$100m plan for Third World GM crops

The International Institute for Tropical Agriculture (IITA), Nigeria and the Consultative Group for International Agricultural Research (CGIAR) have planned to focus more intensively on crops such as cassava, maize and sweetpotatoes, which are of great interest for Third World countries. IITA is also likely to focus on rice, wheat and other starchy staples for boosting the current levels of micronutrients such as iron, zinc and vitamin A in the crops. This is being undertaken keeping in mind the prevalent malnutrition in the African sub-continent. The iron deficiency affects billions of people in the developing world and leads to 100,000 deaths during childbirth every year and Vitamin A deficiency causes more than 500,000 children to go blind each year, and is a leading cause of child mortality. Biofortified crops have the potential to transform the health of these communities. The 10-year programme will cost 100 million dollars, with the World Bank, USAID and the government of Denmark making up much of the balance in the first four years. IITA has also made efforts to mobilize funding from private foundations for working on these crops. The Bill and Melinda Gates Foundation, set up by US software giant Microsoft's multi-billionaire founder, would contribute US$ 25 million towards the costs of the programme. (Source: *Checkbiotech*, November 21, 2003)

Australia, New Zealand and Kenya to consider food labelling bills

In Australia and New Zealand the demand for labelling of food products is growing. In the parliaments of both the countries Private Members Bills have been introduced, demanding better labelling of food. The idea is to provide consumers sufficient, accurate and meaningful information on a label to enable them to make informed food purchasing decisions. Under

the bill, all GM derived foods, ingredients, flavourings and additives will have to be labelled irrespective of whether there is DNA or protein of GM origin in the final product. The Bill would lower the threshold for labelling foods inadvertently contaminated with GM material from one per cent to 0.5 per cent. The threshold for non-approved GM material would remain at zero. The Bill would also require animal feed derived from GM products to be labelled for the first time. That would ensure GMOs can be traced at all stages in the production, distribution and marketing chain. The need for accurate, truthful and meaningful food labelling is recognised by all the major international food standard setting agencies including Food Standards Australia and New Zealand. The existing GM labelling regime exempts all GM foods and ingredients that do not have DNA or protein of GM origin in the final product. The proposed bill requires the minister to implement a monitoring plan to trace any unforeseen effects on human health or the environment as a result of GM food or feed in the market. Government would also have to make publicly available all information it gathers on residues in foods from pesticide, heavy metals, industrial chemicals or by-products, and veterinary medicines.

The National Council for Science and Technology (NCST) and Ministry of Agriculture, Government of Kenya are considering formulation of a Bill to regulate marketing of GM food in Kenya. (*Source: Royal Society News*, October 14, 2003 and *Checkbiotech*, October 9, 2003)

Saline-resistant crops in six years

The International Centre for Genetic Engineering and Biotechnology (ICGEB) has announced that within next six years saline-tolerant crops would be put in the fields for tests. The genes have been isolated and transferred to the ordinary crop plants to introduce saline-resistant properties in them. In India salinity of soil and drought are the two major threats to the crops. Salinity increases with regular cultivation of land. Around 186 million hectares of agriculture land, including UP and Haryana, is facing the problem. According to the projections of Food and Agriculture Organisation, United Nations, 25 per cent of the agriculture land in the world will be rendered useless due to salinity in the next 25 years; and by 2050; it is feared that 50

per cent of the land will turn saline. Since reclamation of land is a costly and time-consuming process, efforts are on to develop genetically-engineered crop varieties. In this connection, ICGEB has conducted studies under glass house conditions, on tobacco and rice plants. There are several plants which can grow in saline soil. (*Source:* Checkbiotech,, October 10, 2003)

GMO import rules move forward in the Philippines

In the Philippines the Department of Agriculture (DA) has issued an order requiring companies that make use of imported corn, soybean and wheat as raw materials to acquire permits from the Bureau of Plant Industry (BPI) and the Bureau of Animal Industry (BAI) before they can bring in GMOs. DA has also imposed mandatory labelling of GMOs that will enter the country. The issuance of stricter regulations is being done to ensure that GMOs entering the country are safe for humans and the environment. At this point, there are 19 applications for bio-safety permits involving new Bt (*Bacillus thuringensis*) corn varieties, canola, soybeans, and Bt cotton varieties. The BPI has assured that the time frame within which permits would be issued would be 60 days. Foreign firms that introduce gene-altered seeds to the domestic market have also been required to secure bio-safety permits from BPI prior to selling their products. Genetically modified organisms that will be propagated in the Philippines will also be required to undergo greenhouse testing, field testing, and multi-locational field testing.

Some of the US based companies have demanded a deferment of the regulations as they have concerns over the Philippines' capability to conduct the risk assessment. However, it has been assured that the Philippines is capable enough to conduct the mandatory risk assessment. Their requirements are very specific and the US companies would be able to comply with the rules. Aside from the US, the Philippine Association of Feed Millers, Inc. has also asked the DA to defer the implementation of the said regulation until the end of the year to ensure that production and sale of feeds will not be disrupted. (*Source: Checkbiotech*, October 7, 2003)

USDA to support rubber research in private sector

US based private biotechnology company Mendel Biotechnology, Inc., would get Small Business Innovative Research (SBIR) grant from the United States Department of Agriculture (USDA). Mendel Biotechnology, Inc. established in 1997 is a pioneer in the application of functional genomics to the study of plant genes. Mendel is working on discovering and characterizing the function of plant regulatory genes and to develop and commercialize high-value products based on these discoveries. Mendel's products will benefit customers in agriculture, especialty ingredient, forestry and horticulture markets. Mendel has partnerships with leading agriculture companies, such as Monsanto and Seminis.

The grant will fund research at Mendel, the USDA's Western Regional Research Center and the University of Arizona to discover and develop naturally occurring plant genes that control the production of latex rubber. The research will focus on increasing the amount of rubber made in the Guayule plant, which grows naturally in the American South West. Guayule produces high quality latex rubber that is suitable for the manufacture of high value, hypoallergenic latex products used in medical devices. This is the sixth SBIR grant awarded to Mendel. This grant may help in creating improved varieties of Guayule that would accumulate more biomass, rubber, and resin. Because Guayule grows in the United States, improved varieties are expected to create new opportunities for American farmers and decrease U.S. dependence on imported rubber from Asia and the use of synthetic rubber produced from fossil fuels. (*Source: Checkbiotech,* October 7, 2003)

Aquaculture biotech research in Rp off to a good start

The Phillippines has launched a major research project at the Bureau of Fisheries and Aquatic Resources (BFAR) and at the Southeast Asian Fisheries Development Center Aquaculture Department (SEAFDEC AQD) based in Tigbauan, Iloilo, the project is being funded by the Japanese government under the P431-million facility. The facilities assist aquaculture technicians in finding better ways of increasing aquaculture production without causing harmful effects on the environment. The priority research

areas identified to be addressed by SEAFDEC AQD, BFAR, or both jointly are selective breeding, growth enhancement, stock enhancement and husbandry of novel species; disease control; seaweeds and microalgae; and environment-friendly feeds. The laboratory's role in aquaculture R&D in the future had earlier been defined to make it the center of biotechnology for aquaculture not only in the Philippines but also in the whole of Southeast Asia. (*Source***:** *Checkbiotech,* October 9, 2003)

Post-harvest management stressed

The National Botanical Research Institute (NBRI) has identified that India suffers a loss of around $20 billion annually, due to 'uncontrolled ripening' and inadequate post-harvest management of fruits and vegetables. A reduction in post-harvest losses by extending the shelf-life of fruits and vegetables through genetic engineering by only 1 per cent, would save the country losses over Rs 200 crores. The NBRI has suggested that around $30 million worth of banana crop is lost every year in India due to fast ripening and destruction. In this regard, the plant gene expression laboratory at NBRI has developed 'anti-sense' technology to slow down this ripening process. Twenty genes have been identified in banana which are responsible for fast ripening of the fruit. Besides this, other climacteric fruits such as mango, papaya, apple, tomato, etc. also show uncontrolled ripening and softening within a short period of time, and this ultimately leads to value destruction of produce. Gaseous plant hormone ethylene has been found responsible for this exaggerated ripening behaviour in such fruits. Laboratory took these genes out of bananas and 'down regulated' their expressions responsible for ripening through genetic engineering. Thereafter, the genes were re-introduced into the banana. This transgenic variety of bananas thus developed, which has both ripening and anti-ripening expressions, will have a longer shelf-life.

The NBRI paper also mentions that the production of orchids can also be turned into a major commercial activity. India has 1,350 identified species of orchids. However, many of them are under threat due to the fast depleting rain forests. Orchids also have medicinal value. Many species of orchids including 'Lady slippers', 'Blue vanada' and 'Red vanada' have been

declared as endangered. Today, commercial farming of orchids is taking place in Tamil Nadu, Weset Bengal and Kerala. The floriculture industry is a major foreign exchange earner for many south Asian countries.

The other issues discussed included orchids. the under-explored moss diversity; on lichen diversity; isolates of bacillus and related genera; rare bryophyte monoselinium, drought as a major abiotic stress on upland rice;. sugarcane production; plant disease management; genetic modification of leucaena leucocephala, a nitrogen fixing leguminous tree, etc. (*Source***:** *Checkbiotech*, October 10, 2003)

Scientists working on GE spuds

In New Zealand a pest-resistant potato crop could be one of the first ready for commercial release when the GE moratorium is lifted. It is being emphasized that the climate of severe scrutiny continues if multinational and New Zealand companies want to release GE. That will make some of the shonkiest ones think twice. Scientists are taking into account consumer fears. The insect-resistent gene of the potato will only work in the foliage of the plant and not underground in the tuber. And that is crucial for finding a market, given polls show 68 per cent of New Zealanders are still against commercial GE release.

The potatoes are genetically modified with a bacteria which makes the leaves toxic to moth pests. But scientists working on the Christchurch crop say it may still be years before the potatoes make it onto shop shelves. When the maggots hatch out, they burrow into the potato leaf and what we want is a specific GM event that kills that insect. Tests on a normal potato crop found 800 of the 3,000 plants were maggot infested. In the GM variety, it was only one in 3,000. Scientists are looking at ways to modify the starch so that it is not so digestible. Therefore you don't gain weight from eating the tubers, but you get the benefit of roughage in your diet to help overcome incidence of colon cancer.

Four years ago the crop was hit by anti-GE activists; however they are back on track and looking to move to farm scale trials. It is the kind of

research that has some consumers worried about what they may end up buying in the shops. But the government says it will not be a free-for-all when the GE ban is lifted on October 29. Instead, the government says it will be a slow and careful process. (*Source***:** *Checkbiotech*,October 13, 2003)

UK Government to support biotechnology industry

The UK Government's Bioscience Innovation and Growth Team (BIGT) publishes a series of policy measures to keep the UK biotech industry in pole position in Europe. EuropaBio calls on other like minded countries to follow suit and make their countries the best places for young innovative companies to grow and succeed. The biotech industry should not always expect solutions to come from Brussels. Any EU initiative takes years and in the process, proposals often get weaker, more complicated, less easy to implement and miss their intended goal. In many cases, it is much better for Member States to use their own power and adopt stimulating measures nationally and rapidly. If that creates competition among Member States for the most effective fostering framework, so much the better.

BIGT is the biggest ever policy review of the UK biotechnology sector to date and key recommendations include fast track approvals for innovative drugs to meet unmet medical needs, creation of a pan European stock exchange to boost funding, a network of bioprocessing centres to make sure that biomanufacturing capacities keep apace with the development of innovative biotech products. There are many stimulating policy measures listed here which should inspire other countries. The UK BioIndustry Association (BIA) and its members will certainly keep the pressure on policy makers to ensure that these actions are indeed carried through. (*Source***:** *Checkbiotech,* November 17, 2003)

Pew Institute suggests road map for university-industry relationships in agricultural biotechnology

The Pew Institute has suggested that there is a need for information regarding influences on academic scientists' research agendas, the intellectual property rights and technology innovations involved in the

relationships, as well as the unique role universities have in developing valuable technologies with little commercial promise.

The report suggests that there is a need for a better baseline to be developed so that all interested parties (e.g. consumers, government officials, university and industry officials) can understand the range and scope of University-Industry Relationships (UIRs) in agricultural biotechnology. Without such a baseline, it will remain difficult for all parties to measure the influence UIRs have on agricultural biotechnology. It also examines the effects on academic scientists' research agendas. UIRs bring new resources and opportunities into university research programmes but also pose risks, such as hampered pursuit of knowledge and decreased communication between scholars about research findings. Both the opportunities and the risks need to be examined and evaluated.

The intellectual property and technology transfer issues are controversial and questions remain whether UIR policies promote or hinder research and technology innovation. Although studies have found that firms whose scientists collaborate with university scientists tend to earn more patents and that academic researchers who participate in UIRs tend to patent more frequently than their peers, the lure of licensing revenues could reduce public access to innovations produced through UIRs.

In recent years, companies have entered into numerous agreements with public and private universities, providing financial support in return for a range of research and testing services. Some believe that the new agreements encourage innovation and early application of new technologies that benefit the agricultural sector and consumers. Others raise a variety of concerns, including whether the focus on developing commercial applications has diverted resources and efforts away from research and technology development that may have significant public benefits but with little potential to garner commercial returns. Despite the assertions pro and con, the issues surrounding university-industry relationships in agricultural biotechnology are not sharply defined and new research is needed to document them, to understand the motivations driving their formation, and to analyze their implications.

The historic roles of universities, industry and government in shaping U.S. agricultural research and technology development appear to be significantly changing. However, little information exists to understand how the changes are influencing agricultural biotechnology, and the implications for consumers, farmers, industry, and the environment. The firms and universities may be well informed about their individual relationships, but general society is largely flying blind through what may be a profound change in our agricultural research system and the future of agriculture. (*Source: Checkbiotech,* November 18, 2003)

Accurate mapping of plant genome opens up new avenues of research

Arabidopsis the genes of the common mustard weed have been accurately mapped. About one-third of nearly 6000 genes, that a plant needs, exists in Arabidopsis. All flowering plants are closely related, and so the genes that encode various traits are also shared. Knowing these genes and how they work can allow researchers — in a short period of time — to use them to change the characteristics of other plants. The achievement may lead to the next generation of genetically modified crops that can grow faster, produce more food, and resist disease.

It is possible, then, to take a gene for flowering from Arabidopsis and insert it into rice or poplar, and have that gene function. The research team placed the entire Arabidopsis genome, consisting of about 25,000 suspected genes, on a series of six gene chips, and then analyzed the chips for any protein-making activity, the primary function of genes. They isolated one-third of the plant's genes, which will be made publicly available to researchers, hoping it will help to fix errors in the current blueprint of the genome. In addition to finding shortcomings in the much-heralded, computerized methods of sequencing a genome, they discovered about 3,300 functioning genes for the first time.

The findings revealed some shortcomings of computer-based gene prediction programmes, including those that have been used to sequence the human genome and the Arabidopsis plant — the plant biologist's equivalent of the fruit fly for genetics research.

The researchers point out that computer algorithms cannot always distinguish whether a piece of code corresponds to a single gene or to two overlapping genes. And while the programmes have become increasingly accurate in recent years, computer programmes may still put genes' parts at the wrong places, find genes that are not really there, or miss genes altogether. What researchers often get from an initial sequence of a genome is a "best-estimate" lineup of transcription units. By putting the entire genome on the gene chips, they could find that what the computers predicted as genes were wrong about a third of the time. But they also found other genes they had not seen before. Genetically, plants are much simpler than animals, so this information can be used almost immediately to improve crop yields and disease resistance.

They eventually want to be able to understand the function of all the proteins within an organism. If you know the correct gene structure, you can clone DNA to express and study proteins. This type of research eventually will lead to advances in proteomics. Many of the researchers on this study were part of the team that sequenced the genome of Arabidopsis nearly three years ago. The initial genome work and the current research are funded by the National Science Foundation (NSF), which established a project to identify an entire plant genome by 2010.

The technology used in this research will be able to reveal the dark matter in a genome. Scientists will be able to identify never-before-seen RNA in regions that were once thought to contain no genes. Researchers could also use this method to get a more definitive answer to how many genes are in the human genome. Finding the genes that lurk in the DNA sequence sounds like an easy problem, but in fact is tremendously challenging. Completion of the DNA sequence of a genome such as Arabidopsis is an important milestone toward understanding the function of every gene in the plant, and discovering the genes that can positively influence the productivity, nutritional, and medical value of the plant to human beings. (*Source: Checkbiotech*, November 5, 2003)

Indian firm Avestha develops new techniques for hybrids

Rice farmers will soon be buying cheap hybrid seeds produced by genetically modified plants if an Indian biotech company has its way. It has patented its own way of producing new hybrid varieties, and is betting its products will not meet the same opposition as GM crops produced by multinationals like Monsanto. Hybrid crops, produced by crossing different varieties, are widely used in agriculture as they are usually more vigorous and produce higher yields. To create hybrids, plant breeders must prevent the parent plants from pollinating themselves. Doing this by hand is labour-intensive and costly, so breeders prefer to use male-sterile strains that cannot make pollen. But there may be few, if any, natural male-sterile strains for any one crop. And relying on just one crop can make it vulnerable to disease, as the US discovered in the 1970's, when its maize produced from "Texas" male-sterile, was devastated by a fungus. So researchers have instead turned to genetic engineering.

Biotech giants such as Aventis have created new male-sterile lines of maize, canola, and chicory, usually by adding a bacterial gene called barnase that is turned on only in pollen-producing cells and blocks pollen production by chewing up RNA. Now Avestha Gengraine of Bangalore has been granted a US patent on a rival technique for making male-sterile lines that relies on a curious phenomenon called RNA editing. In some plants, the cells' energy-producing mitochondria alter the genetic sequence of RNAs encoded by some mitochondrial genes before they are used as a template for making proteins. This happens with the nad9 gene, which codes for a key mitochondrial protein. Avestha adds the nad9 gene from the cress Arabidopsis thaliana to the nucleus of rice cells, along with a sequence telling the cell to transport the resulting nad9 protein to mitochondria. Because RNA from nuclear genes is not edited, this protein is faulty and disrupts energy production in mitochondria. As a result, the plants produce no pollen.

The mutations in many natural male-sterile plants are thought to disrupt energy production in a similar way. For commercial seed production, fertility can be restored to Avestha's plants by adding an "antisense" version of the *nad9* gene to the nucleus. The company claims that the technique, tested

in basmati rice, could halve the time it takes to create new hybrid varieties of cereals, fruits and vegetables, thus reducing the price of seeds. A greater variety of male-sterile lines will also reduce hybrid crops' susceptibility to diseases and pests. Avestha is confident that the company's GM hybrids will not encounter the same opposition in India as other GM crops. When the company was founded, it was deliberately positioned as a home-grown company that can generate intellectual property for India and support domestic agriculture. But in 1993 the French national research agency CNRS patented a very similar method of producing male-sterile plants. CNRS allowed the patent to lapse in 200, because opposition to GM crops in Europe meant no one wanted to license the method. (*Source: Checkbiotech,* September 29, 2003)