

CSA Newsletter

Canadian Society of Agronomy

September 2017



PRESIDENT'S MESSAGE

Fellow CSA members,

Our post-conference newsletter highlights the joint CSA-CPS meeting held June 18-22, 2017 in Winnipeg and includes excerpts from our Distinguished Agronomist (Shabtai Bittman) and the best agronomy paper in CJPS in 2016. I wish to applaud our Student Travel, Oral and Poster, Video (first time), and Photo award winners. For the first time, we recognized CSA members with 10 or more years with certificates and, as per tradition, CJPS Editor Brian Beres gave awards to recognize the Outstanding Reviewer and Associate Editor for Agronomy at the CSA AGM. The wrap-up banquet included a delicious meal and was well attended, and major awardees were recognized including (for the first time) a female Early Career Agronomist, Dr. Yvonne Lawley from the University of Manitoba. Hurray!

With the new academic year comes the new CSA executive committee, about which you can read on the last page of this newsletter. I look forward to working closely with the incoming executive to plan and implement our next conference, which will be held jointly with the American Society of Agronomy (ASA) and the Crop Science Society of America (CSSA). Please mark November 4-7, 2018 on your calendar and plan to participate in this joint ASA-CSSA-CSA meeting in Baltimore, MD.

Over the past year, the CSA executive encouraged active participation of CSA members through the formation of working groups to discuss issues of concern to their discipline. The first to be initiated was a plant breeding working group to discuss issues around open access to plant genetic resources (PGRs) (synonymous with plant germplasm). What are PGRs or plant germplasm you may ask? Well, for a plant breeder, they are the genetic source for the development of new cultivars. As plant breeders, we build on each other's successes and are not able to do this without access to new germplasm. Andrew Burt kindly accepted the nomination to chair the plant breeding working committee. Andrew's first task was to set up a Google Docs spreadsheet to brainstorm about topics and speakers for a CSA plant breeding symposium at our next conference in 2018. If you wish to participate with the group or conference symposium, please contact Andrew or any of the executive and help us to make a significant contribution to the next joint CSA-ASA-CSSA meeting.

I would also like to take this opportunity to thank our outgoing President and Past President Dr. Ali Navabi and Dr. Tarlok Singh respectively for their mentorship and efforts on behalf of our members this past year.

Helen Booker, President



Successful 2017 CSA Conference in Winnipeg

The conference was a great success, thanks to Yvonne Lawley as our primary liaison with our partner society and with the local organizing committee. The venue was good, organization nearly flawless, and the technical content excellent. We did a number of new things, one of which was to invite retired CSA members living in the vicinity to join us at the opening mixer, as our treat. This gesture was appreciated, even by the retired members who could not attend. CSA held its Annual General Meeting at the conference, and in the last newsletter we introduced the new Executive who are now officially in control. A key agenda item for them is to prepare for the next conference, to be held in conjunction with the American Society of Agronomy and the Crop Science Society of America, November 4-7, 2018 in Baltimore, MD. We've met in the US with ASA before, it has advantages and disadvantages, but certainly presents a diverse venue and some significant opportunities. Hope you can attend.

Award for Best Agronomy Paper in CJPS in 2016

In the last newsletter, we promised to say more about this paper. The full paper can be seen at <http://www.nrcresearchpress.com/doi/10.1139/cjps-2016-000> if you have a subscription to CJPS. This paper was also highlighted in Top Crop, and you can see this at <https://www.topcropmanager.com/irrigation/sugar-beets-and-soil-conservation-20179>.

Every year CSA, with the help of the Editor of CJPS, has a panel of members select the best agronomy paper. This is prestigious, because all the papers are well done and fully vetted. The title of the best paper in 2016 is "Sugar beet response to rotation and conservation management in a 12-year irrigated study in southern Alberta", authored by Francis J. Larney, Jennifer J. Nitschelm, Peter J. Regitnig, Drusilla C. Pearson, Robert E. Blackshaw, Newton Z. Lupwayi, and published as Canadian Journal of Plant Science, 2016, 96(5): 776-789.

To quote the Top Crop summary of the paper:

"Conservation management practices can increase sugar beet yields over time – that's one of the key messages from a 12-year irrigated cropping study that compared conservation and conventional management.

The study, which ran from 2000 to 2011, took place at the Vauxhall Research Substation of Agriculture and Agri-Food Canada (AAFC) in southern Alberta's Brown soil zone. It focused on three irrigated row crops: sugar beets, potatoes and dry beans.

"The acreages of potatoes, dry beans and sugar beets were on the rise in the late 1990s, and there was a lot of support from irrigation farmers for some rotation research and also research to look at some soil conservation practices," explains Frank Larney, the AAFC research scientist who co-led the study with his colleague, Bob Blackshaw. "We had a lot of input [in developing the study] from various farmers representing the Potato Growers of Alberta, Alberta Pulse Growers and Alberta Sugar Beet Growers."

Student Travel Awards for 2017

There were four Student Travel Awards presented this year at the CSA Annual General Meeting in Winnipeg, each for \$500. The awards went to Gurcharn Brar (University of Saskatchewan), Waqar Ashiq (Memorial University), Waqas Ali (Memorial University), and Tram Thai (University of Lethbridge). Student can apply for these awards prior to each conference. *Shown in the photo are Gurcharn Brar (left) and Tram Thai (right).*



Awards for Student Oral and Poster Presentations

Each year, we plan to award about \$3000 for the best oral and poster presentations by students at the conference. Usually there are 6 awards, 1st, 2nd and 3rd for both oral and poster. This year, the judges determined that only one oral and one poster presentation were suitable. The 1st Place Oral award, for \$900, was to Jonathan Rosset (U of Manitoba) for his paper “Cultural weed control decisions impact the competitiveness of Glycine max (L.) Merr. grown in the northern Great Plains. Jonathan also helped chair a session at the conference. The 1st Place Poster award, \$600, was to Kamal Khadka (U of Guelph) for his paper “Phenotyping of a Nepali spring wheat (*Triticum aestivum* L.) diversity panel for dark-adapted leaf epidermal conductance.

Awards for Agronomy-Related Video

This was the first year for this award, initiated in part because our partner society at the conference gives this award annually, but more especially because Gurcham Brar, Student Representative on the Executive, was the powerhouse to organize the competition. There were 4 entries, all very interesting:

- Cultural/Agronomic Control Methods for *Ascochyta* Blight in Pulses. Kun Lou, Keiko Nabetani and Megan, University of Saskatchewan
- Tillage. Manpreet Kaur, University of Saskatchewan
- Organic field pea and lentil cultivation methods. Oleksandr Alba, University of Saskatchewan
- Demonstration on JoinMap software for genetic mapping studies. Christine Lee, Rob Brandt and Rachel Whaley, University of Guelph

The judges decided they were all equally worthy and \$300 was given to each of the lead contributors.

Awards for Agronomy-Related Photo

This is also a first for CSA, and in the end the award decision and presentations were subsumed by the local organizing committee. Doug Cattani set up the judging, it was computer based voting by all the conference attendees who dropped by the display.

Two awards were given:

- Photo Winner Agronomy - Saikat Kumar Baku, University of Lethbridge
- Photo Winner Phytopathology - Sudarsana Poojari, Summerland Research and Development Centre.

Certificates for 10 or More Years as a Member of CSA

Another first. This year, Past President Tarlok Sahota proposed that we should recognize in some way our long time members. We have electronic membership records back to 2001, when Steve Sheppard started as Executive Director. We combined all the records and selected out those members who had 10 or more years, and including years as student or post-doctoral members. The 10 years did not need to be consecutive. The pleasant news was that 65 members have been members for 10 or more years. This is strong evidence of the loyalty of our members. Certificates were prepared for all 65, and we were able to hand them personally to 12 members present at the AGM in Winnipeg (see photo). The vision now is to prepare certificates each year as members reach their 10-year membership anniversary.



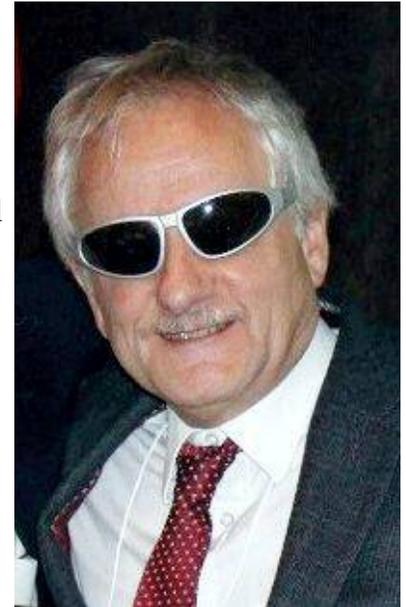
A funny thing happened on the way to....here Shabtai Bittmann (Distinguished Agronomist 2017)

I would like to express my sincere gratitude to the Canadian Society of agronomy for this award for the opportunity to tell you about some funning things that happened on the way to... here.

I have decided to present here not a lecture but a reflection on some 40 years of agricultural research from a generally conflicted city boy. And If I am successful over the next hour and a half, you will be able to take away absolutely nothing form this talk. This is just a personal memory trip; I disavow anything moral or useful that you might infer...

My life in agriculture started in downtown Montreal where I lived and went to university; it was not because my family owned a bakery and I was gripped at a young age with knowing where our wheat and rye flours came from. They were sent by the bakery supplier and I was fine with that, I was more impressed that they delivered dozens of hundred-lb. (45 kilo) bags carrying two at a time which would have crushed me. Starting at McGill, just a few years after Leonard Cohen, I had serious aspirations for a life in chemistry or psychology, or sociology or possibly microbiology, but when it came it, stoichiometry, conflict and order theory for society, pain neurons and the Wasserman test for syphilis held no more interest for me than where the flour in the bakery had come from. But a few days into 4th year, I was meandering the hallways of the Stewart Biology Building up on the hill, I stumbled on a graduate seminar in plant ecology, particularly, physiologically plant ecology, and for reasons I cannot explain, there was not even a pretty girl in the class, I was hooked. This was an important turn in my life, first because my wife-to-be agreed to date me only because she thought ecology was cool- this was the early post-sixties. But also, because though I really liked the subject I could not stay in it. You see my classmates and professor, in these days of the Club of Rome's Malthusian population projections of mass starvation, argued that we should stop shipping food to mitigate famines around the globe because it would eventually lead to more people and more hunger. I remember swallowing hard at this but allowing that it was a theoretical academic position. However, when the professor said how we should deploy the navy should the hungry hoards arrive at our shores, this immigrant son of two WWII refugees who known lots about hunger, decided to defect from plant ecology and to join in with plant agriculture at Macdonald College. I only knew about Macdonald College from riding my bike as a teenager, lost on the West Island of Montreal- you see the Agriculture School was never mentioned at McGill. I was invited to do an MSC on forages, and I agreed since they offered money and I didn't have any, had no idea what forages were, and have been on their case for over forty years since that day. Forages are more like plant ecology than other crops and nothing else would have suited as well. My ecology professor at McGill chastised me that I had joined the other side, and my agriculture professors at Macdonald claimed that there were no ecological issues in agriculture, after-all why would farmers not stop the leaking of their costly resources from their farms. This was 1972.

After my MSC, I lectured a class in plant ecology at Macdonald and two of my students beat me to a PhD in plant science by several years, one became an AAFC research scientist and the other a professor at Macdonald. I struggled to find work, though everyone was predicting massive recruitment which never happened. I wound up as a temp. with AAFC in Nappan, Nova Scotia, which was nowhere on a map and I was afraid to ask in case they would think me an agricultural imposter. You see I had a Master's degree in agronomy but very few basic courses in anything agricultural. I thought I could easily wing it, but I couldn't really, it was all much harder than I thought, but I sort of slipped through because no one at my work could fathom how little about agriculture I actually knew (and there was no internet or even a good dictionary on hand). But the view from my office of the tides on the Bay of Fundy was utterly magnificent, the same office later used by Yousef Papadopoulos, but I bet I wasted more time gazing out the window than Yousef did. Funnily, the window faced the Minudie Pasture where a future AAFC director, Paul McCaughey, was working as a shepherd.



Our newest Distinguished Agronomist, Shabtai Bittman, illustrated how it is still cool to be an agronomist.

A funny thing happened on the way to....here (continued)

And then suddenly there was a Real Job with AAFC in the city of Melfort, SK. I had never heard of Melfort but I was encouraged that I could easily find Melfort on a map, unlike Nappan, and it was even in great big letters. It was the 6th largest city in SK and there was plenty of room all around the map for a large MELFORT. Actually, oscillating around the threshold 6,000 population mark Melfort was sometimes a city and sometimes not a city. Melfort was an adventure and a tough gig, my first spring I was in the field shivering in a down jacket and already getting loads of mosquito bites. My great mentor there was forager John Waddington. I remember asking John when I arrived in late summer (i.e. mid-August) how deep the snow gets in Melfort, and he answered what do you mean, and I replied what do you mean what do I mean, so then he said “well how tall is your stubble?” so I knew then that I was in an all-different world. Which by the way I grew to love and hate, but mostly love. And when 10 year later I left for BC it was a really tough decision that kept me changing my mind by the minute till the very last instant of my very final deadline. I loved working on grasslands even if all were tame pastures in the Aspen Parkland, and I still like to see the world and cowboy movies through the lens of grasslands. I worked on brush control, on alfalfa persistence and, for my PhD at U of SASK, on water relations in semi-arid grasses. Our brush control methods worked but industry was not even a little interested, the alfalfa persistence trials led many, many years later to registration of a very hardy line selected in the late 1960's by Dave Heinrichs, suggested for our trials by Byron Irvine (thank you Byron), which we dubbed Yellowhead for the highway and the ‘Iroquois fur trader’, and for its bright yellow *falcata* flowers. Yellowhead seed became available almost 50 years after the original selection was made (there is a story, but not now). Not surprisingly, the seed industry may not want an uber-persistent alfalfa variety, can you guess why? Market forces are not simple as some would have. I had learned that from all those years plying the bread routes in Montreal.

Drought resistance was more interesting. There was a lot of buzz in the late 70's and early 80's about water relations and dozens of papers and many books were published on the subject every year. For my PhD work, I took hundreds of measurements of water potential, osmotic potential, pressure potential and relative water contents, the linchpins of water relations science, and related them to plant growth and stomatal activity. Some of the eminent plant breeders at U of S laughed at this and called my research useless, and they got really irritated when I basically agreed with them. By the end of my PhD, I was quite sure I had nothing to offer breeders other than the firm opinion that you cannot breed yourself out of droughts and that the research field would gradually wither like an unirrigated sunflower. It came from this. There was indeed a relationship between water potential parameters and stomata but it was shockingly weak; 8+ weeks of zero water and declining plant water, in the deep Melfort soil, had less effect on stomata than a puff of CO₂-rich breath or a cloud passing overhead in the afternoon, when stomata were primed to shut down. I concluded therefore that stomata were not responding to any bulk leaf water potential parameters but rather to a signal of some sort. So if stomata respond to signals then why would plants osmo-regulate entire leaves just to keep stomata open, which needs only regulation of a handful of guard and subsidiary cells with specialized K⁺ pump. So my inference was that observed so-called osmoregulation was an effect of stomata staying open after cell growth stops, and not the cause of stomata staying open. Other conclusions were that the accumulated solutes had an important role in compensatory growth after drought, that the term ‘water stress’ was ill applied to plants since plants had an active not passive response to their surroundings including so-called abiotic stressors, and most importantly that you cannot breed for significantly mitigating drought effects since it is less a plant physiology problem and more a resource deficiency problem. I would liken it to going to a clinic when you are a little short at the end of the month. The data that looked like a shot gun blast on a sheet of paper, that filled me with dread that I had wasted three years and would fail to graduate, became my most cherished data, once I came to trust them. Not sure my PhD co-supervisors ever did. I should add that parallel work in Australia using a completely different approach also postulated a signal and they have been trying to use this knowledge for advancing their breeding. Very different experiments, similar conclusions, but opposite inferences. Science is good that way.

Our work led us to the idea that cavitation of water columns under tension in xylem vessels contributed to drought injury and that this could be detected acoustically. Sure enough we listened to plants and the media loved the story of ‘talking’ plants. We had countless interviews and even a really hilarious editorial in the Globe and Mail about squirting tomatoes. But we could not find a mechanism to explain the phenomenon and we could not convey to the media to not anthropomorphize plants.

The issue of breeding for drought is very much alive today as companies make promises about adapting crops

A funny thing happened on the way to....here (continued)

to drought using molecular techniques and massive phenotyping, perhaps raising public expectations, as governments often think that companies are very smart and must be right. But check out a very excellent presentation by Dr. Ken Cassman last November at the ASA in Phoenix where he compares the ongoing drought breeding efforts of two companies; he concludes that there is only expectation for incremental gains and at considerable expense.

The BC coast has lots of rain so my new boss when I started at Agassiz did not agree that I should accept a sabbatical for drought research at my research nemesis, Australia. Instead, research at Agassiz turned to nutrient management in intensive farming systems working on pure grass stands, and for the first time on corn. I didn't really like corn much – ultra-managed crop that already grew 12 feet (3.6m) high so what was left to be done? That kept me up at night, until I grew my first corn trial, it was a hybrid evaluation trial. Two thirds of the trial grew well enough but one third on one end was purple and stunted. It was a terrible puzzle and frightening to report to our international clients. We rotated the trial the next year, with even stranger saw-tooth like results, and again after that to a site that had been fallow for 3 years, and despite more than ample fertilizers of all types, the crop was the worst yet, nearly an early-season crop failure. My then technician, now colleague, Derek Hunt, suggested poor mycorrhizal colonization and I immediately poo-pooed the idea because of all the P and even Zn we had applied. And besides, I had felt microbial growth effects were often a bit overstated. But as it turned out- not mycorrhiza. We eventually sorted, with help from articles written by Professor Murray Miller and colleagues at U. Guelph, that fallow plus intensive tillage can decimate the intact hyphae needed for rapid root colonization in corn, the absence of which can cause profound early season P and possible Zn deficiencies, and most importantly, that this can occur on highly fertilized soils and can be mitigated but not fully with side-banded or seed placed fertilizer.

However, there is a problem with the story: the major early growth effects often diminishes or even vanishes over the growing season. So this raises the possible inference that for crops, the role AMF changes from symbiotic to parasitic over the season. In nature there are no good guys or bad guys, everyone is just doing their job, which may or may not suit us, and that's just our problem

The seasonal growth pattern of corn, unlike grass, leaves the possibility that N mineralized in late summer and fall will be left in the soil and is subject to winter leaching. So we had the idea of intercropping corn and some sort of grass that would mop up the N after corn harvest. We tried everything- grass and non-grass and nothing worked and we nearly dropped the idea except that in year two, highly motivated Derek Hunt had a few spots left in the trial and some extra seed types and he threw in an alternate variety of Italian ryegrass from the UK (Maris Leger). It was a placeholder that changed everything- these plots showed us and we later validated (with the worlds biggest ever 'grass variety under corn' trial) that tetraploids could survive for months under a corn canopy where diploids could not and we speculated but never proved that the tetraploids have better resistance to *Fusarium graminearum*. At the time dairy farmers just across the border in WA State were under threat from EPA for polluting water so our technology helped them stay in business and twenty years later there is still over 80% adoption of our technology in WA, compared to under 10% adoption in BC. So we can take pride, in bakery business terms, for helping the competition.

When the era of commercialization began at AAFC in the early 90's, we were asked by management why we don't develop a commercial AMF product for inoculating crops and sell it to someone and generate royalties. We had tried to inoculate poorly colonized corn and it clearly didn't work at all. There are two reasons, we suppose: first early colonization (3-9 leaves in corn) requires intact hyphae from the previous crop which cannot be replaced with an inoculum of spores, and anyway the soil itself is loaded with AMF spores which will kick in after 9 leaves when the deficiency symptoms start to fade. There are some limited AMF inocula on the market, but at least for corn, colonization does not need a commercial product- rather good crop rotations and light tillage which cannot be put in a bag and sold. Thankfully I think.

So instead of inventing a commercial inoculum, we invented a commercial manure applicator. We brought together a large German and a larger American/ Canadian manufacturer to Agassiz, and this meeting resulted in the slurry applicator dubbed the Aerway SSD which is manufactured in Ontario. By now, it has been copied and it has been home-built and has had both positive and negative reviews in the literature. The inspiration, if

A funny thing happened on the way to....here (continued)

there was one, was less about a better mousetrap and more about partnering with a skilled manufacturer with unabashed marketing that would sometimes make me cringe. But overall, manure application has likely been improved somewhat, especially in some tough field situations, thanks more to salesmen than agronomists. And by the way the technology could not really be patented, or it could, but no one wanted to; for the government there was little return on the effort to commercialize.

We had another little patenting story. Here we did get a patent. For seed coating Selenium (Se) on corn seed; just a tiny 10 grams per ha reliably increases Se in crops ten-fold and can eliminate cattle white muscle disease in vast low-Se regions around the world. But we could not commercialize the seed coat because Se is a feed additive added to seed. Not a good fit with feed companies or with seed companies. Which is hardly worth the telling except this. Se applied on soil cannot be registered in Canada because it does not meet the definition as a fertilizer. We did however help a company in BC 'market' Se... Se was listed with the list of contaminants.

A tough nut to crack, for us, continues to be starter phosphorous in corn. It is almost universally applied, even when soil P levels are sufficiently high and when manure is applied. We tested this practice on farms and no question there was a positive effect. That's borderline irritating, but what makes this rather galling is that at the critical phosphorous time for corn (up to 9 leaves), the amount of P needed is less than 0.5 kg/ha. And yet for soil with over 50 kg available P/ha, plus manure applied at over 50 kg P/ha, anything less than 20 kg P/ha of starter is not enough. And the crop needs only a fraction of 1 kg. Our current strategy is to precision-apply separated slurry sludge to meet the P requirement. This has proved successful in year of application but with little carryover.

And one last point on P, and for my talk. When is the need for starter P greater for corn - warm or cold soils?



CJPS Editor Brian Beres (right) presenting Lester Young (left) with a certificate for Outstanding Associate Editor for Agronomy.



CJPS Editor Brian Beres (right) presenting Jamie Larson (left) with a certificate for Outstanding Reviewer for Agronomy.

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