



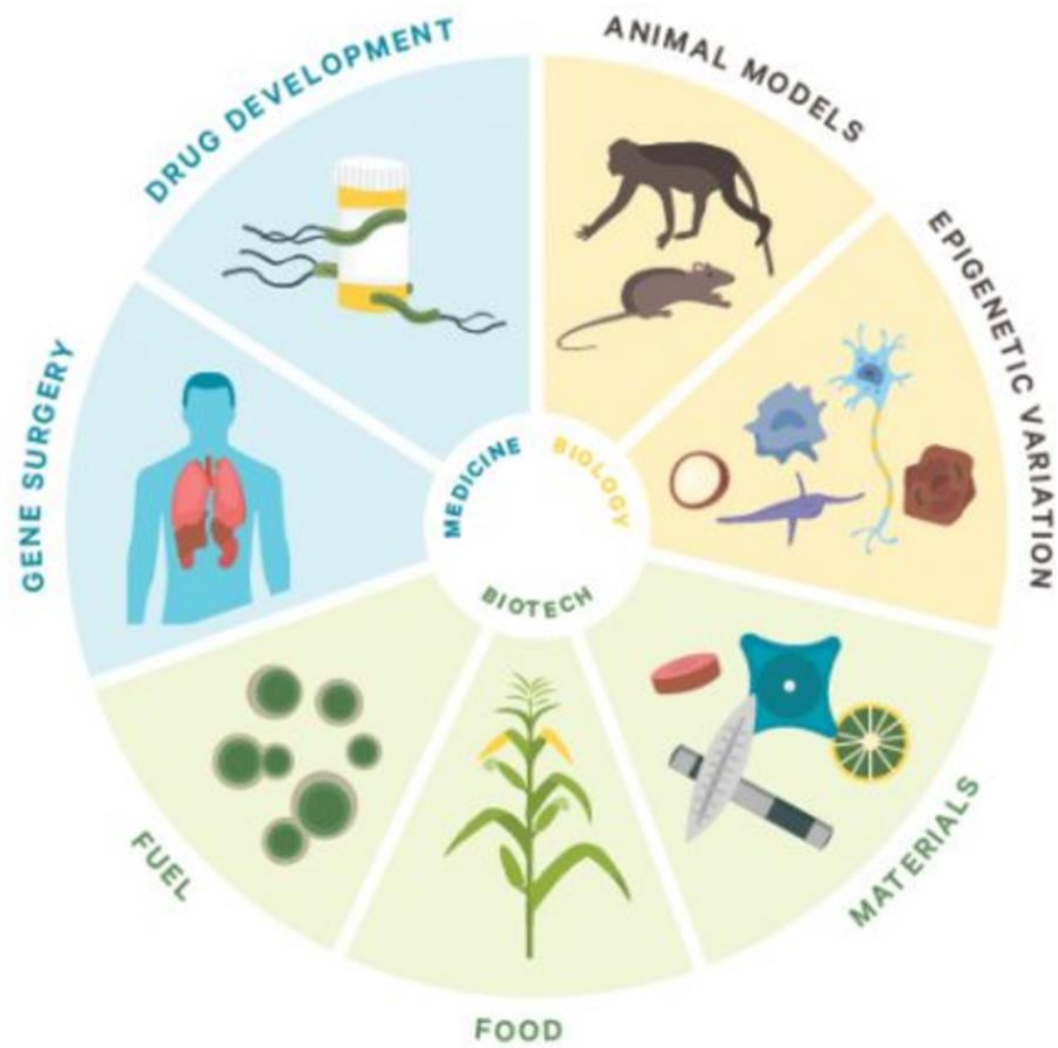
Anna Meldolesi

**CRISPR sui MEDIA**  
la quiete prima della  
breaking news

Bologna 3 dicembre 2018

## APPLICATION OF GENOME EDITING

(Modified from Hsu et al. 2014)



## Table 1: CRISPR-edited plants in the pipeline that USDA will not oversee

From: [With a free pass, CRISPR-edited plants reach market in record time](#)

| Date of USDA response | Inquiring institution (location)                                  | Plant trait engineered with CRISPR-Cas9                                                                                                                                                              |
|-----------------------|-------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10/16/2017            | USDA ARS, Plant Science Research Unit (St. Paul, Minnesota)       | Soybean ( <i>Glycine max</i> ) with drought and salt tolerance; achieved by disrupting the <i>Drb2a</i> and <i>Drb2b</i> genes (double-stranded RNA-binding protein2 genes)                          |
| 8/29/2017             | Yield10 Bioscience (Woburn, Massachusetts)                        | Camelina with increased oil content; target genes not disclosed                                                                                                                                      |
| 4/07/2017             | Donald Danforth Plant Science Center (St. Louis)                  | <i>Setaria viridis</i> , or green bristlegrass, with delayed flowering time; achieved by deactivating the <i>S. viridis</i> homolog of the <i>Zea mays</i> ID1 gene                                  |
| 4/18/2016             | DuPont Pioneer (Johnston, Iowa)                                   | Waxy corn with starch composed exclusively of amylopectin; achieved by inactivating the endogenous waxy gene <i>Wx1</i> that encodes a granule-bound start synthase catalyzing production of amylose |
| 4/13/2016             | The Pennsylvania State University (University Park, Pennsylvania) | White button mushroom ( <i>Agaricus bisporus</i> ) with anti-browning properties; achieved by knocking out a gene coding for polyphenol oxidase ( <i>PPO</i> )                                       |

Source: USDA

2016: USDA

4/13/2016

Pennsylvania State University (University Park)

a gene coding for polyphenol oxidase (PPO)

white button mushroom (Agaricus bisporus) with anti-browning properties; achieved by knocking out

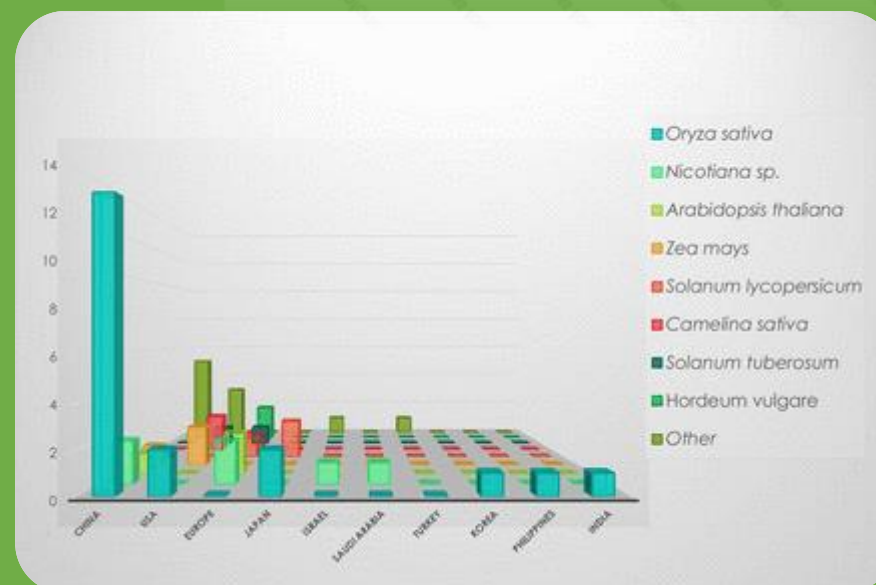
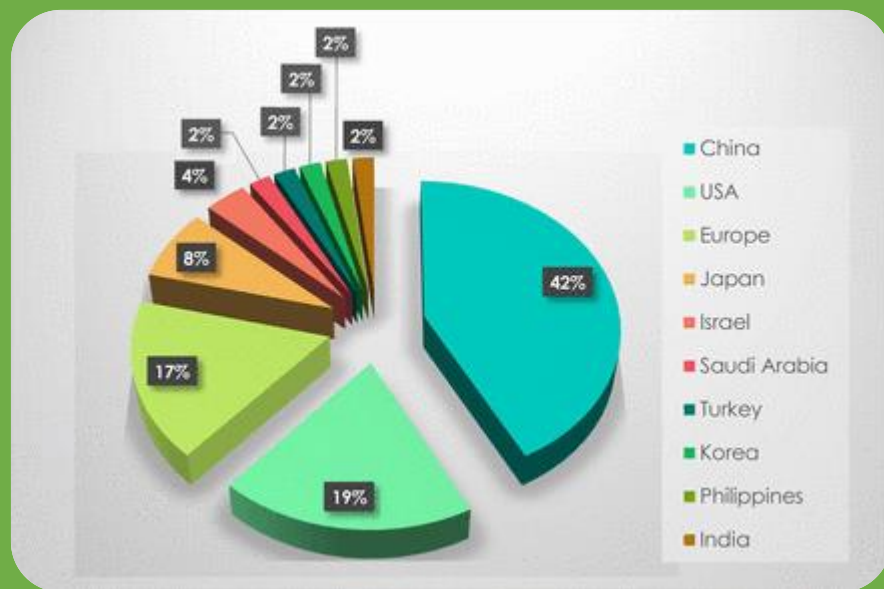
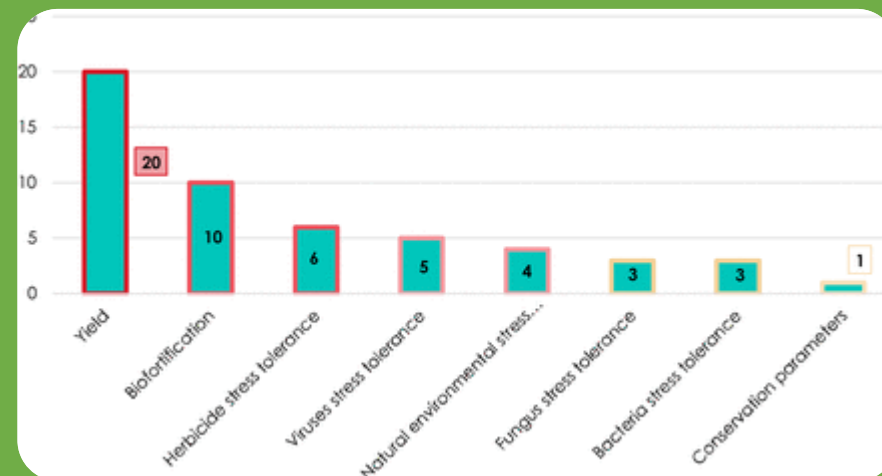


## Review Article

# Use of CRISPR systems in plant genome editing: toward new opportunities in agriculture

Agnès Ricroch<sup>1,2</sup>, Pauline Clairand<sup>1</sup> and Wendy Harwood<sup>3</sup>

<sup>1</sup>AgroParisTech, 16 rue Claude Bernard, Paris F-75231, France; <sup>2</sup>Université de Paris-Sud, Faculté Jean-Monnet, Collège d'Etudes Interdisciplinaires, 54, Boulevard Desgranges, Sceaux F-92330, France; <sup>3</sup>John Innes Centre, Norwich Research Park, Norwich NR4 7UH, U.K.





**The New York Times**

## ***Viruses Spread by Insects to Crops Sound Scary. The Military Calls It Food Security.***

Critics warn that a Defense Department-funded food security project that is still in the lab could set off a “biological arms race.”

# Weird new fruits could hit aisles soon thanks to gene-editing

Guardian  
19 July 2018

**Supermarkets stocked with peach-flavoured strawberries and seedless tomatoes on horizon, scientists say**







1 Why 'Love Actually' Is Trash —Go Ahead, @ Me



2 Hi, Have You Seen Ariana Grande's New Ring Energy?



3 All the Black Friday & Cyber Monday Deals You Need



4 Kate and Meghan Wore \*Seasonal\* Twinning Outfits



5 Let's Re-Watch Our Fave Thanksgiving TV Episodes

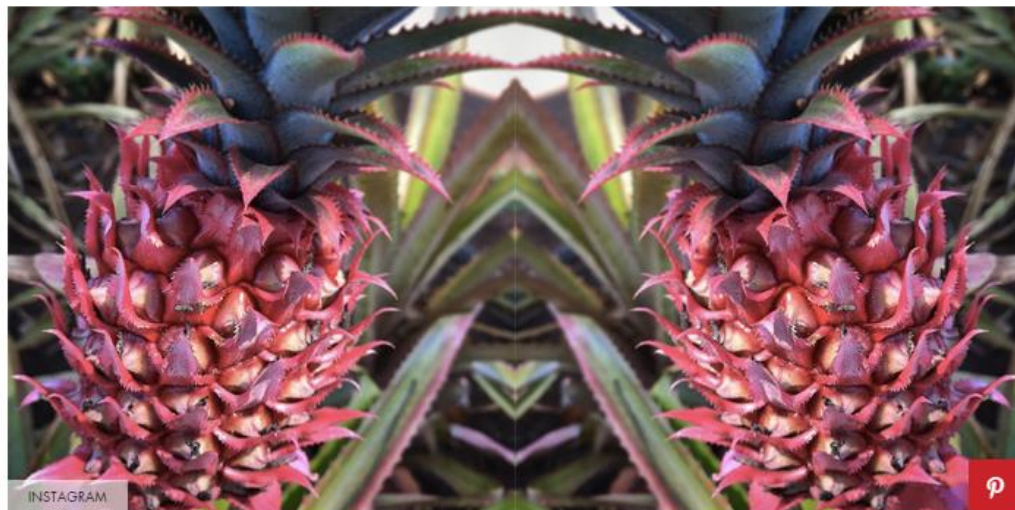
# The First Photos of the Pink Pineapple Are Finally Here

And of course they are beautiful.



by [DANIELLE TULLO](#) MAY 22, 2017

2.3K



INSTAGRAM





L'ESCLUSIVA FINELLA GOTTSCHE

Dentro alle nostre banane  
preferiamo trovare delle banane.

[www.e-coop.it](http://www.e-coop.it)

Fino a che non ci saranno risposte sicure, diremo no ai prodotti geneticamente modificati.

Banane? No grazie. Fino a che la scienza non darà risposte precise e generali di sicurezza, Coop preferisce lasciare fuori i prodotti OGM (organismi geneticamente modificati) o derivanti da OGM. Non di tutela nel confronti della salute dell'uomo. In altre parole, nel dubbio, preferiamo non avere dubbi.

**coop**  
LA COOP SEI TU.





The New York Times

TRILOBITES

# Taming the Groundcherry: With Crispr, a Fussy Fruit Inches Toward the Supermarket

You may have never eaten a groundcherry, but with common gene-editing techniques it and other fruits may be more easily domesticated.

WIRED

STEPHEN S. HALL SCIENCE 07.17.18 06:00 AM

# CRISPR CAN SPEED UP NATURE— AND CHANGE HOW WE GROW FOOD

It took thousands of years for humans to breed a pea-sized fruit into a beautiful beefsteak tomato. Now, with gene editing, scientists can change everything.



## Get ready for genetically engineered 'super chocolate': Scientists use gene editing tools to make cacao trees resistant to disease

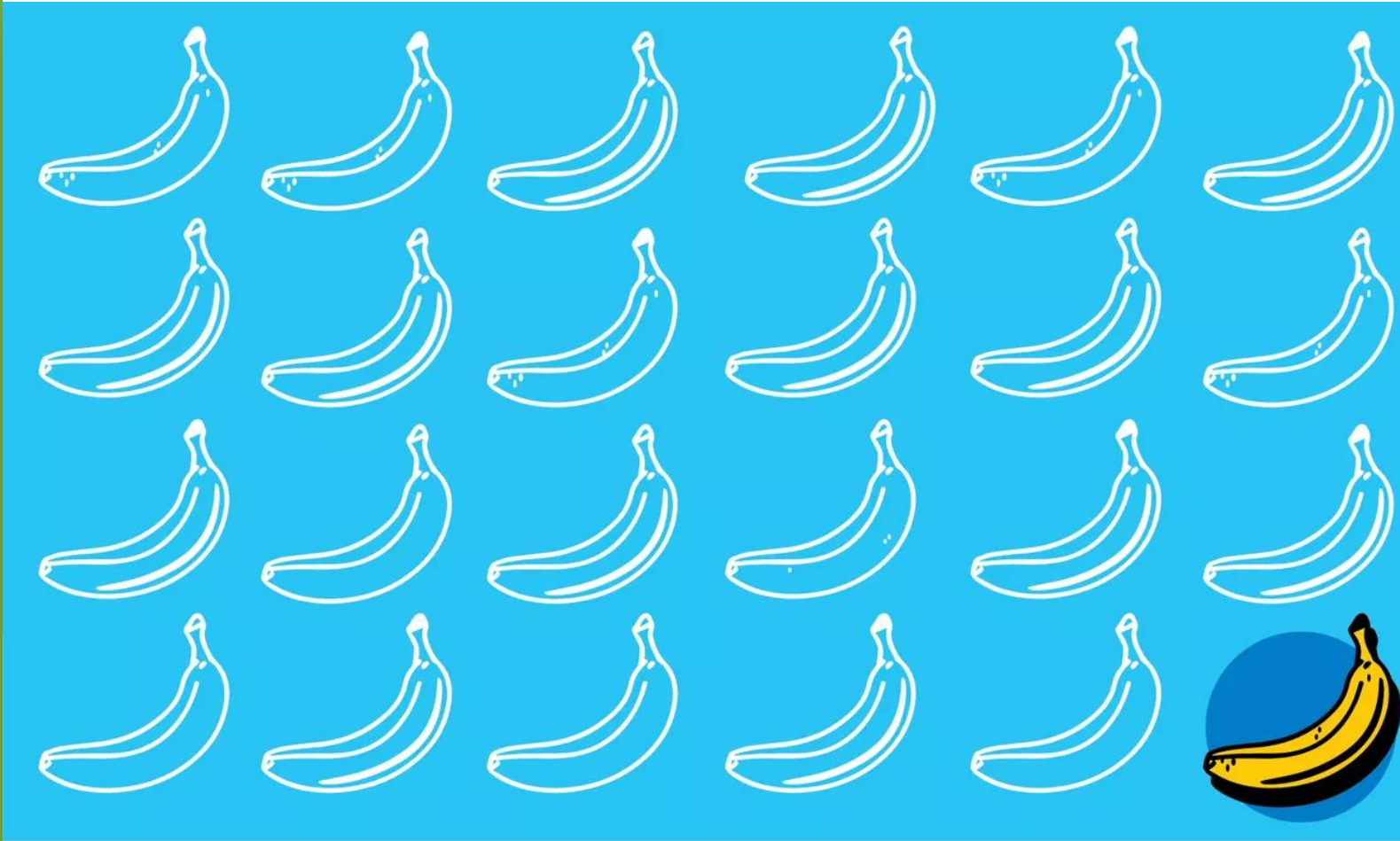
- Gene-editing tool CRISPR-Cas9 could help breed cacao trees that exhibit desirable traits such as enhanced resistance to diseases, Penn State study finds
- The cacao tree produces the cocoa beans that are the raw material of chocolate
- Plant diseases destroy 20 to 30 percent of cocoa pods preharvest each year





# Science's search for a super banana

Observer  
5 Aug 2018





FEATURE

# Is It Possible to Make a Less Allergenic Peanut?

Why scientists and startups are tinkering with our most popular legume.

Nyt  
15 Dec 2016

16 ottobre 2017

## Pane senza glutine grazie a CRISPR



Un gruppo di ricerca spagnolo è riuscito a inattivare 35 geni del grano che producono proteine tossiche per i celiaci, riducendo dell'85 per cento la loro tossicità. L'obiettivo di produrre un grano che sia consumabile anche dai celiaci si fa quindi molto vicino, come spiega Francisco Barro, il genetista che ha firmato il lavoro *di Anna Meldolesi/CRISPerMania*

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NEWS &amp; TECHNOLOGY 26 September 2017

### Genetically modified wheat used to make coeliac-friendly bread



Daily bread: If gluten is not for you

By Michael Le Page

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4

Traces of mystery ancient humans found lurking in our genomes

5





## These Are Not Your Father's GMOs





The New York Times

## ***What Is a Genetically Modified Crop? A European Ruling Sows Confusion***

In Europe, plants created with gene-editing technologies will be stringently regulated as G.M.O.'s. But older crops whose DNA has been altered will be left alone.

# europeanseed

VOLUME 5, ISSUE 3

R.I.P.  
EU PLANT  
BREEDING  
INNOVATION

\*20,000 BC  
†25 JULY 2018

A GREAT LOSS FOR EUROPE

EUROPEAN-SEED.COM



# La sfida dell'agricoltura: quanti Ogm nel cibo bio

Una recente sentenza della Corte di giustizia dell'Unione Europea mette la politica davanti alle sue responsabilità. Da decenni mangiamo vegetali il cui Dna è stato modificato artificialmente. È ora di finirla con le guerre di religione contro la ricerca scientifica: bisogna sfruttare le opportunità dei cambiamenti in corso

di ROBERTO DEFEZ

volenti o nolenti. Ma la sentenza dell'Alta Corte nella causa C 528/16 del 25 luglio ha deluso tutti: nessuno ha festeggiato.

Si disperano gli scienziati che vedono le innovazioni epocali del *genome editing* accomunate ai primitivi Ogm; chinano il capo rassegnati gli agricoltori, amputati nel loro anelito di riannodare il dialogo con la ricerca scientifica e le innovazioni di cui sono assetati da vent'anni; non sorridono i devoti alla Dea Natura che vedono cadere nel postribolo della definizione di Ogm tutte le piante migliorate che loro stessi coltivano e tra queste anche quelle che commerciano con i lustrini accattivanti di «prodotto da agricoltura biologica»; si nascondono tremebondi i politici che dovranno, ora, levare dei tizzoni ardenti dal fuoco a mani nude, visto che la giurisprudenza continentale si è attenuta rigorosamente al dettato delle leggi vigenti, senza esondare nell'ambito politico e senza offrire a nessuno soluzioni indolori. Perché la Corte ha accomunato tutte le piante che l'uomo ha attivamente migliorato nella categoria reietta degli Ogm. C'è la classica soia Ogm, che l'Europa non coltiva, ma che importa per il 92% dei suoi bisogni e che l'Italia consuma per diecimila tonnellate al giorno,

zione vegetale. Per selezionare piante con migliori prestazioni agronomiche, gli scienziati decisero di accelerare la frequenza con cui avvengono le mutazioni del Dna che generano la biodiversità delle piante, utilizzando mutageni chimici e fisici. Il grande sviluppo della fisica bellica veniva così riconvertito per scopi agronomici. Le radiazioni che avevamo imparato a controllare furono dirette sui semi delle piante che volevamo migliorare. Le mutazioni erano casuali, ma usando decine di migliaia di semi si riuscivano a trovare piante più dotate per una qualche caratteristica desiderata (altezza, numero dei fiori, resistenza a stress fisici o ambientali...).

g

Così abbiamo isolato 3.281 piante mutagenizzate di tutti i tipi: ciliegie, fagioli, girasoli, patate, riso, orzo e grano. In Italia GianTommaso Scarascia Mugnozza ha prodotto un grano duro più adatto a fare la pasta, il grano Creso. Circa il 70% del grano duro che abbiamo mangiato a partire dagli anni Ottanta era ed è grano duro figlio di questi esperimenti di mutagenesi. Finora nessuno ha mai regolamen-



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## L'Europe doit s'engager dans la transition génétique

Dans une tribune adressée au « Monde », Jean-Stéphane Joly, directeur de recherche à l'INRA, estime que l'édition de base, révolution dans le domaine médical et environnemental, doit être au cœur des ambitions scientifiques de l'Europe.

Par Jean-Stéphane Joly • Publié le 11 novembre 2018 à 18h00 - Mis à jour le 14 novembre 2018 à 10h21

# The Observer view on Europe's ban on gene-editing crops

## *Observer editorial*

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This absurd ruling restricts highly targeted plant breeding but allows random changes caused by carcinogenic chemicals







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JULY 25, 2018



## expert reaction to Court of Justice of the European Union ruling that GMO rules should cover plant genome editing techniques

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roundups &  
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To provide, for the benefit of the public and policymakers, accurate and evidence-based information about science and engineering through the media, particularly on controversial and headline news stories when most confusion and misinformation occurs.



## Aperitivo Biotech - Innovazione genetica al servizio della viticoltura

**05**  
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MILANO | ORE 18.30

DICEMBRE

03

**Dinner of the 21st century**

October 20, 2016

Soy blinis, smoked salmon

Tofu & soy burger

Soybean hummus, gilt-head bream, lemon

—

Lightly smoked mashed potatoes

Oven-baked potato pie

Fermented potato blinis, confit sardine

—

Soy, marinated fish, caviar

—

Cookpot of soy, seasonal vegetables,

herb & top pesto

—

Beef, potatoes in the fireplace,

cooking jus

—

Soy milk & strawberry fontainebleau

Il Benoit New York, il ristorante di Alain Ducasse a Manhattan ha servito piatti a base di soia e patate edite. L'evento è stato organizzato dalla Calyxt.





Contents lists available at [ScienceDirect](#)

## Global Food Security

journal homepage: [www.elsevier.com/locate/gfs](http://www.elsevier.com/locate/gfs)



### CRISPR versus GMOs: Public acceptance and valuation

Aaron M. Shew<sup>a,\*</sup>, L. Lanier Nalley<sup>a</sup>, Heather A. Snell<sup>a</sup>, Rodolfo M. Nayga Jr.<sup>a,b</sup>, Bruce L. Dixon<sup>a</sup>

<sup>a</sup> *University of Arkansas Department of Agricultural Economics, 217 Agriculture Building, Fayetteville, AR 72701, USA*

<sup>b</sup> *Norwegian Institute of Bioeconomy Research, NBER, Norway*



#### ARTICLE INFO

##### Keywords:

CRISPR

GMOs

Public acceptance

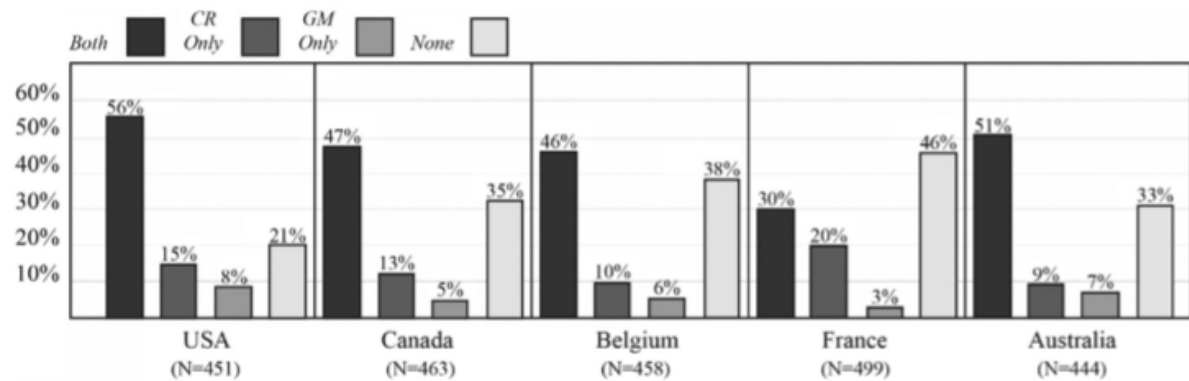
Willingness-to-pay

Agricultural biotechnology

Food regulation

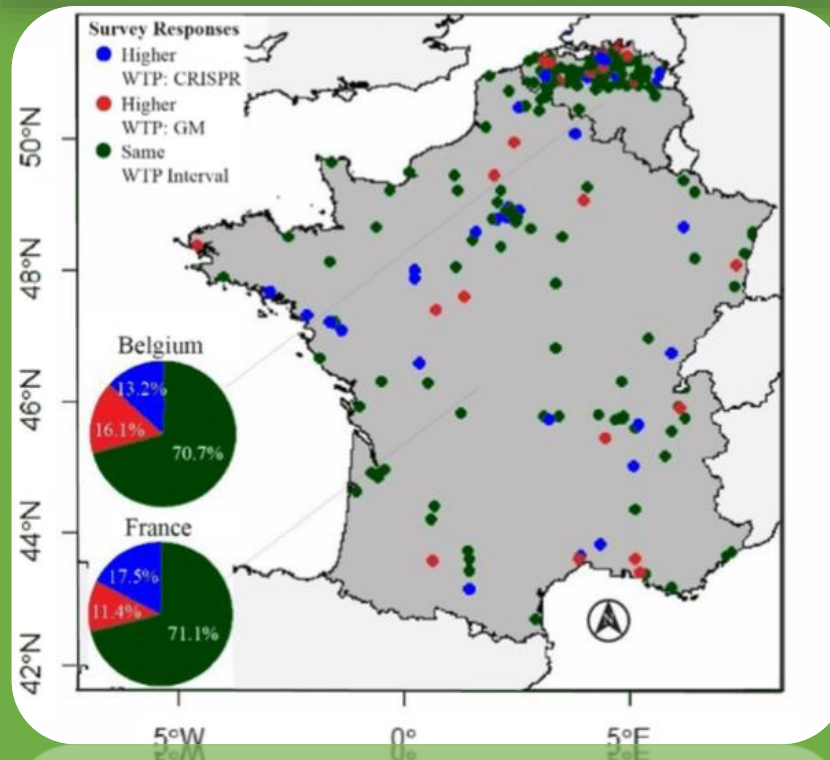
#### ABSTRACT

CRISPR gene-editing has major implications for agriculture and food security. However, no studies have evaluated the public acceptance and valuation of CRISPR-produced food. As such, we conducted a multi-country assessment of consumers' willingness-to-consume (WTC) and willingness-to-pay (WTP) for CRISPR-produced food compared to conventional and genetically modified (GM) foods, respectively. In the USA, Canada, Belgium, France, and Australia, 56, 47, 46, 30, and 51% of respondents, respectively, indicated they would consume both GM and CRISPR food. We also found that biotechnology familiarity and perceptions of safety were the primary drivers for WTC CRISPR and GM food. Moreover, respondents valued CRISPR and GM food similarly – substantially less than conventional food – which could be detrimental for meeting future food demand.

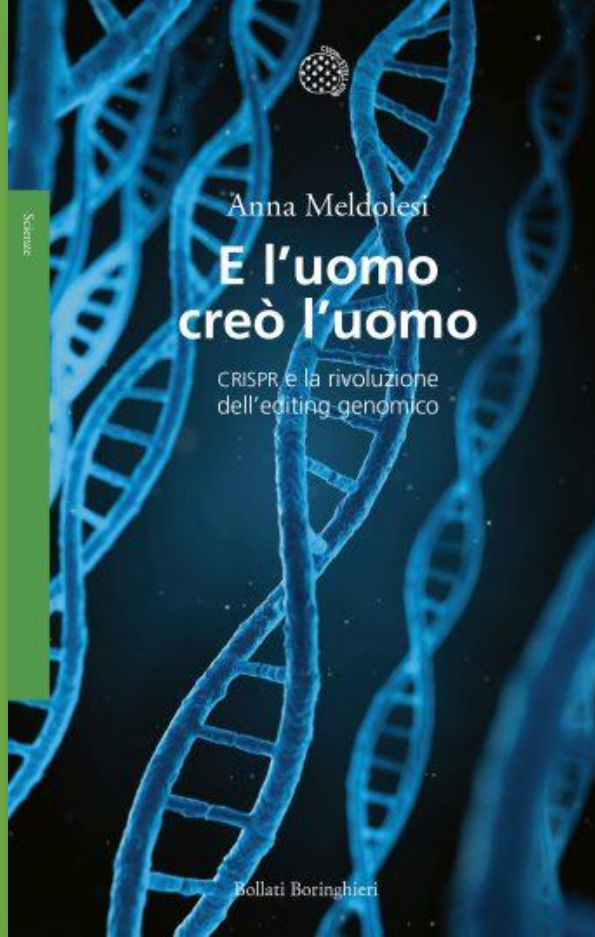


**Fig. 2.** Respondents' WTC CRISPR and GM-derived food by country. Note: Respondents' WTC both GM and CRISPR (both), CRISPR (CR) only, GM only, and neither GM nor CRISPR (none) are presented for each country. Consumers were more willing to consume GM and CR-derived food in all countries except for Australia where WTC GM and CR-derived food was statistically similar ( $p < 0.01$ ). There was also a significant difference in between respondents WTC food produced with both CRISPR and GM technology and those who stated none in all countries ( $p < 0.05$ ). In all

countries except for France, more respondents were WTC both than none. These differences were identified with a Chi-squared test.



The dots represent the latitude and longitude of respondents who would consume both CRISPR and GM rice, and the pie charts show the proportion of respondents in each country with the same price interval (green), higher WTP GM (red), and higher WTP CRISPR (blue), respectively. (For interpretation of the references to color in this figure, the reader is referred to the web version of this article).



<https://crispr.blog/>



## CRISPeR MANIA

Notizie e opinioni dalla frontiera  
dell'editing genomico

# Grazie!





Le Scienze

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25 maggio 2018

## Chicchi ricchi, l'exploit del riso CRISPR



Un gruppo cinese ha usato questa tecnica di editing del DNA per intervenire sull'attività di una decina di geni del riso in modo da ottenere un balzo di produttività per questa pianta *di*

*Anna Meldolesi/CRISPerMania*

CONTENUTI CORRELATI



The New York Times

# *Next Generation of Biotech Food Heading for Grocery Stores*

By The Associated Press

Nov. 14, 2018



WASHINGTON — The next generation of biotech food is headed for the grocery aisles, and first up may be salad dressings or granola bars made with soybean oil genetically tweaked to be good for your heart.



## THE CONVERSATION

# Organic farming with gene editing: An oxymoron or a tool for sustainable agriculture?

Rebecca Mackelprang, University of California, Berkeley

October 10, 2018 6.49am EDT



NUMERI CATEGORIE VIDEO EDUCATIONAL LABORATORIO ABBONAMENTI EDICOLA NEWSLETTER

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e innovazione

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Milano, Cappato distribuisce arancini geneticamente modificati: Senza tecniche scientifiche l'agricoltura italiana sparirà



0:41 / 3:36

