# Can native and conventional crops coexist with GM and gene-edited varieties? The case of Honduras

ver the last several years, it's been more than evident there is an urgent need to increase food production at a global scale to satisfy the constant demand of a growing population. But, at the same time, production increases must be done with existing farmland to preserve the environment and the biodiversity in those ecosystems.

It is equally important to provide safe and nutritious food as to provide an adequate environment to develop for current and future generations. The most logical way to achieve this is by using all available tools that prevent the loss of productivity in fields and by having several food production systems. In this scenario, farmers have the chance to choose the most beneficial and adequate approach that will deliver the best performance in their fields. This may not be as easy as it sounds, because of concerns about whether the coexistence among different food production systems is even possible.

The most important discussion is whether the food production systems-conventional, organic and agrobiotechnology, and more recently gene-editing-are compatible. More important, is it possible for these different systems to coexist? The simple answer is yes. Any modern idea to preserve "pure" varieties and to take precautions to prevent gene flow between native and improved varieties comes from a human perspective over what a "native" or "altered" crop is. The answer gets a little bit more complicated when international and domestic regulations enter the playground.

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## Agriculture and coexistence, its origins

Agriculture has been identified since its origin as a constantly changing entity. It has changed accordingly with times and needs. Farmers had served as drivers of those changes over the centuries, but in recent times scientists are teaming up with farmers, helping in the improvement process, creating new crop varieties in less time. This collaboration has completely changed the way the food is produced.

One of the biggest myths widely spread by environmental NGOs against the use of GM crops in developing nations (in Latin America as well as in Africa and Asia) is the argument that the coexistence between native (wild) relatives of crops, and their GM counterparts is not possible. The myth further points to different food production systems, and states that by allowing different food production systems from organic and the adoption of GM crops it's jeopardizing their futures. This idea resonates most in areas that serve as the center of origin and genetic diversity of fundamental crops (in maize, for example), and is endorsed by developed nations like the European Union. But is coexistence really impossible?

## Regulation – and its limitations – plays a central role

As the idea of GM and organic coexistence is <u>considered by the European Commission</u> and used by other regulatory frameworks around the world:

Under normal agriculture conditions, the possibility of adventitious presence of authorized GM crops in non-GM crops cannot be excluded. Therefore, suitable coexistence measures can be put in place during cultivation, harvest, transport, storage, and processing to ensure the coexistence of GMOs with conventional and organic crops.

This approach is followed by several regulatory frameworks around the world, adding more cost to those that want to initiate an environmental release of GM crops. In addition to covering the expenses of the regulatory process and the steps asked by the authorities to achieve a commercial release of any GM crop, it's necessary to cover the expenses for guaranteeing the surrounding areas are protected from GM technology.

As reported by Koreen Ramessar in Nature Biotechnology:

Even if a GM crop can surmount Europe's excessive product registration process, any farmer hoping to plant it must then navigate tortuous, arbitrary and scientifically unjustifiable coexistence regulations. GM/non-GM coexistence is now a loaded term, used by opponents as a de facto criticism of GM agriculture and a self-fulfilling reason to impose restrictions. Is there any way to encourage a rational approach to the coexistence debate?

This means that even if a GM crop succeeds in its path to environmental release, it faces subsequent coexistence measures implemented in each region. In the European Union, these measures are <u>not</u> <u>strongly science-based</u>. In the United States and Canada, isolation is the main way to prevent gene-flow. Meanwhile, in developing nations there still is a lot of work to do since, due to the lack of capacity and resources to make their own regulations to address coexistence. Most developing countries use the regulations from the EU, which are not adequate to their reality and domestic dynamics in their food production systems.

In some coexistence regulations – <u>as the European</u> Union – marks as fundamental the right that consumers have the ability to decide if they want to eat genetically modified or non-genetically modified food. This concern is not applicable in regions like Latin America, Africa, and Asia, where in some cases the decisions are not based on what kind of food the consumer will prefer, but rather if the consumer will have any access to food at all. This creates some of the most problematic situations to apply foreign regulation in domestic scenarios.

## A coexistence case: Honduras and GM maize

Even when the United States may be the better example to show that coexistence between different crops and food production systems is possible (since the US is the most important producer of GM crops and

organic crops at the same time), the US is big and rich enough to guarantee "native" and GMO coexistence. Since it's not a megadiverse country by allowing GM crops there, it is not a threat to biodiversity.

For this reason, it is worth making a closer look at Honduras, a megadiverse nation from Central America that is a center of origin and genetic diversity for native maize (corn), and at the same time a producer of GM corn. This makes it a territory with transgenic corn where native varieties have prevailed despite the presence of GMOs over the years.



Indigenous Honduran farmer, researcher, plant breeder and community leader Isidora Garcia. Credit: Faris Ahmed/SeedChange

As <u>reported by USDA-GAIN</u>, Honduras allows commercial production of GM crops, mainly corn used for fed, food, and cultivation. It is the only Central American country and one of seven from LATAM that allows commercial cultivation of GM crops. The native and local corn varieties have prevailed in the nation, even when the coexistence <u>measure is restricting farmers</u> who want to use GM corn but due to isolation measures they are limited. Since 1998, when GM corn entered the nation, coexistence is been possible, allowing both food productions systems to generate profits for the country, making market acceptance related to the sale and use of GM plants as <u>favorable</u>. Looking back, the <u>farmers that</u> <u>embraced</u>

GM corn had increased their yields and had transformed the GM corn production in Honduras in a <u>sustainable process</u>. This could not have been accomplished if decision-making processes were not science-based. They thus avoided making decisions based on ideological approaches, such as in Mexico where GM corn is banned "to prevent the loss of the native corn varieties".

GM corn arrived in Honduras fields, as an answer to a <u>food crisis that doubled the corn prices</u>. When farmers saw the benefits from using the new technology, GM corn has been used throughout the country, and its adoption numbers increase each year. After over a decade, GM corn continues to outperform conventional corn hybrids, and provide substantial farm-level benefits to Honduran farmers.

### What about coexistence with gene-edited crops?

The past experiences with GMOs and natives beg the question: how will the world handle CRISPR-Cas9 and other gene-editing techniques? The EU first lumped them in with transgenic modifications (essentially making them impossible to approve), while the US took a more tolerant approach. Gene-edited varieties of crops have changes in just a couple of targeted genes, and the change can be compared with a sporadic mutation. It is possible to say that varieties such as those obtained from genome editing had been already coexisting with wild and conventional crops over years. Whether regulators worldwide agree with that assessment remains to be seen.

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