THE CAPI CONNECTION

October 2021 | No. 10

Lisa Ashton, Hannah Lieberman, Callum Morrison, Marie-Élise Samson | Guest Editors

For the October Edition of The CAPI Connection CAPI's Doctoral Fellows have taken over as guest editors and have curated all content. We invite you to read this month's newsletter and see what is on the minds of some of the top young scholars in soil health in Canada.

Upcoming Events

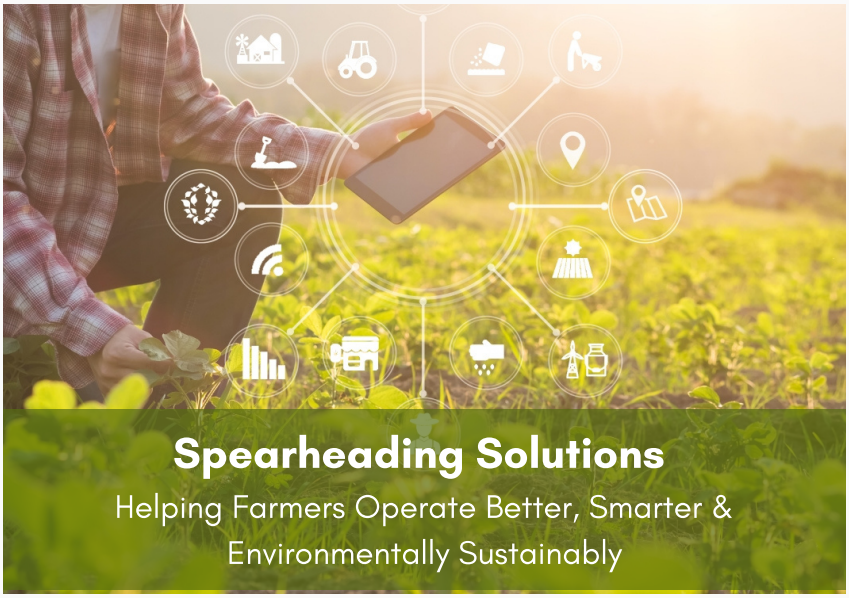
Cover Cropping on the Canadian Prairies
Nov. 3 | 9pm ET
Webinar by Doctoral Fellow Callum Morrison and Manitoba Beef & Forage Initiatives

Federal-Provincial-Territorial Relations: Taking the pulse of agriculture's most underappreciated relationship
Nov. 15 | 11am ET | CAPI Webinar

2021: An agri-food policy year in review
December 2021 | CAPI Webinar
Stay tuned for more details!

Thank You to RBC Foundation

CAPI would like to thank RBC Foundation for their generous support of our Spearheading Solutions Initiative – Helping farmers operate better, smarter, and environmentally friendly. With the support of RBC Foundation, the four doctoral fellows will bring together their diverse expertise and experiences to address how farmers can be positioned as climate solutions providers, and the role of government policy.



CAPI acknowledges the overall support of its many partners particularly Agriculture and Agri-Food Canada.

Canada

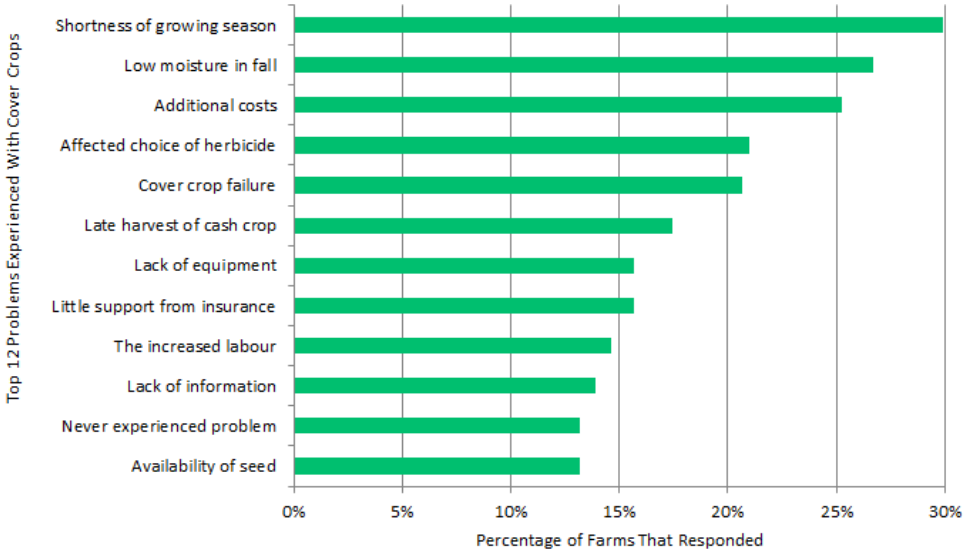
One Great Graphic

Thanks to a global inventory of soil erosion rates and soil formation data, Evans et al. (2020) recently estimated soil sustainability expressed as a lifespan for bare soils, non-bare conventionally managed soils and conservation management. It shows that, globally, about 16% of conventionally managed soils exhibit lifespans of < 100 years, while conservation measures could considerably extend the lifespan of most of these soils. About 39% of soils

under conservation measures even exhibited lifespans exceeding 10 000 years. This clearly highlights the immediacy of the threat posed by soil degradation and the urgent need to globally adapt soil management practices to maintain our capacity to feed the world in the years to come.

Data from Evans et al. (2020): Evans, DL., Quinton, JN., Davies, JAC., Zhao,J., Govers, G. 2020. Soil lifespans and how they can be extended by land use and management change. Environmental Research Letters. 15

The top 12 problems experienced when growing cover crops for farms that responded to the 2020 Prairie Cover Crop Survey.

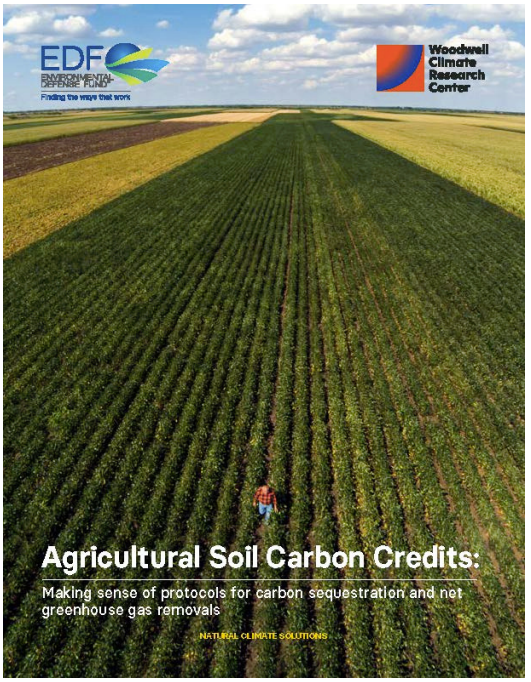


In the Cover Crop Survey of Prairie Producers, the majority (87%) of farms that responded have experienced at least one problem growing a cover crop at some point over the years they have grown cover crops. Perhaps unsurprisingly due to the Prairie climate the most common reason experienced by the farms that responded was the short growing season (30%), followed by the lack of moisture available for cover crop establishment in the fall (27%). Similarly, 17% of farms reported an issue with a late harvest of a cash crop prevented the planting of a cover crop. Additional costs (25%) and cover crops affecting respondents' choice of herbicide (21%) were also common problems experienced. This information is incredibly important as by listening to the most common problems farmers are facing, policies and programs can be better designed to enable producers to overcome commonly reported barriers to adoption.

(N = 281). Note that for this question farms were asked to select all answers that applied from a list, and so may have selected two or more answers.

What We're Reading

This report was written for policy makers to better inform them on how to utilize public investment in climate change mitigation through offset protocols on carbon markets. The report was led by the Environmental Defense Fund and points to key knowledge gaps in measuring and monetizing soil organic carbon through carbon markets.

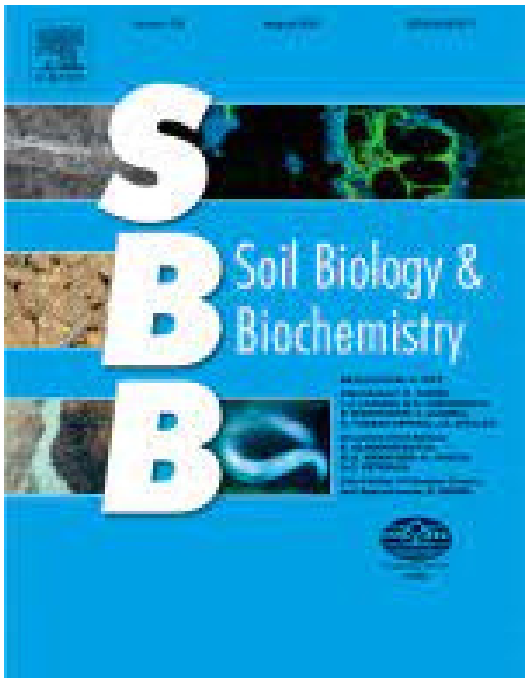


In particular the report identifies:

- Critical research gaps in how soil organic carbon responses to agricultural management.
- Limitations and key uncertainties associated with different soil organic carbon quantification approaches (e.g., computed models, soil samples).
- Different protocol approaches to issues such as additionality, leakage, reversals and permanence.
- Outlines critical actions the public and private sectors can take to strengthen the potential for agriculture in carbon markets.

Source: Oldfield, E.E., A.J. Eagle, R.L Rubin, J. Rudek, J. Sanderman, D.R. Gordon. 2021. Agricultural soil carbon credits: Making sense of protocols for carbon sequestration and net greenhouse gas removals. Environmental Defense Fund, New York, New York.

Soil composition is complex, and the microbial community within it is critical to healthy soils, especially in agricultural soils. Microbial necromass refers to the organic matter from dead microbes in soil. This recent meta-analysis, “Microbial necromass as the source of organic carbon in global ecosystems” determined the contribution of microbial necromass to a soil’s carbon pool on a global scale in cropland, grasslands and forest.



Previous research shows that when microbes uptake carbon they alter the chemistry of the carbon itself, making it more likely for that carbon to enter the stable carbon pool. This previous finding is critical to understanding how to build stable carbon pools in agricultural soils. However, before this study it was unclear how much microbial necromass actually contributes to the soil organic carbon on a global scale.

Why is microbial necromass relevant for Canadian agriculture? In the first 20cm of soil in cropland and grassland soils, on average 51% and 47%, respectively, of the soil organic carbon originates from microbial necromass. This was significantly higher than forest soils (35%). In addition, microbial necromass increases with living microbial biomass. So an active, healthy microbial community creates higher levels of microbial necromass, which in turn can enter the soil carbon pool. These findings demonstrate just how critical microbes are to carbon cycling and sequestration in agricultural soils.

Source: Wang, B., An, S., Liang, C., Liu, Y., & Kuzyakov, Y. (2021). Microbial necromass as the source of soil organic carbon in global ecosystems. Soil Biology and Biochemistry, 108422.

CAPI Commentary

Exploring the Interface between Science and Policy

Over the next few months, we will be spending a lot of time exploring the interface between science and policy to prepare for our joint CAPI Doctoral Fellow report on sustainability in Canadian agricultural soils. This interface is where scientific findings are utilized to inform policy and decision-making processes. While applying research to inform policy and program design may seem like an obvious and needed process, it is met with many barriers and obstacles. For example, researchers are faced with challenges associated with making their findings more accessible to stakeholders, while policy makers are faced with challenges associated with identifying the right questions to ask scientists about the problems they aim to address. Producers are faced with the challenges associated with policy makers and researchers recommending improvements that do address one problem, but may have unforeseen consequences within the complex systems they operate. As early career researchers we have some firsthand experience with these challenges as we each work within our respective fields to improve the sustainability of Canada's agriculture sector. Together, we share what we have learned so far and why it has led us to emphasize building relationships between producers, researchers, and policy makers to strengthen the science and policy interface in agriculture. We conclude by asking you to think creatively with us on how we can better utilize research to inform innovative policies that enable producers to increase resiliency to ensure agricultural productivity and healthy soils.

Digging deeper on the producer, researcher, and policy maker relationships

Researchers are constantly gaining new insights on how different agricultural management practices impact ecosystem functioning and agricultural productivity. Often researchers find that the most effective agricultural management strategies both in terms of maintaining ecosystem health and producing sufficient yield is site specific. For example, a **recent study** found that no till farming in the prairies led to increases in carbon storage. However, in Eastern Canada the results were more inconsistent and sometimes lead to a decrease in soil carbon. Therefore, it is critical that agricultural policy is based on research that is specific to the environmental conditions of farmland. In addition to site specific applied research, studies on fundamental soil processes help inform process-based models. These models can help predict how soil will behave under different and changing environmental conditions, allowing producers and policy makers to make more informed decisions.

Researchers can and should work alongside producers to tailor their research to the needs of the land and producers. Producers provide key expertise on their land as well as the effectiveness of policy implementation. Building policy based on new and evolving research is especially important in light of climate change, where agricultural land will face new weather patterns that can dramatically change the soil environment. With these new challenges, management practices that worked in the past may no longer make sense for the same farmland. These shifting conditions emphasize for us the importance of building regional networks of researchers, producers and policy makers that have the capacity to collaboratively develop solutions that are informed by foundational science that is coupled with site specific applied research.

Commentary continues on Page 5

Exploring the Interface between Science and Policy

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Research in Action: Cover Cropping on the Prairies-a case study

For effective policy it is important to ensure excellent communication and understanding between researchers, policy makers and the producers they serve. One area where this is vital is cover cropping on the Prairies. Prairie producers have historically viewed cover crops with scepticism due to limitations including the short growing season and unpredictable weather patterns characteristic of the region. However, the recent uptake in cover crop use by producers in neighbouring States including North Dakota and in Eastern Canada encouraged an increasing number of Prairie farmers to experiment with cover crops.

Yet, there remains a lack of information on how farmers in the Prairies are using cover crops. This knowledge gap has been a major hurdle for producers interested in adopting cover crops, and for developing policy that supports producers to adopt cover crops effectively. To fill these gaps, the 2020 Prairie Cover Crop Survey was developed, which aims to highlight how farmers are using cover crops, the problems producers are facing, what benefits they have seen, and what would enable future cover crop use. This will ensure cover crops are put into context for stakeholders and policy makers, and guide future areas of research and policy design. To learn more about the results from this survey, please click **here**.

How might we better position producers to build their resilience?

Agroecosystems are inherently complex and vary with pedoclimatic and cultural specificities. To survive over the long term, farms must navigate this complexity while balancing the need to be profitable and environmentally sustainable. This inevitably means working to improve on-farm productivity and the health of soils over time. While it may be convenient to assume that adopting practices that improve soil health also optimizes both the agronomic and environmental services provided by agricultural soils; **researchers found** that crop yields, surface soil health, and carbon sequestration do not necessarily go hand in hand. Producers experience this reality firsthand. This trade-off underlines why producers can be reluctant to voluntarily adopt practices that result in enhancing ecosystem services, unless those practices also have an immediate positive effect on the profitability of their business.

These issues force us to confront the questions: how can policy effectively encourage producers to contribute to environmental goals such as climate change mitigation without undermining producers' economic viability? And how might we ensure producers' efforts are based on reliable measurements and/or predictions tailored to farms' pedoclimatic and cropping context? As we work on our joint report, we will continue to challenge ourselves with these questions while exploring how Canada might improve its science and policy interface in agriculture, where policies are science-based and apply to on-the-ground realities. We look forward to sharing what we find!

Lisa Ashton, Hannah Lieberman, Callum Morrison, and Marie-Élise Samson
2020-2022 CAPI Doctoral Fellows

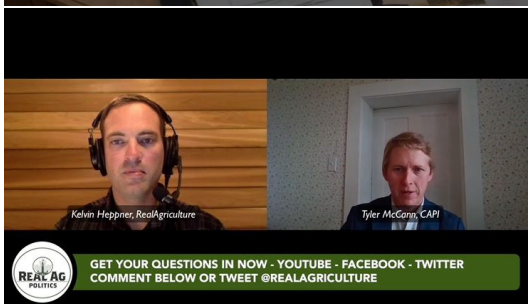
CAPI in the News

La Vie agricole

Nicolas Mesly nous parle du défi de l'eau et de la spéculation des terres agricoles

realagriculture

RealAg Politics, Ep 3: What should be in the next Minister of Agriculture's mandate letter?



La Vie agricole

Entre le Canada et les provinces, un terrain d'entente long et complexe

NATIONAL NEWSWATCH

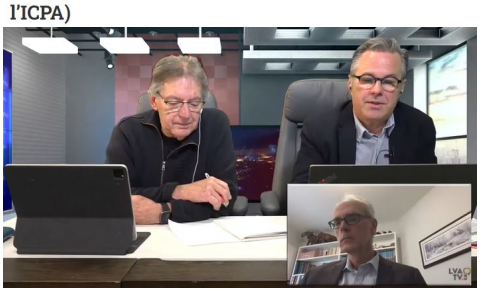
Government agriculture support should aim for productivity boost

Feed navigator.com

What are the key actions needed for Canada to have a thriving and sustainable agri-food system?

La Vie agricole

La Quotidienne "Au-delà de l'élection fédérale": entretien avec Rory McAlpine et Tyler McCann de l'ICPA)



La Vie agricole

Comprendre notre passé et notre présent : Concevoir notre avenir : L'élaboration des politiques fédérales provinciales territoriales et l'agriculture canadienne