Evaluating claims GMOs and modern agriculture have led to a 75% drop in crop diversity



ne of the central concepts that unifies those concerned with biodiversity is the belief that diversity is being lost, piece by piece, to a greater or lesser degree, globally.

The same goes for the biodiversity of what we eat. Scientists and activists have worried about the loss of crops and their many traditional varieties for at least a hundred years, since botanist N. I. Vavilov traveled the world in search of plants useful for cultivation in his Russian homeland. He noticed that diversity was disappearing in the <u>cradles of agriculture</u> – places where crops had been cultivated continuously for thousands of years. The alarm sounded even louder 50 years ago, during the Green Revolution, when farmers in some of the most diverse regions of the world largely replaced their many locally adapted wheat, rice, and other grain varieties with fewer, more uniform, higher yielding professionally bred varieties.

Economic development, human migration, urbanization, and globalization have further affected the diversity of food crops cultivated and consumed around the world. Most modern farmers seem to want uniform, mechanized production. Most eaters seem to want unblemished vegetables of known shapes and sizes, and inexpensive processed food products. In most of the decisions producers, food distributors, and consumers make, crop diversity inadvertently gets the short end of the stick.

This is ironic, since modern productive crop varieties are bred by wisely mixing and matching diverse genetic resources. The disappearance of old varieties thus reduces the options available to plant breeders, including those working to produce more <u>nutritious and resilient crops</u>. Genebank collections, such as the beans, cassava, and other staples <u>conserved at CIAT</u>, which were originally built to provide access for plant breeders to genetic resources, have therefore taken on increasingly important conservation roles.

Screen/Shot at AMnown

In many regions of the world, the loss of crop diversity also has profound cultural and spiritual significance, with seeds no longer handed down through generations and no longer connecting people as closely to the places they call home. What people cultivate and what they eat are important to how they identify themselves, both as cultures and as individuals. "We are what we eat."

Taking stock

Being a food biodiversity scientist, I grew up (in the professional sense) with the loss of crop diversity looming over my head, providing both a *raison d'être* and an urgency to my efforts. Somewhere along the line, I became interested in understanding its magnitude. That is, counting how many crops and how many varieties have been lost.

And that's where it started to become complicated, and also more interesting. Because, when I went

looking for signs of the loss of specific crops, I couldn't find any. Instead, I found evidence of massive global changes in our food diversity that left me worried, but at the same time hopeful.

A bit of background. Most of the numbers seen in the news on how much crop diversity has been lost go back to a handful of <u>reports</u> and <u>books</u> that reference a few studies: for example, the changing number of vegetable varieties for sale in the U.S. over time. The results are estimations for a few crops at local to national levels, but they somehow have been inflated to generalized statements about the global state of crop diversity, the most common of which is some variation of "75% of the diversity in crops has been lost."

Putting true numbers on diversity loss turns out to be a complicated and <u>contested</u> business, with no shortage of strong <u>opinions</u>. One big part of the problem is that there aren't many good ways to count the diversity that existed before it disappeared. Researchers have done some work to assess the <u>changes in diversity in crop varieties</u> of Green Revolution cereals, and to some degree on the <u>genetic diversity</u> within those varieties. The results indicate that, although diversity on farms decreased when farmers first replaced traditional varieties with modern types, the more recent trends are not so simple to decipher.

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Reviewing what had been researched, it was particularly surprising to me that very little work had been done to understand the changes in what is probably the simplest level to measure: the diversity of crop species in the human diet, that is, how successful is maize versus rice versus potato versus quinoa and so on. I realized that data on the contribution of crops to national food supplies were available for almost all countries worldwide via FAOSTAT, with information for every year since 1961. Perhaps these were the data that could show when a particular grain, or legume, or vegetable, fell off the world map, and just how diverse our global food supply is now compared to half a century ago.

Fast forward through a couple of years of <u>investigation</u>. To my surprise, I found that not a single crop was lost over the past 50 years! There was no evidence for extinction. What was going on? Was I missing something or was the loss of food biodiversity narrative wrong?

It turns out that my failure to see any loss of crops was due in large part to the lack of sufficient resolution in the FAO food supply data. Only 52 meaningful crop species-specific commodities are measured and a number of these are general groupings such as "cereals, other." Because of this lack of specificity, the data couldn't comprehensively assess the crops that have been <u>most vulnerable to changes</u> in the global food system over the past 50 years.

In FAO data, these plants are either thrown into the general categories or they aren't measured at all, especially if they are produced only on a small scale, for local markets or in home gardens. This is, in itself, sign enough that they may be imperiled. We need better statistics about what people eat (and grow) around the world. But, enough is known to be confident that many locally relevant crops are in decline.

But that's not to say that the data weren't useful to the question at hand. With some further analysis, they

eventually provided what I think is a powerful argument for further concern about the loss of crop diversity globally. Yet, at the same time, they also offer some hope.

Over the past 50 years, almost all countries' diets actually became more diverse, not less, for the crops that FAO statistics do report. We found that traditional diets that were primarily based on singular staples a half century ago, for instance rice in Southeast Asia, had diversified over time to include other staples such as wheat and potatoes. The same was true for maize-based diets in Latin America, sorghum- and millet-based diets in sub-Saharan Africa, and so on. Diets around the world were balancing out with regard to the contribution of these foods.

Not that there weren't plant <u>winners and losers</u>. Wheat, rice, and maize, the most dominant crops worldwide 50 years ago, became more important globally. Other crops emerged as widespread staples, particularly oilcrops such as soybean, palm oil, sunflower, and rapeseed oil. And, as the winners came to take more precedence in food supplies around the world, alternative staples such as sorghum, millets, rye, cassava, sweet potato, and yam were marginalized. They haven't disappeared (at least not yet), but they have become less important to what is eaten every day.

As countries' food supplies became more diverse in the winner crops reported by FAO, and the relative abundance of these crops within diets became more even, <u>food supplies worldwide became much more</u> <u>similar</u>. If we are what we eat, then it seems that we are quickly becoming very much the same type of human being ? modern people eating globalized food crops.

The publication of our findings of increasing homogeneity in global food supplies generated substantial scientific and public interest. This wasn't, I think, because the main finding was a big shocker. It's easy to see how pizza is now available in Tokyo, bread available in traditional maize and potato regions of Latin America, and McDonalds, Subway, and Starbucks available, well, almost everywhere. Rather, I think it's because we were able to examine the food supplies of virtually all the countries of the world, over a relatively long time period, and put some real numbers to the change we saw. On average, for instance, the amount of variation between food supplies in different countries decreased by 68.8% from 1961 to 2009.

This is why, although we could see no absolute loss in crops consumed over the past 50 years, I am concerned. For even in the relatively small list of crops reported in the FAO national food supply data, . That doesn't seem like a good thing for the long-term resilience of our agricultural areas, nor for human health, although it's important to remember that such changes are the collateral damage resulting from the creation of highly productive mega-crop farming systems, which have increased the affordability of these foods worldwide, leading to less stunting and other effects of undernutrition worldwide. On the other hand, global dependence on a few select crops equates to expansive monocultures, with more lives riding on the outcome of the game of cat and mouse between pestilence and uniform varieties grown over large areas. Moreover, cheaply available macronutrients sourcing from these crops have contributed to the negative effects of the nutrition transition, including obesity, heart disease, and diabetes.

So why then am I hopeful? Because the <u>data</u>, and some <u>literature</u>, and my own direct experience also indicate that diets in recent years, in some countries, are beginning to move in different directions,

reducing the excessive use of animal products and other energy-dense and environmentally expensive foods, and becoming more diverse, particularly with regard to fruits and vegetables, and even healthy grains. This seems good, both for human health and for the sustainability of agricultural production. Change is still occurring, and the future does not appear to be fixed. What better evidence than quinoa, which was relatively unknown outside the Andes a couple of decades ago, and is now <u>cultivated in 100</u> <u>countries</u> and consumed in even more?

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