The Globally Important Research at Ottawa's Central Experimental Farm
Transcript excerpt from *Science in Action*, broadcast by BBC World Radio on August 19, 2016
http://www.bbc.co.uk/programmes/p04498g4#play (scroll ahead to approximately 19min 10sec)

BBC Host: "Now if you pore over satellite images of Canada's capital Ottawa, you'd see a massive 4km square of no houses. Professor Burke's machine-learning poverty tracker would be confused to say the least. You don't expect to see a farm slap-bang in the middle of a capital city. And not just any farm, the Canadian government run **Central Experimental Farm**. This science farm is a facility full of crops like corn and wheat. It started in 1886 and the city simply grew up around it. It's a big, living outdoor laboratory. Its 75 scientists carry out research that aims at helping farmers increase their yields, but they're also keen to discover more about the impacts of **climate change**. BBC Reporter Sian Griffiths visited the Central Experimental Farm to find out about their latest research."

FIELD #1: Soil Carbon Cycles

Ed Gregorich (EG): …. basically a cylinder about a meter in diameter, that's inserted about 5cm into the soil.

Sian Griffiths (SG): (Voice Over) A past member of the **International Panel on Climate Change**, Ed Gregorich, a soil scientist, is in Field #1 where he's been conducting **long term ongoing research on carbon cycling and greenhouse gas emissions** from the soil. He wants to know how tillage effects gas emissions.

EG: … So then we come along and put a top on it and then it's airtight. So then the gas that's coming out of the soil begins building up into this chamber.

SG: You can capture it.

EG: Yup, you can capture it. You take a gas sample using a syringe.

SG: Can you tell us what you have there, in that tray?

EG: This is a tray of vials. Evacuated vials. These are actually for taking blood. They work just fine for our purposes because we want to collect the samples and take them back to the lab for analysis. The three gases we measure are carbon dioxide, nitrous oxide and methane.

SG: Like right now, the gas is coming out.

EG: Right now, right under your feet there are bugs and microbes working and decomposing and using those gases and producing those gases in different quantities. The gas that we're most interested in that comes out in the greatest quantities is carbon dioxide. In a corn crop for example, like this, over the course of a year about 3,000 kg of carbon comes out of the soil from underneath this corn crop and goes into the atmosphere.

SG: That's just one reason why farming contributes up to 10% of the greenhouse gases in the environment.

EG: Everything the farmer does on the field effects that storage of carbon. Plowing has an effect where it either mixes it into the soil where there's lots of organisms that eat it and break it down and release the gases then. So we're really talking about looking at the whole cycle, the whole carbon cycle.

FIELD #6: Fusarium

[Men speaking Mandarin and machine noises.]

SG: (Voice Over) On the other side of the farm, researchers from the Hubei Academy of Agriculture Sciences in China are paying a visit. They are just some of the many international visitors the Farm hosts. Today's group is interested in the work of Dr Gavin Humphreys, a plant breeder who specializes in developing resilient wheat. Dr Humphreys's latest research has been on fusarium head blight, a fungus deadly to wheat and other crops like barley. In Field #6 he compares two heads of wheat to illustrate the damage caused by the fungus.

Dr Gavin Humphreys (GH): Instead of the spike being completely green, only about 1/3 of it is green. The top two thirds are all yellow. They've all been basically infected with the fungus so they
will not make bread or anything.

SG: (Voice Over) He's trying to breed varieties resistant to the fungus by crossing the stronger varieties with the weakest. He gradually weeds out the most susceptible plants, leaving him with increasingly resilient varieties. To do this he has to infect the plants.

GH: So basically we spray all of this wheat at flowering with 50,000 spores per mL of fusarium spores, and because it's flowering the inoculant gets into the heads.

SG: (Voice Over) It's estimated that fusarium devastates about 5% of Canada's $4 billion dollar US wheat crop. It can also spread to other crops like corn and barley, and fusarium is a blight the Chinese researchers know all too well.

Chinese Researcher (CR): … Especially in the region alongside the Yangtze River because weather is more humid, [which] is very helpful for this disease.

SG: Which means China faced problems feeding its people. What kinds of foods is wheat used for in China?

CR: Noodles, bread.

SG: We all know about noodles.

CR: And also dumplings.

ENTOMOLOGY QUARANTINE UNIT: Biological Control

SG: (Voice Over) On the edge of the [Central Experimental] Farm is a quarantine unit.

Peter Mason (PM): We have very strict protocols. We'll go deeply into the quarantine. We can show you how we rear the whole system, and we can show you cages where we have hundreds of the parasitoid as well as hundreds of the leek moth pupae that we use.

SG: (Voice Over) Dr Peter Mason specializes in biological control: finding good bugs to tackle a bad one. As the world becomes more globalized, it's not just human beings who are travelling around the world. Increasingly insects are too [far] away from their natural habitat, and away from their natural predators. This is the case with the leek moth, which first appeared here 20 years ago. It's native to Europe. Due to a lack of natural predators it has been able to devastate leek, garlic, and other onion crops.

PM: Okay, so now we're into the next room. Each of these rooms has light and temperature and even humidity control. There are probably several hundred leek moth larvae here. Do you see the larvae? They are probably about half an inch long. They mine into the internal leaf tissue and basically they just eat it from the inside out, and of course you wouldn't want to buy a leek that looks like that in the market.

SG: (Voice Over) He's been exploring how to control the leek moth for 10 years. While working with British and Swiss scientists, his team tracked down a parasitic wasp which establishes itself inside the leek moth pupae before it has a chance to reach maturity.

PM: You can see that there are a number of wasps that are on the pupae. They will bend their abdomen and insert their ovipositor into the end of the pupa and they will then put an egg inside.

SG: So what happens to the pupa?

PM: The pupa dies and the leek moth pupa is gone, it's dead.

SG: (Voice Over) Five years ago after rigorous testing to ensure the parasitic wasp targeted only the leek moth, the wasp was released. It's still early days but so far it's showing promise as it latches on to the leek moth population.

CONCLUSION

SG: (Voice Over) Now I've highlighted *just three* globally important research projects being carried out at Ottawa's “outdoor lab” and for me, it's been *incredible* to see so much science going on at a farm in the middle of a city.

BBC HOST: Thanks to Sean Griffith for that report. You’re listening the BBC World Service.