

Science AMA Series: I'm Huw Jones, Professor of translational genomics for plant breeding at IBERS, Aberystwyth University. AMA about whether plant breeding is 'natural' or if we do indeed need new cro

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Can you explain risk-based vs hazard-based regulatory policy for GMOs? Which one is better in your opinion and why?

[squidboots](#)

A hazard is something that could cause harm. Any specific hazard could be relatively mild (like a paper cut to your finger) or severe (like for instance an explosive volcano eruption). To consider the risk to any individual of these things causing harm, we must also consider the 'exposure' ie. how often do you handle paper in a way it could cut you or how frequently does any specific volcano erupt and how much time do you spend close by etc. Most people would accept the risks of both these scenarios. In one, the exposure to paper-handling is high but the hazard is low. In the other, although the hazard is extremely severe, the chances of it happening are low so we accept risks of the occasional visit to an active caldera. Any sensible regulatory policy must be based on a transparent and logical analysis of the risk which takes into account both the hazard and the exposure. Any regulatory oversight of biotechnology based purely on hazard removes the power of the individual to choose. All aspects of life are based on balancing risks and benefits and I prefer to keep that power in the hands of the consumer. This also means that there should be complete transparency with regards to labelling etc.

I'm curious about using GMOs to resolve deforestation and food shortages. In Haiti, both are huge problems but attempts to simply plant fruit trees are largely failures because goats eat the saplings and what survives is used to build structures and make charcoal, both of which are necessary things. One proposed solution has been [edible jatropha](#) because goats don't like the saplings, its fruits can be used for cooking oil, and the mash for chicken feed. I've read about genetically modifying this tree to maximize yields and encourage growth in poor soil.

How are scientists thinking about resolving problems like this with GMOs? Do you think these kinds of solutions will work?

[firedrops](#)

Plant breeders use a wide spectrum of methods to 'capture and sort variation' to generate improved varieties. Genetic modification tends to work well only when the trait to be altered is under simple genetic control. Yield is complex and I doubt there will be an easy GM solution to significantly increasing yield of edible jatropha. I would look at other strategies first.

I also conduct GMO risk assessments for the European Food Safety Authority.

I used this website: <http://registerofquestions.efsa.europa.eu/> and found that no GMO application has been denied, only delayed. Do you ever personally find GMOs to be risky? What sort of things would make a GMO risky?

[Sadnot](#)

In theory it could be possible to make a risky GMO. For example, there are genes that encode known allergens or toxins. However, the major seed companies are multinational corporations with reputations to maintain (some already more tarnished than others ). Thus there is a massive in-house screening process to take forward only those genes / events that result in plants that are both commercially promising and substantially the same as the non-GM from a nutritional point of view. It is appropriate that these products are independently assessed but the fact that the EC has currently authorized about 60 different applications for import of GM crops into the EU shows how rarely it finds negative issues in the applications.

I study BSc plant science, and throughout my studies it seems as though the (in my opinion) under utilisation of GM crops in Europe is mostly political rather than evidence based, often times with legislation not making sense from a scientific and practical point of view. To what extent do you think GM technology has a 'PR' problem, and what do you think we as scientists (or future scientists) can do to change it?

[2xw](#)

I study BSc plant science, and throughout my studies it seems as though the (in my opinion) under utilisation of GM crops in Europe is mostly political rather than evidence based, often times with legislation not making sense from a scientific and practical point of view. To what extent do you think GM technology has a 'PR' problem, and what do you think we as scientists (or future scientists) can do to change it?

GM crops were first commercialized just as the EU was suffering a series of major food/ health scares such as BSE, salmonella etc. and understandably, these new crops were caught up in the reaction to improve EU food safety generally. It's a highly polarizing topic and of course there is a lot of politics involved. I think researchers should be open and transparent in discussing the potential benefits and risks. To understand that any problem will have many solutions and science is only one of the many drivers in policy making.

Are there currently any programs, that are having any success in protecting citrus from "greening"?

[3inchescloser](#)

I am not an expert on citrus greening but as with all insect-spread plant diseases, they are best tackled using many approaches simultaneously. For example; preventing spread of the insect, new chemical treatments or management strategies targeting either the insect or the bacterium, and the development of novel, resistant citrus varieties. I am not personally aware of any breeding programmes but this crop

is very important and I am certain there is active research using a range of breeding tools to develop resistant citrus varieties

Could gene modifications have side effects on the plant itself, i.e. reducing the amount of vitamins when trying to improve yields?

[Tuonenlapsi](#)

Could gene modifications have side effects on the plant itself, i.e. reducing the amount of vitamins when trying to improve yields?

Of course it is possible to alter the nutritional balance of a crop by all other forms of plant breeding. It is actually less likely when using genetic modification because there is an understanding of the changes that a specific alteration will cause. There is a pre-market authorization step for GMOs, so changes to nutritional composition of the new crop are analyzed. This does not happen for other types of plant breeding because they have a 'history of safe use' – whatever that means

In your opinion, what is the most common or most potentially damaging misconception held by the layperson regarding GMOs?

[Wilnotcapitulate](#)

In your opinion, what is the most common or most potentially damaging misconception held by the layperson regarding GMOs?

That they are all one thing.... Actually, one GMO can be more different from another than either of them are to their non-GM counterparts.. If that make any sense? I thought it did to me until I wrote it down!

Could you please explain "sporting" as witnessed for example in Red Delicious apple trees? How common is this behavior in different plants and what precipitates it (can it be induced)?

[Scoldering](#)

I am not an apple expert but I know a nice one when I eat it . Apple trees are all clones from one specific tree – often many tens of years old. I assume 'sports' are off-types from the original clone that give a different type of apple. They are examples of natural mutations.

Is there any impact on the soil from growing a GE (or GMO?) crop? I'm thinking of the arguments I've heard about organic vs the standard way most farming is done, and how NPK depletes the nutrients in the soil.

[sheilerama](#)

Is there any impact on the soil from growing a GE (or GMO?) crop? I'm thinking of the arguments I've heard about organic vs the standard way most farming is done, and how NPK depletes the nutrients in the

Soil is hugely important – and can be very different in different locations but the agronomy / inputs/ farm practices have a far bigger impact on soil quality than the breeding methods used to develop the specific variety being grown.

Were you part of this study (published in the journal Nature) or have you read it... also can GMO technology (not talking about corporate greed) exist peacefully alongside organics?

...study...Organic agriculture key to feeding the world sustainably

It is the first such study to analyze 40 years of science comparing organic and conventional agriculture across the four goals of sustainability identified by the National Academy of Sciences: productivity, economics, environment, and community well being. [http://www.eurekalert.org/pub\\_releases/2016-02/ws-u-oak020116.php](http://www.eurekalert.org/pub_releases/2016-02/ws-u-oak020116.php)

[Gallionella](#)

Thanks for the great Q but, ironically, I am about to run out of time.. If Reddit allows me to continue after 5.00pm I will :-)

Cross breeding plants have been around for a long time and has sometime been good and sometimes bad but it was always done plant to plant. Now with some GMOs plants are being grown with other species DNA mixed in (for example I know of a study using frog DNA in tomatoes to make the skin tougher so they can be machine picked) do you think these type of GMOs plants are worse then what Mandela did or even the Golden Rice Project? Can GMOs save biodiversity or hinder it further? How does all this affect our health positively and negatively?

[dude22blue](#)

You cover a lot of ground here and I'll work from the bottom up. Of course diet has massive influences on our health but the 'method' used to make new crop varieties has no direct impact on the nutritional quality of the food. You refer to GMOs which (unlike other types of plant breeding) are highly risk-assessed and regulated for safety. Lots of wild plants can kill you but GM crops are safe and are substantially similar to the non-modified form of the same crop. I have never heard of your 'frog-skinned tomatoes' project but GR is a great example of bio-fortification to improve human nutrition where Vit A is otherwise lacking. Maintain access to a diversity of seed types is important so it's vital to keep samples all current and old heritage varieties because we never know when we may need this biodiversity / specific gene combinations in the future. However if you are talking about the biodiversity in a particular agricultural field, then it's the cultivation methods that are highly significant. For example, organic cultivation with minimal hoeing or other intervention will have a greater range of non-crop plants (so-called weeds) and invertebrates living within it compared to a conventional /intensively-farmed field whether its growing a GM crop or not. Obviously the yields and maybe the quality of the resulting food will be lower in the organic crop too.

Bore da Huw! (Actually it'll be P'nawn Da by the time you read this)

What sort of things do you look at when performing a risk assessment? Are you only looking at GE or all crops?

[djnrrd](#)

Bore da Huw! (Actually it'll be P'nawn Da by the time you read this)

What sort of things do you look at when performing a risk assessment? Are you only looking at GE or all crops?

The European Food Safety Authority is an independent scientific body tasked by the EC to conduct an

analysis of GMO applications for import or for cultivation in EU. Only the tiny proportion of crop types that fall into the definition of a GMO require this type of authorization. The GMO panel of EFSA uses a comparative approach and considers three main areas; a molecular characterization of the inserted DNA and the resulting 'event', an analysis of the food and feed implications of the genetic change and a critical appraisal of the environmental risks. After considering all the available data, the GMO panel produces an opinion on whether the GM plant is equivalent to its non-GM counterpart.

Whats your favorite gmo plant and why

[Spentgecko07](#)

We make lots of different GM plants in the lab to understand how genes work. I love them all equally; but those that give us a high impact reaseach paper- I love a little bit more!:-)

What trait modifications do you think have the most promise for improving yields?

[pensivebadger](#)

What trait modifications do you think have the most promise for improving yields

Yield is hugely genetically complex and I doubt that any simple, single gene modifications will have traction. Getting C3 plants to do C4 photosynthesis is a long-shot but would generate step-changes in yield if successful.