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为什么 GMO 是绿色的——生物技术作物有益于改善环境和减少贫困

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大约在 20 年以前,当 GMO 问题第一次受到媒体关注时,我还是一名反对生物技术的狂热分子。我认为基因改良(GM)是一种危险的技术,它会危害全世界的环境,并且剥夺农民的财产。于是我与其他人一同参与了有组织的反对甚至故意破坏转基因作物的活动——我个人破坏了不少 GMO 的田间试验,包括在英国干扰了有关转基因油菜、转基因甜菜和转基因玉米的试验。即使到了 2008 年的时候,我还给英国卫报写了一篇文章,论证 GM“不会给世界带来丰收”。

直到最近几年,我开始意识到这样的立场是完全错误的。许多事实证明,GMO 作物使农民受益匪浅,并且能够改善环境,因为它能减少杀虫剂的使用,促进免耕农业的推广,从而改良土壤质量和减少碳排放。转基因技术的问题不在于它发展得太迅速,而在于它的潜力还不能充分地发挥出来——整个大陆,包括欧洲、非洲和亚洲的大部分地区,在没有任何科学依据的基础上,仍然存在着针对 GM 作物和种子的禁令。

正如你能想象得到的,我经常被问起我是如何改变对 GMO 的看法的,人们尤其感兴趣的是究竟是什么使我突然意识到自己之前的认识是错误的。不过事实上并没有什么特别的东西,这种改变是随着我对科学的理解日益加深而逐渐产生的,特别是受到了我在气候变化领域所从事的科研工作的影响。当我发现国际科学界对 GMO 安全性的讨论就如同对气候变化这一事实同样强烈时,我没有更多选择的余地——继续反对 GMO 只会把我的智商和科学素养归入到与否认气候变化的人相同的层次上。

尤其需要指出的是,通过 20 年的安全性研究和成千上万的文献报道,用美国科学促进会(AAAS)的话说,“科学研究很清楚地表明:应用现代生物技术手段对作物进行遗传改良是安全的”。因此,我曾经作为反 GMO 积极分子的行为,以及认为重组 DNA 会带来某种危险后果的想法,都被科学证明是错误的。除了改变自己的认识,我别无选择。

在过去的一年里,我很荣幸能够直接与发展中国家的科学家和农业学家们共事,他们致力于保证那些拥有最少土地的、最贫困的农民也能够享受到生物技术的益处。受到盖茨基金会的资助,我与一个以肯尼亚为基础的技术推广民间组织——非洲农业技术基金会一起考察了撒哈拉以南的 6 个非洲国家,发现了不少关于 GMO 技术在改善人们的生活和生计上具有巨大潜力的例子。

例如,在坦桑尼亚,我遇见了一些正在忍受饥饿的农民,他们的主要粮食作物木薯由于受到褐条病病毒的严重危害,其产业已经濒临消亡。这种病毒病还肆虐了乌干达和肯尼亚的木薯种植地区。针对这种病毒,慈善机构资助的科学家已经研发出了一种抗病毒的木薯,目前已在乌干达进行田间试验。

当我去参观这个田间试验时,我惊呆了——那些 GMO 木薯比我在任何一个地方见到的都要健康得多。然而,反对 GMO 的组织和狂热分子却在散播虚假的信息和阴谋论,这些做法可能会导致农民没有机会种植这种改良的木薯品种。他们通过媒体或者广播散播谣言,声称 GMO 能引起人类不育和导致癌症的发生。很多这种公然散布恐惧和反科学

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的民间组织都是由西方资助的。

作为康奈尔大学农业与生命科学学院的新任访问学者，我也正在与其他康奈尔学者以及孟加拉国的科学家们一起合作，他们正在将基因改良的抗虫茄子——就是所谓的 Bt 茄子——引入孟加拉国。这件事的风险非常大，因为反 GMO 的狂热分子已在印度和菲律宾成功阻止了 Bt 茄子的引入，不过孟加拉国的政府倒是立场坚定地支持 Bt 茄子的引进。

Bt 茄子现在在 4 个不同的地区（加济布尔、杰马勒布尔、巴布纳和朗布尔）由 20 个农民进行试验种植，由此带来的收益可能是巨大的：一般情况下，茄子在一个生长季中需要喷洒 140 次有毒的杀虫剂才能防止果梢蛀虫的危害。而 Bt 茄子对这种害虫具有很强的抗虫性，因此，农民可以大大减少杀虫剂的使用，并且农民与杀虫剂接触的机会也会随之减少，同时，消费者也可以大大减少食用杀虫剂残留的机会。农民不仅可以节约成本，而且还可以获得更好的收成。

然而，反对者再一次致力于阻止 Bt 茄子的推广，这次他们仍然是使用制造毫无事实根据的健康威胁和散播所谓的“生物剽窃”言论，而完全无视这项技术的知识产权属于孟加拉国科学家的事实。甚至有蒙面的反对者去找 Bt 茄子的种植户，试图强迫他们谴责自己种植的作物并拍下视频。显然这个南亚首例 GMO 农作物能否成功推广的风险的确很高。

从发展中国家的这些不同例子来看，显然基因改良技术能够给小农户带来非常大的收益——但是它的发展前景却因为持续不断的政治争议而始终不明朗。要打破这种僵局，需要那些热切渴望农业创新的发展中国家的科学家和农民发出更强有力的声音。这也是我的愿望。

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Why GMOs are green-biotech crops to benefit the environment and reduce poverty

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Just under 20 years ago, when the issue of GMOs was first hitting the news, I was a dedicated anti-biotech activist. I believed that genetic modification was a dangerous technology that would harm the environment and dispossess farmers around the world. Accordingly, I joined with others in organising protests and even crop vandalism—I personally destroyed GMO field trials on multiple occasions, including for oilseed rape, sugar beet and maize in the UK. As recently as 2008, I penned an article for the *Guardian* arguing that GM would "not be a harvest for the world. "

In recent years I came to realise that this position is completely wrong. GMO crops have by and large proved to be a boon for farmers and have improved the environment by reducing insecticide applications and encouraging no-till farming which benefits the soil and cuts carbon emissions. The problem with this technology is not that it has been scaled up too fast, but that it has been hampered from being able to fulfil its potential—whole continents, including Europe, Africa and much of Asia, continue to maintain de-facto bans on GM crops and seeds without any scientific foundation.

As you might expect, I am constantly asked how I came to change my mind. In particular, people are especially keen to know what the single "lightbulb" moment was when I realised that I had got this one wrong. The truth, however, is more prosaic; my change in opinion came gradually as a result of a better understanding of science, in particular as a result of my work on climate change. When I realised that the international scientific consensus on GMO safety was as strong as that on the reality of climate change, I had little choice—continuing to fight against GMOs would put me in the same intellectual and scientific category as climate change deniers.

In particular, it is now clear from 20 years of safety research and hundreds of scientific papers that-in the words of the American Association for the Advancement of Science, "the science is quite clear:crop improvement by the modern molecular techniques of biotechnology is safe". Thus the assumption that I had held as an anti-GMO activist, that there was something dangerous about the technology of recombinant DNA, has been proven scientifically to be wrong. I had no choice but to change my mind.

Over the last year, I have been honoured to be able to work directly with scientists and agronomists in developing countries who are trying to ensure that the poorest farmers with the least land are not excluded from enjoying the benefits of biotechnology. Supported by the Bill and Melinda Gates Foundation and working with the Kenya-based tech-transfer NGO, the African Agricultural Technology Foundation, I conducted a tour of six sub-Saharan African countries, and came across multiple examples of how GMO technology has huge potential to improve lives and livelihoods.

In Tanzania, for example, I met farmers whose families are going hungry because the key food security crop—cassava—has begun to fail under pressure of a new disease called Brown Streak Virus. This virus has already wreaked havoc in Uganda and Kenya too. Scientists supported by charitable institutions and working in the public sector have developed a virus-resistant cassava, which is currently in field trials in Uganda.

When I visited the field trial, I was shocked—the GMO cassava plants were the healthiest I had seen anywhere. Yet activists and anti-GMO groups have spread misinformation and conspiracy theories that may yet prevent farmers from ever being able to access this improved cassava plant. They have spread media

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stories and even aired radio adverts asserting that GMOs can make people sterile and cause cancer. Many of these overtly fearmongering and anti-science NGOs are supported by naive Western donors.

As a newly-appointed Visiting Fellow at Cornell University's College of Agriculture and Life Sciences, I have also been working with other Cornell academics and Bangladeshi scientists who are introducing a genetically-modified pest-resistant eggplant—known as Bt brinjal—into Bangladesh. The stakes are high, because anti-GMO activists managed to block this same Bt brinjal from adoption in both India and the Philippines, but the Bangladeshi government has stood firm and supported its introduction.

Bt brinjal is now being trialled by about 20 farmers in four different regions:Gazipur, Jamalpur, Pabna and Rangpur. The benefits could be enormous: under conventional circumstances, brinjal is sprayed with toxic pesticidesas much as 140 times a season in order to prevent infestation by an insect pest called the fruit and shoot borer. The Bt brinjal is fully resistant, so farmers can dramatically reduce their use of pesticides, their exposure to toxins, and consumer consumption of toxins. They can also save money and harvest a better crop.

However, once again activists have sought to stop the deployment on the basis of unfounded health fears and so-called "biopiracy", despite the intellectual property residing with Bangladeshi government scientists. Masked activists have even visited the farmers growing brinjal and tried to force them into making video statements condemning their own crop. Clearly the stakes are very high regarding the perceived success or failure of South Asia's first GMO food crop.

Looking at these different examples from the developing world, it is clear that genetic modification technology has a lot to offer to small farmers—and yet its deployment is far from certain given the ongoing political controversy. A stronger voice for public sector scientists and farmers in the developing world who are keen to have access to agricultural innovations could be key to breaking the impasse. I certainly hope so.