline logistics, Macton (Wellington County) served as the third and heavier soil site.

The goal of this two year project was to examine the performance and interaction of seed treatment and foliar fungicides that have recently been registered for use with oats and barley. The performance measures were yield and presence of disease. The latter included counts of true loose smut in barley and fusarium head blight in both oats and barley, as measured by DON tests.

Executive Summary

The spring of 2012 was ideal from a planting standpoint when compared to the very late and wet planting season in 2011. Very dry conditions for all of the cereal growing season in 2012 resulted in less than normal disease pressure. Although, we would not expect to have two consecutive years with little evidence of crown rust disease in oats or fusarium head blight in both crops…such was the case in past two years.

In spite of low observed disease pressure and considerable variability in results across the multiple locations and years, the following trends were recorded:

1. Regardless of foliar applied fungicide used, in general, seed treatments of any kind increased yield by 3% to 6% in barley and 2% to 5% in oats.
2. Under the growing conditions in the trial years, adding insecticide seed treatments did not provide a significant yield increase above fungicide seed treatments.
3. A single foliar fungicide application on plots with treated seed improved yield by 2% to 16% in barley and 4% to 11% in oats.
4. DON test results from untreated check samples across all sites averaged 0.52 ppm in 2011 and 0.06 ppm in 2012 indicating low presence of fusarium head blight.

One barley site in 2011 and one oat in 2012 was dropped due to crop condition or unacceptably high CV numbers.

Seed preparation, planting and spraying services, harvest assistance, data collection and analysis was performed by Ecologistics Research Services of Thorndale, Ontario.

This project was funded in part through Growing Forward, a federal-provincial-territorial initiative. The Agricultural Adaptation Council assists in the delivery of several Growing Forward programs in Ontario.

In addition I thank: Dr. John Sutton, Dr. Lily Tamburic-Ilincic, Peter Johnson and Brian Kerr for their guidance. This project would not have been possible without the support of: BASF, Bayer CropScience, Syngenta, SeCan, and Cribit Seeds staff lead by Sarah Fretz.

Quentin Martin

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All 2012 Treatment Combinations Ranked by average yield as kg/ha

Dignity Barley, 252 plots over 3 sites

	Seed Treatment	Foliar	kg/ha
1	Rancona Apex + C7	Caramba	3551
2	Cruiser Vib. + ProSeed	Caramba	3421
3	Raxil MD+Stress Shield	Prosaro	3416
4	Rancona Apex	Prosaro	3415
5	***check***	*Caramba*	3412
6	Rancona Apex	Caramba	3376
7	Rancona Apex + C7	Prosaro	3372
8	Rancona Apx Stress Shd	Caramba	3363
9	Raxil MD+Stress Shield	Caramba	3358
10	Raxil MD	Caramba	3355
11	Raxil MD	Prosaro	3301
12	Rancona Apex	*none*	3288
13	Cruiser Vib. + ProSeed	Prosaro	3272
14	Cruiser Vib. + ProSeed	*none*	3250
15	Rancona Apx Stress Shd	Prosaro	3231
16	Raxil MD+Stress Shield	*none*	3191
17	Rancona Apx Stress Shd	*none*	3186
18	Raxil MD	*none*	3171
19	***check***	*Prosaro*	3086
20	Rancona Apex + C7	*none*	3083
21	***check***	*none*	3003

AC Bradley Oats, 168 plots over 2 sites
(Conn omitted)

	Seed Treatment	Foliar	kg/ha
1	Rancona Apex	Folicur	3632
2	Raxil MD	Caramba	3620
3	Rancona Apx Stress Shd	Folicur	3590
4	Rancona Apex + C7	Folicur	3571
5	Raxil MD+Stress Shield	Folicur	3558
6	Rancona Apx Stress Shd	Caramba	3514
7	Raxil MD	Folicur	3502
8	Cruiser Vib. + ProSeed	Caramba	3475
9	Raxil MD+Stress Shield	Caramba	3471
10	Cruiser Vib. + ProSeed	Folicur	3440
11	***check***	*Folicur*	3407
12	Rancona Apex + C7	Caramba	3386
13	Rancona Apex + C7	*none*	3327
14	***check***	*none*	3297
15	Rancona Apex	*none*	3278
16	Rancona Apx Stress Shd	*none*	3270
17	Rancona Apex	Caramba	3257
18	Raxil MD+Stress Shield	*none*	3237
19	***check***	*Caramba*	3229
20	Raxil MD	*none*	3190
21	Cruiser Vib. + ProSeed	*none*	3129

Summary Comments: Across 122 comparisons, 57% of plots with both a seed and foliar treatment out yielded plots with only one. Of the top yielding plots across 4 locations, 2 years and 2 crops, 25/30 were seed treated and foliar sprayed.

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Aggregate mean comparisons of all Seed Treatments

The following data is summarized from 60 plots per treatment, all locations, over 2 crop years

Dignity Barley @ All sites⌘, with/without foliar	*2011*	2012	2011 + 2012
Rancona Apex vs. NoSeedTreat (NST)	*7%*	5%	**6%**
Raxil MD vs. NST	*3%*	3%	**3%**
Vibrance* +Cruiser+ProSeed vs. NST	*3%*	5%	**4%**
Rancona Apex+Stress Shield vs. NST	-	3%	**-**
Raxil MD** +Stress Shield vs NST	*7%*	5%	**6%**
Rancona Apex+C7 Biological vs NST	-	4%	**-**
C7 Biological vs NST	*3%*	-	**-**

⌘Site locations: Winterbourne & Conn Ontario, 2011 Winterbourne, Conn & Macton Ontario,2012

AC Bradley Oat @ All sites⌘, with/without foliar	*2011*	2012	2011 + 2012
Rancona Apex vs. NoSeedTreat (NST)	4%	3%	**4%**
Raxil MD vs. NST	6%	3%	**5%**
Vibrance* +Cruiser+ProSeed vs. NST	2%	2%	**2%**
Rancona Apex+Stress Shield vs. NST	-	4%	**-**
Raxil MD** +Stress Shield vs NST	6%	4%	**5%**
Rancona Apex+C7 Biological vs NST	-	4%	**-**
C7 Biological vs NST	-1%	-	**-**

⌘Site locations: Winterbourne, Conn & Macton Ontario, 2011 Winterbourne & Macton Ontario, 2012

* Sedaxane became known as Vibrance in yr 2

** Prothioconazole added to Raxil MD in yr 2

True Loose Smut in Barley Infected heads/plot	2012
No Seed Treatment	23
Rancona Apex	1
Raxil MD	4
Vibrance*+Cruiser+ProSeed	9
Rancona Apex + Stress Shield	2
Raxil MD** + Stress Shield	4
Rancona Apex + C7 Biological	2

SMUT COUNT is average of multiple counts taken at Winterbourne, Conn & Macton ON.

This is the second year of a two year project.

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Seed Treatment and Foliar Fungicide Trial Results
Summary of all Locations, 2 crop years

Dignity Barley @ All sites

	2011+2012
Seed treatment (no foliar) vs. No treatment	6% increase
Seed treat+Caramba vs. Seed treat	9% increase
Seed treat+Prosaro vs. Seed treat	9% increase

Site locations: Winterbourne & Conn Ontario, 2011 Winterbourne, Conn & Macton Ontario, 2012

AC Bradley Oat @ All sites

	2011+2012
Seed treatment (no foliar) vs. No treatment	1% decrease
Seed treat+Caramba vs. Seed treat	7% increase
Seed treat+Folicur vs. Seed treat	11% increase

Site locations: Winterbourne, Conn & Macton Ontario, 2011 Winterbourne & Macton Ontario, 2012

Products tested

Seed Treatments

No treatment check
Rancona Apex
Raxil MD
Cruiser Vibrance + Proseed
Rancona Apex + Stress Shield
Raxil MD + Stress Shield
C7 Biological

Foliar FungicidesTreatments

Caramba
Prosaro
Folicur
No spray check

This is the second year of a two year project.
This project was funded in part through Growing Forward, a federal-provincial-territorial initiative. The Agricultural Adaptation Council assists in the delivery of serval Growing Forward programs in Ontario.

Technology Transfer

Five plot tours were held during the two year project. In 2011 approximately 130 growers attended one of two site meetings. In 2012, approximately 140 growers in total attended one of the meetings held at each of the 3 locations.

Conn 2011

Winterbourne 2012

This report will be available on our website www.cribit.com and the Ontario Cereal Crop Committee website www.gocereals.ca

We will make ourselves available to present the report at various industry and association meetings during 2012 and 2013.

This will complement the print media attention the project has already received as indicated in the following pages.

NEW CROP PROTECTION TECHNOLOGIES POSSIBLE FOR OATS AND BARLEY

Work is underway by the Ontario Cereal Research Industry Council to test the potential impact of new crop protection technologies for oats and barley.

The Council-led project is evaluating the effectiveness of newly available seed treatments and a foliar fungicide for oats and barley.

"There generally aren't a lot of new technologies coming to market for oats and barley and it is important that information is available to growers of these crops," says Quentin Martin of Cribit Seeds, the principal seed grower and processor involved in the project. "If these technologies are effective, they will help maximize yield for growers and improve the quality of harvested grain."

How is the research being conducted?

Trial plots in the two-year project are spread across central Ontario to measure the effectiveness of the products in various geographic regions, climate zones and soil types. Approximately 250 plots are at each of the three trial locations: near Winterbourne northeast of Waterloo, near Conn in southeast Grey County, which has a shorter growing season, and in the Elmira – Listowel area, where clay soils are prevalent.

Crown rust is a significant threat to oats, which has limited genetic resistance against the disease. Barley is affected by several pathogens, including true loose smut. Fusarium can pose a threat to both crops.

What is the research showing?

"The plots that received both seed treatments and foliar application had a better chance of floating to the top of the yield charts," says Martin of the project results to date. "In the two years we've been working with this, weather has definitely impacted us. Conditions in both 2011 and 2012 have meant less disease pressure, which makes it more challenging to measure product effectiveness and track the differences between treated and untreated plots."

Timing is also important, says Martin, adding that part of the challenge with foliar applications is making sure the product is applied at just the right time for maximum effectiveness.

What impact could this technology have on oat and barley growers?

"We are doing yield testing on all of our plots to compare the different treatments we are evaluating," says Martin. "If we can determine what works best, we will be moving forward with making recommendations to other authorized seed establishments, as well as providing that information to our growers."

Where can I get more information?

Information will be available this fall on **www.cribit.com**, and on **www.gocereals.ca**, the website of the Ontario Cereal Crops Committee. The Farm Innovation Program (FIP) was funded in part through Growing Forward, a federal-provincial-territorial initiative. The Agricultural Adaptation Council assists in the delivery of several Growing Forward programs in Ontario.

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CEREAL PERFORMANCE RESEARCH

Preliminary results of trials involving insecticides, seed treatments and foliar fungicides.

by Treena Hein

"New seed treatments and foliar fungicides have recently been registered for use with oats and barley, and an evaluation of their performance and interaction is needed," says Quentin Martin, co-owner of Cribit Seeds and Wintermar Farms, a grain and seed farm operation in West Montrose, Ontario. "As well, getting a handle on controlling *Fusarium* in both crops and loose smut in barley is important." To help, Martin applied for and received federal "Growing Forward" funding (delivered through the Agricultural Adaptation Council) to do trials over the 2011 and 2012 growing seasons. Assistance for the experiments was also provided by BASF, Bayer CropScience, Engage Agro, Syngenta, SeCan, Dr. Lily Tamburic-Ilincic (a research scientist at the University of Guelph, Ridgetown Campus) and Peter Johnson, cereal specialist at the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA). Ecologistics Research Services of Thorndale, Ontario, performed seed preparation, planting and spraying services, harvest assistance, data collection and analysis.

As of now, data has been analyzed from the first year of the project, 2011, which involved 360 plots in three locations: Winterbourne (north of Waterloo), Conn (north of Arthur) and Newcastle (east of Toronto). "The performance parameters measured are yield and disease control, including true loose smut in barley and Fusarium head blight as measured by DON tests," says Martin. "Soil at all locations is medium loam, with some growing season differences; Conn, the shortest, Winterbourne middle and Newcastle, longest."

Martin's trials involved only one variety of each crop in order to keep number of plots manageable: Bradley oats and Dignity barley. "We were looking at seed treatments, foliar fungicides and the interaction between them, and so we just couldn't look at variety differences too," he says. Seed treatments used in the trials were Rancona Apex, Raxil MD, Sedaxane-CruiserMaxx-Proseed, Raxil MD-Stress Shield and Endophyte. Foliar fungicides included Caramba (oats and barley), Prosaro (specific to barley) and Folicur (specific to oats).

Data from the first year very preliminary

"I don't recommend anyone change their practices because of it," he says, "but we do have some findings that are statistically significant. It's no secret that 2011 was a very challenging year for oats and barley production because of the late wet spring conditions followed by a hot, dry summer. Trials at Winterbourne and Conn remained relatively uniform despite the weather challenges. Only the oat plots were harvested at Newcastle because of too much

ABOVE: **The multi-year experimental area run by Quentin Martin is exploring how new seed treatments and foliar fungicides perform when used on oats and barley.**

weed pressure in the barley plots.

With treatments versus no treatments in barley, the biggest impact was a yield boost of seven percent with Rancona and Raxil MD-Stress Shield. With oats, two trials had a yield difference of six percent – Raxil MD and Raxil MD-Stress Shield. With foliar fungicide treatments, three of five treatment scenarios showed a significant response of 10 to 27 percent. In trials with both fungicide and seed treatments, Martin found that 60 percent of plots out-yielded those with only fungicide or seed treatments. "Of the top five yielding plots across three locations and both crops, 22 of 25 were seed-treated and foliar fungicide-sprayed," he says.

Some results unexpected

"For example, these trials showed no yield response in oats to foliar fungicides applied at the Winterbourne location," Martin notes. "However, on the same farm, and with the same variety (Bradley), the OMAFRA Smart Trials demonstrated a meaningful response to both one and two foliar applications." Martin thinks the lack of response to the application of a single foliar fungicide at the Winterbourne location may have been because it occurred after the ideal growth stage (flag leaf) of the oats. "We did the fungicide application applications for both crops at the same time, and it was a little late for the oats," he says. "Comparing the results of the two experiments at the same location verifies the importance of timing of application."

In terms of *Fusarium*, disease pressure was very low at the three trial locations. "DON test results on our non-treated control plots averaged 0.5ppm, and that may not be enough pressure to expect a treatment response," says Martin. "We are still looking into that."

With loose smut in barley at Winterbourne and Conn, Rancona Apex provided the best seed treatment protection, followed by Raxil MD+ Stress Shield and Raxil MD.

The Ontario Cereal Crop Committee (OCCC) has published an interim report with 2010 data (2011 data is being analyzed now) on the influence of fungicides on provincial variety rankings and performance of winter wheat, spring wheat, barley, and oat. One fungicide was applied at flag leaf in oat, and two fungicides were applied in wheat and barley (one at weed control timing and another just after heading).

"It's no secret that 2011 was a very challenging year for oats and barley production because of the late wet spring conditions followed by a hot, dry summer."

"Fungicides increased yield for all crops," says Peter Johnson. "More importantly, however, is the finding that some varieties respond more to fungicide than others." For example, there was a range of zero to 48 percent increase in yield across winter wheat varieties and locations, zero to 68 percent in spring wheat, zero to 41 percent in barley, and zero to over 300 percent in oats. "However, we found that, in general, variety rankings did not change significantly in locations with inherently low disease pressure," Johnson notes. "Likely diseases were controlled on the most susceptible varieties, and these varieties tended to have the highest response to fungicide. Further analysis of the three-year data should define those answers."

SOYBEANS

Products	Common name	Chemical group (Rotate groups to manage resistance) (Check label for details)	DISEASES: Fusarium seedling blight	Phomopsis seed mould	Pythium damping-off	Phytophthora	Rhizoctonia damping-off	INSECTS: Bean leaf beetle	European chafer	Seed corn maggot	Soybean aphid**	Wireworm
Agrox B-2	diazinon + captan	1B,M4	•	•						•		
Agrox CD	diazinon + captan	1B,M4								•		
Allegiance FL	metalaxyl	4			•	•						
Anchor	carbathiin + thiram	9,M3	•	•			•					
Apron FL	metalaxyl	4			•	•						
Apron XL t	metalaxyl-M	4			•	•						
Apron Maxx (RTA or RFC)	metalaxyl-M + fludioxonil	4,12	•	•	•	•	•					
Belmont 2.7 FS	metalaxyl	4			•	•						
Captan Flowable	captan	M4	•	•								
Cruiser 5 FS t	thiamethoxam	4A						•	•	•	•	•
Cruiser Maxx Beans t	thiamethoxam + metalaxyl-M + fludioxonil	4a,4,12	•	•	•	•	•	•	•	•	•	•
Maxim 480 FS t	fludioxonil	12	•	•			•					
Trilex FS t	trifloxystrobin	11	•	•								
Vitaflo 280	carbathiin + thiram	9,M3	•	•			•					

** Early season protection only.
t Available to commercial seed treaters only.

Important: Top Crop Manager's Seed Treatment and Inoculant Guide tables are a guide only. It is highly recommended that growers refer to local provincial guides and labels.

Clean up the smut

New smut control could help our barley acreage grow to meet market opportunity

By Ralph Pearce, CG Production Editor

These days, most growers are interested in planting corn, then soybeans, then wheat. In terms of priority, barley rarely makes the 10, which is too bad, since incorporating a fourth or even fifth rotational crop has been proven to have significant benefits for the more popular "Big Three."

One factor that may be holding barley back in its bid to recapture acres is the recent increase in frequency and severity of loose smut. Part of this increase can be attributed to having just the right environmental conditions for the disease's spread, yet according to Peter Johnson, cereals specialist for the Ontario Agriculture Ministry, it could also be attributed to weakening genetics.

For example, OAC Kawartha, which has been one of the best barleys to come out of the provincial system and has been Ontario's No. 1 barley variety, was tremendously consistent up until it started to have these loose smut issues, Johnson says. "Suddenly, for the last three or four years, we've been getting all sorts of complaints."

Loose smut causes total yield loss in the infected plant, so it's little wonder growers watch it with concern. Infected heads release their spores prior to harvest to blow across the field and infect healthy heads (by attacking the embryo). The spores won't affect the quality of those healthy heads at harvest, but if and when those seemingly healthy spore-carrying seeds are planted the next year — and provided there are no control measures used — the spores will germinate and systemically infect the new plant and create a new batch of spores.

Plus, since environment plays such an important role in the disease's development, the spores could lie dormant for years without any visual symptoms.

Cereal breeders haven't helped, it's thought, because they've taken their eyes off smut tolerance in order to focus on answering the grower's demand for more yield and better standability. As a result, the drive for improved disease tolerance and resistance has been overlooked.

This is where seed treatments provided some levelling of the playing field. For years, Vitaflo 280 (carbathiin + thiram) was the standard for control of loose smut in barley. Now, it is suggested that its efficacy has decreased at the same time as the anti-smut power of barley genetics has also declined.

"You need both (genetics and seed treatments) working in concert to get the level of control you'd like," says Johnson. "In this case, we had a reasonable fungicide but without that genetic support, it just couldn't carry the load."

Now the picture is improving, with new fungicides that are ready to carry more of that load — up to 95 or 98 per cent control.

Two of those fungicides are Dividend XL RTA (difenoconazole + metalaxyl-M) from Syngenta, and Rancona Apex (ipconazole), from UAP Canada. According to Brodie Blair, product manager for UAP Canada, Rancona Apex has become a popular option away from Vitaflo, both for its control of loose smut and *cochiobolus sativus*, the fungal pathogen that causes some *fusarium*-like seedling blight.

"Rancona is really good on a lot of these diseases," says Blair, who is based in Winnipeg. "It does have systemic and contact activity, so it will provide good control of soil-borne seedling disease as well as disease that's inside the seed, like true loose smut or loose smut."

Another property that makes Rancona a popular choice, says Blair, is its flowability. It behaves like a true liquid, making it easy to apply for growers who do the job themselves. Its formulation also allows for treating seed at temperatures as low as -20 C without having to worry about lines freezing. That means seed companies and growers can get a jump-start on the season, even in the middle of winter.

FIGURE 1. 2011 COMPARISON OF BARLEY PLOTS — TWO SITES

Loose smut in barley infected heads/plot	Winterbourne	Conn	Average
No seed treatment	174.3	12.0	93.2
Ranconca Apex	0.3	1.0	0.7
Raxil MD	16.0	4.7	10.4
Sedaxane + Cruiser + Proseed	67.0	7.3	37.2
Raxil MD + Stress Shield	10.3	2.0	6.2
Endophyte	135.3	10.7	73.0

Source: Quentin Martin, Cribit Seeds and Wintermar Farms.

Seeing and believing

For Quentin Martin, finding the best solution to loose smut in barley is particularly important. As principle of Cribit Seeds and Wintermar Farms, northeast of Waterloo, Ont., Martin is a seed grower and processor of various cereals, so his customers' livelihoods — and his own — all depend on effective disease control.

In 2011, Martin participated in a seed and foliar treatment trial at three sites (Winterbourne, near his

home farm, Conn and Newcastle). He cautions that although this was an extensive replicated trial with 360 total plots, it was the first of two years for this study, which was funded in part through the Growing Forward initiative, with the help of the Agricultural Adaptation Council and several private- and public-sector partners. The results for loose smut in barley were encouraging, but data were gathered from the Winterbourne and Conn sites only.

"The main focus was looking at DON (deoxynivalenol) levels in oats and barley, and looking at the new seed treatments and the new registrations for foliar fungicides for oats and barley," says Martin. "And the tests afforded us the opportunity to do some smut counts as well."

In fact, Martin notes the most conspicuous results from 2011 did not come from responses to foliar fungicides or seed treatments, it was from their tests for loose smut. In the introduction on the test's report, Martin pointed out that 2011 "was a very challenging year for oats and barley production, because of the late, wet spring conditions followed by a hot, dry summer." That actually affected the results at Newcastle but provided some solid evidence that the issue with loose smut is related to weather and environment, with disease conditions at Conn worse than those at Winterbourne.

"We worked with Dignity barley," says Martin, noting that the variety out of Duane Falk's program at the University of Guelph is one of the higher-yielding, six-row barleys available to growers in Ontario. "It's a good variety for tracking smut, and we were looking for disease control in oats and barley. Ironically, the disease that produced the clearest results in the test was loose smut."

Dignity is a relatively new variety and Martin concedes that loose smut flourished under suitable conditions.

"We'd used Vitaflo for 25 years in spring cereals, but in 2011, we switched to Rancona and did see improved performance with it," Martin says. "In this research work, we were able to look at things much more closely and going to Rancona was the right choice for smut." **CG**

Barley boom ahead?

Barley's glory days in Ontario peaked in 1986 in Ontario at 580,000 acres. Compare that to 2011, when there were just 105,000 acres harvested.

In those 16 years, average yield has barely budged. Growers got 60 bushels per acre in 1986. In 2011, they got 61.

Not all fields were average, however. Quentin Martin of Wintermar Farms north of Kitchener has made a point of stepping up his cereal management and he is notching yields of 80 bushels per acre on oat and barley acres (numbers confirmed by Agricorp).

Impressively, those yields are on 500-plus acres per year, not on small plots or even strips.

In Quebec, 2011 production was down markedly to just 79,000 acres. That compares to 2003 statistics, when 137,000 acres were harvested, meaning the province has seen barley acreage drop by 42 per cent.

Prince Edward Island had 43,000 acres dedicated to barley production in 2011, and while the numbers for Nova Scotia and New Brunswick are not as recent, Nova Scotia has seen more than a 50 per cent drop in harvested acres from 2000 to 2009, from 10,600 acres down to 5,000. In New Brunswick, the figures for barley production indicate the lowest drop in acres planted, from 40,000 in 2004 to 34,100 in 2006.

As for barley's future in Eastern Canada, there is research by Athar Shah, a business development consultant with the Ontario Agriculture Ministry who cites significant market potential in an area roughly centred in the Middle East.

In September 2011, Shah used a presentation to underscore the value of the global Halal food market, as well as export opportunities for the Middle East, North Africa, the Gulf Co-operation Council (including oil-rich countries such as Dubai, Saudi Arabia and the United Arab Emirates).

Although Shah focused on the growing market for wheat, the GCC, the Middle East and Africa hold a total food value worth more than $600 billion. Clearly, Shah says, even a small market share for barley there could be huge news for barley in Eastern Canada.