Why did global GMO crop acreage decline in 2015?

Over the last two decades we've witnessed something unprecedented and remarkable in agriculture.

Scientists have learned how to improve seeds by harnessing techniques cribbed directly from Mother Nature herself, whom we have discovered to be unexpectedly wanton, promiscuous, and generous in her sharing of genes between the far flung branches of the tree of life.

Using methods of the same sort nature used to make a viral DNA sequence the most common gene in the human genome, researchers have learned how to armor plants to fend off insect pests without the use of pesticide sprays; how to make plants that allow farmers to manage weeds more easily; and how to improve the productivity, nutritional value, flavor, and safety of foods derived from plants or animals in myriad ways, while at the same time dramatically reducing their environmental impacts, particularly greenhouse gas emissions.

The result of this explosion of innovation has been that seeds improved with these techniques have been adopted by farmers at stunningly rapid, in fact unprecedented rates wherever farmers have been allowed to buy them. Starting from zero only 20 years ago, the growth in adoption of these seeds by farmers has been steady and steep to the point where they now saturate major commodity seed sales in most of the Americas (for corn, cotton, soy, and canola) and have established a new global standard for "conventional" seeds.

The New York Times provides an accurate summary of these historic developments, noting the many significant details that make up this story. But the editors miss the point by headlining the story, "Acreage for Genetically Modified Crops Declined in 2015." This is true, but misleading.

Nowhere in history, economics, biology, or anywhere else in the real world do we find a case where double digit growth could be sustained indefinitely. So the meteoric climb in biotech crop acreage documented over the past two decades by the International Service for Acquisition of Agri-biotech Applications (ISAAA) was certain to end at some point. Given the finite amount of arable land on the surface of the earth, the question was never "Will it end?" but, "When will it end, and how?" And now we have the answer: 2015. But is this the headline maker? Consider the features marked "A" and "B" in the figure below:

Global Area of Biotech Crops (Million hectares, 1996-2015). Courtesy of Clive James, ISAAA, 2015.
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It is well known that agriculture is fundamentally a cyclical enterprise. Years of high production alternate with those of lower production; droughts alternate with floods; pest, disease, and weed populations alternate from high to low and back again; the only constant is change. It follows that the economics of farming are also cyclical, with high prices one year and lower prices the next. It is thus completely unsurprising that one years' peak in seed sales should be followed by a dip – Feature "B" above. *The Times* notes correctly that "…the main cause for the decline, which measured 1 percent from 2014 levels,

was low commodity prices, which led farmers to plant less corn, soybeans and canola of all types, both genetically engineered and nonengineered." But it neglected to mention the drought-driven "massive 23 percent decrease of 700,000 hectares [1.7 million acres] in intended plantings in 2015" cited by ISAAA.

In other words, the real story in the figure is Feature "A" – the two decades of atypical departure from the normally cyclical nature of agricultural trends during which farmers around the world rushed to adopt biotech improved seeds.

Among the genuinely headline worthy items cited by ISAAA are the following:

- New biotech crops were approved or commercialized in Brazil, Argentina, Canada, Myanmar, and the United States, where we saw approval of:
    - Innate™ potatoes, with lower levels of acrylamide, a potential carcinogen, resistance to bruising, and late blight resistance.
    - Arctic® Apples that do not brown when sliced.
    - The first genome-edited crop to be commercialized globally, SU Canola™, was planted in the United States.
    - The first-time approval of a GM animal product for human food, GM salmon.
- Vietnam planted a stacked-trait biotech Bt and herbicide-tolerant maize as its first biotech crop.
- Biotech DroughtGard™ maize, first planted in the United States in 2013, increased 15-fold from 50,000 hectares in 2013 to 810,000 hectares reflecting high farmer acceptance.
- Eight African countries field-tested, pro-poor, priority African crops, the penultimate step prior to approval.

The last item, that field trials are now underway in eight African countries, is of huge significance. Despite massive interference from well fed but misguided activist groups, African nations are moving ahead to solve their own problems in ways that have massive positive implications for human welfare, economics, and the environment. These developments are worthy of attention.

The fact that the fundamentally cyclical nature of agriculture should reassert itself after a two-decade hiatus is not remarkable. What is truly unprecedented is the hiatus itself, a remarkable two-decade departure from baseline. How *The Times'* editors could miss such a gigantic forest for the presence of a single, entirely expected sapling, is truly a mystery.

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