FDA Orders Destruction of Soybeans Contaminated with "Pharm" Corn

The US Food and Drug Administration (FDA) ordered a biotechnology company, ProdiGene, to destroy 500,000 bushels of soybeans worth approximately $2.7 million. The order was given because a corn variety intended to make a pharmaceutical product got mixed with the soybeans. The problem started in 2001 when ProdiGene contracted a Nebraska farm to grow an experimental corn crop on a small plot of land. After the tests, the farmer planted conventional soybeans this year. However, some seed left over from last year's experiment grew in plants in the soybean field. ProdiGene discovered up to 65 grams of corn stalks in 500,000 bushels of soybeans.

The "biopharming" industry uses plants to make medically important proteins. It is beginning with only 120 acres used in the US this year. Corn is a popular plant among researchers and ProdiGene is attempting to produce different medications such as a hepatitis B vaccine and an insulin-making enzyme in corn plants. FDA Deputy Commissioner Lester Crawford said early this week that none of the soybeans made it into the food supply so there is no risk to the public. He also said that the amount of contamination would not have been a threat to public health but it was not supposed to be there. This case was said to be markedly different from the Starlink case since the regulators caught the contamination before the soybeans made it to the market.

ProdiGene was reported to have committed a similar mistake in Iowa. Fearing that pollen from corn not approved for human consumption may

have spread to nearby fields of ordinary corn, the US Department of Agriculture (USDA) was cited as ordering 155 acres of Iowa corn pulled up incinerated. Cindy Smith, acting head of biotechnology regulation for USDA said that the genetically modified corn did not enter the food supply in both cases. "It wasn't luck… it was planned luck". The government considers the violations significant and is weighing serious penalties. Further, the department may consider revising its rules to lessen the chance of similar problems.
Source: *Crop Biotech Update*, November 15, 2002

Tomato Vaccine One of the "Best Inventions"

A tomato genetically modified to produce a vaccine is among 42 inventions chosen by Time Magazine as the best in 2002. The inventions are divided into transit and talk, clothing, home and safety, robots and tech, toys and sports, and medical and more.

The researcher, Charles Arntzen, an Arizon State University biologist has been working on a tomato that carries a gene from strain of E. coli Bacterium. Some strains of E.coli can cause violent diarrhea and death. However, the product of Arntzen's research should act as a vaccine, priming the immune system to recognize and fight off the real thing. Arntzen focused on diarrhea because "diarrheal diseases kill at least 2 million people in the world every year, most of them children".

Researchers have been conducting experiments which would use plants to distribute medicine since the method is cheaper than producing conventional vaccines. Such a technology would help in developing countries especially if the plants can be grown locally. Arntzen chose tomatoes because greenhouse-grown tomatoes cannot easily pass their altered genes to other crops and tomato processing equipment is relatively cheap. Arntzen's plan is to process the tomatoes so that the dosage would be uniform. He is thinking about vaccines for cholera, hepatitis, and measles. Around four-dozen laboratories around the world are conducting similar researches.
Source: *Crop Biotech Update*, November 15, 2002

USDA Mulls Strict Rules for Monsanto Biotech Wheat

The U.S. Agriculture Department said on the weekend it may impose strict requirements on Monsanto company to ensure it was abiding by its pledge not to sell biotech wheat until foreign markets. Monsanto's "Roundup Ready" wheat, which would be the first genetically modified wheat in the world, is under review by the U.S. and Canadian governments and could be approved for commercialization within the next two years. Critics have said consumer attitudes about genetically modified wheat are so negative that both domestic and foreign buyers are likely to shun all U.S. wheat if it is sold. Even if the wheat is approved by the United States, Monsanto has promised not to sell it until at least Canada and Japan accept it. The St. Louis-based company said a secure segregation system must also be in place to ensure the separation of genetically modified and traditional wheat. This is a sensitive issue and Monsanto will get the approvals before it markets any of these products. The new Monsanto wheat has been engineered to withstand herbicide so weed control is easier for farmers. The United States is the world's largest producer of biotech crops. Corn and soybeans are its biggest sellers. The USDA said Monsanto may have to meet certain requirements if and when the government approves the product. U.S. wheat exporters currently sell their wheat to foreign markets with a USDA-approved statement saying no biotech wheat is commercialized in the United States.

The company would also have to sign a statement before every marketing year that it would not commercialize the genetically modified wheat. And Monsanto would need to provide information so DNA testing could be conducted by USDA. Monsanto could face felony charges if it knowingly violates any of these proposals. Monsanto said it was too early to comment on USDA's proposal. Monsanto field-tested Roundup Ready wheat on 35 acres (14.16 hectares) in the United States last spring. It would plant some this year in Monsanto, North Dakota, and perhaps Idaho. Growers and environmental groups last week filed a petition with the USDA demanding a moratorium on the Monsanto wheat.

Source: *www.checkbiotech.org*, March 20, 2003

The Issue of Biotechnology: Ghana to Assess the Benefits and Risks

The Minister for Environment and Science, Prof. Dominic Fobih has said Ghanaians need to engage in discussions on development issues driven by science and technology. It is important for Ghanaians to recognize the potential of science and technology as critical tools for socio-economic development and the need to understand the benefits and risks of specific technologies such as Biotechnology. Biotechnology is defined as any technique that makes use of organisms (or parts thereof) to make or modify products to improve plants or animals or to develop micro-organisms for specific purposes.

The potential of Biotechnology as a tool for cleaner environment is recognized. Biotechnology processes and products can be deployed in biomediation and microbial treatments of polluted water and soils, industrial and domestic wastes as well as the development of diagnostics to enhance environmental monitoring, assessment and management. The mining sector in Ghana is making "breathtaking advancements" in heap mining technologies using bioleaching techniques in mining activities. Ashanti Goldfields for instance has installed a BIOX plant believed to be one of the largest in the world. This BIOX plant enhances the recovery of gold from tailings, which are normally discarded with negative impact on the environment. The bacteria in the BIOX plant on arsenates to survive and therefore metabolise the arsenates from the tailings. This natural characteristic of the bacteria eliminates arsenates from the tailings-leading to the release of a clean air in mining areas, which suffered pollution for years. Biotehcnology processes and products have also been widely deployed in the world for treatment of waste water, which can be recycled. Again modern biotechnologies are also being exploited to convert agricultural wastes into biodegradable plastics.

The developments of biodegradable plastics will reduce the proportion on non-biodegradable and ozone depleting plastic bags in mountainous waste dumps considering the fact that plastics have become the packaging material for virtually all street foods and drinks and water in particular. The conversion of agricultural waste and sludge into biogas is a technology process and has already been demonstrated in Ghana-Appolonia, a farming community near

Accra, Pokuase, and Achimota School among others. If this technology is efficiently applied in small communities, hospitals and schools, it could reduce the nation's heavy dependence on conventional sources of energy notably petroleum. Biotechnology can also be used to convert agricultural wastes into bio fertilizers, which are environmentally clean.

Although the biotechnology has its positive sides, it has its negative sides as well. Rights activists worldwide have been fighting against biotechnology being used to produce genetically modified food. Seeds from such plants though give higher yields are unable to germinate again and farmers always have to go back to special shops and countries to buy them at a high price. There are also fears that genetically modified food may lead to health hazards over a long period of time. Research is not conclusive on this. Many European countries are helping their farmers to grow organic food while consumers will not have anything to do with genetically modified food. However, Americans are not as worried as Europeans about their food choices and opposition to GM food are not as strong as in Europe although many of them will opt for organically grown foods.

Perhaps it is against this background the goal of government of Ghana is to ensure the safety of Ghanians and their environment. It may appear that only the benefits of biotechnology are being highlighted. But then it is appreciation of these benefits that would stimulate a thorough investigation of the technology to identify potential risks and challenges associated with its deployment. The Ministry of Environment and Science is exploiting opportunities to enhance the development of technical capability for the safe and environmentally sound management of biotechnology applications in Ghana. Ghana ratified the Cartegena Protocol last December. Development Biosafety is also defined as the development of policies and procedures adopted to ensure the environmentally safe application of modern biotechnology. This protocol also seeks to assist parties develop and implement environmentally sound management of biotechnology at both the international and local levels. The ratification of the protocol paved the way for Ghana to join the global community in the implementation of the protocol for sound environmental management.

Ghana is currently among some 100 countries participating in a United Nations Environment Programme (UNDP) project in collaboration with the Global Environment Facility (GEF). The project is to assist countries develop their National Biosafety policy frameworks and build local capacity in the sound management of biotechnology.

Ghanaian scientists have been in the forefront in the use of tissue culture for crop improvement while researchers have developed protocols for crops such as cassava, plantain, pawpaw and pineapple. Research on the use of sterile insect technique to control the population of tested flies in the Northern Region is also on going. The successful applications of this technique should control sleeping sickness in both animals and humans, improve health, increase human productivity and reduce poverty. Ghanaian scientists have acquired considerable expertise in the application of radiation processing to reduce post harvest loss, improve food safety and also for sterilization of medical products. But whether all these would benefit the country only, time will tell.

Source: *www.checkbiotech.org,* March 5, 2003.

ISAAA Survey on Southeast Asia

Southeast Asians show high interest in biotechnology and express strong appreciation for the role of science in the development of agriculture. In addition, they do not think that agricultural biotechnology is a risk to public health and food safety. They see the possible benefits arising from the applications of biotechnology in medicine, food, and crop production. More specifically, they believe that biotechnology will benefit agriculture and the small farmers in their own countries.

Most of the businessmen, consumers and farmer leaders in Southeast Asia agree that genetically modified (GM) food should be labelled although not all of them would be willing to pay for the extra cost involved. Thai policy makers and consumers topped the bill of those stakeholders who would be willing to pay for labeling. Majority of the stakeholders in Thailand, Vietnam, Indonesia and Malaysia expressed dissatisfaction over regulatory processes in their respective countries. The Philippine stakeholders remained divided in this issue.

Moreover, the results indicate that survey respondents consisting of consumers, businessmen, extension workers, farmer leaders, policy makers, and journalists consider university scientists and research institutes as most trustworthy. Across the five countries, the respondents believe that university scientists and research institutes tend to be highly concerned about public health and safety issues relating to biotechnology. They also think that university scientists and research institutes should be entrusted the responsibility for assessing and managing the risks relating to agricultural biotechnology.

These are some of the results of a recent survey of key stakeholders in Indonesia, Malaysia, Philippines, Thailand, and Vietnam by communication researchers from the University of Illinois at Urbana-Champaign (UIUC), and the International Service for the Acquisition of Agri-biotech Applications (ISAAA). The survey is based on a random sample of 2,047 respondents in five Southeast Asian countries: Indonesia, Malaysia, Philippines, Thailand, and Vietnam. (Details on Cropbiotech update May 20, 2003).

Australian State Ban on GE Crops Until 2008

A two-year ban on genetically modified crops has been extended for five years, the Tasmanian State Government announced. The move has been welcomed by the Tasmanian Greens but has drawn criticism from some agricultural sectors. Under the policy, field trials of non-food genetically modified crops including poppies will be allowed to continue. Primary Industries, Water and Environment Minister Bryan Green said the five-year extension of moratorium followed a review of the Government's 2001 Gene Technology Policy. The Government has adopted a cautious and balanced approach to gene technology in the primary industry sector. Tasmania's reputation for its clean and wholesome foods is much deserved but has been hard-won and nothing should be allowed to threaten it. Opposition primary industries spokesman Jeremy Rockliff said the decision was "overly cautious". A three-year time frame would certainly have been more appropriate to allow greater flexibility for future opportunities. Tasmanian Agricultural Productivity Group was disappointed by the decision. This effectively shuts the door on any opportunities in terms of research or

extensive crop production that might have occurred. The State Government should capitalize on its policy by better marketing Tasmania as GE-free.

The moratorium was welcomed by the Greed leader Peg Putt but they were opposed to open air field trials of GM crops. The trials should be conducted in a laboratory to reduce the risk of contamination. The moratorium and the 2001 parliamentary inquiring on genetically engineered crops, overseas markets had continued to resist GE produce. Staying GE free is an economic imperative for Tasmania.

A genetically modified poppy trial at Frankford, near Devonport, conducted by the CSIRO and Tasmanian Alkaloids, began in November and is due to wind up this year. More than 40ha of crops in the Northern Midlands were destroyed in November because they were contaminated by genetically modified canola crops sewn in the area five years ago. The moratorium will be reviewed by June 30, 2008.

A Group of Australian farmers has commended the NSW Government for its decision to slap a three-year ban on the commercial introduction of genetically modified (GM) food crops such as canola, clover, mustard and field peas until 2006. The ban was welcomed as sensible precautionary decision and it proves that the Government is listening to farmers.
Source: *www.checkbiotech.org*, March 1, 2003 and March 5, 2003

Economic Commission for Africa (ECA) and UN Commissioner Call for Harnessing Technologies for Sustainable Development

According to the ECA report on " Harnessing Technology for Sustainable Development" new and emerging technologies can yield a high payoff in catalyzing Africa's transition to sustainable development. Where effective, the new technologies can lower the incidence of disease, reduce food insecurity, and reduce vulnerability to environmental damage by allowing more flexible crop management systems.

The report also tracks the progress of African countries towards sustainable development. The indicators reveal sobering challenges - while some countries have made good progress, many have slipped down the rankings. The Report identifies medical and agricultural biotechnologies as key missing

ingredients often overlooked as a basis for sustainable development. These exciting new technologies range from genetically engineered mosquitoes that have the potential to eradicate malaria, to vitamin A enriched rice that can reduce blindness in children. And many more are on the horizon.

The report concludes that Biotechnology offers rich opportunities to increase agricultural productivity and address current food shortages in Africa. It accelerates plant and animal breeding efforts. It offers solutions to previously intractable problems. But it is no panacea. African countries need to develop appropriate national policies and identify key national priorities for biotechnology, bearing in mind the potential biological risks and the needs of poor people who rely on agriculture for their livelihoods. And the international community needs to loosen the arrangements for access to proprietary technology-enabling developing countries to pro-vide poor farmers with improved seeds while protecting them from inappropriate restrictions on propagating their crops.

The report underline that debate is essential. Governments should involve diverse stakeholders in the development of national biotechnology policies, strategies, and plans. They should encourage full and candid discussions on biotechnology, aimed at determining how best to address problems while building achievements. Biotechnology policy should take into account national development policies, private sector interests, market opportunities, and mechanisms and links for the diffusion of technology. The biggest risk for Africa would be to do nothing, allowing the biotechnology revolution to pass the continent by. If that happens, Africa will miss opportunities for reducing food insecurity and child malnutrition and see the agricultural productivity gap with industrial countries widen. The result could be what former chairperson of the CGIAR, calls “scientific apartheid,” with cutting-edge science oriented exclusively towards industrial countries and large-scale farming.

The Executive Secretary of the UN Economic Commission for Africa at the International Livestock Research Institute in Addis Ababa Ethiopia said that there is a need to promote African-focused biotechnology research that emphasizes “orphan crops”, particularly cassava, millet, sorghum, sweet

potato and yarns, and other cereals such as corn, rice and wheat; develop African-owned biotechnology policies that involve all relevant stakeholders, including civil society, the private sector and farmer organizations, in the formulation of national plans; establish national regulatory institutions for risk assessment and management; increase investment in modern biotechnology research; promote public/private sector partnerships in modern biotechnology research; and strengthen the linkages between modern crop biotechnology and its use in practical plant breeding.
Source: *CBTNews print version*, April 25, 2003

A Biotechnology Strategy for New Zealand

A vision and direction for the development of biotechnology in New Zealand is set out in the Government's Biotechnology Strategy. This strategy is about developing the biotechnology sector with care. Development with care means the Government wants New Zealand to reap the benefits of biotechnology in a responsible and sustainable way. To achieve that we need engagement and understanding between the biotechnology sector and the community, along with the robust regulation that safeguards people and the environment.

The policy statement recognises that biotechnology is an industry and it generates knowledge, skills and technology that can contribute in numerous ways to achieving our economic, social and environmental aspirations. The strategy calls for action in three areas — growth, community engagement and effective regulation. To promote growth in biotechnology the strategy draws on the work of the Biotechnology Taskforce, set up under the Government's Growth and Innovation Framework. The Taskforce has highlighted important factors including a strong knowledge, skill and research base, investment and infrastructure focused on New Zealand's strengths and strong international research links. Constructive community engagement and public confidence in effective regulation will underpin growth in biotechnology. This strategy represents a commitment by the Government to work with communities, researchers and industry so New Zealanders can benefit from developing and applying our world-class biological knowledge, skills and innovation.
Source: *www.checkbiotech.org*, May 27, 2003

AstraZeneca Establishes Clinical Research Center at Shanghai

AstraZeneca has established a clinical research centre in Shanghai. First year of operation, AstraZeneca intends to invest US$ 4 million into the construction of the center. The Shanghai clinical research center is an integrative part AstraZeneca's worldwide research network. All data receive mainland China, as well as Hong Kong, Taiwan, and South Korea will be processed there. Thus it provides a direct link between the Chinese market and international market, and is expected to joint the center.

AstraZeneca provides medicines designed to fight disease in such as cancer, cardiovascular, central nervous system, gastrointestinal, infection, pain control and respiratory. Its product portfolio includes drugs for treating cancer (Casodex, Arimidex, Faslodex and Iressa), gastrointestinal disease (Nexium) asthma (Symbicorot), hypertension (Atacand), migraine (Zomig) and schizophrenia (Seroquel). The company spends over US$11 million every working day research and development. Its total R&D spending in 2002 US$3.1 billion. There is a number of significant innovations R&D pipeline. ***Source:*** *Asia Pacific Biotech*, April, 2003.

AstraZeneca Establishes Centre at India

AstraZeneca has opened a new multi-million dollar research facility in Bangalore, India, which will focus principally on finding new treatments for tuberculosis (TB), a disease which is diagnosed in about two million people every year in India and in more than eight million people worldwide, mostly in the developing world. AstraZeneca previously announced an investment programme for the drug discovery center in Bangalore, which included $ 10 million to create the new research laboratories. Now that the center has been created, AstraZeneca is investing another $30 million over the next five years for laboratory equipment and operations costs. The discovery center in Banaglore, with more than 100 scientists, works closely with AstraZeneca's global network of research and development (R&D) centers, especially the genomics and infection research centres in Boston, USA, and in Cheshire, UK.

The AstraZeneca research programme in Bangalore, which also involves collaborations with academia, is utilizing the latest technologies in drug

discovery and development to find new candidate drugs that are better than existing treatments, active with shorter duration of therapy, and active against latent disease and resistance organisms. Developments in molecular science have revolutionized anti-infective drug hunting, in particular the ability to analyse and investigate the entire genome, such as the pathogen Mycobacteriun tuberculosis, which causes TB. This has enabled scientists at AstraZeneca to initiate novel approaches to treatment. In the past, TB research had been limited, and its treatment had relied on use of drugs developed for other infections. The promise for the future is for specific selective therapies, which could be "tailormade" to address the challenges of a potential TB epidemic in the twenty-first century.
Source: *AstraZeneca International,* June 2, 2003.

Survey Report: Food Biotech Companies Leave Europe

A European Commission survey has indicated that while Europeans are in favour of medical applications of biotechnology, they are still special about agricultural and food-related biotechnology. This, the survey indicates, combined with an uncertain legal situation and doubts on future commercial markets. "Europeans and biotechnology 2002" reveals that 44 per cent of those polled believe that biotechnology will improve their quality of life, compared to 17 per cent who do not, with 25 per cent undecided. But there is a lack of support for agricultural and food applications, contrasting with a strong backing for medical uses. According to the EC, this is seriously slowing down biotech R&D in the EU, particularly in the private sector, and may put at risk Europe's competitiveness in a promising sector of new technologies.

According to another EU study on scientific and technological developments in GM plants, the number of genetically modified organisms (GMO) field trial applications in the EU has dropped by 76 per cent since 1998. GMO research has also been seriously undermined. Some 39 per cent of the respondents have cancelled R&D projects on GMOs over the last four years. This share is higher for the private sector alone: 61 per cent of respondents have stopped projects in this field.

"People in Europe are becoming increasingly aware of biotechnology applications and their benefits" said European Research Commissioner Philippe Busquin. "We must continue to champion a rational and informed debate on biotechnology so that Europeans are bale to make informed decisions. Without sound scientific and other information, and the increasingly sceptic climate is scaring Euorpean biotech companies and research centers away. If we do not reverse the trend now, we will be unable to reap the benefits of the life science revolution and become dependent on technologies developed elsewhere. Now that strict EU legislation in this field is finally in place, there is no ground for unjustified fears and prejudice."

The Euro barometer survey on biotechnology and the life sciences is the fifth in just over ten years. The survey is based on a representative sample of 16,500 respondents, approximately 1000 in each EU member state. The European Commission has emphasized the need for "societal scrutiny and dialogue" in the Communication on "Life Sciences and Biotechnology – A Strategy for Europe" in 2002, and in the recent progress report.

When asked whether biotechnology would improve our way of life or not, 44 per cent of European citizens were optimistic, 17 per cent pessimistic and 25 per cent said they did not know. This is about the same percentage as in 1999. After a decade of continuously declining optimism in biotechnology, the trend has reversed in this latest survey. In the period 1999-2002, optimism has increased to the level seen in the early 1990s. This rise in optimism holds for all the EU Member States with the exception of Germany and the Netherlands, where such a rise was observed between 1996 and 1999. While support for medical applications was strong, for genetically modified (GM) crops, support is lukewarm. Respondents to the survey judged this application to be moderately useful but agreed that there were risks for GM foods. Public opinion tends to support GM crops in Spain, Portugal, Ireland, Belgium, UK, Finland, Germany and the Netherlands, while France, Italy, Greece, Denmark, Austria and Luxembourg have publics that are, on average, opposed to GM crops.

Most Europeans do not support GM foods, considering them of little value and dangerous for society. Overall support for GM foods is seen in only four countries – Spain, Portugal, Ireland and Finland. These varying degrees of acceptance show that Europeans continue to distinguish between different types of applications, particularly medical in contrast to agri-food applications. All the EU countries, with the exception of Spain and Austria, showed moderate to large declines in support for GM crops over the period 1996-1999. Thereafter support more or less stabilizes in France and Germany and increases in all the other countries with the exception of Italy, which sees a 10 per cent decline in support.

The survey showed that across Europe as a whole about 25 per cent lack confidence in farmers, shops, government and industry. In addition, there is more confidence in the European Commission, than in national governments in relation to regulations and their implementation. The study on scientific and technological developments in GM plants published by the European Commission's Joint Research Centre (JRC) shows that the prolonged slowdown in R&D for agricultural GMOs has had widespread consequences. The EU has seen significant delays to new GM varieties and applications; small and medium-sized enterprises (SMEs) have stopped participating in innovative plant biotechnology research and large biotech companies have relocated research, field trials and commercialization of new GMOs outside the EU. This will quite possibly lead to importing and processing only of GM materials in the EU. However, in marked contrast, interest in GM technology continues to grow outside Europe, with many new applications being researched and followed up in field trials.

The Commission study provides for a list of new commercial GM varieties in the pipeline in the short, medium and long term. The intention is to devise a sound scientific basis for EU policy development and implementation, particularly regarding the traceability, labelling and regulation of GMO use in food, feed and seed. However, despite the lack of confidence from consumers, the study shows that in the next decade, the range and quality of genetic modification in crops and the numbers of new products likely to be seeking regulatory approval will be greater than those already considered. ***Source*****:** *www.checkbiotech.org*, March 20, 2003.

Japan Plans a National Policy on Intellectual Property

The Intellectual Property Policy Headquarter has been established following the enactment of the Basic Law on Intellectual Property in Japan. This has been established to promote a focused and systematic manner policies relating to the creation, protection and application of intellectual property, in light of the increased need to strengthen the international competitiveness of Japanese industry. Specifically, its activities will involve constructing a plant to promote implementation of intellectual property policy, based on the report compiled by the Strategic Council on Intellectual Property, the intellectual property policy outline, and working towards its implementation.

On March 19, the first meeting of the Headquarters took place, attended by experts in legal affairs, patents and business, not to mention Prime Minister Koizumi and ministers in charge of each relevant ministry. The meeting decided to compile by the *Intellectual Property Promotion Plan,* which is to consist of measures that the government should implement in a focused and systematic manner with regard to the creation, protection and application of intellectual property.

The Plan contains 50 proposals for reforms, with the objectives of bringing about enhanced creativity in intellectual property generation, increased international competitiveness of industry and thereby securing a prosperous future for the people of Japan, by ensuring an active intellectual creation cycle based on the pillars of creating, protecting, and applying intellectual property and improving the human infrastructure thereof. Each ministry is required to study these proposals and put them into practice by 2005.
Source*: Japan Bioindustry*, March 2003.

Japan Plans a Report on Proteins

In addition to rapidly progressing developments in the field of biotechnology, there is a need to clarify swiftly what the verdict will be regarding the patent ability of newly emerging technologies. Consequently, patent offices in Japan, the US and Europe have been conducting research comparing the operations of each office using hypothetical case studies, in fields where research is thought necessary. In late November 2002, the Report on the

Trilateral Comparative Study on Protein-Dimensional Structure-Related Claims was compiled and published. Based on the results of this comparative research, the Japan Patent Office published on its website a draft version of the case studies with special examples of judgements, and is soliciting opinions from a wide range of people. Based on the opinions garnered, it is planned to publish the final version of the case studies (in Japanese) in March 2003.

Source: *Japan Bioindustry*, February 2003.

AP & Ventureast float Rs 150-crore Biotech Fund

The Andhra Pradesh government, in a 2:1 joint venture with a venture capital group Ventureast, launched a Rs 150-crore venture fund for exclusive support to biotech companies, with precedence to start-ups. The fund, recognized by the IRDA despite the cap of 5 per cent on insurance companies' exposure to long-term VC funding has already got a commitment of Rs 10 crore from LIC, in addition to another Rs 10 crore from Andhra Bank. The fund – APIDC Venture Capital (APIDC-VCL) – is expected to reach financial closure in nine months.

APIDC-VCL is the first dedicated venture fund for the biotech industry in India. In the US, there are around 100 biotech VCs which exclusively find biotech companies. APIDC-VCL is in talks with three more insurance companies, two banks and one FI to close the fund.

The fund has already received 41 proposals from biotech start ups and entrepreneurial aspirants, out of which 14 have been short listed, including Genomica Designs Pvt, BioServe technology and Silico Insights. The APIDC-VCL's norm is to pick up 2-49 per cent equity in the companies which it funds. The minimum funding size would be Rs 1 crore and the maximum would be 25 per cent of the total fund size. The exit would be through sale equity to a strategic partner, IPOs or transfer of IPRs acquired in lieu of equity. The income-tax exemption on capital gains being enjoyed by venture funds is an in tacit recognition of their role in propelling economic growth. In the US, insurance companies have 10 per cent exposure to VC funds.

Having got the advantages of rich scientific talent especially in life science and process chemistry traditional knowledge base and abundant biological resources, money is the only resource that hampers proliferation and growth of fledgling biotech ventures in India, said CSIR director general R A Mashelkar.

Source: *The Economic Times,* May 24, 2003,

TCG to Invest in Pune Biotech Park

Ernst & Young and Rabo India Finance have picked the Kolkata-based Purnendu Chattterjee group to develop the Maharashtra Industrial Development Corporation's (MIDC) ambitious Rs 90-crore, 100-acre biotech park near Pune. MIDC signed an MoU with the Chatterjee group for the project. The corporation's 12 per cent equity in the project would be in the form of land. E&Y and Rabo India Finance were roped in by MIDC to find strategic investors and attract anchor investors to the BT Park. MIDC has decided to involve private players instead of doing industrial development on its own. MIDC and industry would be joint developers in important future projects. The existing practice of MIDC developing what it considers right for industry will be done away with. The state-owned MIDC houses over 26,000 industries spread over 200 industrial areas across the state. MIDC is also scouting for partners to develop an agri-BT park in the Jalna-Aurangabad belt, which is home to major seed companies. It wants to focus on developing IT and biotech industries in the state on the advice on E&Y and Rabo.

Source: *The Economic Times,* May 19, 2003.

Maharashtra Tops in Bt Cotton Acreage

The total cultivated area under Bt cotton in major growing states in the country has been estimated at 72,682 acres with Maharashtra topping the list at 30,699 acres during 2002-2003 season. Quoting figures provided by the Bt cotton seed distributing companies Mahyco and Monsanto, sources in South India Cotton Association said Gujarat cultivated Bt cotton in 22,577 acres, followed by Andhra Pradesh in 9,404 acres and Karnataka in 5,401 acres. MP had cultivated Bt cotton in 3,676 acres, while Tamil Nadu in 925 acres. However, the figures of total output were yet to be ascertained.

With the Centre seeking reports from all the cotton states on Bt performance, the extent of acreage that may be covered under Bt cotton during the coming season would depend on these reports sources said. SICA was preparing the report with regard to Tamil Nadu, as directed by the State Government. Cotton imports had come down to 20 lakhs bales during 2002-2003 season, compared to 22.13 lakh bales in 2000-01 and 24.70 lakh bales in 2001-02.

Source: *The Economic Times*, May 13, 2003.

GEAC Sends Rasi's Bt Cotton Hybrid for Extensive Trials

The Genetic Engineering Approval Committee has referred one of the five Bt cotton hybrids from Rasi Seeds Pvt. Ltd. for large-scale field trials. The results of the small-scale trials conducted by the company and the Indian Council of Agricultural Research (ICAR) were found inconclusive for the purposes of commercialization and it was tought fit to conduct further trials. The company has been allowed to start large-scale trials for RCH 2 Bt this year in the central and southern zones. If biosafety is established during Kharif 2003 through these trials, we will approve its commercialization for next year. RCH 2 Bt hybrid was a direct derivative of RCH 2 non-Bt hybrid, which is widely acceptable to cotton growers. Which is why it had allowed the company to produce the RCH 2 Bt hybrid in 1 lakh acre area. The GEAC has also permitted seed multiplication for four other Bt cotton hybrids of the company – RCH 20 Bt, RCH 138 Bt, RCH 134 Bt and RCH 144 Bt – across an area of 10 hectares for possible large-scale trials in 2004. Meanwhile continuing its efforts to streamline the monitoring of transgenic crops (Bt cotton at present), the GEAC has decided to induct an agro economist in the Monitoring and Evaluation Committee – which is part of the genetic engineering regulatory framework. The GEAC also proposes to have the ministry of agriculture monitor progress as per the recommendations of the monitoring committee. It has also suggested training of field-level officers involved in monitoring through the Central Institute of Cotton research (CICR) immediately.

To ensue that interests of all stakeholders are upheld, the ministry of environment and forests would organize meetings with farmers and NGOs. The company has decided to constitute district and state-level committees

in six states where Bt cotton has been introduced. It is a beginning of the road in transgenics and a lot will unfold in coming years for which there is need for thorough set-up. There was no proposal for transgenic potato. As for spurious Bt cotton seeds the GEAC has taken up the matter with the chief secretary of the state and forwarded packets of the allegedly spurious seeds to the CICR for verification.
Source: *The Economic Times*, June 14, 2003.

GM-pulses Next in Indian Transgenic Crop Calendar

After commercial cultivation of transgenic cottong and field evaluation for mustard, India is all set to release genetically modified (GM) pigeon-pea and chick-pea pulses, for which work is "feverishly" going on in its agri-labs. According to the new Director-General of Indian Council of Agricultural Research (ICAR), Mangala Rai.

India favours introduction of transgenic varieties in all crops and emphasis now is to release GM-pulses for commercial growth at the earliest to curb imports and tackle insect menace. The priority is being given to pulses in the GM-crops' project as the country is deficient in the commodity in the commodity and facing the menace of a dangerous borer insect. However, it forms part of a larger project in which GM-varieties are being developed for rice, potato, brinjal, tomato, sorghum, cauliflower amongst others. India's share in world production of pigeon pea and chick pea is 90 per cent and 73 per cent respectively making it imperative that the cultivation of these commodities is perfected even if it means tinkering with genes. Being the world's largest producer of these crops, India faces the borer menace like nobody else and efforts are on to make the GM-varieties Armgera-resistant. ICAR being the apex body on agri-research related issues is developing these varieties based on the principle that GM-crops should be inferior in none (parameters) and superior in at least one to the conventional types.

Though the transgenics project is very wide, there are at least 10 crops on which work is at a fairly advanced stage. In some crops field evaluation is being carried on, in others gene has been transferred to the laboratory and

in few, level of expression in the gene is being studied. On the possible adverse effect of GM-crops, the ICAR's mandate is effective evaluation of material that is to be cultivated and studying how compatible it is to the Indian environment. Certain varieties like ones with terminator and sterility genes can be harmful but on these grounds the entire science of transgenics cannot be rejected. Drought resistant characterstics in cactus can be introduced in other crops, and profile of others can be improved by studying the gene-map of those rich in proteins. Already 54 million hectares worldwide have been covered by GM-crops, even though the science has recent origins of 1990s.

Source: www.checkbiotech.org, January 13, 2003.

Syngenta's New Plant to Serve as Global Hub

Indian subsidiary of the $6.4-billion Swiss biotech major Syngenta Crop Protection AG has decided to go ahead with setting up of a second plant in the country. The new facility would be involved in insecticide production and function primarily as a global sourcing hub for the Swiss parent. The decision to go ahead with the plant was taken recently after the board's approval. The plant would be engaged in the manufacturing of thiamethoxam, a general insecticide which can be used for most crops in the country including vegetables, rice and cotton. This is yet another instance of an MNC relocating its manufacturing facility to Asia. The choice of India fits in with its evolving image as a centre for research based manufacturing as against mass scale export hub in China. The market in India would be small for the particular insecticide in the region of Rs 80-100 crore. But internationally it has a huge market potential and production in India would help cut costs significantly. In fact, the new plant would serve as an export hub for Syngenta in all the markets whether in the US, Europe, Asia or Latin America.

The company's first plant, also located in Goa, is engaged in manufacturing of critical intermediates and active ingredients used in plant protection agents including insecticides, fungicides and herbicides. In the insecticides segment, Syngenta currently has a stable of seven products including vertimes, curacron, polytrin, ekalux, nuvan, nuvacron and karate. It is not clear

whether the new product would be herded as a separate brand. This particular product was being manufactured in Switzerland for global sales though test production for it begun in India last year.
Source: *The Economic Times*, May 21, 2003.

World First Seed Oil Enhancement Technology Developed by Scientists

Scientists from the Zhejiang Academy of Agricultural Sciences had developed a technique to enhance the oil contents of rapeseed, which could be used as petroleum substitutes.

Leveraging on the knowledge of a long-term in-depth study on the biosyntheses of protein and fat in crops, a research developed this new technology which is based upon the principles of "substrata competition". The team manipulated the adverse PEP genes, from the platform of photosynthesis in such a way that protein synthesis was suppressed for the activation of oil production, in accordance with the law of energy conservation. To date, the team had successfully cultivated Chouyou I and super-high oil and high erucic acid Chaoyou II new varieties of oil content attaining at 47 per cent, which became the rape varieties of the highest oil content in the world cabbage family. These new varieties had recorded the highest oil yield among existing genetically modified counterparts. Currently, the finding has been published in the UI.S., Canada, France, Germany and its utility, originality and innovation been confirmed. The Chouyou series had been completed environmental and released by the Ministry of Agriculture experimental production. This technology is filing for invention patent application at Intellectual Property Bureau and has entered extensive research review. This technique of producing seeds with altered protein and composition is important for the development of sustainable energy resources, and could be a useful reference for the petroleum substitute when other resources are threatened exhaustion. The team is also looking into enhancing the effectiveness of Chinese medicinal herbs as well as the essential oil content of roses.
Source: *http://www.asiabiotech.com.sg/kh-biotech/readmore/vol17/v7n06/seed/html*

China Gives Long-awaited Nod to Brazil Soy Imports

China has said that it has given long-awaited approval to Brazilian soybean imports, throwing open a market worth more than $1 billion annually to the South American country. The Brazilian embassy welcomed the news cautiously but said it was waiting to see something on paper, which the market hopes should happen early so that early shipments from Brazil could commence. China's rules on imports of what it deems transgenic foods have held up soybean trade with top producing countries such as the United States and Brazil, which are eager to supply the world's biggest soybeans importer. China has given approval for Brazilian soybeans to enter China. They would start accepting applications after the Lunar New Year, because soybean suppliers are required to obtain import permits. But Brazilian officials said that approval from the GMO office was just the first step, as actual trade would require the stamp of approval from other senior officials, including the vice agriculture minister. Of course, it is good news but the Brazilian diplomatic circle have not received anything official yet.

China implemented a draft of rules on importing GMO foods in 2001 that virtually cut off soybeans trade with countries like the United States and Brazil. They required exporters to go through an arduous and confusing process of applying for import permits. China extended those temporary import rules – which were originally due to expire December 20 – to September 20, 2003. But the rules required suppliers to re-apply for permits and producing countries to prove their GMO crops were safe for the environment and for human consumption. Although Brazil's government officially bans transgenic crops, unofficial estimates show that about 30 per cent of its soy crop is bioengineered – sparking worries that Brazilian beans might have problems entering China.

Traders were worried that China would be short of soybeans in coming months when the U.S. soybean season would end and that of South America's would start. China's approval of Brazilian beans might alleviate that potential shortfall, although some traders remained skeptical. It was possible buyers could switch a few cargoes to Argentina from Brazil if

imports permits did non come swiftly. If they could can get the Brazilian papers and start applying early then everything would still be manageable. But if it draged on then the time would be very tight.
Source: *www.checkbiotech.org*, January 29, 2003.

Singapore to Ensure Safety of GM Food

Singapore is gearing up to handle a possible onslaught of genetically modified food in the next five years. A laboratory has been set up by the Agri-Food and Veterinary Authority (AVA) to test such food items and make sure they do not pose any health risks for people here. Six AVA staff have also been trained to test for food that has been altered. The laboratory, which was set up last year at AVA's public health laboratory in Jurong, would be relocated to its new Lim Chu Kang public health centre soon.

Genetically-modified (GM) food is from plants or animals that have been injected with special genes to give them certain properties. In 2001, more than 52 million ha of such soya bean, corn, cotton and canola oil were grown in 13 countries. About half of the soya and a third of the corn sold here is genetically modified, but they have all been tested stringently before hitting the shelves. AVA has not rejected any GM product, but caution is still needed for future ones. If they came in through normal procedure, then they would be safe. But sometimes food producers may not tell you the food being sold has been modified genetically.

On whether Singapore would label these foods, the Government's stand has been reiterated that it would wait for the Codex Alimentarious' decision. This is an international committee sanctioned by the World Health Organisation and the United Nation's Food and Agriculture Organisation. The group is expected to come up with biosafety protocols for the world by the middle of the year, but a decision on labelling will be taken later.

If it decides that labelling is not needed, Singapore, because of its small size, would find it difficult to insist that sellers and importers do so.
Source: *www.checkbiotech.org*, March 10, 2003.

The Future of the MIRCEN*

ASM and MIRCEN Network Collaboration

The UNESCO MIRCEN-ASM collaboration over the last 14 years was comprised of a joint ASM/UNESCO research fellowship scheme; an ASM/UNESCO resource persons programme; and UNESCO support to the ASM Global Outreach programme.

These programmes, in accordance with the objectives of the joint ASM-UNESCO collaboration, namely of providing opportunities for young scientists to develop their research interests and to obtain expertise in advances in the field of microbiology; providing technical expertise to upgrade national capacity in the biotechnologies and support indigenous research work through the resource persons programme; fostering the development of new inexpensive technologies native to specific regions; and of promoting the economic and environmental applications of microbiology, have reached many scientists in several developing countries, and have responded, to some extent, to the needs for information exchange and technology transfer. The continuation and expansion of these programmes thus remains obligatory in promoting microbiological science education and research on a global scale.

In light of reduced resources as a result of zero-growth, novel ways of responding to the needs of especially the developing and least developed Member States have to be initiated. The above-mentioned joint ASM/

* Based on MIRCEN Directors' Meeting held in Washington, DC, in April 2002

UNESCO fellowship programme, an acknowledged mode for cost-effective use of available resources, serves as a proven model for the continued and future development of efforts in capacity building.

Complementary issues covered during the review meeting were:

1. New global initiatives, e.g. the Biological Resources Centres initiative of the Organisation for Economic Co-operation and Development (OCED), that are of immediate concern to the activities of the MIRCEN network
2. Organization of UNESCO training sessions in topical issues in sustainable development, e.g. environmental microbiology and bio-safety in collaboration with international partners working in these fields
3. Development of digital and interactive teaching materials for use at graduate and post-graduate university levels
4. Greater access to online subscriptions of ASM Journals
5. Stimulation and support by UNESCO of national microbiological societies through the MIRCEN network and collaborators for increased co-operation with international institutions like the ASM for a mutually beneficial exchange
6. Procurement of equipment for those institutions and laboratories suffering from the constraints of limited budgets and lack of appropriate and basic laboratory equipment.

Proposals for Future Collaboration

Future collaborative efforts will likely focus on continued capacity building and increased scientific collaboration in applied research by seeking out new international cost-sharing initiatives and extra-budgetary resources whilst maintaining ongoing long-term mutually beneficial co-operation. Two such proposals are the planned development of a joint UNESCO-ASM Professorship Scheme and a Voluntary Senior Resource Persons Professorships programme.

Financial support for laboratory equipment upgrade and research will be through existing programmes. The procurement of used equipment was

indicated via an established link in the ASM Resource Clearinghouse Bulletin Board at http://www.asmusa.org/international/international-resource-list.htm. UNESCO, in approved cases, will provide some support towards the transportation costs.

The development of digital training materials for the biotechnology programmes of the MIRCEN network has been produced through collaboration with partners like the *Electronic Journal of Biotechnology* (EJB) and the MIRCEN at the International Centre for Chemical Studies in Ljubljana, Slovenia. On-line, interactive teaching modules can be considered a collaborative initiative between the ASM and the MIRCEN network. Implementation of these proposals, which will play an important part in furthering microbiological science education, is dependent upon the mobilization and availability of extra-budgetary resources. Efforts to obtain extra-budgetary funds will be initiated by UNESCO in 2003.

The establishment of a MIRCEN web forum for information exchange and thematic discussions has been accepted as a means of following up on some of the ideas put forward during this meeting and bringing to the fore topics of interest and concern at the regional, national, and international levels and which could impact on the activities of the MIRCEN network. UNESCO is taking the necessary action to establish such a forum.

Since the 2002 MIRCEN Directors Meeting, an e-mail discussion among some MIRCEN directors and ASM volunteers has highlighted the desirability of initiating a strategic planning process to develop a common vision for future MIRCEN activities. The proposed MIRCEN web forum is an opportunity for a wide-ranging discussion to determine the future role of the MIRCEN network in the evolving environment of Biological Resources Centres. It has been proposed that a discussion paper could be prepared and posted for input and comment by the MIRCEN Directors.

Bio Web

We give below a list of web sites providing interacting information on biotechnology and biosafety related issues.

http://www.nff.org.au/pages/sub/biotechnology_position.pdf
The National Farmers' Federation (NFF) from Australia issued a statement recognizing the potential of biotechnology, including gene technology as a valuable tool within agricultural production system. NFF advocates that producers should understand and assess potential risks associated with the technology and implement appropriate strategies to manage such risks.

http://www.nature.com/naturebiotechnology
Different categories for organisms currently designated as transgenic or genetically modified are intragenic (within genome), famigenic (species on the same family), linegenic (unrelated species), and xenogenic (laboratory-designed genes). The extent to which transgenic organisms differ from traditionally bred organisms underlines much of the controversy surrounding the use of GMOs. The proposed terms will hopefully permit a more precise communication of the sources of genetic variability used in gene technology-based breeding.

http://www.fao.org/biotech/index.asp
The Food and Agriculture Organization (FAO) recognizes that genetic engineering has the potential to help increase production and productivity in agriculture, forestry, and fisheries. There is concern about the potential risks posed by certain aspects of biotechnology. The benefits of crop biotech for agricultural productivity include better resistance to stress, more nutritious

staple foods, more productive farm animals for the environment, and more food from less land. GMOs reduce the environmental impact of food production and industrial processes, and help in rehabilitating damaged or less-fertile land. Benefits for human health are investigation of disease with genetic fingerprinting, vaccines, and medicines, and identification of allergenic genes.

http://www.jrc.es/gmoreview.pdf

The report by the EU funded Joint Research Centre (JRC) shows that European small- and medium-sized enterprises (SMEs) scale down their researches, while large firms continue their research and commercialization of innovative agri-biotech products in other countries. The decline in the number of researches conducted is due to the 1999 decision of the EU Council of Environment Minister to block any new commercial release of genetically modified organisms (GMOs). The report focuses on cultivated GM plants used for seed, food, feed, industrial purposes, and medicine.

http://www.ahbfi.org/biotech/newscenter.asp

African scientists clarifies that the rejection of GM food by some African countries is not based on scientific data evidence of harm to human beings, animals or the environments. They assert that Southern African governments may not have consulted local scientists and communities and that their decisions to refuse GM food aid have been influenced by the anti-GM lobby groups. African scientists stand for the proper introduction of GM crops based on international protocols, and the responsible deployment of GM crops in Africa under the Global International Biosafety Protocol and National Biosafety Regulations and Guidelines.

http://www.usagnet.com

United States's Agriculture Department has constituted an advisory committee on biotechnology to study issues related to agriculture and genetically modified crops. Dr. Patricia Layton, a professor at the South Carolina-based Clemson University has been appointed as a chairman of the Agriculture Deparment's advisory committee.

www.biospherenz.com/download.biotech_taskforce_report.pdf
New Zealand's Biotechnology Taskforce has come out with a report commissioned by the New Zealand government, which considers large animal and plant biotechnology as core strength for the country. The major recommendations forwarded include the need to build critical mass; the introduction of a package of regulatory reform to create a competitive environment for growth; and the establishment of a robust international network to stimulate the flow of international investment.

http://www.searca.org/~bic
The Department of Agriculture (DA) in the Philippines stands firm in its decision to allow its planting of GM crops despite hunger strikers from non-government organizations protesting the commercialization of Bt corn. There was no sufficient scientific evidence to warrant a moratorium on the commercialization of Bt corn says DA.

Bio Stats

Allocations for Biotechnology in Japan*

The budgetary allocations for Biotechnology in Japan for the period 2003 have been released. This year Yen 2,33,331 million have been kept aside for the frontier technology. There are five major ministries which are sharing this allocation. The Ministry of Economy, Trade and Industry (11.97 per cent); Ministry of Health, Labour and Welfare (57.42 per cent); Ministry of Education, Culture, Sports, Science and Technology (15 per cent); Ministry of Environment (1.70 per cent) and Ministry of Agriculture, Forestry and Fisheries (6.25 per cent).

The Ministry of Economy, Trade and Industry has proposed to spend Yen 3028, 11 per cent of its budget on consolidation of intellectual infrastructure which covers expenditure on National Institute of Technology and Evaluation. This Ministry is also responsible for promotion of R&D for creative research and product development. This activity would get 89 per cent of Yen 27,949 the biotechnology budget marked for the Ministry. Among the research projects DNA sequencing, genome informatics, recycling based industrial system using biological functions are some of the top priorities. One of the upcoming areas for research funding is development of highly efficient techniques for conversion of biomass energy. The Human Frontier Science Programme is also proposed to be restrengthened for developing international linkages.

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* Prepared by Sachin Chaturvedi on the basis of *Japan Bio-industry Newsletter* Vol. 19 No. 4, March 2003.

The Ministry of Health, Labour and Welfare has a total budget of Yen 1,33,994 million. Out of this a large sum is proposed to be spent on management of clinical research data; improving of national testing and research institutes for ensuring food safety; expenses for assessment and research on risks from medicine and other technologies and expenses for research on overcoming intractable diseases. At least 15 per cent of the budget is proposed to be spent on research related to treatment of cancer at different national hospitals.

The Ministry of Education, Culture, Sports, Science and Technology has an earmarked budget of Yen 72,754. This is largely proposed to be spent on promotion of research and development projects for economic vitalization, development of combine facilities for government industry and academia and for promotion of life science research by core research institutes which play a leading role in scientific and technological development. The Ministry of Environment has proposed to spend a large sum on carrying out independent studies pertaining to the adoption and defusion of GM goods. The Ministry of Agriculture, Forestry and Fisheries which gets 6 per cent of total biotechnology allocation proposes to spend a large sum on strengthening agro-marine research infrastructure along with promotion of R&D activities in the private sector especially food industry.

Allocations for Biotechnology in Japan

(Unit: million yen)

	2002	2003
1. The Ministry of Economy Trade and Industry		
A. Consolidation of intellectual infrastructure	3887 (1.43)	1514 (0.65)
B. Promotion of R&D	21,285 (7.86)	24,956 (10.70)
C. Consolidation of environment for market expansion		61 (0.03)
D. International relations	1,418 (0.52)	1,418 (0.61)

	2002	2003
2. The Ministry of Health, Labour, and Welfare		
A. Science and technology promotion expenditures	102,510 (0.52)	106,378 (9.10)
B. Welfare, labour and science research subsidies	40,702 (15.02)	41,687 (17.87)
3. The Ministry of Education, Culture, Sports, Science and Technology		
A. Promotion of research and development projects for economic vitalization (leading projects)	0 (0.00)	21,238 (9.10)
B. Promotion of research and development programme (RR 2002) toward the national target by combined facilities of government, industry and academia	20,541 (7.58)	9,900 (4.24)
C. Promotion of life sciences research by core research institutes which play leading roles in scientific and technological developments	50,006 (18.46)	3,887 (1.67)
4. The Ministry of the Environment		
A. Expenses for tests and researches on global environment conservation	927 (0.34)	803 (0.34)
B Expenses for surveys and research on pollution control, etc.	3,018 (1.11)	3,143 (1.35)
C. Expenses for investigation on biotechnology	23 (0.01)	31 (0.01)
D. Expenses for general promotion of environmental research	(3,660) (1.35)	(3,730) (1.60)
5. The Ministry of Agriculture, Forestry and Fisheries Budget related to innovative industrial technologies such as biotechnology, etc.		
A. Promotion of R&D by testing and research institutes, etc.	14,525 (5.36)	10,691 (4.58)
B. Promotion of R&D activities of private sectors through providing subsidies	7,400 (2.73)	3,010 (1.29)
C. Consolidation of R&D infrastructure	97 (0.04)	94 (0.04)

	2002	2003
D. Expenses for the promotion of R&D	135 (0.05)	87 (0.04)
E. Measures to ensure security of innovative technologies such as genetic recombination, etc.	612 (0.23)	521 (0.22)
F. Promotion of international exchange	198	182
Total	**2,70,944**	**2,33,331**

Note: The figure in parenthesis is % share on total.