Genetically modified (GM) crops

Happy with Numbers

2006 marked a year of several milestones for commercialised genetically modified (GM) crops, or so it was claimed by the International Service for the Acquisition of Agri-Biotech Applications (ISAAA) at the release of its annual report. The 100 millionth hectare barrier was breached when in 2006 more than 10 million farmers planted 102 million hectares of biotech crops. The annual growth rate was 13% compared to 2005.

The report provides a lot more detailed numbers but we have listed some of them here. In 2006, 22 countries grew biotech crops, 11 developing countries and 11 industrial countries. One new country, Slovakia, an EU country, joined another five EU biotech crop countries bringing the total number of EU countries planting biotech crops in 2006 to six. Spain continued to lead in the EU, planting approximately 60,000 hectares in 2006. Importantly, the collective Bt maize hectarage in the other five countries (France, Czech Republic, Portugal, Germany and Slovakia) increased over 5-fold from approximately 1,500 hectares in 2005 to approximately 8,500 hectares, albeit on small hectarages.

However, these numbers are still peanuts when compared with the world leaders. The US retained its number one position globally with 54.6 million hectares (53% of global biotech area), followed by Argentina 18.0 million hectares, Brazil 11.5 million hectares, India 3.8 million hectares and China 3.5 million hectares.

Biotech soybean continued to be the principal biotech crop in 2006, occupying 58.6 million hectares (57% of global biotech area), followed by maize (25.2 million hectares at 25%), cotton (13.4 million hectares at 13%) and canola (4.8 million hectares at 5% of global biotech crop area).

At the same time, herbicide tolerance, deployed in soybean, maize, canola, cotton and alfalfa continued to be the most dominant trait occupying 68% or 69.9 million hectares followed by Bt insect resistance at 19 million hectares (19%) and stacked traits occupied 13.1 million hectares (13%). Stacked traits were the fastest growing trait group between 2005 and 2006 with 30% growth, compared with 17% for insect resistance and 10% for herbicide tolerance.

The ISAAA refers to those numbers as "unprecedented growth in biotech crops" and therefore, considers them as "testimony to the trust and confidence of millions of small and large farmers in crop biotechnology in both industrial and developing countries".

That, however, seems to be too optimistic a statement for Europe. Despite some slight growth in planting, European farmers continue to lag behind the rest of the world in terms of access to agricultural biotechnology, commented Marc Van Montagu, Chairman of the International Plant Biotechnology Organisation (IPBO) and President of the European Federation of Biotechnology. "Europe is held back by a dysfunctional regulatory system and by disproportionate co-existence rules," Van Montagu was quoted by the online magazine *Science|Business*, adding that the regulatory system is centred on emotional arguments, rather than on science.

Norway

Authorship Denied

What's the practical use of scientific ethics committees? That's a question asked quite often by sceptics. The Norwegian national committees for research ethics recent- ▶▶

PAUL THE POSTDOC

BY RAFAEL FLORÉS

▶▶ ly provided a good example – which is particularly significant as it refers to rather common malpractice in scientific publishing.

The case concerned a project manager, who demanded co-authorship to a publication by two Norwegian junior researchers. However, the researchers did not consider his contribution to be sufficiently substantial to meet the necessary requirements for co-authorship. So they went to several university officials, who, to their surprise, supported the project manager on all accounts without actually assessing the circumstances.

Hence, the two researchers brought the case to the National Committees for Research Ethics, which finally came out in support of them, referring to the Vancouver Convention on the publication of scientific papers. "To be a co-author, a person's contribution must be substantial, it must be related to the project and the author must have participated in the whole process with critical reflection," said Knut Ruyter, the Director of the secretariat for the National Committee for Medical Research Ethics (NEM).

The university where the project took place, however, continues to agree with the project manager and thinks the Vancouver requirements are too vague to be applied in this case. "This is problematic because the university supports the established practice. We disagree that the requirements are vague. Being project manager alone is not enough to qualify you as a co-author," Ruyter underlines.

The students, the project manager and the university were not identified by the committees.

Politics and Science

Two Worlds

It's well known that people often do not really understand what has been explained. Many have suggested that this gap is particularly wide when it comes to how politicians integrate research results into their decisions. A study into Swedish politicians' attitudes to science and researchers performed by the Swedish organisation Vetenskap & Allmänhet (VA) has even turned this suggestion into a paradox.

The extensive three-part study arrived at the following results: 86% of politicians believe that medical research has a great influence on the development of society; this is followed by technology and natural science (72%), whilst for humanities and social sciences the figure is only 39%. The policy areas most influenced by research results, according to politicians, are health, the environment and energy.

Almost all politicians claimed to have great trust in researchers at universities and three out of four extend the same level of trust to researchers at companies. Consistently, three out of four politicians claimed to seek out scientific research information in order to support political decisions. But paradoxically politicians seldom look for research information within the areas they believe to be most influential. Only 16% often make use of medical research results, with the percentage increasing to 21% for technology and natural sciences and 33% for social sciences and the humanities.

A communication problem? The study expresses exactly this when closing, "It is clear that researchers and politicians need new ways of interacting and new meeting places, as well as easy-to-read information on research."

EU expenditure for R&D in 2005

Chasing One's own Tail

In 2000 the European Council adopted the so-called Lisbon Agenda, with the ambitious goal of making the EU "the most competitive and dynamic knowledge-driven economy by 2010". To give the knowledge part a boost, the target was set to increase investments in Research and Development (R&D) from 1.9 per cent of the General Gross Product (GDP) by 2000 to 3 per cent by 2010. Midway through the agenda, however, "little progress had been made", as a report from November 2004 bluntly concluded. One identified bureaucracy and the overall lack of political will exhibited by the member states as being the predominant cause, though weak economic growth also played a significant role. In 2004, the private sector in Europe financed only 55 per cent of total R&D expenditure, as opposed to 62 per cent in the US and 75 per cent in Japan.

The latest Eurostat data on R&D investments by the EU27 in 2005 doesn't raise hopes for a change in progress pace. Expenditure remained flat at 1.84 per cent, the same as in 2004. This is significantly lower than in other major economies, such as the US (2.68 per cent in 2004) or Japan (3.18 per cent in 2004). The famous gap between the EU and its main competitor, the US, apparently does not close but continues to widen rapidly.

Differences between member states within the EU remain huge. Cyprus, Slovakia and Latvia are bringing up the rear with 0.40, 0.51 and 0.87 per cent of the GDP respectively. France and Germany, two of the three largest EU members in terms of the GDP, range well above average with 2.13 and 2.51 per cent of the GDP, topped clearly by the European no.1 research countries Finland (3.48 per cent) and Sweden (3.86 per cent). Surprisingly, UK investments in 2005 only rated at 1.73 per cent and were beneath EU average.

These dire facts are not being ignored by European officials. Two Commission communications were issued in November 2006, providing guidelines and improvements for state aid and tax incentives in favour of R&D for the EU member states. Whether these actions will only prove to be cosmetic surgery or will sustainably alter the course in Europe remains to be seen.

Open Access

Petition Started

In order to clarify what the Open Access initiative embodies, we invite you to consider the following scenario. Up until one year ago you've published, say, 15 research articles. Today nine of these are still not freely available from the journals in which they were published and you can't find any full-text copies online. Nobody can read these nine papers of yours without paying a fee (usually around €40) or physically go- ▶▶

Recently Awarded

▸ **Ada Yonath**, Director of the Structural Biology Department at the Weizmann Institute of Science in Rehovot, Israel, and **Harry Noller**, Director of the Center for Molecular Biology of RNA at the University of California in Santa Cruz, will be awarded the German **Paul Ehrlich and Ludwig Darmstaedter Prize**, endowed with €100,000. Both, together with their co-workers, were key players in unravelling the three-dimensional molecular structure and the dynamics of the ribosome. For the first time Ada Yonath and her team crystallised ribosomal complexes – the small 30S sub-unit of the ribosomes – in various phases of protein bio-synthesis and determined their exact three-dimensional structure and architecture using X-ray crystallographic methods. This gave new insights into the catalytic processes and channels in the ribosomes leading to the formation of viable proteins. Harry Noller and his team were the first worldwide to decode the complete structure of a ribosome of the bacteria Thermus thermophilus. Subsequent work revealed details of how a ribosome translocates genetic information in the form of messenger RNA into the synthesis of proteins.

▸ **Dennis Bray**, active Emeritus Professor at the University of Cambridge's Department of Physiology, Development, and Neuroscience, has been chosen as the inaugural winner of one of the largest international prizes in science, the **Royal Society and Académie des Sciences Microsoft European Science award**. The award consists of €250,000, completely funded by Microsoft; €7,500 is prize money, with the remainder earmarked for further research. According to the jury, Bray has successfully used computational tools to unravel key detailed aspects of bacterial chemotaxis. In the process, he demonstrated that when computer simulations reach sufficient richness and accuracy, they can be treated as experimental objects in their own right. These surrogate organisms then can be used to tackle problems that cannot be approached with existing technology and equipment.

▸▸ ing to a library, which carries (and has therefore paid for) the journal and issue in question. Neither can your professional colleagues, unless their institution happens to subscribe to the journal or some package, which includes it; and these subscription fees are commonly extortionate (Elsevier being a particularly egregious offender).

For the taxpayers, this means that they are denied access to information they've already paid for because your research has always been funded by government grants. For you, as a scientist, it means that more than half of your life's work to date, whilst not useless, is certainly of much less use to the world than it might be...

It's down to this very situation that in January 2006 the European Commission (EC) published the Study on the Economic and Technical Evolution of the Scientific Publication Markets of Europe. The study noted that "dissemination and access to research results is a pillar in the development of the European research area" and it made a number of recommendations to improve the visibility and usefulness of European research outputs. The first and most important one of these was to "guarantee public access to publicly-funded research results shortly after publication".

Apparently, not much has happened since then. Why else would a consortium of organisations working in scholarly communication now be sponsoring a petition to urge the EC to adopt the recommendations in the report? Why else would they have to poignantly re-emphasise, "research must be widely disseminated and read to be useful"?

The petition, which can be found at *http://www.ec-petition.eu*, received 19.000 signatures within the first three weeks.

Nobel side-effects

Long Live the Winners!

Being awarded the Nobel Prize pays off in many ways. However, it's not only cash and glory – in fact, it is claimed that this one renowned December night in Stockholm adds about two years to a scientist's life span. That's at least what the two UK economists Andrew Oswald and Matthew Rablen concluded from their study "Mortality and Immortality" published last month.

In this study the authors tried to answer the long-standing question as to whether social status alone can affect people's well-being and life span. They viewed Nobel Prize winners in particular as an ideal group to study, as the winners could be seen as having their status suddenly dropped upon them. They also come with a ready-made control group against which they can be directly measured, namely scientists who were nominated for a Nobel prize but did not actually win.

The Warwick researchers included winners and nominees in physics and chemistry between 1901 and 1950 (the full list of nominees are kept secret for 50 years). This gave them 524 male scientists with known birth and death dates who hadn't died prematurely for non-biological reasons. They looked at one sex only to avoid differences in life span between sexes. Of them 135 actually won a Nobel Prize.

The study revealed the Winners of the Nobel Prize live 1.4 years longer on average (77.2 years) than those who had "merely" been nominated for a prize (who lived an average 75.8 years).

Although the value of the Nobel prize has changed over time, the amount of actual prize money apparently had no effect on the longevity of the winners. Thus the authors suggested that it is indeed the sheer status boost of the award, which effectively extends life span. Or, in the words of Andrew Oswald: "Status seems to work a kind of health-giving magic. Once we do the statistical corrections, walking across that platform in Stockholm apparently adds about two years to a scientist's life span. How status does this, we just don't know".

Scotland/Sweden

Stem Cell Alliance

The news is about human stem cell research, granted! But what's equally interesting is how this research alliance came into being and what the business model offers. ▸▸

▸▸ Firstly, the Scottish public investment agency ITI Life Sciences conducted a market analysis to find the gaps in Scotland's stem cell infrastructure. Once the corresponding conclusions were drawn, ITI internationally assessed the companies in the field to find the best candidate to carry out the necessary research. The Swedish company Cellartis AB emerged at the top of the list.

The Gothenburg-based company has already developed 30 defined cell lines, two of which are listed on the US NIH registry and 20 in the UK Stem Cell Bank. In addition, Cellartis has successfully established and characterised the first human embryonic stem cell line completely free of any animal components.

Now the company is to receive £9.5 million of public money from ITI Life Sciences to build up an R&D and manufacturing facility in Dundee. One aim is to devise processes for deriving different cell types from human embryonic stem cells. Furthermore, the "Swedes" will work on the development of an automated process for high-volume manufacture of stem cells to a standard that is suitable for use in human therapies.

Under the terms of the deal Cellartis will collaborate with scientists in the faculties of medicine and life sciences at Glasgow University. The progress of research is closely monitored and laboratory notebooks and all intellectual property belong to ITI. When the project is completed ITI Life Sciences hopes to hold the rights for an end-to-end process for differentiating cell lines and manufacturing them in volume. "A somewhat unusual business model," as confirms Fergus McKenzie, programme manager at ITI Life Sciences.

UK Crop Initiative

Better Beer, Bread and Bags?

In 2003 the Biotechnology and Biological Sciences Research Council (BBSRC) emphasised in a review how the advances in UK crop research needed to be applied to a greater extent in plant breeding and agriculture. As a result, BBSRC has now funded 18 projects through a £13.3M initiative

entitled "Crop science – exploiting genetics for better crops".

BBSRC Chief Executive Julia Goodfellow defines the overall aim of the initiative is "to support basic crop research that will produce outcomes to make farming more sustainable and able to meet the challenges of a changing environment." The projects, therefore, centre on the following four problems:

➤ How to grow crops able to cope with climate change

➤ How to breed vegetables that remain nutritious after days in the fridge

➤ How to grow more effective biofuels to help reduce the UK's dependence on fossil fuels.

➤ How to exploit plants more effectively to produce better bread, beer, biodegradable carrier bags and for other applications.

Whiter than Milk

An ingenious surface structure brightens up the shell of a beetle.

Pete Vukusic, optical physicist at the University of Exeter's School of Physics, made an exciting discovery whilst searching the foraging grounds of a modern scientist – the internet. On an insect collector's web page he stumbled across a picture showing a beetle of such whiteness, that he knew – even in times of Photoshop – he had found something special. *Cyphochilus* spp., a common sugarcane pest located in south-east Asia, features a shell, whiter than milk or a baby's tooth. This strikingly bright outfit probably evolved to provide camouflage among the local white fungi and is provided by long, flat scales that cover the bug.

What exactly makes this finding so spectacular is the amazing thinness of the scales, compared to their brightness. "Any industry can make something very white that's thick" Vukuvic says. Colour is created by either pigmentation or by regularly arranged structures. Any repeating pattern on a surface will reflect the wavelengths that match that pattern. The secret of white, which contains all wavelengths, therefore is a random structure, which produces "scattering" of all wavelengths. The more layers a material has, the stronger it can scatter light and the brighter its colour can be.

With only 5 µm, the beetle's mysterious scales are at least a hundred times thinner than any synthetic structures, mineral coatings or plastics that are equally white. Using electron microscopy imaging, Vukusic and his team observed an ingenious surface design that scatters light much more effectively than any other known structure (*Science*, Vol. 315. p. 348). The scales are made of a tangle of seemingly randomly oriented filaments, each one 250 nm wide. Gaps of air between the filaments produce the brightness of the colour, utilising the effect that light scatters every time it passes between two materials that differ in their refractive index. These scattering centres are arranged at an optimised distance from each other, reaching the maximal density of scattering centres without lowering the scattering intensity by overlapping effects (optical crowding). This principle, Vukusic says, if adapted by industry, could be used to whiten just about anything that's white.

(More research results from European labs on p. 28-33)