ENVIRONMENTAL & SOCIAL RESPONSIBILITY (/ADVOCATE/CATEGORY/ENVIRONMENTAL-SOCIAL-RESPONSIBILITY)

On GM foods, part 2: Let's talk about what truly matters

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In searching for clarity on GM foods, we should question what's more important: the process or the outcome

(/wp-content/uploads/2016/10/shutterstock_321754439.jpg)

At a time when we look for and emphasize our differences, one quite obvious thing unites us all. We eat.

Some of us pay more attention to food. Some less. If you're in the more-attention group you've certainly noticed, as with everything in our world, that food is touched by technology. This is not new. As soon as humans started domesticating plants, we started manipulating them (Fig. 1).

Through millennia our tweaking has become increasingly sophisticated. Breeders use genetic markers to help accelerate the inclusion of desirable traits in new plants and animals. Precision agriculture allows farmers to tailor and optimize water, pH and nutrient treatments at the resolution of a few square meters using GPS and other tools to map fields.

Fig. 1: Human directed evolution. Pictured on the left is an ear of teosinte, the progenitor of modern maize, first domesticated about 9,000 years ago. Selective breeding of spontaneous mutations resulted in modern maize about 6,000 years ago. On the right is *Brassica oleracea*, the genetic parent of cauliflower, broccoli and cabbage.

A recent entry into the highly technical world of agriculture is genetic engineering. For many, this results in an indifferent shrug. But for some, the subject evokes passion and the stakes are high. Depending on your point of view, we are either headed to Armageddon or we are on a virtuous path to feeding the world effectively.

The binary discussion has existed since the introduction of the first genetically modified crop (the **Flavr Savr (http://calag.ucanr.edu/Archive/?article=ca.v054n04p6)** tomato) in the mid-1990s. Most points made haven't changed much over time. Stale as they are, the arguments present themselves more loudly and/or more frequently with the hope that loud and frequent translates into true and convincing.

With such entrenched positions it is difficult to see how to change the conversation. Nevertheless, we must find a way to change it. This perpetually contentious climate doesn't serve us well and we must abandon the current paradigm to define a new framework that facilitates more useful discussions.

In a previous **article (https://www.aquaculturealliance.org/advocate/on-gm-foods-part-1-lets-move-this-unproductive-conversation-forward/)** I wrote that, until the GMO labeling issue is resolved to the general satisfaction of all, it is nearly impossible to deal with any other issues. My suggestion was to label every food or drug that is genetically engineered. Whether you agree with that or not, for what follows, assume that the labeling issue has been resolved 100 percent to your satisfaction.

With labeling resolved, we then need to construct the new lens through which we examine genetic engineering in food production. In doing that, we can learn quite a bit from pharmaceutical development, which, like agriculture, develops many of its products through highly technical processes.

For all the complexities in the practice of medicine, most people basically agree on what makes a drug worthwhile: It should improve or cure somebody who is sick. The outcome is what matters.

Agriculture doesn't yet have such clarity; it is ambivalent about whether to focus on outcomes (plants and animals with particular traits) or the processes that deliver them (genetic engineering or traditional breeding).

An example of this is herbicide-resistant crops. Herbicide resistance offers farmers the ability to control weeds in their fields by spraying with an herbicide that is benign for the crop but lethal to weeds. The resistance trait can be achieved either by traditional breeding or by genetic engineering. The public discussion about herbicide resistance largely focuses not on the trait itself but on how the trait came to be.

NGOs (http://www.foodandwaterwatch.org/news/superweeds-and-herbicide-use-rise) and **others (https://chipotle.com/gmo)** are critical of plants genetically engineered to resist herbicides and remain silent on herbicide-resistant plants that result from breeding programs. Perhaps one of the most well-known cases of this come from the restaurant chain Chipotle Mexican Grill. In April, they **announced (https://chipotle.com/gmo)** they would no longer source genetically modified ingredients such as soy oil from soybeans genetically engineered to resist the herbicide glyphosate.

In particular, Chipotle cited a concern for increased herbicide use by growing plants with genetically engineered herbicide resistance traits. Their solution was to switch their frying oil to sunflower. But, through traditional breeding methods, many commercial sunflower lines are also resistant to herbicides. Process trumped outcome.

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Insulin offers a parallel in medicine. There are two sources for insulin. It can be isolated from the pancreas of slaughtered animals or it can be produced in genetically engineered bacterial cells. U.S. regulatory policy formally is indifferent to the technologies used to produce drugs; the public seems to be as well. Whether a drug is isolated from a fungus, synthesized chemically or produced biologically by genetically engineered cells does not play in our assessment of it. Simply, the measure of a drug's success is based on how well it treats and/or cures.

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What would happen if, in agriculture, we turned our focus from process to outcome? For one, we would not debate the use of chemicals in agriculture; rather, we would have questions such as:

- Does planting herbicide resistant crops increase no-till farming?
- Are the herbicides used on herbicide-resistant crops better or worse than those that would be used on non-resistant crops?
- Does pesticide use increase or decrease with pest-resistant crops versus conventional crops?
- What are the relative risks of pest-resistant crops when compared to pesticides used on crops that aren't pest-resistant?

Is the food supply enhanced by raising animals that grow to maturity in much shorter times? This can happen by **traditional breeding (https://nonprofitchronicles.com/2016/10/10/the-next-frontier-for-the-animal-welfare-movement-broiler-chickens/)** and through **genetic engineering (https://www.dna.com/Company/Subsidiaries/AquaBounty)**. With the recent approval of **AquaBounty AquAdvantage® salmon (http://www.fda.gov/AnimalVeterinary/DevelopmentApprovalProcess/GeneticEngineering/GeneticallyEngineeredAnimals** aquaculture will lead the discussion of transgenic animals in agriculture. Needless to say, transgenic animals evoke numerous environmental questions.

Not just with genetically engineered animals but throughout all agriculture — whether plants or animals raised in the ocean or on the land — environmental considerations are central. All agriculture has environmental impacts. Those impacts must be taken into account when we assess new varieties of plants and animals and how they are raised.

Circling back to medicine's directive to develop drugs that treat or cure disease, what is agriculture's outcome-based equivalent? We do well to ask our aquacultural and agricultural systems to produce more and more nutritious food in ways that do not degrade the planet's ability to continue to provide the food we need in the future.

In a subsequent article, I will use this thought to develop questions for how we might discuss and assess a number of different agricultural products.

Author

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