

GM FOOD: BOON OR BANE

In a world of limited resources and growing population, genetically modified (GM) food presents a seemingly more efficient and cost-effective option of producing food. The GM debate was re-ignited last month when a group of Greenpeace activists destroyed a trial crop of modified wheat in Canberra, sparking a discussion on GM food's long-term safety to both people and the environment. The Straits Times looks more closely at the issue of modified food.

UNDERSTANDING GM/ TRANSGENIC CROPS

WHAT?

GM crops are developed through genetic engineering where a gene or genes are artificially inserted instead of the plant acquiring them through pollination.

WHY?

To obtain desirable plant traits (see diagram on right).

Conventional breeding vs Genetic engineering

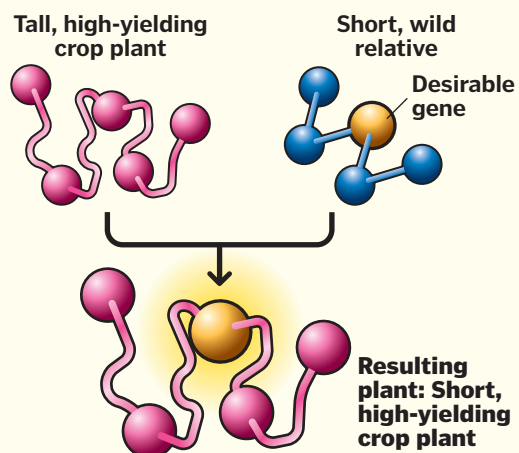
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| <ul style="list-style-type: none"> Restricted to exchanges between the same or very closely related species Little or no guarantee of getting the desired gene combination from the millions of crosses generated It takes a long time to attain favourable results as undesirable genes can be passed on along with desirable ones | <ul style="list-style-type: none"> Allows the direct transfer of one or a few genes between either closely or distantly related organisms Better and more productive crop varieties with new combinations of genes New crop varieties not possible with traditional cross-pollination, and selection techniques can be created |
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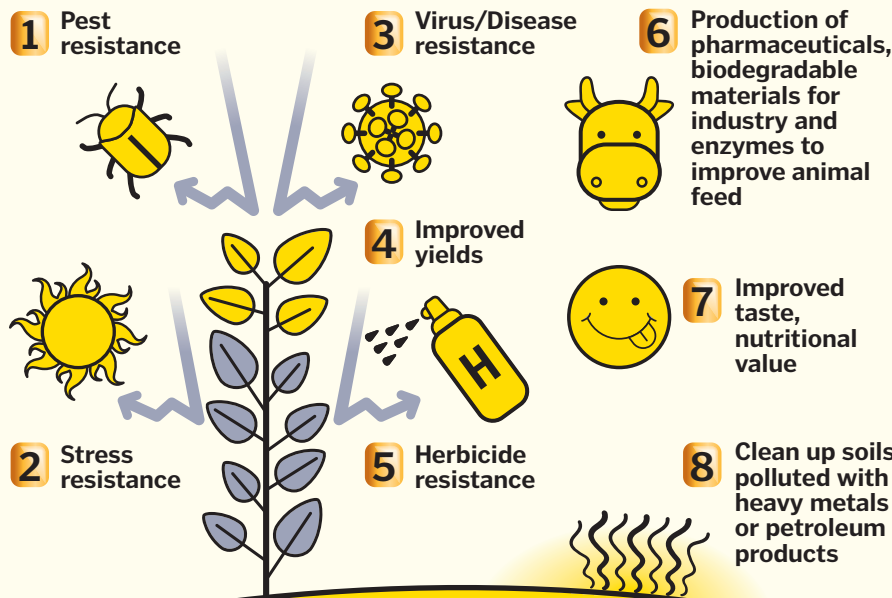
HOW?

Developing a transgenic crop

- For example, the gene controlling the expression of a short plant can be transferred into a tall but high-yielding plant.
- The resultant will now be a short plant type but with high yield.



DESIRED PLANT TRAITS AND BREEDING AIMS

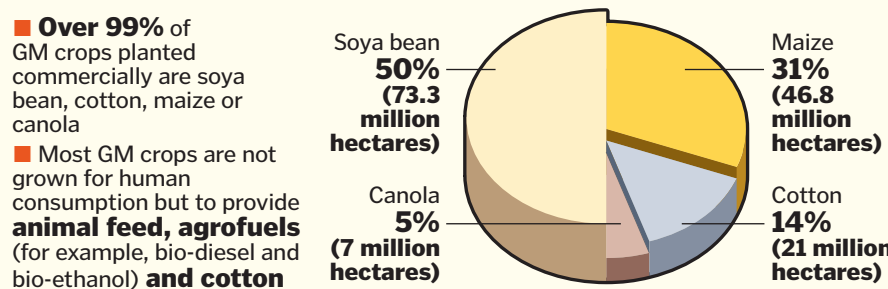


GM CROP CULTIVATION BY COUNTRY, 2010

Country	Millions of hectares	Crops grown
US	66.8	Maize, soya bean, cotton, canola, sugarbeet, alfalfa, papaya and squash
Brazil	25.4	Soya bean, maize and cotton
Argentina	22.9	Soya bean, maize and cotton
India	9.4	Cotton
Canada	8.9	Canola, maize, soya bean and sugarbeet
China	3.5	Cotton, tomato, poplar, papaya and sweet pepper
Paraguay	2.6	Soya bean
Pakistan	2.4	Cotton
South Africa	2.2	Maize, soya bean and cotton
Uruguay	2.1	Soya bean and maize

Out of 1.5 billion hectares of cropland worldwide... GM crops make up only 10 per cent because of the complex regulatory process, stringent field trials and safety studies for transgenic crops.

TYPES OF GM CROPS (WORLDWIDE)



Over 99% of GM crops planted commercially are soya bean, cotton, maize or canola. Most GM crops are not grown for human consumption but to provide animal feed, agrofuels (for example, bio-diesel and bio-ethanol) and cotton.

A PEEK INTO THE FUTURE

ATLANTIC SALMON

- GM salmon grows up to twice as fast as conventional ones.
- It will be the first GM animal sold in the market if approved.
- GM fish, if they escape into the wild, may harm the wild gene pools with unpredictable results.
- Other GM animals being developed include a GM trout with 15 to 20 per cent more muscle and a GM pig that produces less-polluting manure.

'SUPER' CROPS

- Field testing is under way for a variety of crops that are genetically engineered to survive on very little water – a vital asset in the world's expanding arid regions.



GOLDEN RICE

- Engineered to contain beta carotene, which helps produce Vitamin A – a vital component in preventing eye diseases and childhood blindness – in poor nations where rice is a staple.
- First prototype developed in 1999.
- Expected to become available by 2013 in the Philippines and by 2015 in Bangladesh.
- Sceptics play down its merits as eating golden rice alone will not greatly diminish Vitamin A deficiency.

GM WHEAT

- Traits: better yield and improved baking qualities and nutritional value.
- Probable commercialisation of Australian GM wheat in seven to 10 years' time.
- US, Canada and several European countries also have ongoing field trials of GM wheat.
- Greenpeace activists broke into a government research farm in Canberra on July 14, destroying a trial GM wheat crop in protest over safety concerns.

GM CROPS FACTS & FIGURES

1994

When the first GM whole food, the delayed-ripening Flavr Savr tomato, was sold in the market

NOTE: Production ceased several years later due to production, marketing and other problems

2010

The year marks the 15th anniversary of the commercialisation of GM crops

15.4 million

farmers planted 148 million hectares of GM crops in 2010

17

Number of countries growing 50,000ha, or more, of GM crops

NOTE: Land area of Singapore = 71,240ha

87-fold

increase in cropland between 1996 and 2010

29

Total number of countries planting GM crops in 2010

40

Projected number of countries planting GM crops by the year 2015

US\$11.2 billion

Estimated market value of biotech crops in 2010

Monsanto,

the world's biggest seed maker, will begin selling GM sweet corn in the US consumer market this year

THE SINGAPORE SCENE

Manufactured foods such as soya bean curd that contain approved GM food crops as ingredients are regulated like other conventional foods.

They must meet the same safety standards of the Singapore Food Regulations outlined by the Agri-Food & Veterinary Authority (AVA).

- GM crop developers conduct safety assessments of their GM food crops
- Exporting countries' national food regulatory authorities will assess the products' safety
- In Singapore, the report will be submitted to the Genetic Modification Advisory Committee, where the safety of the products will be assessed according to its guidelines
- AVA will conduct further safety assessment on the products
- Upon final approval, they can be used as food or as ingredients in manufactured foods

Sources: INTERNATIONAL SERVICE FOR THE ACQUISITION OF AGRI-BIOTECH APPLICATIONS, COUNCIL FOR BIOTECHNOLOGY INFORMATION, COLORADO STATE UNIVERSITY, GMO COMPASS, INTERNATIONAL RICE RESEARCH INSTITUTE, COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION, AMERICAN MUSEUM OF NATURAL HISTORY, BLOOMBERG and AVA