

How Scientific Research Works

AGRI-VIEWS

by Chuck Otte, Geary County Extension Agent

It seems, in recent years, that science and scientific research has been under attack from many angles. As a trained scientist, that concerns me. Okay, it even hurts a little bit. It seems like everywhere you turn, in the real media, on social media, just about everywhere, science, scientists and the scientific process is being discredited, belittled, and bluntly ignored. Okay folks, lets be straight up right now: someone's blog on the internet is probably not scientific - it is their opinion. A Facebook page probably doesn't stand up to scientific peer review and something that is tweeted in 140 characters or less absolutely isn't scientific UNLESS it redirects you to peer reviewed research.

Part of the problem, from my point of view, is that scientific research involves science and math, two subjects that many people didn't care for that much in school. Often it isn't just math, it's worse than that, it's statistics (a subject that I had a lot of classes on in college and thoroughly enjoyed.) As a scientific community I think that we scientists have to shoulder part of the blame as well.

Starting with the space race in the 1960's, scientific process exploded and it became harder and harder for the general public to keep up with advances in knowledge. So when questions were raised, instead of explaining what was happening to the public, we tended to say, "we're scientists, just trust us." Which the public did for a while, but then the gap between the general knowledge and the current state of affairs simply became too great. So the buck stops here and I will try to start closing the gap, but it won't all happen in one column. It will be like scientific process itself, it will be a process.

Research starts with a question, often "what if..." A hypothesis is posed and an experiment is set up. Because of all the things that can happen in any experiment the testing will be replicated in several different ways trying to rule out all variation possible except what we are trying to measure. It may be repeated over several different locations and over several different years with multiple repetitions (replications) at each location. We try to gather as much data as possible to give more validity to our statistical analysis.

Data collection becomes very critical. If data collection is sloppy it will show up in the analysis as having great variability. Great variability may indicate extreme climate impact OR possibly poor design of the experiment to take that into account. Once the data is collected it is analyzed and yes, this will involve statistical analysis, sometimes very complex analysis. In research we often say that we never actually prove anything, we just fail to disprove something.

Once the analysis is finished, a paper is often written describing the problem, what research and findings have been done by others (if any). Then we describe what we did, how we did it and what the analysis showed followed by what we think is happening. It may be a new drug. It may be a new higher yielding crop. It may be an analysis showing changes in weather and climate. But it's backed up with statistical analysis.

This is not even addressing the tip of the iceberg or scientific research process. There'll be more columns on this topic. But what I want you to be aware of is that there are people locally, in the County Extension Office that can access this information and help you understand it. Don't waste your time believing what someone in a testimonial has to say. They're probably trying to sell you something. Find out what the peer reviewed research says. We're local and we want to help you!