

PolicyPennings by Daryll E. Ray & Harwood D. Schaffer

Chicago Council lists three-decade changes in greenhouse gases and average temperature

In 2011, we wrote a column, “Global warming is happening: How should farmers respond?” (<http://agpolicy.org/weekcol/549.html>). In that column we began by saying, “There was a time when one could legitimately argue that there was a lack of scientific agreement over the issue of the role of humans in global warming and even whether we were in a cooling or warming period. It is becoming increasingly difficult to ignore the scientific evidence.”

Well, we were wrong, not about the global warming part, but rather the “increasingly difficult to ignore the scientific evidence” part. Shortly after that column appeared in print, we were contacted by an attorney for a state’s department of agriculture who demanded to know what evidence we used to support our contention that the climate change that is occurring is human induced.

We also received emails from several readers. One wrote, “It was with some degree of astonishment that I read, and have heard discussed, this latest piece about human-caused global warming. I was under the impression that the theories about mankind’s addition to the global warming trend had been thoroughly debunked.”

Well the issue of the role of humans in climate change has not gone away. In fact, with the release of the most recent report from the Intergovernmental Panel on Climate Change, the urgency of addressing the issue has become greater than ever.

Both the National Geographic’s article, “A Five Step Plan to Feed the World,” which we examined in our previous column, and the Chicago Council on Global Affairs’ publication, “Advancing Global Food Security in the Face of a Changing Climate” (www.ti-nyurl.com/mb4pj5s)—the focus of this week’s column, takes the impact of agriculture on climate change and the impact of climate change on agriculture seriously.

While the National Geographic article acknowledges both impacts, it focuses its comments on feeding a larger population in 2050 and an increasing middle class in developing countries, the publication by the Chicago Council gives more background on the issue of climate change.

The Chicago Council report, with Gerald C Nelson serving as the principal author of the report and Douglas Bereuter and Dan Glickman serving as Cochairs of the advisory group responsible for the publication, provides a definition for “weather and climate.”

In defining “weather and climate,” Nelson writes “‘Climate’ is usually defined as average weather. The United Nations Framework Convention on Climate Change (UNFCCC) defines ‘climate change’ as

changes in climate caused directly or indirectly by human activity.* People do many things to cause local changes in climate. For example, ‘heat islands’ are caused by higher temperatures in cities compared to the surrounding countryside. Deforestation can cause local increases in temperature and changes in rainfall patterns. This report, however, focuses on global changes in climate.”

The asterisked footnote says, “Article 1 of the UNFCCC defines climate change as ‘a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.’”

The first section of the first part of the report is titled “A Changing Climate Will Alter the Global Food System,” and is the section that reviews the key points on climate change. They start with an idea that every farmer understands better than almost anyone else: “food production and food prices are inextricably linked to weather.”

With climate change, the likelihood of extreme weather events increases, triggering more frequent fluctuations in production and thus prices. While farmers in the US and around the world have normal variations in weather and production factored into their farming activities, an increase in extreme weather events can put their livelihood at risk.

The report provides graphs that show the increase in the atmospheric concentrations of major greenhouse gases between 1978 and 2013—carbon dioxide, 335 parts per million to 390 ppm; nitrous oxide, 340 parts per billion to over 390 ppb; methane, over 1550 ppb to over 1800 ppb. Over that same period, the average global temperature has increased by 1 degree. They also point out that “unlike other major greenhouse gases that disappear from the atmosphere relatively quickly, carbon dioxide stays put for hundreds to thousands of years, making increased concentrations in the atmosphere difficult to reverse.”

Agricultural activity is responsible for 24 percent of greenhouse gasses that contribute to global warming. The biggest contributor is the conversion of grasslands and forests to agricultural production. “Without careful management practices, soils in the newly converted lands lose about 50 percent of the initial soil organic carbon in the top surface layer in 25 to 50 years in temperate climates and in five to 10 years in the tropics, making land less productive.” Other contributors include digestion and decomposition of manure from ruminants, rice production,

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improper use of fertilizers, and farm machinery that burns fossil-based fuels.

As average global temperatures increase, the zones in which crops are grown will for the most part move toward the poles or to higher elevations—there is a limit to both moves. One only has to look at the northward march in US corn production to understand this. In addition, the areas with comparative advantage in crop production will be partly determined by changes in rainfall and rainfall patterns. Too much rain at the wrong time can be devastating while drier weather at harvest can be beneficial.

They point out that for most countries, between 1980 and 2008 climate change has had a negative impact on crop yields. In addition to yield drag, farmers will face increased problems from plant diseases and pests, both domestic and invasive. As any temperate farmer can attest, cold winters reduce pest pressure while warmer winters allow them to survive in greater numbers. With climate change, the winters will generally be warmer.

Although it has been less studied than yield and production, climate change also has a negative impact on the quality of the food that is produced. Wheat protein levels fall at high carbon dioxide levels. In addition, “experiments in the United States and China have shown that in nonleguminous grain crops, protein and mineral content such as iron and zinc are substan-

tially reduced when carbon dioxide concentrations reach levels likely to occur by midcentury.”

Livestock production will be negatively impacted as animals face increased heat stress. Higher temperatures also affect fertility. Higher temperatures will negatively affect the nutritional content of forages, they argue.

For farmers whose fields are only slightly above the average sea level, any increase in that level can be devastating, either by flooding or salt-water intrusion into fresh water aquifer. Some island states will be submerged by a rise in the sea level.

And if this is not challenging enough for farmers, the report says that transportation costs will increase because “higher temperatures reduce the efficiency of human and animal transport, require roads to be built to higher standards, and increase the costs of cooling for sensitive produce.”

Next week we will look at their argument that “Adapting the global food system to climate change should be a priority.”

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