

Amy Young
Christopher Jensen
MSWI- 260C: Evolution
01 05 2019

Project Summary

Evolution is a series of changes in populations through adaptations and mutations. Evolution doesn't have a consciousness, or a destination, except for 'selecting' organisms that are better suited to survive in their environment. If a mutation is beneficial to better surviving in an environment, it will be more likely to be passed on because the mutated organism will live long enough to reproduce. Likewise, if it's a disadvantageous mutation, the organism probably won't live long enough to reproduce, thus the mutation will not be passed on. In that sense, evolution is only a process of actions and reactions, a cycle of trying to escape death and to live long enough to reproduce.

However, with Genetically Modified Organisms, humans are changing that narrative. We have become the source of genetic change- with GMOs the organism isn't 'evolving' to survive better in nature, instead we're consciously altering its DNA so that it can better serve us and our needs. For example, we're creating bigger apples with a longer shelf life to be more desirable to consumers. Those traits aren't advantageous in nature, instead they're used to succeed in the human-created environment. GMOs are created through genetic engineering, where scientists isolate a trait, and they then implement that trait into another organism to 'enhance' the 'abilities' of that organism (Powell). Genetic editing differs from artificial selection because we are altering the organism on a genetic, molecular level, rather than through selectively breeding together the 'best picks of the litter'. However, we are limited in only being able to combine pre-existing traits together. For example, the trait that causes fast maturity in the Chinook Salmon was implemented into Atlantic Salmon, creating the first GMOD Salmon (Living Oceans). Through using genetic editing and modification, we're able to 'enhance' species to have several advantageous traits, such as pest-resistance, drought resistance, and faster maturity time. Genetic engineering is able to help us achieve desirable produce, but it doesn't allow us to change the environment in which those traits are needed. For example, we can produce drought-resistant crops, but we aren't able to alter a drought-prone environment. Of-course, we can alleviate the conditions of an undesirable environment by human inventions, such as irrigation, but we are unable to completely change the nature of the environment. We're only able to create organisms that would thrive in those environments.

Unfortunately, a concern with GMOs is that it can cause a lack of genetic diversity. Because of traits such as pest resistance and drought resistance, it can easily outcompete native, unmodified organisms in a natural environment. Given time, they would be able to eliminate most surrounding natural organisms, which effectively also reduces the genetic diversity of that area. (Landry). This is problematic because if there's a harmful virus or pathogen, it could potentially destroy the entire population. The only way for a population to survive a harmful

pathogen would be if there was genetic diversity, with groups with certain genes that would be able to survive and develop a resistance to the pathogen (Landry). For better or worse, mutations help with biodiversity in the ecosystem, helping to avoid the extinction of an entire species. If we were the ones controlling the mutations, we could potentially 'blindsided' an entire population when a pathogen strikes. The consequences of that could be disastrous. A historic example would be the potato famine in Ireland; instead of using seeds, the Irish used sections of existing 'parent' potatoes, creating genetic clones and little variation. When the pathogen occurred, it wiped out the entire population for a few years (Landry).

Another concern is that GMOs would cause a dangerous evolutionary arms-race. An example would be Genetically Modified Corn and the Western Corn Rootworm (Evolution Berkeley). The GM corn has the ability to release toxins to kill pests. The rootworms have begun to develop a resistance to the toxin in as short as three generations, and widespread resistance around ten generations (Evolution Berkeley). If the rootworms were able to develop a complete resistance against the toxins of the corn, it would render the GM corn with that trait useless. Thus science needs to continually experiment with new ideas and different methods to ensure that we do not 'lose' in the evolutionary arms-race. One way to do so would be to use crop rotation, ensuring that the next batch of Western Corn Rootworm hatchlings would starve to death from not having any corn to eat, after swapping the corn with another crop (Evolution Berkeley).

Fortunately, other than the potential lack of biodiversity as well as the potential in creating extremes in the evolutionary arms-race, there have been no known direct effects on the health of organisms that consume GMOs, which came from observing cows who regularly eat GM crops (Pachin). However, that is solely a short-term study, and we are still unaware of any long term health effects that may occur from decades of GMO consumption (Pachin).

I had originally planned to make the mode of presentation a story book, but I found that it would be easier if I made it a comic book. Each panel would be able to contain more information than if it was a story book, and I needed to get a lot of information across because of the subject matter that I was dealing with. Because it was in a direct communicative format, I was able to implement my scientific ideas quite literally; I was informing the reader about GMOs directly, through using pictures and visual aids to communicate the ideas.

My scientific ideas were that humans have created GMOs because we wanted to modify various organisms (usually vegetation) to be able to give us a greater benefit than in their 'original' state. That I depicted quite literally, as I drew Simon the Salmon, who was bigger than his other family members (Living Oceans). I also did a small 'chart comparison' of GMO and non-GM organisms, like how the apple looks rounder, redder and generally more appetizing than its non-modified cousin. Another scientific idea that I highlighted was that we are unable to create a new organism from scratch- it is always by combining the DNA of two or more organisms together (implementing a desirable trait into another organism) (Powell). That I showcased by drawing Simon the Salmon's physical appearance and colour as a combination of

that of the Chinook and the regular Salmon, as well as highlighting how limited we are in the creation of new creatures through drawing a giant pumpkin and a super muscular Simon. The third idea I chose to incorporate was that we are still quite ignorant of any long term effects it might have on the environment or to people who regularly eat GMOs, which again, I depicted literally using a field of corn, and how 50 years later, the GMd corn overtook the field of regular corn due to its superior 'survival' skills (Landry). The last idea that I implemented was that GMOs don't solve the root of the issues, like poverty and wealth disparity, and I drew a few examples like pollution from vehicles and a man standing on a pile of gold while the other had little to nothing.

I wanted my visual work to be for kids, perhaps around 8-12, and to keep them interested in a more 'nitty gritty' subject that doesn't necessarily appeal to younger ages. I wanted to make sure that they were at-least aware that GMOs are only a temporary relief to bigger international issues, such as wealth disparity in society that causes poverty and famine in the first place, which I had shown using the difference in gold coins as well as the pollution of the cars. The impact I wanted this short comic strip to have was to start them on a path to being a conscious consumer, especially to develop an awareness of what foods and products they were putting into their bodies. However, overall, I wanted to deliver the information in a more light-hearted and more entertaining way than textbook paragraphs. I wanted the comic to be fun, and to keep the reader entertained, and perhaps be able to use the visuals to help them recall certain information in the future.

Works Cited

AY, Panchin. "Published GMO Studies Find No Evidence of Harm When Corrected for Multiple Comparisons." *Ebscohost*, 14 Jan. 2016, eds.a.ebscohost.com.ezproxy.pratt.edu:2048/eds/detail/detail?vid=0&sid=6c7e4c1f-afbd-4e00-952b-6b38d8a96578@sidc-v-sessmgr01&bdata=JnNpdGU9ZWRzLWxpdmUmc2NvcGU9c2l0ZQ==#AN=26767435&db=cmedm.

Pratt source. Secondary source, trustworthy; published in a database. Talks about how the researchers analyzed various studies and data, and found no conclusive evidence for a correlation between health risks and GMOs

"Genetically Modified Salmon." *Living Oceans*, 18 Apr. 2016, livingoceans.org/initiatives/salmon-farming/issues/genetically-modified-salmon.

Tertiary source. Talks about GM salmon, gives a brief history of how GM salmon came to be and how it's now being sold on the market. Could be biased because the website advocates the protection of the 'natural' fish population and environment.

"GMOs Struggle to Stay One Step Ahead of Evolution." *GMOs Struggle to Stay One Step Ahead of Evolution*, Oct. 2016, evolution.berkeley.edu/evolibrary/news/161011_evolutiongmo.

Tertiary source. Trustworthy because it's run by Berkeley university. Talks GM corn and soybean, and the pest rootworm. Gives examples to how we can try to postpone the resistance of the rootworm.

Landry, Heather. "Challenging Evolution: How GMOs Can Influence Genetic Diversity." *Science in the News*, 12 Aug. 2015, sitn.hms.harvard.edu/flash/2015/challenging-evolution-how-gmos-can-influence-genetic-diversity/.

Tertiary source. Trustworthy- harvard article. Talks about the dangers of GMO in terms of contributing to a lack of biodiversity. Gives example of how disastrous the lack of biodiversity can be.

Powell, Chelsea. "How to Make a GMO." *Science in the News*, 11 Aug. 2015, sitn.hms.harvard.edu/flash/2015/how-to-make-a-gmo/.

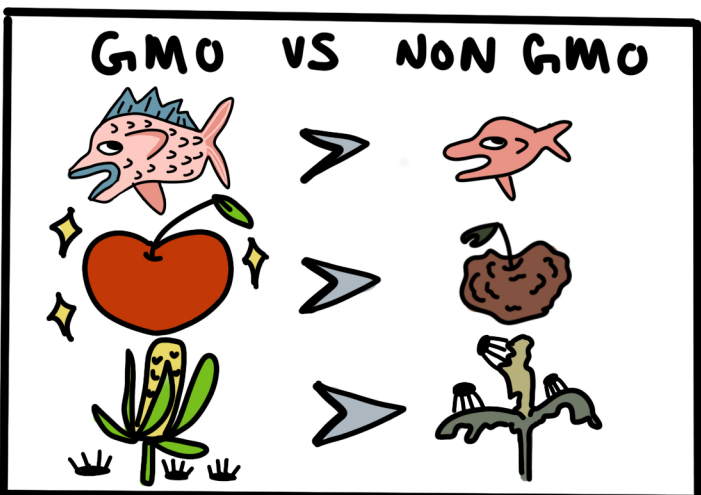
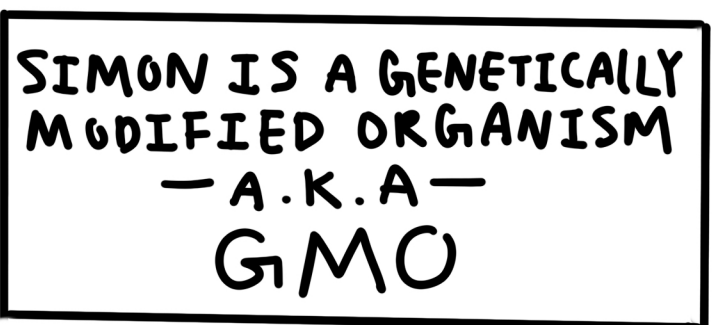
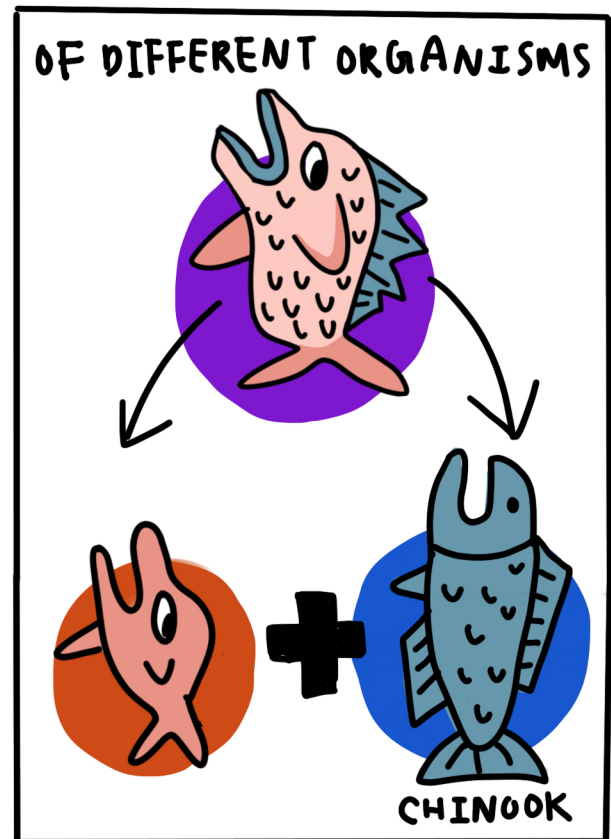
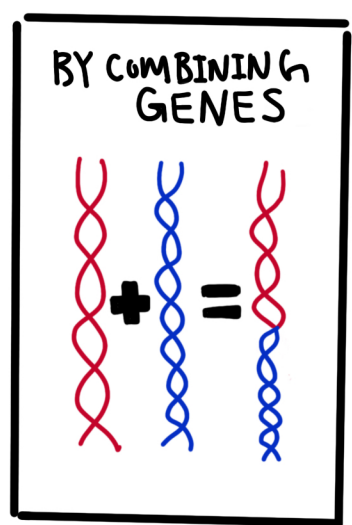
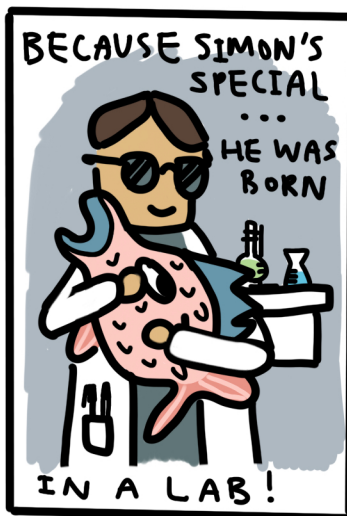
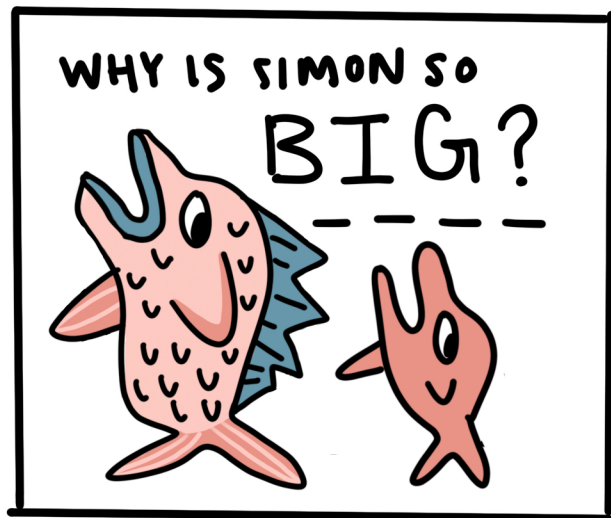
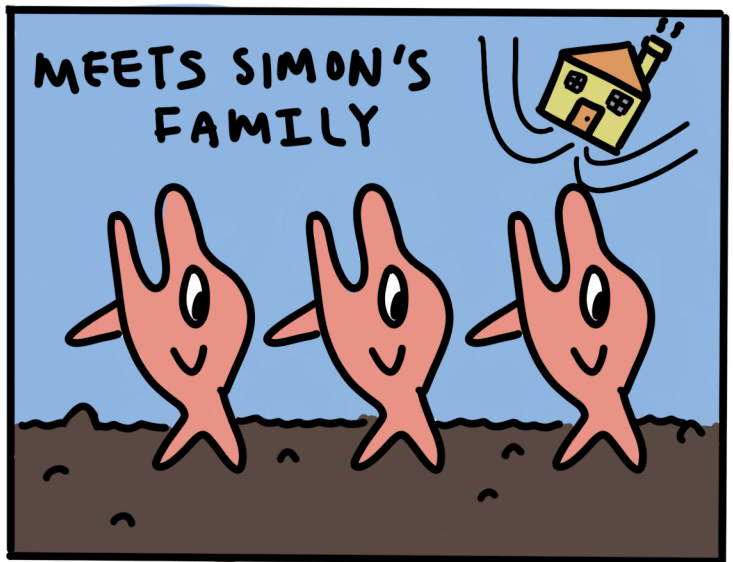
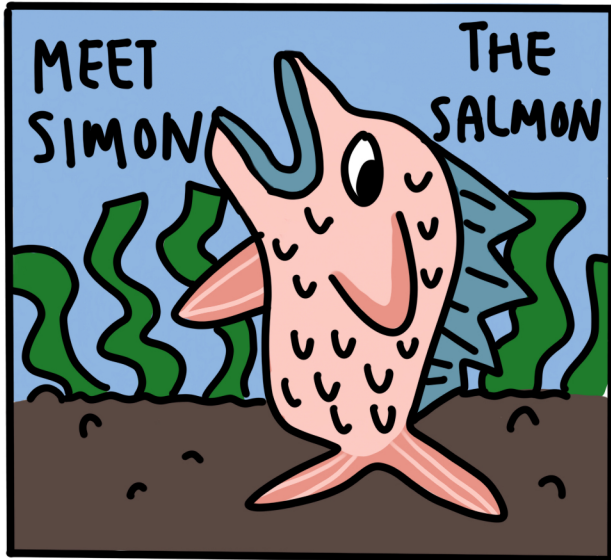
Tertiary source. Trustworthy because it's a harvard article. It's useful because it delivers the information in an easy-to-understand format, which is supplemented by graphs and pictures. It also provides a comprehensive 'beginner's guide' to what a GMO is.

THE QUICK GUIDE TO

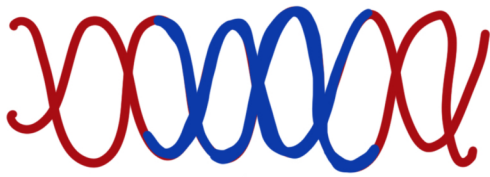
GMOs

BY AMY YOUNG

✧ PLEASE READ FROM LEFT → RIGHT,
& UP → DOWN ✧

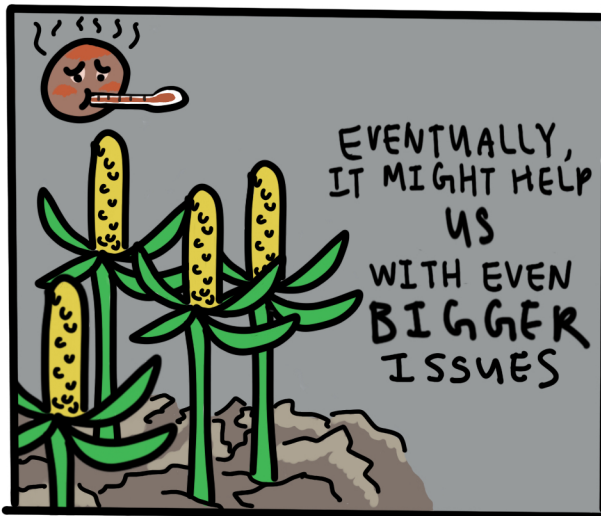
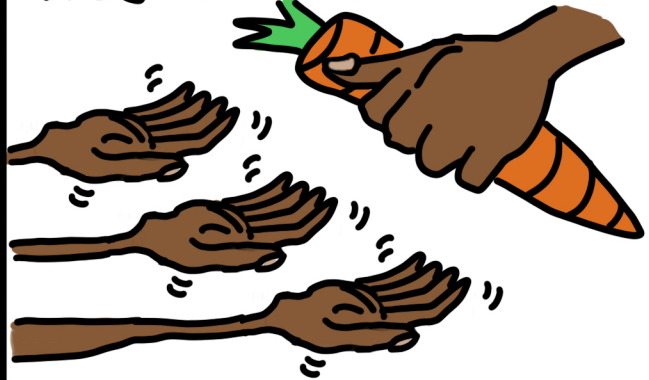


GMOs ARE DIFFERENT
FROM SELECTIVE
BREEDING BECAUSE

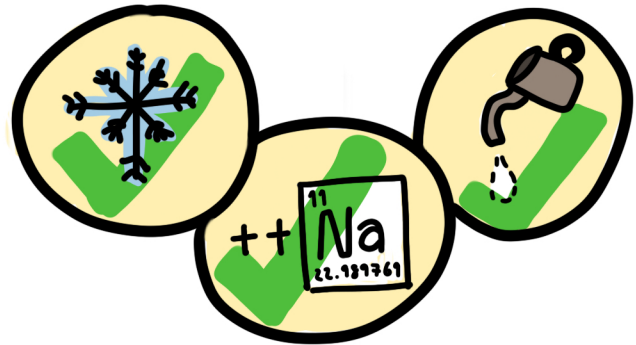


WE CHANGE THE GENOME

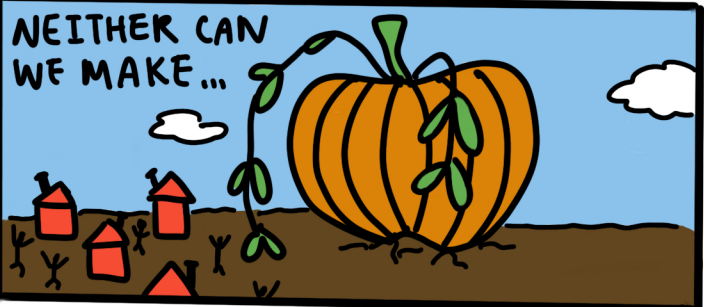
WE MAKE GMOs TO
HELP SOLVE PROBLEMS



IN ADAPTING TO CHANGES
IN THE ENVIRONMENT



BECAUSE WE CAN'T
CHANGE THE ENVIRONMENT



OK...

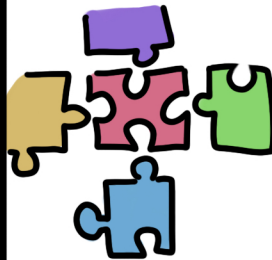


BECAUSE WHEN IT COMES
TO GENETIC ENGINEERING

THIS IS
US
STILL



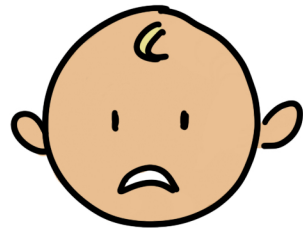
& WE CAN
ONLY
MIX N' MATCH



TRAITS

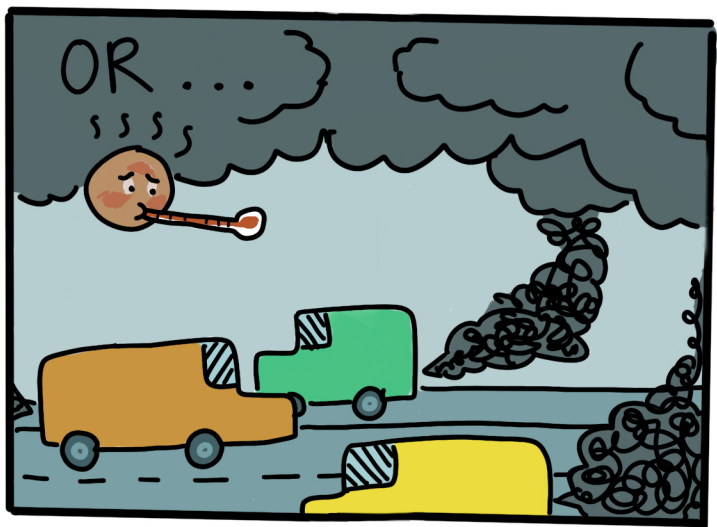
DISAPPOINTING

...



I KNOW

FURTHERMORE, GMOs
AREN'T SOLVING THE
UNDERLYING PROBLEMS
LIKE ...



EVEN IF WE COULD
CREATE ANY-AND-EVERYTHING
WITH GMOs, IT'D STILL
BE **CONTROVERSIAL**



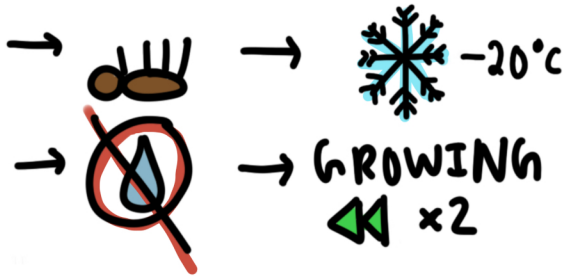
THERE'S ALSO NOT MUCH
RESEARCH DONE, BECAUSE
GMOs ARE SO **NEW**



AND NOTICING THE EFFECTS OF GMOs COULD TAKE DECADES



THE REASON FOR THIS
GMO INVASION
IS BECAUSE GMOs
ARE MORE 'FIT':
HAVING BETTER
TRAITS LIKE...



AND IN THIS 'ALL-OR-
NOTHING' GAME ...



SO WE NEED TO BE
CAREFUL ABOUT
GMO REGULATION
...
LIKE BY MAKING
SIMON STERILE



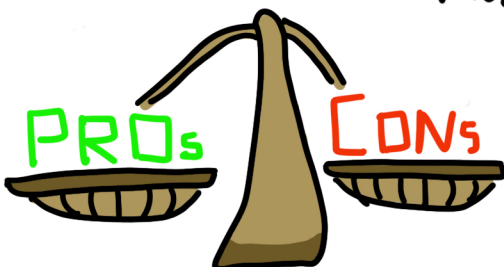
HOWEVER, SHORT-TERM WISE,
GMOs HAVEN'T SHOWN
ANY ADVERSE EFFECTS



AS WITH MOST THINGS,
GMOs COME WITH ...



SO YOU SHOULD MAKE
YOUR OWN DECISIONS
WHEN IT COMES TO GMOs



AFTER ALL, IT NEVER
HURTS TO BE
INFORMED ON A
SUBJECT

THE END

THANKS FOR READING!
(& FOR BEING A GREAT TEACHER)

