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CONFERENCE OF THE PARTIES TO THE
CONVENTION ON BIOLOGICAL DIVERSITY
Ninth meeting
Bonn, 19–30 May 2008
Item 3.4 of the provisional agenda*

COMPILATION OF VIEWS ON THE POTENTIAL ENVIRONMENTAL, CULTURAL AND SOCIO-ECONOMIC IMPACTS OF GENETICALLY MODIFIED TREES

Note by the Executive Secretary

1. In paragraph 3 of decision VIII/19 B, the Conference of the Parties requested the Executive Secretary to collect and collate existing information, including peer-reviewed published literature, in order to allow the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) to consider and assess the potential environmental, cultural, and socio-economic impacts of genetically modified trees on the conservation and sustainable use of forest biological diversity, and to report to the ninth meeting of the Conference of the Parties. In order to facilitate the collation of information on the potential environmental, cultural and socio-economic impacts of genetically modified trees, the Secretariat distributed, through notification 2006-027 of 4 May 2006, a questionnaire to Parties and relevant organizations inviting them to provide information. The views were compiled by the Secretariat, and circulated as document UNEP/CBD/SBSTTA/13/INF/7.

2. The Subsidiary Body, at its thirteenth meeting, requested the Executive Secretary to forward documents UNEP/CBD/SBSTTA/13/INF/6 and INF/7, recognizing that SBSTTA has not assessed them in detail, to ninth meeting of the Conference of the Parties for information.

3. Accordingly, the Executive Secretary is circulating herewith, for the information of participants of the ninth meeting of the Conference of the Parties, a compilation of views received in response to the questionnaire on the potential environmental, cultural and socio-economic impacts of genetically modified trees.

4. The submissions are reproduced in the form and the language in which they were received by the Secretariat and without annexes.

* UNEP/CBD/COP/9/1

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ARGENTINA

[29 August 2006]
[SUBMISSION:SPANISH]

1- ¿Su país tiene plantaciones, comerciales o experimentales, de árboles modificados genéticamente?
Si la respuesta es positiva, por favor responda a todas las preguntas siguientes. Si la respuesta es negativa, por favor enuncie la razón.

SI, pero no de especies forestales, sino agrícolas. *La Comisión Nacional Asesora de Biotecnología Agropecuaria (CONABIA), organismo que funciona en la Secretaría de Agricultura, Ganadería, Pesca y Alimentos y se encarga de evaluar los eventos de organismos genéticamente modificados previamente a su liberación al medio no ha recibido hasta la fecha ninguna solicitud cuyo objeto de investigación sea una especie de árbol nativo.*
En cambio, existen actualmente dos ensayos experimentales que no son referidos a especies de aprovechamiento forestal, sino a cultivos agrícolas de especies leñosas: Expediente N° 7858/06 Naranjo con resistencia a virus de la psorosis de los cítricos y Expediente 285387/02 06 Naranjo con resistencia a virus de la psorosis de los cítricos.
En este sentido, cabe mencionar que desde 1991 hasta 2003 fueron evaluados 667 permisos, de los cuales el 83% fueron ensayos a campo, todos ellos correspondientes a especies agrícolas. Los principales cultivos involucrados fueron: maíz, soja, girasol y algodón, y las principales características evaluadas fueron la resistencia a insectos y la tolerancia a herbicidas.

Si bien se desconoce la razón por la cual no se presentaron solicitudes de evaluación de árboles genéticamente modificados para forestación hasta el momento y podría pensarse que ello se relaciona con las características de la industria forestal argentina, más recientemente se han conformado grupos de investigación que procuran desarrollar técnicas para transformar otras especies

2- ¿Su país ha desarrollado una red de discusión o un forum, o un comité a nivel nacional etc. que se encargue de árboles modificados genéticamente?
Si la respuesta es positiva, por favor responda a todas las preguntas siguientes. Si la respuesta es negativa, por favor enuncie la razón.

No existe ningún foro, entidad o reglamentación destinado a árboles genéticamente modificados, exclusivamente. *Existe la CONABIA (Comisión Nacional Asesora en Biotecnologia Agropecuaria),*

que es el organismo encargado de asesorar a la SAGPyA sobre los requisitos técnicos y de bioseguridad que deberán reunir los materiales genéticos obtenidos por procedimientos biotecnológicos, en forma previa a que los mismos sean incorporados por cualquier procedimiento o método y en cualquier carácter (ensayos, difusión, etc.) al biosistema. Se trata de un cuerpo integrado por representantes de distintos organismos y asociaciones del sector público y privado cuyas competencias se relacionan con la materia.

3- ¿ Su país tiene directrices o reglamentación para minimizar los impactos de los árboles mofidifcados genéticamente con fines científicos o comerciales?
Si la respuesta es positiva, por favor responda a todas las preguntas siguientes. Si la respuesta es negativa, por favor enuncie la razón.

***Si bien no están específicamente diseñadas para árboles, se cuenta con reglamentaciones completas en materia de Organismos Vegetales Genéticamente Modificados**, cuyo procedimiento es caso por caso. Estas reglamentaciones (pueden encontrarse en el sitio web de la SAGPyA) se consideran suficientes para el análisis de riesgo y el establecimiento de las condiciones de bioseguridad para minimizar impactos ambientales de los ensayos con fines científicos o comerciales.*

Impactos ambientales de los árboles modificados genéticamente. (Ejemplo: efectos sobre los ecosistemas nativos, uso de herbicidas)

Caso por caso. En los ensayos llevados a cabo hasta ahora se han establecido condiciones de modo que no se produzcan potenciales impactos ambientales. Dada la naturaleza específica de los eventos ensayados, no se esperarían impactos significativos sobre los ecosistemas en que esos árboles se han plantado o desarrollado.

Impactos culturales de árboles modificados genéticamente. (Ejemplo: impacto positivo o negativo sobre comunidades indígenas y locales y sus conocimientos tradicionales).

Caso por caso.

Impactos socioeconómicos de árboles modificados genéticamente (Ejemplo: impactos positivos o negativos sobre la cantidad, calidad y el valor económico de la producción forestal, impacto positivo o negativo sobre los modos de subsistencia de comunidades).

Dado el estado actual del desarrollo de la biotecnología forestal en la Argentina, no es posible contestar esta pregunta.

AUSTRALIA

[13 July 2007]
[SUBMISSION: ENGLISH]

PILOT ASSESSMENT

On the potential environmental, cultural and socio-economic impacts of genetically modified trees on forest biological diversity

1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?

No. GM trees are not grown commercially in timber plantations in Australia and there are no GM forest trees in field trials. GM research on trees in Australia is all "contained research", i.e., undertaken in laboratories under certified and controlled conditions without any release to the outside.

If yes, please answer all remaining questions.
If no, please state the reasons why:

(i) The economic rationale for investing in GM forest trees for commercial application in Australia is not clear at present. Long-term risk assessment may entail high up-front costs and as yet there are no generally accepted protocols for assessing the risks associated with new GM tree varieties.

(ii) The two main Australian commercial plantation species, *Eucalyptus globulus* and *E. nitens*, are technically very difficult to genetically transform and clone. These species, other eucalypts, pines and pine hybrids are all conventionally bred.

(ii) Conventional breeding of forest trees is currently cost effective for producing the relatively large number of different varieties of trees tailored for each of the wide range of soils and climates found in Australia, including for commercial plantations, farm forestry and salinity mitigation.

2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?

Please refer to answer 3 below.

If yes, please answer the remaining questions.
If no, please state the reason why:

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?

In Australia, dealings with GM organisms, including trees, are regulated by the Gene Technology Regulator (the Regulator) supported by the Office of the Gene Technology Regulator (OGTR) located in the Australian Government Department of Health and Aging. The role of the Regulator is to protect human health and safety and the environment by identifying and managing risks posed by the use of gene technology. The Regulator liaises with other regulatory agencies, including Food Standards Australia New Zealand (FSANZ), Australian Pesticides and Veterinary Medicines Authority (APVMA), and the Therapeutic Goods Administration (TGA) to coordinate the approval of GM products for use and sale.

Australia's strong national regulatory regime is underpinned by the Gene Technology Act (Cth) 2000 (the Act), that has been in force since 21 June 2001. Associated with

administration of the Act are Gene Technology Regulations (Cth) 2001 and a Gene Technology Ministerial Council (GTMC). The Regulator and the GTMC receive advice on request from the Gene Technology Technical Advisory Committee (GTTAC), Gene Technology Community Consultative Committee (GTCCC) and the Gene Technology Ethics Committee (GTEC). GTTAC provides scientific and technical advice. The other two committees advise on matters of general concern and ethical issues in relation to GMOs and gene technology. An independent review of the Gene Technology Act was tabled in the Australian Parliament on 27 April 2006. The Act was found to be rigorous, has a high level of transparency, is appropriate and is being applied effectively. Detailed information is available on the Regulator's web site (http://www.ogtr.gov.au/index.htm). The Regulator has published a *Risk Analysis Framework* which describes the principles of risk analysis used to protect human health and safety, and the environment, in accordance with the Gene Technology Act. Economic and other issues were intentionally excluded from the scope of risk assessments under the Act.
If yes, please list them according to the categories below: If no, please explain the reason why here:
Environmental impacts of genetically modified trees (Example: effects on native ecosystems, use of herbicide) See above.
Cultural impacts of genetically modified trees (Example: positive or negative impacts on indigenous and local communities and their traditional knowledge) See above.
Socio-economic impacts of genetically modified trees (Example: positive or negative effects on quantity, quality and economic value of forest production; positive or negative impacts on livelihoods of communities) See above.

AUSTRIA

[24 August 2006]
[SUBMISSION: ENGLISH]

1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?

NO
Reason: *Austria is generally very sceptical about GMOs and in particular about GMTs. Because of potential threats of GMTs and the little knowledge on potential impacts of GMTs, political will to allow the use of GMTs for either commercial or experimental proposes is very low at this point.*

2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees? ***NO***
Reason: *No specific committee on GMTs has been established, but the Subcommittee on deliberate release and placing on the market of the Austrian GMO Advisory Committee on Gene Technology (Gentechnikkommission) is responsible in general. In so far no specific discussion on GMTs has taken place in this forum.* ***The Austrian Gene Technology Act*** *lays down the rules for the installation and work of an Advisory Board and its three scientific committees, for strict liability for damages due to genetic engineering and punishment for offences against the law.* *The* ***Ordinance on Public Hearings*** *prescribes in detail the administrative procedures that have to be considered in those cases where the Gene Technology Act requires a mandatory public hearing. These cases are: applications for deliberate release of GMOs into the environment and contained use of GMOs in higher classes and at large scale.* Within the **Austrian Forest Dialogue** general aspects of GMTs and their release are being discussed among more than 80 different forest relevant stakeholder groups and institutions. The Austrian Forest Dialogue was started in 2003 and is a permanent forest platform dealing with all aspects of sustainable forest management.
3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes? ***No, but*** *the general GMO legislation in Austria (GMO Act and Ordinance on Deliberate Releases) applies*
Environmental impacts of genetically modified trees (Example: effects on native ecosystems, use of herbicide) *Environmental impact of GM tree trial must be assessed thoroughly according to the Austrian Gene Technology Act (1994) amended in 1998, 2002, 2004 and 2005, and different national directives (Ordinance on Work with GMOs in Contained Use 2002, Ordinance on Deliberate Release of GMOs into the Environment 2005, Ordinance on Public Hearings 1998 [Systemverordnung 2002, Freisetzungverordnung 2005 and Anhörungsverordnung 1998]). Marketing of GM trees is additionally restricted by the Act on Forest Reproductive Material 2002 (Forstliche Vermehrungsgutgesetz).*
Cultural impacts of genetically modified trees (Example: positive or negative impacts on indigenous and local communities and their traditional knowledge) *According to the Austrian Gene Technology Act and the respective ordinances also Cultural impacts of GMOs have to be considered*
Socio-economic impacts of genetically modified trees (Example: positive or negative effects on quantity, quality and economic value of forest production; positive or negative impacts on livelihoods of communities) *According to the Austrian Gene Technology Act and the respective ordinances also Socio-economic impacts of GMOs have to be considered*

BELGIUM

[31 August 2006]
[SUBMISSION:ENGLISH]

PILOT ASSESSMENT

On the potential environmental, cultural and socio-economic impacts of genetically modified trees on forest biological diversity

1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?

Belgium has experimental plantations of genetically modified trees but only in indoor growth rooms.

The first species is a hybrid *Populus tremula* x *Populus alba*. These trees were transformed in first instance to understand the function of a particular gene. The overall aim is to increase the production of wood or to optimize the quality of wood. We have already made transgenic trees that have better wood for pulp and paper, *i.e.* less chemicals have to be used in the pulping step, thus less environmental pollution.

The second species is an apple tree. Insertion of genetic material into the apple (host) genome (transformation) was achieved via co-cultivation with the kanamycin-sensitive *Agrobacterium tumefaciens* strain EHA105 (Hood et al., 1993). The leaves used for transformation were the youngest fully expanded leaves of micro-propagated shoots. *Malus* x *domestica* Borkh., cultivar "Jonagold", were transformed with vectors containing:
- a cDNA encoding an extension-like prolin-rich protein
- a cDNA encoding an apple knotted1-like homeobox protein
in sense orientation.

2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?

There is no specific forum for genetically modified trees but this issue is dealt with in general GMO forums.

Belgium has a common scientific evaluation system made of the Biosafety Advisory Council and the Biosafety and Biotechnology section of the Scientific Institut for Public Health.

The Biosafety Advisory Council (BAC) is one of the two pillars (the other one being the Division of Biosafety and Biotechnology - SBB) of the common scientific evaluation system that has been set up in Belgium to advise the competent authorities about the safety of activities involving genetically modified organisms (GMOs) and/or pathogens, including genetic and ecological aspects related to biodiversity.
The Council consists of representatives of the Regional and Federal authorities. It is assisted by experts in its scientific work. The secretariat of the Council is ensured by the SBB.
The Council can be consulted by the Regions or the SBB for the contained use activities (laboratories, greenhouses, animal husbandries, production plants). It must be consulted for the deliberate release of GMOs in the environment and the placing on the market of all GMOs and GMOs-based products.

Belgium also has a Biosafety Steering Group under the Coordinating Committee for International Environmental Policy. The federal entity and the Regions of Belgium can exchange information in this forum. This group prepares Belgian positions and reports for European and international organisations.

There is also a Belgian Biosafety Server (http://www.biosecurite.be/HomePageFR.shtml) and a Belgian Biosafety clearing house (http://www.biosafetyprotocol.be/).

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?

General provisions on GMO's

Belgium has managed an harmonized implementation in the Belgian laws of European Biosafety Directives, Decisions, Regulations and Guidelines. The decisions by different administrative bodies representing different institutional levels are mainly based on a single common science-based biosafety advisory system. In such a system, all regulatory-related aspects of the uses of GMO's and pathogens are assessed altogether in a coordinated way, independently of the implicated specific regulation(s).
This common advisory system is founded by a Cooperation Agreement concerning Biosafety.

Specific Provisions on GMO's:

- Deliberate release of GMOs in the environment and placing on the market of GMOs

The European legislation in this field has been transposed in the Belgian law by the Royal Decree of 21 February 2005.
This Decree implements or enforces Directive 2001/18/EC and subsidiary Decisions.
In addition to the Decree of 21 February 2005, the two following Laws are also of application:

- Law of 20 July 1991, especially article 132 (provisions concerning the deliberate release in the environment of genetically modified organisms)
- Law of 22 February 1998 (amending the law of July 20, 1991), especially articles 222 and 226.

- Contained Use of pathogenic and/or genetically modified organisms, including clinical research

The European legislation has been transposed at Regional level as a part of the Regional Environmental laws for classified installations.
These regulations implement or enforce European Directive 98/81/EC revising Directive 90/219/EEC, and related Decisions 2000/608/EC and 2001/204/EC.

- Protection of workers exposed to biological agents at work

The legislation currently in force in Belgium is the Royal Decision of 29 April 1999 (Belgian Official Journal of 07.10.1999 - p. 37917) amending the Royal Decision of 4 August 1996 concerning the protection of workers from risks related to exposure to biological agents at work (Belgian Official Journal of 01.10.1996 - p. 25285).
This decision implements European Directives 90/679/EEC, 93/88/EEC, 95/30/CE, 97/59/CE and 97/65/CE.
Directive 90/679/EEC has been repealed in September 2000 by Directive 2000/54/EC.

BRAZIL

[17 August 2006]
[SUBMISSION:ENGLISH]

1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?
If yes, please answer all remaining questions. If no, please state the reason why:
Yes. Brazil has experimental plantations of trees from the genera *Eucalyptus* and *Papaya*.

2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?
If yes, please answer all remaining questions. If no, please state the reason why:
Yes. There are two national bodies: a) the National Biosafety Technical Commission (CTNBio), a multidisciplinary consultative and deliberative body, with the participation of Government and civil society representatives, that provides technical support and advice to the Federal Government on the formulation, updating and implementation of the National Biosafety Policy for Genetically Modified Organisms (GMOs) and their derivatives; and b) the National Biosafety Council (CNBS), a ministerial-level political advisory body that provides support and advice to the Presidency of the Republic on the formulation, updating and implementation of the National Biosafety Policy. Further information on the CTNBio may be obtained through the following electronic address: <http://www.ctnbio.gov.br>. The functions of each of the above-mentioned bodies are regulated by Federal Law no. 11,105/2005 and Decree no. 5,591/2005, both of which are available for consultation through the Biosafety Clearing House of the Cartagena Protocol on Biosafety, at the following electronic address: <http://bch.biodiv.org/database/results.aspx?searchid=240891&page=1&documenttype=3>.

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?
If yes, please list them according to the categories below: If no, please explain the reason why here: **Yes. Federal Law no. 11,105/2005 provides for safety standards and oversight mechanisms for the building, cultivation, production, manipulation, transport, transfer, import, export, storage, research, trading, consumption and release into the environment of genetically modified organisms (GMOs) and their derivatives, guided by the need to encourage scientific progress in the area of biosafety and biotechnology, protection of life and of human, animal and plant health, in keeping with the precautionary principle for the protection of the environment. According to Federal Law no. 11,105/2005, the CTNBio can issue safety technical norms regarding the authorization of research-related activities and the commercial use of GMOs and their derivatives, based on the evaluation of their zoo-phytosanitary, human health and environmental risk. The risk analysis is based on a case-by-case evaluation. The commercial release of a GMO can also be subject to analysis by the CNBS, which may take into account socio-economic as well as national interest considerations.**
Environmental impacts of genetically modified trees:
Cultural impacts of genetically modified trees:
Socio-economic impacts of genetically modified trees:

CANADA

[14 August 2006]
[SUBMISSION:ENGLISH]

1. ***Does your country have any plantations, either commercial or experimental, of genetically modified trees?***

There are no commercial plantations of genetically modified trees in Canada. Currently, the only experimental trials of genetically modified forest trees carried out in Canada are conducted by Natural Resources Canada's Canadian Forest Service under strict terms and conditions imposed by the Plant Biosafety Office of the Canadian Food Inspection Agency (CFIA). These terms and conditions are enforced by CFIA inspectors. These experimental trials are of poplar and spruce; they are designed to collect information on the performance of the trees, and to develop protocols for tracking the fate of the inserted DNA in forest soil and litter. None of the experimental materials are targeted for deployment or commercial release.

2. ***Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?***

Provincial governments own 77% of the forest and set the rules for forest management on Crown land. The Forest Genetic Resources Council of Alberta issued a Position Paper in 2001 recognizing the potential of genetically modified trees in reforestation but not recommending their use for reforestation at this time due to a poor understanding of their performance and impact on forest ecosystems. The British

Columbia Chief Forester's Standards for Seed Use does not permit the use of genetically modified trees when reforesting public land. The government of Quebec has created the Interdepartmental working group on biosafety to discuss genetically modified organisms, including genetically modified trees.

A formal federal/provincial committee was formed in 1998 to discuss regulatory issues related to genetically modified trees. Ad-hoc expert committee meetings were held in 1999 and 2002.

Natural Resources Canada's Canadian Forest Service has developed a public discussion document to advance the debate on genetically modified trees; this document entitled Genetic Engineering for Forestry in Canada has been on line at http://nrcan.gc.ca./biotech/english/discuss.html since 2002 to invite opinions on social and economic considerations, and benefits versus risks of using genetically modified trees.

A side event dealing with regulatory challenges related to plants with novel traits that are forest trees was organized by Canada at the World Forestry Congress in Québec City in September 2003.

A Canada - US Public Opinion Research Study on Emerging Technologies, including GM trees, was conducted in 2005. Results can be seen at: http://www.biostrategy.gc.ca/english/view.asp?x=721&all=true#470

A science/policy dialogue session was organized by the Canadian Forest Service in March 2006 to explore risks and benefits related to environmental, ethical, socio/economic, and regulatory issues and Canada's capacity to assess them.

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?

Environmental impacts of genetically modified trees

Yes. The Plant Biosafety Office (PBO) of the Canadian Food Inspection Agency regulates the environmental release of plants with novel traits (PNTs), including genetically modified trees, under the *Seeds Act* and *Regulations Part V* and, their importation into contained facilities under the *Plant Protection Act*.

The PBO grants approvals for two levels of environmental release of PNTs: confined research field trials and unconfined environmental release. Approvals for confined research field trials are granted where there is insufficient data or scientific rationale to support an assessment and authorization for unconfined release of the PNT in question. The PBO may approve the trial if potential environmental impacts can be mitigated, and imposes terms and conditions on the trial, enforced by CFIA inspectors, to ensure this mitigation. These terms and conditions provide for reproductive isolation of the plants within the trial from plants outside it, provide for physical separation of plant material from the trial from food and feed supply chains, and mitigate persistence of the PNT in the environment post-harvest. To minimize environmental interactions, the size and number of trials are restricted.

An approval for the unconfined environmental release of a genetically modified tree would require a thorough environmental safety assessment. Environmental safety assessments are carried out according to rigorous, internationally-accepted procedures using the most current scientific knowledge. The applicant is required to provide the PBO with extensive high-quality, statistically-sound data and/or valid scientific rationale to demonstrate the environmental safety of the plant with novel trait (PNT) with respect to:

- The potential of the PNT to become a weed or be invasive of natural habitats;

- The likelihood and consequences of gene flow from the PNT to wild relatives;
- The potential impact of the PNT on the health of other plants;
- The potential impact of the PNT or its gene products on non-target organisms, including humans; and
- Other potential impacts of the PNT on biodiversity.

The PBO then undertakes a comparative environmental safety assessment of the plant based on the submitted data and rationale, relative to its unmodified counterpart. Evaluations also consider the unique combinations of species and traits, using companion biology documents as a baseline for comparison and for identifying species-specific considerations in relation to the novel trait. If the PBO concludes that there is minimal potential for significant negative environmental impact of the PNT relative to its unmodified counterpart, an unconfined environmental release may be authorized. In some cases, the PBO may authorize an unconfined release with conditions, such as a requirement that the applicant ensures that users of an insect-resistant PNT deploy methods to delay development of resistance among insect populations.

These federal regulations are the primary filter; provincial regulations then apply should a proponent wish to plant the forest tree PNT on public land.

Social and cultural impacts of genetically modified trees

Canada has not developed specific guidelines or regulations to assess cultural and socio-economic impacts of genetically modified trees. Instead, the Canadian Biotechnology Advisory Committee (CBAC) was established in1999 to advise government on policy issues associated with the ethical, social, regulatory, economic, scientific, environmental and health aspects of biotechnology. Its mandate includes prioritizing and conducting research in support of its advisory role. CBAC was also tasked with making it easier for Canadians to obtain balanced information on issues related to biotechnology, engaging the public in discussions, and providing an on-going forum for Canadian views. CBAC has not researched the issue of genetically modified trees yet. Since some applications of genomics research might include the development of genetically modified trees, the initiative led by Genome Canada (www.genomecanada.ca) is also relevant. Genome Canada supports research projects aimed at studying and analyzing the ethical, environmental, economic, legal and social issues related to genomics research (GE^3LS). One of the goals under this initiative is to support dialogue among scientists, policy makers and the public so that public concerns are truly reflected in policies related to genomics.

COLOMBIA

[07 September 2006]
[SUBMISSION: SPANISH]

EVALUACIÓN PILOTO

Sobre los impactos ambientales, culturales y socioeconómicos de los árboles genéticamente modificados en la conservación y el uso sostenible de la diversidad biológica de los bosques.

País: COLOMBIA

Nombre, afiliación y dirección del respondiente al cuestionario:
MINISTERIO DE AMBIENTE, VIVIENDA Y DESARROLLO TERRITORIAL,
Oficina de Asuntos Internacionales

1. ¿Su país tiene plantaciones, comerciales o experimentales, de árboles modificados genéticamente?

En Colombia a la fecha no existe ningún tipo de plantación a ninguna escala de árboles modificados genéticamente, en razón a que no se ha cursado por parte de ninguna persona natural o jurídica, pública o privada, solicitud de autorización para el desarrollo de actividades con este tipo de Organismos Genéticamente Modificados. Así mismo, ninguna de las entidades de investigación o desarrollo tecnológico (universidades, centros de investigación, etc.) ha solicitado autorización para el desarrollo de actividades de investigación en materia de árboles modificados genéticamente.

2. ¿Su país ha desarrollado una red de discusión o un forum, o un comité al nivel nacional etc., que se encargue de árboles modificados genéticamente?

En Colombia no se han establecido redes o forum que se encarguen de manera específica de la discusión sobre árboles modificados genéticamente. No obstante, a través del Decreto 4525 del 5 de diciembre de 2005 (por el cual se reglamenta la Ley 740 de 2002 que ratificó en Colombia el Protocolo de Cartagena sobre Seguridad en la Biotecnología del Convenio sobre Diversidad Biológica) se crearon el Comité Técnico Nacional de Bioseguridad para Organismos Vivos Modificados con fines agrícolas, pecuarios, pesqueros, plantaciones forestales comerciales y agroindustria, y el Comité Técnico Nacional de Bioseguridad para Organismos Vivos Modificados con fines ambientales. Los dos Comités referidos tienen como objeto, en el ámbito de sus competencias, atender las solicitudes para el desarrollo de actividades de movimiento

transfronterizo, tránsito, manipulación y la utilización de los Organismos Vivos Modificados que puedan tener efectos adversos para el medio ambiente y la diversidad biológica, teniendo en cuenta los riesgos para la salud humana, la productividad y la producción agropecuaria.

En este sentido, el Comité Técnico Nacional de Bioseguridad para Organismos Vivos Modificados con fines agrícolas y pecuarios (en cabeza del Ministerio de Agricultura y Desarrollo Rural y del Instituto Colombiano Agropecuario) se encuentra a cargo de la autorización de solicitudes relacionadas con plantaciones forestales comerciales con árboles modificados genéticamente, en tanto que el Comité Técnico Nacional de Bioseguridad para Organismos Vivos Modificados con fines ambientales (en cabeza del Ministerio de Ambiente, Vivienda y Desarrollo Territorial) se encuentra a cargo de la autorización de solicitudes relacionadas con árboles modificados genéticamente para fines ambientales (como pueden ser, entre otros, restauración ecológica, conservación *ex situ* o *in situ*, introducción de especies exóticas, reintroducción, repoblamiento, etc.). No obstante, para la autorización de solicitudes relacionadas con plantaciones forestales comerciales con árboles modificados genéticamente (competencia del Ministerio de Agricultura y Desarrollo Rural y del Instituto Colombiano Agropecuario) se requiere el concepto favorable del Ministerio de Ambiente, Vivienda y Desarrollo Territorial.

3. ¿Su país tiene directrices o reglamentación para minimizar los impactos de los árboles modificados genéticamente con fines científicos o comerciales?

En Colombia no se han generado directrices o reglamentación específica en relación con árboles modificados genéticamente, ya que la norma marco de Bioseguridad sobre OVM (Decreto 4525 del 5 de diciembre de 2005) incluye bajo su ámbito a este tipo de organismos. Para estos efectos, frente a las solicitudes de desarrollo de actividades con OVM (incluyendo los árboles) la Evaluación de Riesgo se realiza bajo la metodología Caso a caso, teniendo en cuenta además de los aspectos establecidos en el Anexo III del Protocolo de Cartagena, los posibles efectos ambientales, de salud humana, culturales o socioeconómicos que puedan derivarse en el desarrollo de la actividad particular con el OVM objeto de evaluación.

Impactos ambientales, culturales y socioeconómicos de la implementación de cultivos forestales de árboles modificados genéticamente en la conservación y uso sostenible de la diversidad biológica de los bosques.

Aún no se ha determinado si la inserción artificial de genes puede desestabilizar a los organismos, producir mutaciones o hacer que el gen transferido no logre mantenerse estable en la planta en el curso de la generaciones. Una vez se introduce un nuevo gen, también se introduce un gen promotor para activarlo, el cual podría activar u gen dormido en circunstancias no deseadas.

La larga vida de un árbol implica que éste tiene más probabilidades de enfrentar dificultades a raíz del clima o de las plagas que podrían desencadenar respuestas genéticas imprevisibles. El lento crecimiento de los árboles hace que los problemas tarden más en revelarse.

En lo que se refiere a fuga y propagación de genes modificados, estos pueden transmitirse a otros organismos y producir efectos negativos sobre ellos. No se conocen en realidad el alcance de los impactos por lo que es necesario aplicar el criterio de precaución. Puede presentarse una resistencia a posibles plagas y modificaciones de su comportamiento, en especial ampliando su rango de acción sobre organismos diferentes, generando una extinción de poblaciones y la disminución de la diversidad biológica.

En general, se observa que estos organismos pueden reducir la biodiversidad por competencia con las especies silvestres. Pueden llegar a sustituir especies nativas o parientes silvestres que han evolucionado para adaptarse a las presiones ambientales actuales, lo cual es especialmente importante en zonas con endemismos. Los genes pueden experimentar mutaciones que provoquen efectos nocivos y pueden transmitirse a especies que produzcan reacciones peligrosas para la salud humana.

Por otra parte, el dominio de mercado en pocas manos restringe el acceso fácil a comunidades con poder adquisitivo limitado, como por ejemplo las comunidades campesinas. La propiedad privada de los productos mejorados genéticamente y procesos biotecnológicos podrían impedir el acceso a los investigadores nacionales a los diferentes recursos genéticos en sus diferentes manifestaciones.

CZECH REPUBLIC

[13 September 2006]
[SUBMISSION:ENGLISH]

1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?
No, the Czech Republic doesn't have any plantations, neither commercial nor experimental, of genetically modified trees.

If yes, please answer all remaining questions.
If no, please state the reason why:

2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?
No, for instant, the Czech Republic hasn't developed any platform or discussion forum or national committee dealing with genetically modified trees.

If yes, please answer the remaining questions.
If no, please state the reason why:

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?
As far as question 3 is concerned, our response „NO" apparently corresponds with the question in a strict sense. No specific guidelines or regulations on genetically modified trees has been adopted in the Czech Republic yet, but, generally speaking, advanced national biosafety framework and all its components, i.e. legislation, administration, information sharing, education, public awareness and participation, inspection and control have been developed in the Czech Republic recently.

If yes, please list them according to the categories below:
The Act No. 78/2004 Coll., on the Use of Genetically Modified Organisms and Genetic Products came into effect on February 25, 2004. It repeals Act No. 153/2000 that had been in force since January 1, 2001. The Act 78/2004 together with an implementing Decree No. 209/2004 covers the contained use, deliberate release of GMOs into the environment and placing on the market of GMOs as or in products, including the export and import thereof. The Act transposes EU Directives 2001/18/EC and 98/81/EC and the Cartagena Protocol on Biosafety.

If no, please explain the reason why here.

Environmental impacts of genetically modified trees
(Example: effects on native ecosystems, use of herbicide)

Cultural impacts of genetically modified trees
(Example: positive or negative impacts on indigenous and local communities and their traditional knowledge)

Socio-economic impacts of genetically modified trees

(Example: positive or negative effects on quantity, quality and economic value of forest production; positive or negative impacts on livelihoods of communities)

DENMARK

[19 November 2007]
[SUBMISSION:ENGLISH]

1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?

Denmark has no plantations, either commercial or experimental of genetically modified trees.

If yes, please answer all remaining questions.
If no, please state the reason why:
Denmark has not received any applications for the deliberate release of genetically modified trees.

2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?

Denmark has not developed any platform/ platform/discussion forum/national committee etc. dealing with genetically modified trees.

If yes, please answer the remaining questions.
If no, please state the reason why:
Denmark has not seen the need for such measures.

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?

Denmark does not have any specific guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes. An application for the deliberate release of genetically modified trees would be regulated by the provisions of Directive 2001/18 on the deliberate release into the environment and placing on the market of GMOs (Directive 2001/18/EC of the European Parliament and of the Council of 12 March 2001 on the deliberate release into the environment of genetically modified organisms and repealing Council Directive 90/220/EC).

If yes, please list them according to the categories below:
If no, please explain the reason why here:
Denmark has not seen the need for such measures.

ESTONIA

[19 November 2007]
[SUBMISSION:ENGLISH]

1. **Does your country have any plantations, either commercial or experimental, of genetically modified trees?**

If yes, please answer all remaining questions.

If no, please state the reason why: according to available data, there are neither commercial nor experimental plantations of genetically modified trees in Estonia.

2. **Has your country developed any platform/discussion forum/national committee etc dealing with genetically modified trees?**

If yes, please answer all remaining questions.

Estonia does not have any special arrangements for genetically modified trees. This issue belongs under general GMO policy and is regulated similarly to any other GMOs. There has been some discussions about GM trees (in internet based e-mailing list „*loodusaja list*"), but the government has not worked out its special platform or position in regard of GM trees as there has not been any applications or real interest in this regard so far. There have been a couple of cases when scientific institutions have been interested in starting experiments with GM trees, but as soon as they learned about the rules and conditions for getting permit, they gave up and did not start those experiments outside of greenhouses. According to legislation in Estonia, using GM higher plants (incl trees) in contained use does not need any special permit.

Under Ministry of Environment, the Gene Technology Commission has been composed. This is an advisory body to the government and it reviewes all GMO applications (both for contained use and in the environment) and gives advice to the governmental institutions in regard of biotechnology. In principle, and if needed, they would advise government also in regard of GM trees.

If no, please state the reason why:

3. **Does your country have any guidelines or regulations for minimizing the impacts of genetically modifed trees for scientific and/or commercial purposes?**

If yes, please answer all remaining questions.

The use of genetically modified trees is not regulated separately, this issue belongs under GMO legislation together with regulation of other GMHP-s. If somebody wants to release GM trees in Estonia, the permission should be applied for from the Ministry of Environment. As it was said before, the use of GMHPs in contained use does not need any special permit in Estonia. In this case, use of GM trees would be regulated under good laboratory practice and other existing rules.

If no, please state the reason why:

Estonia does not have any guidelines for using GM trees, but it is planned to work out some guidelines for GMHPs in the framework of starting UNEP/GEF Biosafety Framework Implementation Project during years 2006 – 2010.

EUROPEAN COMMUNITY

[19 November 2007]
[SUBMISSION:ENGLISH]

1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?

Not applicable to the European Community. Information on activities in Member States are provided in Member State submissions annexed to the EU submission.

2. Has your country developed any platform/discussion forum/national committee etc. dealing

with genetically modified trees?

There is no platform, discussion forum or committee specifically set up at EC level to deal with GM trees. As explained below, European Community rules on the deliberate release into the environment and placing on the market of GMOs also apply to GM trees. If needed, GM trees can be discussed in regular meetings of the competent authorities under Directive 2001/18/EC or in the Council Working Party on International Environmental Issues (Biodiversity).

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?

The European Communities' strict rules on genetically modified organisms seek to ensure that potentially negative impacts of GM trees are minimised.

The provisions of Directive 2001/18/EC[1] on the deliberate release into the environment and placing on the market of GMOs apply to GM trees, in accordance with the definition of GMOs provided in Article 2. GM trees may only be introduced into the environment in conformity with Part B (research purposes) or Part C (commercial use) of the Directive, respectively. In addition, if one of the expected uses is either food or feed, cultivation of GM trees could be authorised in accordance with the provisions of Regulation 1829/2003[2]. The latter provisions require a prior authorisation to be granted on the basis of a full environmental risk assessment.

Environmental impacts of genetically modified trees

Annex II of Directive 2001/18/EC describes the principles to be followed to perform environmental risk assessments, both for authorisations under the Directive itself and under Regulation 1829/2003. These principles have been supplemented by Commission Decision 2002/623/EC of 24 July 2002[3] providing detailed guidance on the objective, elements, general principles and methodology of the environmental risk assessment. Decision 2002/623/EC makes explicit reference to possible delayed effects of GM trees on health and environment due to their potential longevity, as well as to the importance of taking them into account in the environmental risk assessment.

In addition, Directive 90/219/EEC[4] on the contained use of genetically modified micro-organisms requires that 'containment conditions' are implemented, on the basis of a risk assessment, to ensure the necessary protection of human health and the environment. Member States undertaking contained use activities with GM plants (including GM trees) have transposed the Directive to govern such organisms under containment.

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1 Directive 2001/18/EC of the European Parliament and of the Council of 12 March 2001 on the deliberate release into the environment of genetically modified organisms and repealing Council Directive 90/220/EC

2 Regulation (EC) No 1829/2003 of the European Parliament and of the Council of 22 September 2004 on genetically modified food and feed

3 Commission Decision of 24 July 2002 establishing guidance notes supplementing Annex II to Directive 2001/18/EC of the European Parliament and of the council on the deliberate release into the environment of genetically modified organisms and repealing Council Directive 90/220/EEC (2002/623/EC)

4 Council Directive of 23 April 1990 on the contained use of genetically modified organisms (90/219/EEC), as amended by Council Directive of 26 October 1998

Directives 2001/18/EC and 90/219/EEC include requirements for risk assessments to be carried out taking into account potential adverse effects on environment and health. Provisions for risk assessment are founded on comprehensive scientific evaluations.

Cultural impacts of genetically modified trees

Cultural aspects could be taken into consideration in the risk management phase of decisions on the deliberate release of GM trees, as appropriate.

Socio-economic impacts of genetically modified trees

Socio-economic considerations could be taken into account in the risk management phase of decisions on the deliberate release of GM trees, as appropriate.

Reporting obligations under Directive 2001/18/EC require the Member States to send a report to the Commission every three years on the measures taken to implement the provisions of the Directive. This document includes a brief factual report on their experience with GMOs placed on the market in or as products under this Directive. Furthermore, the Directive requires the Commission send to the European Parliament and the Council, in 2003 and thereafter every three years, a report on the experience of Member States with GMOs placed on the market under this Directive. In 2003, the Commission was requested to include an assessment of the related socio-economic implications. Accordingly, socio-economic issues were addressed in the 2003 report, which referred mostly to coexistence issues, whilst referring to concerns about the possible adverse impacts of the EU regulatory framework on producers in developing countries. Specific implications of GM trees were not identified.

FINLAND

[19 November 2007]
[SUBMISSION:ENGLISH]

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1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?

If yes, please answer all remaining questions.
If no, please state the reason why:

YES, at the moment (June 2006) one experimental plantation of silver birch (*Betula pendula* Roth) for scientific research. Before that, two already finished field studies with transgenic silver birch and one field study where transgenic pollen from Norway spruce, pine and silver birch was used for controlled crossings.

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2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?

If yes, please answer the remaining questions.
If no, please state the reason why:

YES, the following :

Board for Gene Technology

The Board for Gene Technology is constituted by the Gene Technology Act (No.377/1995). In addition to being a national authority in Finland, the Board functions as a competent authority towards the European Community. It processes notifications concerning the use and release of genetically modified organisms as defined in directives **90/219/EEC**, its amendment **98/81/EEC** and **90/220/EEC**, and responds to them within its authority to make legally binding decisions.

The Board aims to promote safe and ethically acceptable use of gene technology and to prevent and avert any harm gene technology may inflict on human health, animals, property or the environment. Its priorities include processing notifications, issuing instructions and regulations, acting as a registration authority, preparing opinions and recommendations, monitoring, restricting or prohibiting the use of potentially dangerous organisms and imposing administrative sanctions to ensure its provisions are complied with.

The Board consists of a chairman, a vice chairman and five members who represent the Ministry of Trade and Industry, the Ministry of Agriculture and Forestry, the Ministry of Social Affairs and Health and the Ministry of the Environment. Ethical expertise shall also be represented on the Board. The Board is appointed for five years by the Council of State.

Advisory Board for Biotechnology

The main duties of the Advisory Board are to promote communication between users of gene technology, to promote research in the field, to follow the development of environmental effects and risk assessment, and to advance information and education in the field of gene technology. The primary task of the Advisory Board is to consider ethical issues, follow public debate on gene technology and improve the public perception of gene technology. Under the Gene Technology Decree (821/1995), the duties of the Advisory Board for Biotechnology are as follows:

1. To promote cooperation between authorities, the research community and research organisations in matters relating to biotechnology and in particular to gene technology;
2. To monitor and promote international cooperation on biotechnology;
3. To follow the progress in biotechnology, biotechnology research and the health and environmental effects of biotechnology;
4. To develop and promote research, information and education in biotechnology;
5. To promote the consideration of ethical issues in biotechnology; and
6. To handle other matters relating to biotechnology assigned by ministries.

The Advisory Board does not give legally binding decisions. The Board may issue opinions by request or on its own initiative. It publishes a journal and organises debates and seminars in the field. The Advisory Board is appointed by the government for a term of three years at a time and is composed of representatives of the research community, public authorities and nongovernmental organisations. When needed, the Board sets up working groups in specific areas: e.g. EC legislation, national regulation of genetic engineering, environmental issues, bioethics, and information services.

www.bioteknologia.info

A contact, information and discussion forum in the form of Www-pages that contain a lot of information on different aspects of biotechnology. The topics include legislation, bioethics, human health, food, environment, global view, and safety issues including also gene technology and transgenic approaches. This info is open to all public and gives an opportunity to discuss biotechnology topics with national

experts and researchers. The www-pages are coordinated and updated as a part of NeoBio programme financed by the Finnish Funding Agency for Technology and Innovation (TEKES).

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3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?

If yes, please list them according to the categories below:
If no, please explain the reason why here:

Environmental impacts of genetically modified trees
(Example: effects on native ecosystems, use of herbicide)
Cultural impacts of genetically modified trees
(Example: positive or negative impacts on indigenous and local communities and their traditional knowledge)
Socio-economic impacts of genetically modified trees
(Example: positive or negative effects on quantity, quality and economic value of forest production; positive or negative impacts on livelihoods of communities)

YES;

National legislation including:

- **The Gene Technology Act** (Geenitekniikkalaki 377/1995)
- **The Gene Technology Decree by the Council of the State** (Valtioneuvoston asetus geenitekniikasta 928/2004)
- **Detailed Decrees by the the Ministry of Social Affairs and Health** (Sosiaali- ja terveysministeriön asetukset 272/2006, 110/2005, 90/2005, 184/2005, 1053/2005)

The Finnish Gene technology Act is based on **the following EU Directives:**

- The Directive 90/219/EEC with its amendment 98/81/EEC and 90/220/EEC
- The Decision by the European Commission 2000/608/EC
- Directive 2001/18/EEC together with the following EU regulations:
    - 2002/813/EEC
    - 2002/812/EEC
    - 2002/811/EEC
    - 2002/623/EEC
    - 2003/701/EEC
    - 2004/204/EEC
    - The Decree by European Commission N:o 65/2004

All the above mentioned legislation and regulations aim at minimizing potential environmental effects of genetically modified trees, and to some extent, also give guidance to socio-economic aspects.

In addition, the leading research funding organization in Finland (the Academy of Finland) has a current ESGEMO Research Programme on Environmental, Societal and Health Effects of Genetically Modified Organisms for the years 2004-2007. The objectives of the ESGEMO Programme are 1) to create new knowledge on environmental and health effects and potential risks of GMOs used in agriculture, aquaculture, forestry, and environmental applications, particularly in boreal conditions; basic knowledge on related ecology and population genetics is emphasised; 2) develop novel tools for research and assessment of the potential impacts of GMOs on nature and its complex processes, and 3) evaluate the socio-economic and technological impacts of the use of GMOs, including ethical considerations and public acceptance of novel biotechnology.

FRANCE

[19 November 2007]
[SUBMISSION:ENGLISH AND FRENCH]

ENGLISH VERSION

1. **Does your country have any plantations, either commercial or experimental, of genetically modified trees?**

Yes - two experimental plots of genetically modified trees (poplars), covering respectively 500 m2 and 1000 m², are currently in place.

2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?

An Internet site on GMOs has been set up by the French Gvt, posted at http://www. ogm.gouv.fr (in French). The aim is to provide information to the general public and civil society organizations on the issue of genetic modification. This inter-ministerial site proposes replies to FAQs. Users can improve their knowledge by consulting thematic sheets (*more about the issue*), existing regulations, on-going / requests for new experiments, and commercial developments in Europe.

The site is not a platform nor a forum for specific discussions on genetically modified trees. GM tree issues are marginal in France and relate only to a limited number of experiment trials conducted by research institutions (less than 10 experimental plots set up between 1989 and 2006).

Since 2003, each application to the ministry of agriculture for the establishment of a GMO field trial is processed through public information and consultation.

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?

Yes, France implements EU legislation (inc. Directives 2001/18/EC and 1999/105). All field trial applications are processes by a Biomolecular Engineering Commission – Commission du Génie Biomoléculaire, an advisory body which may provide recommendations and revisions to applications.

Environmental impacts of genetically modified trees

(Example: effects on native ecosystems, use of herbicide)

To date, the french authorities have received no application for the commercialisation of a GM tree..

As regards ongoing field trials, two experimental plots set up by INRA, for a total area not exceeding 1,500 m², follow strict tending procedures, including annual pruning before flowering, to avoid gene-flow in the environment.

Cultural impacts of genetically modified trees
(Example: positive or negative impacts on indigenous and local communities and their traditional knowledge)
n.a. (the 1,500 m² area is too small to have any significant impact).

Socio-economic impacts of genetically modified trees
(Example: positive or negative effects on quantity, quality and economic value of forest production; positive or negative impacts on livelihoods of communities)
n.a. (the 1,500 m² area is too small to have any significant impact).

FRENCH VERSION:
1. Est-ce que votre pays a des plantations, soit sur une base commerciale ou expérimentale, d'arbres génétiquement modifiés ?

Oui, la France recense actuellement deux plantations expérimentales d'arbres génétiquement modifiés (des peupliers), d'environ 500 et 1000 m².

Si vous avez répondu par l'affirmative, répondez aux questions suivantes:
Si vous avez répondu par la négative, expliquez la raison:

2. Est-ce que votre pays a mis en place une plate-forme, ou un forum de discussion, ou un comité national, etc., pour aborder le sujet des arbres génétiquement modifiés ?
Si vous avez répondu par l'affirmative, répondez aux questions suivantes:
Si vous avez répondu par la négative, expliquez la raison:

L'Etat Français a mis en place un site internet sur les OGM, accessible à l'adresse http://www.ogm.gouv.fr, dont l'objectif est de répondre aux questions posées par la société civile sur les organismes génétiquement modifiés (OGM). Ce site interministériel propose des réponses aux interrogations les plus fréquentes. L'internaute peut approfondir ses connaissances en consultant les fiches thématiques (en savoir plus), les dossiers sur la réglementation, les expérimentations en cours ou à venir, et la mise sur le marché européen.

Ce site ne peut cependant pas être considéré comme étant une plate-forme ou un forum de discussion spécifique sur les arbres génétiquement modifiés. La problématique « arbres forestiers génétiquement modifiés » est très marginale en France et ne concerne qu'un nombre très limité d'expériences conduites par des organismes scientifiques (moins de 10 entre 1989 et 2006).

Précisons que, depuis 2003, pour chaque demande d'autorisation d'une expérimentation en plein champ adressée au ministère de l'agriculture et de la pêche, une information et une consultation du public est réalisée par ce ministère.

3. Est-ce que votre pays a développé des lignes directrices ou des réglementations, à des fins scientifiques et/ou commerciales, pour minimiser les impacts des arbres génétiquement modifiés ?
Si vous avez répondu par l'affirmative, veuillez les lister selon les catégories suivantes:
Si vous avez répondu par la négative, expliquez la raison:

Oui, la France applique la réglementation communautaire et notamment les directives 2001/18/CE (relative à la dissémination volontaire d'organismes génétiquement modifiés dans l'environnement) et 1999/105 (relative à la commercialisation des matériels forestiers de reproduction). Tous les dossiers de demande d'autorisation d'une expérimentation sont examinés par la Commission de génie biomoléculaire, qui peut assortir son avis de recommandations ou de prescriptions.

Impacts sur l'environnement des arbres génétiquement modifiés

(Exemples: impacts sur les écosystèmes indigènes, utilisation d'herbicides, etc.)

A ce jour, aucune demande d'admission d'arbres génétiquement modifiés, en vue de la commercialisation, n'est intervenue en France.

S'agissant des expérimentations en plein champ, les deux expérimentations conduites actuellement par l'INRA, sur 1 500 m² au total, font l'objet d'un cahier des charges très strict, qui impose notamment l'élagage avant floraison, afin d'éviter toute pollinisation et dissémination dans le milieu naturel.

Impacts culturels des arbres génétiquement modifiés
(Exemples: impacts positifs ou négatifs sur les communautés indigènes ou locales, sur leur mode de vie ou sur leur savoir traditionnel)
Sans objet (en dehors des 1 500 m² mentionnés plus haut)

Impacts socio-économiques des arbres génétiquement modifiés
(Exemples: effets positifs ou négatifs sur la quantité de production forestière, la qualité et la valeur économique de la production forestière ; ou impacts positifs ou négatifs sur les modes de subsistance des communautés).
Sans objet (en dehors des 1 500 m² mentionnés plus haut).

GERMANY

[30 August 2006]
[SUBMISSION:ENGLISH]

1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?

If yes, please answer all remaining questions.
If no, please state the reason why:

NO commercial release

YES, we have/had four **experimental (field) releases** of poplar (Populus tremula x P. tremuloides, Populus tremula x P. alba) for scientific research between 1996 and 2005 (see also Annex I containing a study by various contractors on behalf of the Federal Agency for Nature Protection: "Basic studies for the risk assessment of the deliberate release of genetically modified woody plants" (English translation) and Annex II containing a referenced list of several studies under the German Biosafety Research Programme).

2. Has your country developed any platform/discussion forum/national committee etc. dealing

with genetically modified trees?

If yes, please answer the remaining questions.
If no, please state the reason why:

NO specific committee dealing with GM-trees only. However, the national Commission for Biosafety (ZKBS) is giving scientific advice with regard to the biosafety of genetically modified organisms.

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3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?

If yes, please list them according to the categories below:
If no, please explain the reason why here:

Environmental impacts of genetically modified trees
(Example: effects on native ecosystems, use of herbicide)
Cultural impacts of genetically modified trees
(Example: positive or negative impacts on indigenous and local communities and their traditional knowledge)
Socio-economic impacts of genetically modified trees
(Example: positive or negative effects on quantity, quality and economic value of forest production; positive or negative impacts on livelihoods of communities)

YES;

National legislation including:

- **The Gene Technology Act**

The German Gene Technology Act implements the respective EU Directives and Regulations (to be submitted by the European Commission) with regard to any genetically modified organism.

HUNGARY

[13 September 2006]
[SUBMISSION:ENGLISH]

1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?
No.
Only one application for permit has arrived until now, but the competent authorities rejected it because of environmental reasons. This application for permit for plantations of genetically modified poplar trees was submitted on 18 March 2003.

2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?
No.
Due to the low number of requests for plantations of genetically modified trees, there has been no need for developing a special platform, discussion forum or national committee dealing with GM trees.

However, Hungary has an independent Gene Technology Advisory Committee, which deals with genetically modified organisms including GM trees. The composition of the Gene Technology Advisory Committee is as follows:

- the President of the Hungarian Academy of Sciences shall delegate five members;
- the Minister for Agriculture and Rural Development, the Minister of Economy and Transport, the Minister of Environment and Water, the Minister of Education, the Minister of Health, Social and Family Affairs and the Managing Director of the National Committee for Technological Development shall delegate one representative each;
- the non-governmental organizations of environmental protection purpose shall altogether delegate four representatives; and
- the non-governmental organizations of health protection purpose shall altogether delegate two representatives.

This Committee delivers scientific opinion on the notifications considering the potential adverse effects on human and animal health and the environment. Afterwards, the gene technology authority shall decide about the application for permit taking into consideration the opinion of the Gene Technology Advisory Committee. The gene technology authority may reject the application for permit despite the positive opinion of the Gene Technology Advisory Committee.

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?

Yes.
Hungary has legislation in place for minimizing the impacts of any kind of genetically modified organisms including GM trees, namely Act No. XXVII of 1998 on gene technology activities. Additionally, there are several regulations for its implementation, all of which are in line with the European Community legislation. The above Act applies to the genetic modification of natural organisms and the contained use, deliberate release into the environment, commercialization, import, export and transportation of genetically modified organisms and products thereof.

All of the guidelines of the EC on risk assessment and risk management are applicable in Hungary.

Annex I. of the Joint Decree of the Ministry of Agriculture and Rural Development and the Ministry of Economy and Transport No. 142/2004. (IX.30) on certain rules of the gene technology activity in the field of agriculture and industry contains the principles of environmental risk assessment.

INDIA

[25 September 2006]
[SUBMISSION:ENGLISH]

1.Does your country have any plantations, either commercial or experimental, of genetically modified trees? (If yes, please answer the remaining questions, If no, please state the reason why.)

There are no plantations, either commercial or experimental of genetically modified trees.

However, the Institute of Forest Genetics and Tree Breeding (IFGTB) in Coimbatore, is conducting research on transgenic trees (eucalyptus, casuarina), which is in laboratory stage.

India has put in place a well-defined regulatory system at the national level for genetically modified organisms through the Rules for the Manufacture, Use, Import, Export and Storage of Hazardous micro-oranisms Genetically engineered organisms or cells, enacted in 1989 under the Environment (Protection) Act, 1986. In accordance with the 1989 Rules, the IFGTB has set up an Institutional Biosafety Committee (IBSC) which meets twice a year to review the activities of their transgenic programme. The IBSC submits its report to the competent Review Committee on Genetic Manipulation (RCGM) set up at the national level under the 1989 Rules.

2.Has your country developed any platform/discussion forum / national committee etc. dealing with genetically modified trees?

3.Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and / or commercial purposes?

IRELAND

[19 November 2007]
[SUBMISSION:ENGLISH]

1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?

Ireland has no plantations of genetically modified trees. There is no policy in Ireland to allow for the planting of GMO trees.

If yes, please answer all remaining questions.
If no, please state the reason why:

2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?

If yes, please answer the remaining questions.
If no, please state the reason why:

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?

If yes, please list them according to the categories below:
If no, please explain the reason why here:

ITALY

[19 November 2007]
[SUBMISSION:ENGLISH]

1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?

In the framework of CONECOFOR Programme, it's being carried out by Italy the GMO & BIODIVERSITY Project, co-financed on the basis of Reg. CE no.2152/2003 Forest Focus and concerning some trials on specimens of *Prunus avium*, *Olea europea* and *Vitis vinifera*, respectively the first and the second at Tuscia University of Viterbo, and the third one at Ancona University.

2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?

2001/18/CE Directive was incorporated within Italian legislation with D. Lgs. 224/2003. Ministry of Environment, Territory Protection and Sea of Italy is the National Competent Authority (ANC) on OGM matters; that Authority is supported by an Interministerial Assessment Commission (CIV) with regard to acceptance and evaluation of related applications.

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?

D. Lgs. 224/2003 has fixed the promulgation of a specific national law, containing guidelines for risk assessment on agricultural biodiversity, agricultural systems and agricultural and food- row.
At the moment, 21 technical protocols are being approved by a Technical Coordination Committee established in Ministry of Agricultural, Food and Forests Policies of Italy (MIPAAF); these protocols also regard specimens of *Prunus avium, Olea europea, Vitis vinifera, Malus pupila, Populus spp, Prunus domestica, Citrus spp.*

LATVIA

[19 November 2007]
[SUBMISSION:ENGLISH]

2. Does your country have any plantations, either commercial or experimental, of genetically modified trees?

If yes, please answer all remaining questions.
If no, please state the reason why:

To date, having regard available data, there are neither commercial nor experimental plantations of genetically modified trees (hereinafter-GM trees) in Latvia.

3. **Has your country developed any platform/discussion forum/national committee etc dealing with genetically modified trees?**

If yes, please answer all remaining questions.
If no, please state the reason why:

There is no **specific** platform, discussion forum or committee set up in Latvia to deal with GM trees.

The government has not elaborated specific platform or position to deal with GM trees as there have not been any applications or real interest in this regard so far.

No one scientific institution has been interested in starting experiments with GM trees, thereby no one application has been submitted to the Competent Authority to get permit and start experimental release of GM trees.

The Food and Veterinary service established scientific Committee which serves as an advisory body with respect to scientific evaluation of all GMO applications (contained use, deliberate release into the environment and placing on the market).

The Ministry of Agriculture is responsible for coordination of the National GMO Working Group activities with regard to elaboration and presentation of the national positions in the field of GMO and biotechnology. In principle, if needed, the issue of GMO trees could be discussed there and national position will be prepared and adopted by the Cabinet of Ministres of the Republic of Latvia.

There is possibility for all Member States if needed to raise and discuss this issue in regular meetings of the competent authorities under Directive 2001/18/EC or in the Council Working Party on International Environmental Issues (Biodiversity).

4. **Does your country have any guidelines or regulations for minimizing the impacts of genetically modifed trees for scientific and/or commercial purposes?**

Latvia does not have any guidelines for using GM trees.

European Community rules on the deliberate release into the environment and placing on the market of GMOs which fully implemented into national legislation also apply to GM trees.

In accordance with the definition of GMOs provided in Article 2 of Directive 2001/18/EC GM trees may only be introduced into the environment in conformity with Part B (research purposes) or Part C (commercial use) of the Directive, respectively. The provisions require a prior authorisation to be granted on the basis of a full environmental risk assessment.

The Directive 90/219/EEC provisions to undertake contained use activities with GM plants (including GM trees) have been transposed into the National legislation as well.

The national Regulation includes requirements for risk assessments to be carried out taking into account potential adverse effects on environment and health. Cultural and socio-economic impacts of genetically modified trees could be taken into consideration in the risk management phase of decisions on the deliberate release of GM trees, as appropriate.

LITHUANIA

[19 November 2007]
[SUBMISSION:ENGLISH]

1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?
No, the Lithuania doesn't have any plantations, neither commercial nor experimental, of genetically modified trees.

If yes, please answer all remaining questions.
If no, please state the reason why:

2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?
No, for instant, the Lithuania hasn't developed any platform or discussion forum or national committee dealing with genetically modified trees.

If yes, please answer the remaining questions.
If no, please state the reason why:

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?
As far as question 3 is concerned, our response „NO" apparently corresponds with the question in a strict sense. No specific guidelines or regulations on genetically modified trees has been adopted in the Lithuania yet, but, generally speaking, advanced national biosafety framework and all its components, i.e. legislation, administration, information sharing, education, public awareness and participation, inspection and control have been developed in the Lithuania recently.

If yes, please list them according to the categories below:
The *Law on GMOs* was adopted on June 12, 2001, (No. IX-375, amended on March 20, 2003 by the order No. IX-1384 and on June 22, 2006 by the order No. X-720) legally came into force since 31 of December 2002.
Lithuania has developed and approved variety of orders under the Law. The main legal measures include:
– *Order on Regulation of Risk Assessment on GMOs* adopted by the order No. 681/689/525/753 of the Ministers of Environment, Agriculture, Health and the Director of State Food and Veterinary Service in December 2002, amended in 2004. The order establishes the main principles, methods and performance procedures for the activities related to the risk assessment of GMOs and GMPs, consisted of GMOs, posed to the human and animal health, environment and agriculture.
– *Order on Regulation on Public Information and Participation in Issuing of Consents for Use of GMOs* adopted by the order No. 299 of the Minister of Environment on June 11, 2003, amended on December 30, 2005 by the order No. D1-660. The order applies for the parties (natural and legal persons, public institutions) involved in the process of information and participation during the notification and permitting to use the GMOs and GMPs in the Republic of Lithuania. It declares the rights and duties of notifier to inform public announcing the intention to use GMOs or GMPs, inviting to express and deliver comments on the application and preliminary decision taken on each specific case.
– *Establishing of the Steering Committee on GMOs* adopted by the order No. 602 of the Minister of Environment on December 18, 2001 (amended on March 20, 2003 by the order No. 127 and on February 28, 2005 by the order No. D1-110). The Steering Committee on GMOs is a political advisory body for the development and enforcement of national regulatory system with respect to biosafety issues. This

Committee consists of members appointed by relevant state authorities, the subordinated organizations, national biotech industry, non-governmental organizations, universities, scientific institutes.
– *Establishing of the Experts Committee on GMOs* adopted by the order No. 198 of the Minister of Environment on April 25, 2003. The Experts Committee on GMOs is a consultative advisory body with clear task to act as an advisor to the competent authority. The national Experts Committee on GMOs is formed taking into account the risk assessment requirements from scientific staff of the following specializations: genetics, ecology, botany, health care, agriculture, veterinary, biochemistry, geochemistry, microbiology and some others.
– *Regulation on GMOs Deliberate Release into the Environment, Placing on the Market* adopted by the order No. D1-225 of the Minister of Environment on April 29, 2004. The overall objective of this order is to regulate use and control requirements on GMOs and GMPs deliberate release into the environment, placing on the market in the Republic of Lithuania.
– *Order on Regulation on Contained Use of Genetically Modified Microorganisms* adopted by the order No. 413 of the Minister of Environment on August 4, 2003 (amended on April 29, 2004 by the order No. D1-233 and on March 4, 2005 by the order No. D1-130). The overall objective of this legal act: enable current and potential users to participate in the world GMOs research and development market, to ensure safe use of GMOs in contained use, thus protecting human health and environment from possible negative harmful effects posed by GMOs.
– *Order on Regulation on Preparation of Monitoring Plan of GMOs after the Placing on the Market* adopted by the order No. 601 of the Minister of Environment on December 1, 2003.
– *Order on Regulation on GMOs database* adopted by the order No. D1-542 of the Minister of Environment on October 18, 2004.
– *Order on Control of GM plants and plants products subject to phytosanitary control and not intended for human consumption and animal feed and propagating material of GM plants* adopted by the order No. 3D-515 of the Minister of Agriculture on September 14, 2004, amended on August 21, 2006 by the order No. 3D-343.
– *Resolution on the Reports to the European Commission Concerning EU Environment Division Legislation Implementation, and Information Needed to the Report to the European Environment Agency* adopted by the Government of the Lithuanian Republic in April 2004.
– *Environmental Protection Validity for the State Regulatory Officials* provided by the order No. D1-445 of the Minister of Environment on August 20, 2004.
– *Code on Administrative Right's Violation* adopted by the Parliament (Seimas) of the Republic of Lithuania in 2004, amended in 2006.
The Cartagena Protocol on Biosafety was ratified on September 18, 2003, at the Parliament (Seimas) of the Republic of Lithuania by adopting the *Law on Ratification of the Cartagena Protocol on Biosafety to the Convention on Biological Diversity*.

If no, please explain the reason why here.

Environmental impacts of genetically modified trees
(Example: effects on native ecosystems, use of herbicide)

Cultural impacts of genetically modified trees
(Example: positive or negative impacts on indigenous and local communities and their traditional knowledge)

Socio-economic impacts of genetically modified trees
(Example: positive or negative effects on quantity, quality and economic value of forest production; positive or negative impacts on livelihoods of communities)

LUXEMBURG

[19 November 2007]
[SUBMISSION:ENGLISH]

1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?

No.

2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?

There is no specific platform that is specifically dealing with genetically modified trees. The topic was raised in 2006 in the forum established to elaborate a National Plan for Nature Protection (PNPN).

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?

No specific legislation and guidelines so far. Measure 8.2 of PNPN stipulates to strive for the interdiction of the use of genetically modified trees in forestry in Luxembourg. This measure was approved by all stakeholders.

Environmental impacts of genetically modified trees
(Example: effects on native ecosystems, use of herbicide)

Cultural impacts of genetically modified trees
(Example: positive or negative impacts on indigenous and local communities and their traditional knowledge)

Socio-economic impacts of genetically modified trees
(Example: positive or negative effects on quantity, quality and economic value of forest production; positive or negative impacts on livelihoods of communities)

MAURITIUS

[19 August 2006]
[SUBMISSION:ENGLISH]

1. Does your country have any plantations, either commercial or experimental, of genetically modified trees? *No*

If yes, please answer all remaining questions.

- If no, please state the reason why: *Interest has not been really shown locally for genetically modified trees.*

2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees? *Yes; not specifically for genetically modified trees. A National Biosafety Committee has been set up dealing with genetically modified crops in general.*

If yes, please answer the reaming questions.
If no, please state the reason, why:

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes? *A legislation, namely the GMO Act 2004 is in place. Regulations under the Act (including those related to minimizing impacts) have been developed and are at Draft stage at the Ministry's level.*

If yes, please list them according to the categories below:
If no, please explain the reason why here:

Environmental impacts of genetically modified trees
(Example: effects on native ecosystems, use of herbicide)
Regulations under the GMO Act are being developed, taking care of environmental impacts of GMOs in general.

Cultural impacts of genetically modified trees
(Example: positive or negative impacts on indigenous and local communities and their traditional knowledge)

Not really relevant to Mauritius

Socio-economic impacts of genetically modified trees
(Example: positive or negative effects on quantity, quality and economic of forest production; positive or negative impacts on livelihoods of communities)

Forest production is not commercially done by planters and/or private landowners. Not relevant to our context.

1. ***Does your country have any plantations, either commercial or experimental, of genetically modified trees ?*** No
If yes, please answer all remaining questions:
If no, please state the reason why : Most of our plantations are created from seeds collected locally

2. ***Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees ?*** No
If yes, please answer the remaining questions.
If no, please state the reason why : No, Mauritius has not dealt with genetically modified trees as yet

3. ***Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes ?***
Yes, in 2004, the Genetically Modified Organisms Act was passed. The act makes provision for a National Biosafety Committee. One of the functions of the Committee is to publish guidelines and a code of practice for all uses of genetically modified organisms.
If yes, please list them according to the categories below :
If no, please explain the reason why here :
Environmental impacts of genetically modified trees
(Example : effects on native ecosystems, use of herbicide)
The Act makes provision for a prohibition notice in case the facility or the manner in which the facility is carrying on its activities involves a serious risks to environment or to human or animal health
Cultural impacts of genetically modified trees
(Example : positive or negative impacts on indigenous and local communities and their traditional knowledge)
Not applicable
Socio-economic impacts of genetically modified trees
(Example : positive or negative effects on quantity, quality and economic value of forest production; positive or negative impacts on livelihoods of communities)
Not applicable

MEXICO

[22 September 2006]
[SUBMISSION:SPANISH]

1. **¿Su país tiene plantaciones, comerciales o experimentales, de árboles modificados genéticamente?**

No, no se han recibido solicitudes para la plantación de árboles genéticamente modificados por parte de ningún grupo de investigación o empresa.

2. **¿Su país ha desarrollado una red de discusión o un forum, o un comité al nivel nacional etc. que se encargue de árboles modificados genéticamente?**

No específicamente para árboles genéticamente modificados, pero existe un Subcomité Especializado de Medio Ambiente (SEMA) en donde se han discutido y analizado aspectos relativos a la liberación al ambiente de OVM incluyendo árboles. Adicionalmente existe un Grupo de Discusión en Bioseguridad en donde participan distintos sectores del gobierno, empresas y de la sociedad civil para discutir diversos aspectos, tanto científicos como sociales y económicos de los OVMs.

3. **¿Su país tiene directrices o reglamentación para minimizar los impactos de los árboles modificados genéticamente con fines científicos o comerciales?**

No existe una reglamentación particular para minimizar impactos de los árboles genéticamente modificados, aunque existen diversas disposiciones jurídicas de aplicación en todo nuestro país como son :

- Ley de Bioseguridad de Organismos Genéticamente Modificados;
- Ley General de Desarrollo Forestal Sustentable;

- Reglamento de la Ley General de Desarrollo Forestal Sustentable;
- Ley de Desarrollo Rural Sustentable.
- Ley General del Equilibrio Ecológico y Protección al Ambiente (de manera general)

A continuación enlistamos los artículos directamente relacionados al tema:

Ley de Bioseguridad de Organismos Genéticamente Modificados[1]
(Diario Oficial de la Federación, DOF 18 marzo 2005)
Toda la Ley, con especial énfasis en los artículos 4, 7, 12, 14, 30 fracción V.

Ley General de Desarrollo Forestal Sustentable[2]
(DOF 25 febrero del 2003)

ARTICULO 2. *Son objetivos generales de esta Ley:*
III. Desarrollar los bienes y servicios ambientales y proteger, mantener y aumentar la biodiversidad que brindan los recursos forestales;
V. Respetar el derecho al uso y disfrute preferente de los recursos forestales de los lugares que ocupan y habitan las comunidades indígenas, en los términos del artículo 2 fracción VI de la Constitución Política de los Estados Unidos Mexicanos y demás normatividad aplicable.

ARTICULO 7*. Para los efectos de esta Ley se entenderá por:*
XXXVI. Secretaría: La Secretaría de Medio Ambiente y Recursos Naturales;

ARTICULO 101*. La colecta y uso de recursos biológicos forestales con fines de utilización en investigación y/o biotecnología requiere de autorización por parte de la Secretaría.*
La autorización a que se refiere este artículo sólo podrá otorgarse si se cuenta con el consentimiento escrito previo, expreso e informado, del propietario o legítimo poseedor del predio en el que el recurso biológico forestal se encuentre.

Reglamento de la Ley General de Desarrollo Forestal Sustentable[3]
(DOF 21 febrero 2005)

ARTÍCULO 65. *Las personas interesadas en obtener autorizaciones de colecta biotecnológica con fines comerciales deberán solicitarlo mediante el formato que expida la Secretaría, el cual contendrá lo siguiente:*

I. Nombre, denominación o razón social, nacionalidad y domicilio del solicitante;
II. Objetivo de la colecta del recurso biológico forestal;
III. Descripción del proyecto, duración y aplicación final de los recursos biológicos recolectados;
IV. Vigencia;
V. Nombre del personal técnico y operativo designado para realizar la colecta;
VI. Métodos, técnicas y equipo para la colecta;
VII. Circunscripción territorial de la colecta, a nivel nacional, regional, estatal o local, en la que se señalen los sitios específicos donde se llevará a cabo;
VIII. Descripción del recurso biológico forestal por recolectar, en la que se indique tipo, cantidad y volumen, incluyendo el nombre científico y común de las especies, y
IX. Lugar de destino final del material recolectado.

Junto con la solicitud deberá presentarse currículum vitae y cédula profesional del responsable del proyecto, y original o copia certificada del instrumento jurídico donde conste que el propietario o legítimo poseedor del predio fue informado del objetivo de la colecta del recurso biológico forestal y de su utilización, así como su consentimiento expreso. En su caso, documentos con los que se acredite el respaldo o apoyo de instituciones científicas o académicas interesadas en el proyecto, así como el convenio a que se refiere el artículo 102, párrafo segundo, de la Ley, de conformidad con las disposiciones aplicables.
En el caso de ejidos y comunidades, se deberá presentar original o copia certificada del acta de asamblea en la que conste su consentimiento para realizar la colecta, en términos de lo dispuesto en el párrafo anterior, inscrita o en trámite de inscripción en el registro que corresponda, así como copia simple para su cotejo.
Cuando se trate de terrenos nacionales forestales, la autoridad competente otorgará dicho consentimiento de conformidad con las disposiciones aplicables.

Cuando la colecta se realice por entidades públicas de los gobiernos federal, estatales o municipales, o bien, por el dueño del recurso, bastará con que se presente el aviso respectivo ante la Secretaría ajustándose a la Norma Oficial Mexicana correspondiente y acreditando que se cuenta con el consentimiento del propietario forestal.

ARTICULO 102. *Las colectas y usos con fines comerciales o científicos de los recursos biológicos forestales deberán reconocer los derechos de las comunidades indígenas a la propiedad, conocimiento y uso de las variedades locales. El registro y certificaciones de los recursos genéticos forestales o de formas modificadas de las mismas, así como las patentes obtenidas por personas físicas o morales, será jurídicamente nulo, sin el reconocimiento previo indicado, salvo lo acordado en los tratados y convenios internacionales relativos a la materia.*
Cuando además se pretenda aprovechar los conocimientos de los pueblos y comunidades indígenas sobre los recursos biológicos forestales, deberá reconocerse la propiedad del conocimiento de los pueblos indígenas y presentar un convenio celebrado entre el solicitante de la autorización a que se refiere el artículo anterior y la comunidad titular del conocimiento, en el que se acredite que se cuenta con el consentimiento previo, expreso e informado de ésta.
Podrá revocarse el permiso correspondiente si se acredita que no se satisficieron los requisitos mencionados.

ARTICULO 103. *También se requerirá de autorización por parte de la Secretaría, cuando se trate de la colecta de especies forestales maderables y no maderables con fines de investigación científica, cuyos términos y formalidades se estipularán en las normas oficiales mexicanas que se expidan, así como en las demás disposiciones administrativas que resulten aplicables.*
En todo caso y cuando sea del interés y aprovechamiento de la Nación, se deberá garantizar que los resultados de la investigación estén a disposición del público.
Las autorizaciones correspondientes a solicitudes que contemplen la manipulación o modificación genética de germoplasma, para la obtención de organismos vivos genéticamente modificados con fines comerciales, deberán contar previamente con el dictamen favorable de la Secretaría y se sujetarán en su caso, a lo biodiversidad y en especial aquéllas de interés científico, biotecnológico o comercial;

Ley de Desarrollo Rural Sustentable[4]
(DOF 7 diciembre del 2001)

ARTÍCULO 3º..- *Para los efectos de esta Ley se entenderá por:*
XXI. Organismos Genéticamente Modificados. *Cualquier organismo que posea una combinación de material genético que se haya obtenido mediante la aplicación de biotecnología moderna;*

ARTÍCULO 4º..- *En relación con los organismos genéticamente modificados, el Gobierno Federal, a través del organismo especializado en dicha materia, promoverá y regulará la investigación, y en su caso, será responsable del manejo y la utilización de tales materiales, con observancia estricta de los criterios de bioseguridad, inocuidad y protección de la salud que formule el Ejecutivo Federal con la participación de las dependencias y entidades competentes y de los productores agropecuarios en el marco de la legislación aplicable.*

ARTÍCULO 91.- *En materia de sanidad vegetal, salud animal y lo relativo a los organismos genéticamente modificados, la política se orientará a reducir los riesgos para la producción agropecuaria y la salud pública, fortalecer la productividad agropecuaria y facilitar la comercialización nacional e internacional de los productos.*
Para tal efecto, las acciones y programas se dirigirán a regular la importación, tránsito y manejo de organismos genéticamente modificados, a evitar la entrada de plagas y enfermedades al país, en particular las de interés cuarentenario; a controlar y erradicar las existentes y a acreditar en el ámbito nacional e internacional la condición sanitaria de la producción agropecuaria nacional.
Las acciones y programas que llevarán a cabo las dependencias y entidades competentes se ajustarán a lo previsto por las leyes federales y las convenciones internacionales en la materia.

ARTÍCULO 95.- *La Comisión Intersecretarial, con la participación del Consejo Mexicano, propondrá, a la Secretaría de Relaciones Exteriores, la adhesión a los tratados e instrumentos internacionales que resulten necesarios en asuntos de sanidad agropecuaria y de organismos genéticamente modificados; asimismo, podrá promover acuerdos tendientes a la armonización y equivalencia internacional de las disposiciones fitozoosanitarias.*

ARTÍCULO 97.- *Se consideran de interés público las medidas de prevención para que los organismos de origen animal y vegetal genéticamente modificados sean inocuos para la salud humana, por lo que el Gobierno Federal establecerá los mecanismos e instrumentos relativos a la bioseguridad y a la producción, importación, movilización, propagación, liberación, consumo y, en general uso y aprovechamiento de dichos organismos, sus productos y subproductos, con la información suficiente y oportuna a los consumidores.*
En caso de presunción de riesgo fitozoosanitario o de efectos indeseados del uso de organismos genéticamente modificados, ante la insuficiencia de evidencias científicas adecuadas, las orientaciones y medidas correspondientes seguirán invariablemente el principio de precaución.
Esta materia se regulará por las leyes, reglamentos y normas específicas que al respecto aprueben el Congreso de la Unión y el Ejecutivo Federal.

ARTÍCULO 102.*- El Servicio Nacional de Inspección y Certificación de Semillas tendrá los siguientes objetivos:*
V. Instrumentar las medidas de inspección y certificación para garantizar la inocuidad de los organismos genéticamente modificados, en los términos del artículo 97.

NETHERLANDS

[19 November 2007]
[SUBMISSION:ENGLISH]

1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?

Yes; one case of an experimental deliberate release of GM apple trees,
permit IM 04-002.

2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?

There is no specific platform that is specifically dealing with genetically modified trees. GM trees are dealt with within the framework of de EU Directive 2001/18/EC. Any commercial release would be covered by EU procedures under Directive 2001/18/EC and the Regulation EC/1829/2003.

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?

No specific legislation and guidelines. GM trees are however covered by
2001/18/EC, that is implemented in Dutch legislation by a Decree on genetically modified organisms, and accompanying secondary legislation and guidelines. The Committee on genetic modification (COGEM) advises the competent authority for 2001/18/EC in all matters concerning GMOs, including GM trees.

Environmental impacts of genetically modified trees

(Example: effects on native ecosystems, use of herbicide)

Covered for all GMOs by the permitting procedures of the CA for 2001/18/EC. Any commercial release would be covered by EU procedures under Directive 2001/18/EC and the Regulation EC/1829/2003.

Cultural impacts of genetically modified trees
(Example: positive or negative impacts on indigenous and local communities and their traditional knowledge)

Socio-economic impacts of genetically modified trees
(Example: positive or negative effects on quantity, quality and economic value of forest production; positive or negative impacts on livelihoods of communities)

The Advisory Committee COGEM has a standing sub-committee discussing and reporting on the ethical and socioeconomic aspects of GMOs in general.

NEW ZEALAND

[30 August 2006]
[SUBMISSION:ENGLISH]

This document is provided in the context of decision VIII/19 B paragraph 3, in which

> *the Conference of the Parties to the Convention on Biological Diversity requested the Executive Secretary to collect and collate existing information on genetically modified trees, in order to allow the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA), at its 13th meeting, to consider and assess the potential environmental, cultural, and socio-economic impacts of genetically modified trees on the conservation and sustainable use of forest biological diversity.*

In the subsequent paragraph of the same decision, Parties, other Governments and relevant organizations, including indigenous and local communities, as well as relevant stakeholders were invited to provide relevant views and information to the Secretariat for inclusion in this assessment.

The following submission is designed to provide information on current work on genetically modified trees in New Zealand, and the regulatory system for assessing and managing the potential risks of that work, including risks to biodiversity. We note that notification 2006-027 describes the questionnaire as "the first step" in the preparation of an assessment on genetically modified trees, and does not specifically invite a submission of New Zealand views in accordance with decision VIII/19B, paragraph 4. We look forward to the opportunity to provide views on what guidance the CBD might provide on genetically modified trees at a later date.

NEW ZEALAND'S SUBMISSION

New Zealand in its submission has provided a response to the specific questions posed by the CBD Secretariat on the issue of genetically modified trees. We have also provided additional information that is relevant to the consideration and assessment of the SBSTTA on the potential impacts of genetically modified trees on the conservation and sustainable use of forest biological diversity.

The submission from New Zealand is set out as follows:

1 Background

- Why genetically modify trees ?
- Overview of forestry in New Zealand, covering conservation forests, indigenous forests and plantation forestry;
- Regulation of genetic modification in New Zealand;
- Biotechnology and forest-related research

2 Responses to the specific questions posed in the questionnaire.

New Zealand's answers to the specific questions posed by the Secretariat in its questionnaire needs to be read in conjunction with the background information provided in this submission.

BACKGROUND

Why Genetically Modify Trees ?

New Zealand would note that there will potentially be interest in genetically modifying trees for a number of reasons. These include for timber production purposes, to ensure adaptation to differing environmental conditions and also for food (for example fruit and nuts) and fibre production purposes.

Overview of Forestry in New Zealand

Types of Forest

Forestry in New Zealand, unlike many countries, is characterized by a clear separation between commercial production forests and natural indigenous forests. Forests cover 8.2 million hectares, or 30% of New Zealand's land area. Of this, 6.4 million hectares are indigenous forest and 1.8 million hectares are commercial production planted forests of exotic timber species.

New Zealand's production forests largely comprise privately-owned planted forests. The government is the major natural forest owner. Through the Department of Conservation, the government of New Zealand manages about 77% of the natural forest estate for conservation, heritage and recreational purposes. There is no timber production from this conservation estate.

Twenty one percent[5] of the natural, indigenous forest estate is in private or Maori[6] ownership and, of this area, less than 10% is used for timber production purposes.

Despite this clear separation of forest types for their predominant uses, there are some instances where the forest types are effectively mixed. Some of our planted production forests have an understory of native species, which is encouraged through good management practices. Also, some planted forests are established between discrete areas of conserved indigenous forests, the result being mixed patterns of continuous forest use.

Forestry Legislation and Policy Background

5 The 2% balance is in miscellaneous reserves etc.

6 The indigenous people of New Zealand.

New Zealand has a number of policy strategies, related legislation and voluntary mechanisms that are relevant to the management of forestry in New Zealand. Government policies and legislation, in conjunction with non-government organisation (NGO) and sector accords and codes of practice, have consolidated environmental standards and sustainable forest management (SFM) practices.

Legislation

The key mechanism is the Resource Management Act 1991 (RMA), which was established to provide a coherent framework for environmental and resource management in New Zealand. At its heart, the RMA requires the sustainable management of natural and physical resources[7].

Underlying the RMA is the concept of integrated environmental management. Since the RMA was enacted, successive governments have continued to refine these strategies based on :

- principles covering sustainable management of natural and physical resources;
- integration of environmental, social and economic values;
- consideration of both regional and global environmental impacts; and,
- imposing the least cost on both the economy and the environment.

Part IIIA of the Forests Act 1949, introduced in 1993, covers the sustainable management of indigenous forests in private ownership and gives owners of private indigenous forests options for managing their forests in order to harvest and mill timber.

The management of forests in protected areas is governed by the relevant legislation – the National Parks, Reserves, Conservation and Wildlife Acts. With very minor exceptions, harvest of timber is not permitted in protected areas, and forests are managed for their heritage and public recreation values.

Voluntary Mechanisms

Voluntary mechanisms for the management of forests in New Zealand include the New Zealand Forest Accord 1991 and the Principles for Commercial Plantation Forest Management in New Zealand.

The New Zealand Forest Accord 1991 is an agreement between non-government forest industry and environmental organisation representatives and was signed in 1991, by members of New Zealand's Forest Owners' Association and several conservation groups.

It recognises the important heritage values of indigenous forests and the need for their conservation, maintenance and enhancement. The Accord recognises the role of commercial planted forests and the need for protection and conservation of indigenous forest and particularly recognises the principle that existing areas of indigenous forest should be maintained and enhanced. It sets protocols and defined limits for planted forest establishment on indigenous forest areas. The Accord also recognises the scope for sustainable management of indigenous forests allowing the harvest of timber for the production of added-value solid wood products in New Zealand.

7 Under the Resource Management Act "sustainable management" means managing the use, development and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic and cultural wellbeing and for their health and safety while (a) sustaining the potential of natural and physical resources to meet the reasonably foreseeable needs of future generations; and (b) safeguarding the life-supporting capacity of air, water, soil and avoiding, remedying, or mitigating any adverse effects of activities on the environment.

There are also mechanisms available to allow private forests to be legally protected while remaining in private ownership. These mechanisms cover both covenants for use on normal private land, and "kawenata" for use on Maori land. There are also numerous voluntary forest restoration projects and the government provides technical and financial support for these through programmes funded under the New Zealand Biodiversity Strategy (New Zealand's NBSAP).

Forest Management

Management of New Zealand forests has progressed from the early exploitative practices in the 19th Century, based on natural forests, to a well developed planted forest industry based on a strong legacy of research and development, coupled with the preservation and conservation management of substantial areas of natural forest. Having a large planted forest resource has provided New Zealand with the opportunity to protect or sustainably manage its remaining publicly and privately owned natural forests.

Commercial Planted Forests

New Zealand commercial planted forests comprise species introduced largely from North American sources over 100 years ago. The planted forests, while focused on commercial timber production, are the result of a long-term strategy commenced in the early decades of the last century to establish an alternative resource to offset the depletion of relatively slow-growing indigenous forest species.

This development has been enhanced by rigorous selection, and research and has achieved superior genetic tree stocks well adapted to New Zealand condition. As a result planted forests now provide 99% of New Zealand's present 20 million cubic metre wood harvest. More than 90% of the planted forests estate comprises radiata pine, with the remainder being predominantly Douglas fir, along with smaller quantities of eucalypts and a variety of other introduced species such as cypresses.

Planted forest management is oriented to commercial timber production and the establishment, management and harvest practices of such forests are constrained under sustainability provisions of the Resource Management Act 1991 (RMA). Requirements to ensure that management conforms to RMA provisions vary according to local conditions. For example, management practices may be required to make special provision for specific water and soil protection measures, setting aside of habitat area in remnant indigenous forest areas, or specific landscape requirements.

Privately Owned Indigenous Forests

As noted above, there are limited areas of privately owned indigenous forests in New Zealand. If the owners of these forests wish to pursue timber production objectives, then under Part IIIA of the Forests Act 1949 these forests are required to be managed under a registered Sustainable Forest Management Plan or Permit. This means the forests are managed in a way that maintains their ability to provide products and amenities in perpetuity.

Indigenous Conservation Forests

The management of forests in protected areas is governed by the relevant legislation - the National Park, Reserves, Conservation and Wildlife Acts. With very minor exceptions, harvest of timber is not permitted in protected areas, and forests are managed for their heritage and public recreation values.

Management actions are largely focused on the control of alien species and forest fires (which are the major threats to these forests). There is some active restoration through revegetation and re-introduction of species. These forests provide significant economic benefits through water and soil protection,

recreation and tourism, and the production of products such as honey. Commercial activities are managed through concessions (leases, licences and permits) under the Conservation Act.

Integration of Indigenous and Planted Forests

New Zealand has particular concerns about the balance and integration of remnant indigenous vegetation landscapes with farming and planted forest landscapes. The New Zealand Forest Accord, discussed above, is an agreement setting out how planted forests fit into this framework.

Regulation of Genetic Modification in New Zealand

The New Zealand government's policy and the domestic legislation covering the use of genetically modified organisms is based on a cautious, case-by-case approach consistent with the recommendations of the Royal Commission on Genetic Modification in 2001. (See http://www.mfe.govt.nz/publications/organisms/royal-commission-gm/index.html .)

In New Zealand, genetic modification is controlled under the Hazardous Substances and New Organisms (HSNO) Act 1996, which regulates the use of "new" organisms (which includes genetically modified organisms). Anyone proposing to develop or use in containment, or release to the environment, any new (including genetically modified) organism has to apply to the Environmental Risk Management Authority (ERMA New Zealand) and go through a rigorous assessment process. Assessment of all applications for use of genetically modified organisms in field tests or for release includes opportunity for public submissions.

The overall purpose of the HSNO Act is to protect the environment, and the health and safety of people and communities, by preventing or managing the adverse effects of hazardous substances and new organisms. The Act requires that all persons exercising functions, powers, and duties under that Act shall take a precautionary approach, and must take into account the need for caution in managing adverse effects where there is scientific and technical uncertainty about those effects.

Consideration is given to the need to balance the anticipated advantages of the organism while ensuring an appropriate level of caution is applied in relation to the potential risks the organism may present, not only to the environment, and to the health, safety and social, cultural and economic well-being of people and communities. An approval will only be given if a proposal meets stringent minimum standards designed to protect the environment, and the health and safety of people and communities, by preventing or managing the adverse effects of the organism, and if the benefits of the genetically modified organism outweigh any adverse effects, including the potential economic impact.

There have to date been no applications to release any genetically modified organisms into the New Zealand environment. Since 1988, contained field trials have been undertaken, including work involving pine trees. Prior to entry into force of the new organism provisions of the HSNO Act in 1998, genetically modified organisms were assessed by the Minister's Interim Assessment Group, a non-statutory body established in 1988 under the Environment Act. Field tests of GM trees were approved by the Minister for the Environment based on advice from the Interim Assessment Group.

Biotechnology and Forestry-related Research

In 2000, the New Zealand government commissioned an independent Royal Commission[8] on Genetic Modification. The Royal Commission commissioned research, received public submissions, and held

8 A Royal Commission is the highest body for hearing and investigation available in New

public hearings on the issue of genetic modification. Forest trees were a significant focus for the inquiry because of the importance of plantation forestry to the New Zealand economy and the advanced stage of laboratory research in New Zealand on genetically modified trees. In 2001, the Royal Commission released its report recommending that the government should proceed with caution with the use of genetic modification, minimising and managing risks and confirmed the existing regulatory approach.

The government adopted this approach and in recent years has invested significant public funds in support of research aimed at, among other related matters, providing a better understanding of the social and environmental effects of genetically modified organisms, notably including projects monitoring the effects of genetically modified plants on beneficial insects, native invertebrates and birds.

The New Zealand government considers there are many areas where biotechnology has potential to add value to our key exports, including, but not limited to wood and forestry products. Long-term controlled research and development work being undertaken in New Zealand in relation to genetically modified trees includes, inter alia, work:

- to develop improved resistance to forest diseases, such as those infecting *Pinus radiata,* New Zealand's primary forestry production species;
- to genetically modify exotic forestry tree species (for example, pines and eucalypts) to produce enhanced wood quality (fibre strength, reduced number of lateral branches).
- to understand gene expression to investigate the potential risks that genetically modified trees may pose the environment;
- to evaluate the potential impact of genetically modified trees on soil microbial populations and soil insects;
- to modify specified tree species with genes related to pest and pathogen resistance, wood quality traits, reproductive development, and herbicide resistance, to provide information on gene expression patterns and long term gene expression in trees;
- to study factors influencing gene expression and to assess the influence of genetic modifications, involving the insertion of marker genes, on the growth and morphology of trees;
- to determine whether the transformation techniques used have any detrimental effect on the growth and morphology of genetically modified trees;
- to evaluate the expression of the marker genes in juvenile genetically modified trees, to determine the stability, level, and zones of gene expression and what influence field conditions have on that expression.

Controls that have been placed on both contained glass house research and contained controlled field trials include strict measures to prevent cross fertilisation between genetically modified trial plants and surrounding non- genetically modified plants. Such measures include, inter alia :

- Where whole plants grown in registered containment plant houses/glasshouses are allowed to develop reproductive structures, such structures or whole plants are bagged or other appropriate measures used to contain the pollen and any subsequent seed to prevent dispersal of seed or pollen from transgenic plants.
- Trial plants in field tests are monitored regularly for development of pollen-bearing structures which are removed before pollen can mature. Approvals for field trial sites include requirements for long term monitoring after research is completed.

RESPONSES TO SPECIFIC QUESTIONS POSED IN QUESTIONNAIRE

Zealand.

1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?

Currently there are no commercial or experimental plantations of GM trees in New Zealand. However, contained laboratory research and contained field tests have been approved that involve genetic modification of tree species.

See commentary below for details of the contained laboratory research and strictly contained field tests, and also for details of the process by which approval was obtained.

If yes, please answer all remaining questions.
If no, please state the reason why:

Comment on Question One

In 1997 the Minister for the Environment approved a field test of genetically modified *Pinus radiata*. All decisions on the importation and domestic use of genetically modified organisms in New Zealand are now made by ERMA on the basis of a thorough assessment of the potential risks posed by the organism, under the stringent requirements of the HSNO[9].

Under the HSNO Act, there are four application options available for the out-of-doors growing of genetically modified plants: field test, conditional release, and two types of release without controls – standard assessment (where consideration is given to the balance between risks and benefits) and rapid assessment (where only risks are taken into account in the assessment). Although field tests are undertaken out-of-doors, they are still considered a "containment" approval. Research carried out under outdoor contained field test approvals must comply with the formal standard that covers all new organisms held in facilities or field tests, and describes the generic structural and operational requirements for containing organisms of that type.

In relation to genetically modified trees, ERMA New Zealand has to date approved only laboratory research and contained use (developments and strictly controlled field tests), including work with *Pinus* spp, *Picea* spp, *Abies* spp and *Eucalyptus* spp. Details of the nature of the work undertaken under all approved developments in containment and contained field tests, and the conditions placed on these approvals by ERMA New Zealand for the purposes of preventing, minimising or managing risk, is accessible electronically through the directory of approvals on the regulatory agency's website (http://www.ermanz.govt.nz/search/registers.html).

Field test (approvals with strict controls have been granted for GM tree species):

All applications to ERMA New Zealand to field test genetically modified organisms are publicly notified, and therefore subject to a public consultation process. Field tests are strictly controlled to minimise the risk of transfer or release of transgenic genetic material to the surrounding environment and are therefore considered to be fully contained. Applications need to include an assessment of the risks, costs and benefits. For field tests for genetically modified organisms, consideration of alternative methods of achieving the research objectives should be discussed in the application. In situations where risks of

9 The HSNO Act came into effect for new organisms in 1998.

significance to Māori (New Zealand's indigenous people) have been identified, applicants are expected to consult with relevant Māori prior to submitting an application.

ERMA New Zealand assesses each application before deciding whether or not to approve the field test. Containment requirements are set by ERMA New Zealand, to manage any risks to the environment or human health and safety. Controls can include factors such as: the size and location of the trial and any requisite separation distances; requirements for removal of any heritable material at the end of a field trial for a genetically modified organism; reporting requirements during the trial, and the length of time the approval is valid for and requirements for post-trial monitoring. The field test would be approved if the benefits are considered to outweigh the risks (and costs).

All field test sites are required to be registered by the Ministry of Agriculture and Forestry (MAF) as containment facilities under the Biosecurity Act 1993 (http://www.legislation.govt.nz). Field test sites must be operated in accordance with controls imposed by ERMA New Zealand, including adherence to the standard applicable for registration as a containment facility: *Containment Facilities for New Organisms (including genetically modified organisms) of Plant Species* (available electronically at http://www.biosecurity.govt.nz/border/transitional-facilities/plants/155-04-09.htm).

Additional outdoor approvals are provided for in the legislation but have not to date been granted:

Before any new organism, including any genetically modified organism, can be approved for release to the environment it must be shown that it meets certain strict minimum environmental standards set out in the HSNO Act. Under the HSNO Act, any application to release a new organism (including a genetically modified organism) must be declined where the new organism is likely to cause any:

- significant displacement of any native species;
- significant deterioration of natural habitats;
- significant adverse effects of human health and safety;
- significant adverse effects to New Zealand's inherent genetic diversity; or
- disease, be parasitic, or become a vector for human, animal or plant disease, unless that is the purpose of the importation.

Only after these minimum standards are met will a new organism be considered for release (either conditionally or without controls).

Conditional release : An application for conditional release must be made to ERMA New Zealand for approval to release a new organism such as genetically modified trees into the environment subject to controls designed to manage risks associated with that application. Conditional release can also cover small-scale, strictly controlled releases through to a full commercial release. Any organism approved for conditional release approval remains a new organism under the HSNO Act, and therefore remains regulated. The Ministry of Agriculture and Forestry (MAF) monitors compliance with the controls imposed by the ERMA New Zealand and is mandated to take appropriate enforcement action when needed.

Release without controls : An application to ERMA New Zealand must be made to import for release ,or release from containment, any new organism for uncontrolled use in the environment. ERMA New Zealand assesses the risks, costs and benefits of each application and will only approve the release, if the benefits outweigh the risks and costs. Any application to field test, conditionally release or release genetically modified trees require public notification.

A rapid assessment process is available for organisms that meet low risk criteria specified in the HSNO Act (the organism could not establish a self-sustaining population in the field (taking into account ease of eradication); is not capable of displacing any native species within its natural habitat; and is not able to breed with any native species).

Once an approval of release without controls is made anyone is free to use the same organism for any purpose. Therefore, when considering an approval for release, ERMA New Zealand will have to consider the possibility that the organism could be released throughout New Zealand.

2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?

Yes – please refer detailed commentary below.

If yes, please answer the remaining questions.
If no, please state the reason why:

Comment on Question Two

General Consultation Processes

In New Zealand, consultation with the public is integral during the development of laws and regulatory mechanisms. The requirements for public consultation in the development of legislation in New Zealand are set out in the Legislative Advisory Committee's *Guidelines and Content of Legislation*. Once draft legislation is introduced into Parliament, it is scrutinised by a Select Committee. The Select Committee process also involves a public consultation phase. This process was followed for the development of the HSNO Act 1996.

Public Consultation Programme of Royal Commission on Genetic Modification

As noted in the background section, in 1999/2000 the government tasked the Royal Commission on Genetic Modification to advise on the future role of genetic modification in New Zealand. The Royal Commission developed an extensive public consultation programme to meet the requirements of its terms of reference (Warrant). The Commission was directed to "receive representations upon, inquire into, investigate, and report" on the strategic options and any changes considered desirable to existing regulatory processes regarding genetic modification in New Zealand. The Warrant also referred to the Commission's consultation process:

"And you are required, in carrying this Our Commission into effect, —

- *to consult with the public in a way that allows people to express clearly their views, including ethical, cultural, environmental, and scientific perspectives, on the use, in New Zealand, of genetic modification, genetically modified organisms, and products; and*
- *to adopt procedures that will encourage people to express their views in relation to any of the matters referred to in the immediately preceding paragraph; and*
- *to consult and engage with Maori in a manner that specifically provides for their needs; and*
- *to use relevant expertise, including consultancy and secretarial services, and to conduct, where appropriate, your own research."*

The consultation programme included Formal Hearings, Public Meetings (including specific meetings with Maori), Public Submissions, a public opinion survey and a Youth Forum. There were 15 public meetings schedules and participants were asked to respond to questions based on the following eight topic headings:

- human health issues
- consumer choice/labelling issues
- cultural/spiritual issues
- environmental issues
- economic issues
- future use issues
- global development issues
- ethical issues.

In addition, the Royal Commission received and considered some 10,000 written submissions.

Public Consultation under HSNO Act 1996

All new (including genetically modified) organisms are regulated under the HSNO Act 1996 and must undergo risk assessment by the ERMA New Zealand on a case-by-case basis before any approval is granted for their import or domestic use. All applications to field test in containment or to release any genetically modified organism must be publicly notified, thus allowing for public consultation. The results of such decisions are made available through the ERMA New Zealand website (www.ermanz.govt.nz), and directly to any members of the public who have made submissions during the decision-making process.

Private Research Consultation

In addition, research agencies and forest biotechnology companies operating in New Zealand also undertake their own public consultation and information exchange programmes.

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?

All genetically modified organisms, including genetically modified trees, are regulated under the Hazardous Substances and New Organisms (HSNO) Act 1996 by the ERMA New Zealand. The HSNO Act provides strict assessment criteria against which any application is assessed (the full provisions of the HSNO Act can be accessed electronically via the New Zealand government statutes website (http://www.legislation.govt.nz).

The Act requires that all persons exercising functions, powers, and duties under that Act shall take a precautionary approach, and must take into account the need for caution in managing adverse effects where there is scientific and technical uncertainty about those effects.

If yes, please list them according to the categories below:
If no, please explain the reason why here:

Comment on Question Three

The ERMA New Zealand assesses all applications on a case-by-case basis under the HSNO Act 1996. The HSNO Act requires the ERMA New Zealand decision-making body (the Authority) to develop a decision-making Methodology which includes an assessment of monetary and non-monetary costs and benefits, and to apply it consistently. This Methodology has been approved by the Government and established as an Order-in-Council.

If the risks associated with an application are deemed to be negligible, then under the Methodology, the ERMA New Zealand may approve the application if it is evident that benefits outweigh costs where costs and benefits are assessed from a national perspective. However, if some of the risks are not negligible then, risks and costs must be balanced against benefits. In this context, risk means the combination of the magnitude of an adverse effect and the probability of its occurrence (http://www.ermanz.govt.nz/resources/publications/pdfs/ER-TG-05-01.pdf).

To supplement the Methodology Order, ERMA New Zealand has developed more decision-making guidance that is published in the form of a set of Protocols. The Protocols indicate how ERMA New Zealand addresses certain issues in its decision-making and how some of the key concepts found in the HSNO Act and the Methodology are interpreted. In preparing these Protocols the Authority has been conscious of both its needs, as a decision-maker, and the needs of its stakeholders. As decision-maker, ERMA New Zealand recognises the value of Protocols as a means of assisting it to produce high quality decisions consistently over time. Similarly, stakeholder groups can benefit from the additional clarification of the way in which the Authority makes decisions. The Protocol may be modified and added to over time as further information or insights into the Authority's decision-making become available.

Environmental impacts of genetically modified trees

All decisions on the importation and domestic use of genetically modified organisms are made on the basis of a thorough assessment of the potential risks to the environment posed by the organism, under the stringent requirements of the HSNOAct 1996. Under the HSNO Act, "environment' is defined as including:

(a) Ecosystems and their constituent parts, including people and communities; and
(b) All natural and physical resources; and
(c) Amenity values; and
(d) The social, economic, aesthetic, and cultural conditions which affect the matters stated in paragraphs (a) to (c) of this definition or which are affected by those matters.

The overall purpose of the HSNO Act is to protect the environment, and the health and safety of people and communities, by preventing or managing the adverse effects of hazardous substances and new organisms.

To achieve the purpose of the HSNO Act, all persons exercising functions, powers, and duties under the Act must take into account, among other considerations, the following matters:

(a) the sustainability of all native and valued introduced flora and fauna;
(b) the intrinsic value of ecosystems;
(c) public health:
(d) relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu (sacred things), valued flora and fauna, and other taonga.

The Act provides that, in determining whether to approve applications to import or use domestically any genetically modified organism, ERMA New Zealand must evaluate the potential risks of the organism according to strict minimum standards designed to protect the environment, and the health and safety of people and communities, by preventing or managing the adverse effects of new organisms.

In particular, the Hazardous Substances and New Organisms Act 1996 requires that ERMA New Zealand shall decline an application, if the new organism is likely to

- cause any significant displacement of any native species within its natural habitat;
- cause any significant deterioration of natural habitats
- cause any significant adverse effects on human health and safety
- cause any significant adverse effect to New Zealand's inherent genetic diversity; or
- cause disease, be parasitic, or become a vector for human, animal, or plant disease, unless that is the specific purpose of that importation or release.

ERMA New Zealand has developed *Decision Making A Technical Guide to Identifying, Assessing and Evaluating Risks, Costs and Benefits* to assist decision-making (http://www.ermanz.govt.nz/resources/publications/pdfs/ER-TG-05-01.pdf).

Cultural impacts of genetically modified trees

Under the HSNO Act, any application to field test, conditionally release or release genetically modified trees require public notification. Consultation by the applicant with Māori is likely to be needed in situations where risks have been identified that may be of significance to Māori.
The HSNO Act also establishes a committee called Nga Kaihautu Tikanga Taiao, whose function is to provide advice and assistance, given from the Maori perspective, to ERMA New Zealand on matters relating to policy, process, and applications.

ERMA New Zealand's Technical Guide *Taking account of cultural, ethical and community issues* provides process guidelines for taking account of cultural, ethical and community issues, in relation to work on genetically modified organisms carried out under the HSNO Act (http://www.ermanz.govt.nz/resources/publications/pdfs/ER-TG-04-1.pdf). ERMA New Zealand's Protocol Incorporating Māori Perspectives in Part V Decision Making outlines how the Authority assesses Māori and Treaty of Waitangi information, pursuant to sections 6(d) and 8 of the HSNO Act (http://www.ermanz.govt.nz/resources/publications/pdfs/ER-PR-01-02.pdf).

In their 2001 report, the Royal Commission on Genetic Modification recommended that the New Zealand Government establish Toi te Taiao: the Bioethics Council to:

- act as an advisory body on ethical, social and cultural matters in the use of biotechnology in New Zealand
- assess and provide guidelines on biotechnological issues involving significant social, ethical and cultural dimensions
- provide an open and transparent consultation process to enable public participation in the Council's activities.

In response to this recommendation of the Royal Commission, the Bioethics Council was established in 2002 to advise and, where appropriate, provide guidelines on, biotechnological issues involving significant cultural, spiritual or ethical dimensions with a view to preventing or reducing value conflicts.

The Council was also established to promote and guide public dialogue on these matters, with its advice guiding the ethical decision-making of regulatory bodies as well as those involved in the research or application of biotechnology.

ERMA New Zealand's Ethics Advisory Panel provides for a practical means of implementing case-by-case implementation of consideration of cultural, spiritual and ethical considerations on specific applications. The Ethics Advisory Panel's role is quite separate from that of the Bioethics Council in that it

- provides expert advise and assistance on ethical matters relating to hazardous substances and new organisms.
- is concerned with HSNO specific issues and applications to ERMA New Zealand.

The Ethics Advisory Panel provides advice to the Authority and the Agency in three general areas:

- scoping the HSNO legislation;
- assisting in developing a more explicit framework for dealing with ethical and cultural issues of specific applications;
- provide ad hoc advice on the nature and handling of generic ethical issues arising under HSNO decision-making.

Socio-economic impacts of genetically modified trees

The HSNO Act requires that all persons exercising functions, powers, and duties under the Act shall recognize and provide for the following principles:

- the safeguarding of the life-supporting capacity of air, water, soil, and ecosystems
- the maintenance and enhancement of the capacity of people and communities to provide for their own economic, social, and cultural wellbeing and for the reasonably foreseeable needs of future generations.

All persons exercising functions, powers, and duties under this Act shall, to achieve the purpose of this Act, take into account the economic and related benefits and costs of using a particular new organism.

In addition to the considerations listed above, and in relation to consideration of environmental or cultural impacts of genetically modified organisms, ERMA New Zealand's technical Guide Assessment of *Economic Risks, Costs and Benefits: Consideration of impacts on the market economy* is part of a series of technical guides produced by ERMA New Zealand to help people involved with the HSNO Act. The Guide is intended to be particularly helpful for those people who are reviewing applications (and that is the way it has been written), but is useful for people interested more generally in such risks (http://www.ermanz.govt.nz/resources/publications/pdfs/ER-TG-06-01.pdf).

Furthermore, section 68 of the HSNO Act provides that the Minister for the Environment may call in and decide applications to ERMA New Zealand that are considered by the Minister to entail potentially significant cultural, economic, environmental, ethical, health, international or spiritual effects.

NORWAY

[08 September 2006]

[SUBMISSION:ENGLISH]

1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?

There are no field releases, either experimental or commercial, of GM trees in Norway, and no applications for field trials or commercial plantations have been submitted to the authorities of Norway so far. There is, however, some cultivation of GM-hybrid aspen for experimental purposes taking place at universities in confined facilities.

2. Has your country developed any platform/discussion forum/national committee etc dealing with GM trees?

There is no committee or forum dealing only with GM trees, but the committees/institutions dealing with other genetically modified organisms would also be involved in the assessment of GM-trees:

- Ministry of the Environment and underlying bodies: Effects on biodiversity
- Ministry of Health and Care Services and Ministry of Agriculture and Food and underlying bodies: Food and feed, human an animal health
- The Norwegian Biotechnology Advisory Board: Ethical and socio-economic considerations

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific or commercial purposes?

The same law, regulations and guidelines that apply for other genetically modified organisms also apply for GM-trees. The most central are:

The Norwegian Gene Technology Act (*Act of 2 April 1993 No. 38 relating to the production and use of genetically modified organisms, etc.*)
The purpose of this Act is to ensure that the production and use of genetically modified organisms and the production of cloned animals take place in an ethically justifiable and socially acceptable manner, in accordance with the principle of sustainable development and without adverse effects on health and the environment.

http://bch.biodiv.org/database/record.shtml?id=8187

Regulations relating to impact assessment pursuant to the Gene Technology Act

http://bch.biodiv.org/database/record.shtml?id=10278

Environmental impacts of GM-trees:
Regulations relating to impact assessment pursuant to the Gene Technology Act: §§ 13-16, appendix 1 part B, appendix 2 and appendix 3.

Cultural impacts of GM-trees:
Regulations relating to impact assessment pursuant to the Gene Technology Act: § 17 and appendix 4.

Socio-economic impacts of GM-trees:
Regulations relating to impact assessment pursuant to the Gene Technology Act: § 17 and appendix 4.

PANAMA

[14 August 2006]
[SUBMISSION:SPANISH]

1. ¿Su país tiene plantaciones, comerciales o experimentales, de árboles modificados genéticamente?

No se cuenta con tales plantaciones. Algunas de las razones para ello es que no se cuenta en el país con la tecnología para ello, no se cuenta con los recursos financieros, y hay falta de personal especializado.

2. ¿Su país ha desarrollado una red o un forum, o un comité al nivel nacional etc. que se encargue de árboles modificados genéticamente?

No se ha creado algún foro o comité a nivel nacional para este tema. Sin embargo, se han hecho algunos iniciativas, entre las que podemos mencionar: con la Agencia de Cooperación Internacional de Japón (JICA), en el Centro para el Manejo de Recursos Naturales (CEMARE) en el área de Río Hato, provincia de Coclé, donde se establecieron huertos clonales de especies forestales, especialmente de Cedro Espino (***Pachira quinata*** (Jacq.) W. S. Alverson), para ser sembrados por la técnica de estacas; también la Secretaría Nacional de Ciencia y Tecnología de Panamá (SENACYT) ha iniciado la preparación de un proyecto sobre huertos clonales con especies de maderas tropicales.

3. ¿Su país tiene directrices o reglamentación para minimizar los impactos de los árboles modificados genéticamente con fines científicos o comerciales?

No se cuenta actualmente con tales directrices o reglamentaciones específicas. Un razón para ello es que hasta ahora no ha sido una prioridad, porque se ha utilizado mayormente las técnicas de plantación tradicionales o convencionales.

4. ¿Su país tiene plantaciones, comerciales o experimentales, de árboles modificados genéticamente?

No se cuenta con tales plantaciones. Algunas de las razones para ello es que no se cuenta en el país con la tecnología para ello, no se cuenta con los recursos financieros, y hay falta de personal especializado.

5. ¿Su país ha desarrollado una red o un forum, o un comité al nivel nacional etc. que se encargue de árboles modificados genéticamente?

No se ha creado algún foro o comité a nivel nacional para este tema. Sin embargo, se han hecho algunos iniciativas, entre las que podemos mencionar: con la Agencia de Cooperación Internacional de Japón (JICA), en el Centro para el Manejo de Recursos Naturales (CEMARE) en el área de Río Hato, provincia de Coclé, donde se establecieron huertos clonales de especies forestales, especialmente de Cedro Espino (Pachira quinata (Jacq.) W. S. Alverson), para ser sembrados por la técnica de estacas; también la Secretaría Nacional de Ciencia y Tecnología de Panamá (SENACYT) ha iniciado la preparación de un proyecto sobre huertos clonales con especies de maderas tropicales.

6. ¿Su país tiene directrices o reglamentación para minimizar los impactos de los árboles modificados genéticamente con fines científicos o comerciales?

No se cuenta actualmente con tales directrices o reglamentaciones específicas. Una razón para ello es que hasta ahora no ha sido una prioridad, porque se ha utilizado mayormente las técnicas de plantación tradicionales o convencionales.

PHILIPPINES

[23 August 2006]
[SUBMISSION:ENGLISH]

1. Does your country have any plantations, either commercial or experimental, of genetically modified trees? None

   If yes, please answer all remaining questions.
   If no, please state the reason why:

   There are no applications yet received by the National Committee on Biosafety of the Philippines (NCBP) on the introduction of GM trees. Most of the plants being developed and commercialized are agricultural crops. The Philippines is also importing genetically engineered crops for direct use or propagation that are being genetically modified elsewhere, e.g. banana, canola, corn, etc.

2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees? Yes. Executive Order No. 514 dated March 17, 2006 entitled "Establishing the National Biosafety Framework, Prescribing Guidelines for its Implementation, Strengthening the National Committee on Biosafety of the Philippines".

   If yes, please answer all remaining questions.
   If no, please state the reason why:

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes? Yes

   If yes, please list them according to the categories below:
   If no, please explain the reason why here:

   Environmental impacts of genetically modified trees
   (Example effects on native ecosystems, use of herbicide)

   - Policy Statement on Modern Biotechnology issued by *Her Excellency*, President Gloria Macapagal-Arroyo on June 18, 2001 (Document 1) – this policy statement supports the safe use of modern biotechnology and provides the need to: a) ensure that all technologies that the Philippines promote, including modern biotechnology, will provide farmers and fisherfolks the opportunity to increase their over-all productivity and income; enhance the welfare of consumers; promote efficiency, competitiveness, and improved

quality standards of local industries; b) address the current issues associated with the local and global dimensions and trends of modern biotechnology, including its potential health, environmental and social impacts; and c) allocate appropriate resources for the upgrading of capacities and capabilities to effectively regulate the technology and its products, including but not limited to product testing and labeling.

- Philippine Environmental Impact Statement (EIS) System. It requires that every proposed project and undertaking, which significantly affect the quality of the environment to prepare an Environmental Impact Statement after conducting an impact assessment study,

- Republic Act 9147 (Wildlife Resources Conservation and Protection Act). Under this Act no exotic species shall be introduced into the country, unless a clearance from the Secretary or the authorized representative is obtained. In no case shall exotic species be introduced into protected areas covered under by Republic Act 7586 and to critical habitats. In cases where introduction is allowed, it shall be subject to environmental impact study which shall be focus on bioecology, socioeconomic and related aspects of the area where the species will be introduced.

  The law further provides that all activities dealing on genetic engineering and pathogenic organisms in the Philippines, as well as activities requiring the importation, introduction, field release, and breeding of organisms that are potentially harmful to man and environment shall be reviewed in accordance with the biosafety guidelines ensuring public welfare and the protection of wildlife and their habitats.

- Guidelines on the introduction, use, and transfer of Genetically Modified Organisms (GMOs) and Potentially Harmful Exotic Species (PHES) Cultural impacts of genetically modified trees

- Executive Order No. 514 "Establishing the National Biosafety Framework (NBF), Prescribing Guidelines for its Implementation, Strengthening the National Committee on Biosafety of the Philippines, and for other Purposes". It aims to (1) strengthen the existing science-based determination of biosafety to ensure the safe and responsible use of modern biotechnology so that the Philippines and its citizens can benefit from its application while avoiding or minimizing the risks associated with it; (2) enhance the decision-making system on the application of products of modern biotechnology to make it more efficient, predictable, effective, balanced, culturally appropriate, ethical, transparent and participatory; and, (3) serve as guidelines for implementing international obligations on biosafety;

Cultural impacts of genetically modified trees
(Example: positive or negative impacts on indigenous and local communities and their traditional knowledge)

- Indigenous People's Rights Act (IPRA). Recognizes and protects the rights of ownership and possession of indigenous cultural communities and indigenous peoples to their ancestral lands and domains, including the right to manage and conserve natural resources within the territories, and the right to negotiate

the terms and conditions for the exploration of these natural resources for the purpose of ensuring ecological and environmental protection and conservation measures, pursuant to national and customary laws.

Socio-economic impacts of genetically modified trees
(Example: positive or negative effects on quantity, quality and economic value of forest production; positive or negative impacts on livelihoods of communities)

- Policy Statement on Modern Biotechnology issued by *Her Excellency*, President Gloria Macapagal-Arroyo on June 18, 2001 (Document 1) – this policy statement supports the safe use of modern biotechnology and provides the need to: a) ensure that all technologies that the Philippines promote, including modern biotechnology, will provide farmers and fisherfolks the opportunity to increase their over-all productivity and income; enhance the welfare of consumers; promote efficiency, competitiveness, and improved quality standards of local industries; b) address the current issues associated with the local and global dimensions and trends of modern biotechnology, including its potential health, environmental and social impacts; and c) allocate appropriate resources for the upgrading of capacities and capabilities to effectively regulate the technology and its products, including but not limited to product testing and labeling.

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POLAND

[01 September 2006]
[SUBMISISON:ENGLISH]

1. Does your country have any plantation, either commercial or experimental, of genetically modified trees?

We have got experimental fields with genetically modified plum trees. At present five varieties resistant to Plum pox virus PPV (also known as sharka) released into environment are tested. The plants were transformed with plum pox virus coat protein gene PPV-CP conferring resistance to virus. They contain also nptII marker gene which confers resistance to the antibiotic kanamycin and gus reporter gene.
We haven't developed and we don't intend to establish commercial plantations of GMO trees in the future. Such decision was made by the polish government and it is consistent with public expectations.

If yes, please answer all remaining questions.

If no, please state the reason why:

2. has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?

No. We haven't any platform, forum etc. dealing **solely** with genetically modified trees.

If yes, please answer all remaining questions.

If no, please state the reason why:

The Minister of Environment as the polish competent authority on genetically modified organisms appointed GMO Commission dealing with the whole GMO issues. There was no reason to develop special subsidiary body dealing with genetically modified trees due to small scale of scientific research and lack of commercial GM trees planting at the moment and in the future. If should the need arise we will use local experts in relevant discipline to assess risk assessment or another aspect connected with applying genetically modified tree varieties. Simultaneously we make efforts to include public in decision making process-especially in decisions on GMOs. We laid down and put into practice legislative framework which obliges government to provide public consultations before commencement of every field trial with GMOs - including genetically modified trees. The Minister of Environment provides national registers where key information on GMO activities is made available to the citizens. This is also an exquisite platform for information sharing and a kind of electronic mailbox for commentaries from public.

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?

No. We haven't any guidelines or regulations concerning **exclusively** genetically modified trees.

If yes, please list them according to the categories below.

If no, please explain the reason why: We are preparing new act " Law on genetically modified organisms" which will become complex regulation on all GMOs in Poland. Because of small scale of scientific research in this area and polish government policy against experimental and commercial introducing varieties of genetically modified trees into environment there is no need to pass separate act on genetically modified trees. Obviously we realize that the lack of official registered plantations doesn't absolve us from responsibility for protection from unintentional movement of non authorized GM trees varieties. The primary goal of new law is to ensure total control of all activities with GMOs within the polish territory. The bill imposes specific obligations on users planning experimental and commercial introduction GMOs into environment among over providing field schemes, risk assessment and risk management plans. Environmental and cultural impacts of GMO is the most important aspect of every evaluation. In evaluation are engaged local authorities and local communities to eliminate or minimize possible adverse effects from GMOs. The bill doesn't take into consideration any economic arguments in the context of deliberate release or commercial cultivation.
Environmental impacts of genetically modified trees (Example: effects on native ecosystems, use of herbicide)
Cultural impacts of genetically modified trees (Example: positive or negative impacts on indigenous and local communities and their traditional knowledge)
Socio-economic impacts of genetically modified trees (Example: positive or negative effects on quantity, quality and economic value of forest production, positive or negative impacts on livelihoods of communities)

PORTUGAL

[19 November 2007]
[SUBMISSION:ENGLISH]

1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?

Portugal doesn't have any plantations of genetically modified trees, either commercial or experimental. However, in 1997 we received a notification concerning the deliberate release of genetically modified trees into the environment for any other purpose than for placing on the market. This notification refers to the cultivation of *Eucalyptus globulus* between the period 1998-2000 (350 plants, 3150m^2).

2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?

There is no platform/discussion forum or national committee specifically set up to deal with GM trees.

Portuguese rules that transpose European Community rules on the deliberate release into the environment and placing on the market of GMOs also apply to GM trees.

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?

SLOVENIA

[19 November 2007]
[SUBMISSION:ENGLISH]

1. Does your country have any, either commercial or experimental, of genetically modified trees?
According to available data there are NO plantations of GM trees in Slovenia.
Reason why:
The Ministry of the Environment and Spatial Planning as a Competent Authority (CA) has never received a notification for either commercial or experimental plantations of genetically modified trees.

2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?

In Slovenia, there is no specific platform/discussion forum/national committee etc. dealing only with genetically modified trees. However, according to the Management of Genetically Modified Organisms Act there is a scientific committee to work with GMOs in contained use or scientific committee for the deliberate release of GMOs into the environment and placing products on the market would require experts' opinions in the notification procedures for all GMOs. Experts could also provide opinions and proposals on GM trees if asked by CA. In addition, the Management of GMO Act sets up the Commission for GMO management which is, among other tasks, responsible for: monitoring conditions and development of the use of genetic technologies and management of GMOs; adopting positions and providing opinions and initiatives in relation with the use of gene technologies and management of GMOs as well as in relation to social, ethical, technical and technological, scientific and other aspects of GMO management; advising the government on the use of gene technology and GMO management. The GMO Commission could also address socio-economic and cultural impact of GMOs, including GM trees.

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?

There is no specific regulation just on GM trees in Slovenia. The existing regulatory framework covers all GMOs. The contained use of GMOs, deliberate release of GMOs and placing on the market of GMOs are regulated by the Management of GMO Act. The Management of GMO Act transposes the EU Directive 2001/18/EC as well as the EU Directive 98/81/EC revising Directive 90/219/EEC. Unlike the EU Directive 98/81/EC revising Directive 90/219/EEC on the contained use the Management of GMO Act regulates also GM animals and GM plants including GM trees. The regulatory framework strives to ensure that human health and the environment are highly protected from any possible adverse effects of GMOs.

Environmental impacts:
In all administrative procedures on issuing permits on contained use of GMOs, deliberate release of GMOs and placing on the market of GMOs the environmental and human health risk assessments are the key components in making any decision.

Cultural and socioeconomic impacts of GMOs could be addressed by the Commission for GMO management.

SPAIN

[19 November 2007]
[SUBMISSION:SPANISH]

1.¿Su país tiene plantaciones, comerciales o experimentales, de árboles modificados genéticamente? (DOES YOUR COUNTRY HAVE ANY PLANTATIONS, EITHER COMMERCIAL OR EXPERIMENTAL, OF GENETICALLY MODIFIED TREES?)

No hay, en principio, impedimentos para ensayar con árboles modificados genéticamente en Europa (siempre que se cumpla la legislación) y, si estos pasan las pruebas de evaluación y autorización, también podrían realizarse plantaciones comerciales (los redactores de este informe no conocen en la UE, ni en el mundo, ningún árbol modificado genéticamente en uso comercial). Por otro lado, no existe en la UE, ni en España, una legislación específica para árboles modificados genéticamente, ya que la legislación existente (Directiva 2001/18/CEE en la UE y Ley 9/2003 y RD de desarrollo 178/2004 en España) cubren perfectamente la regulación de organismos modificados genéticamente (OMG). Hay que tener en cuenta que la legislación de OMG se basa en el principio "caso por caso", de manera que los árboles OMG (cada especie y cada modificación) serían un elemento más que tendría que ser evaluado específicamente y determinados sus riesgos.

En España, al igual que en otros países de la UE, se han realizado varios ensayos experimentales de árboles MG. Concretamente las notificaciones B/ES/94/09; B/ES/96/15; B/ES/96/16; B/ES/98/27; B/ES/03/39 y B/ES/05/14. La anotación B/ES indica que se trata de liberaciones voluntarias al medio (o parte B de la Directiva) en España (ES), el siguiente número es el año y el siguiente un número interno de control. El cuadro siguiente resume cada una de ellas:

Nº notificación	**Empresa /institución**	**OMG**	**Lugar realización ensayos**	**Objeto modificación**	**Periodo liberación**	**Superficie**	**Fecha aprobación**
B/ES/94/09	CEASA (celulosas de Asturias)	*Eucalyptus camaldulensis*	Asturias	Resistencia Kanamicina	1994-1997 El material fue destruido tras el exprimento. Todos los pies y tocones se retiraron antes de la madurez floral.	3600 m^2	13/1/1995
B/ES/96/15	IVIA Instituto Valenciano de Investigaciones Agrarias	Cítricos (*Citrus sinensis, Citrus aurantifolia, C.sinesis x P. trifoliata)*	Valencia	Tolerancia antibióticos Marcadores histoquímicos	Mayo 1997 (durante 10 años)	1630 m^2 48 pies transgénicos + plantas de borde no MG como control	27/1/1997
B/ES/96/16	IVIA Instituto Valenciano de Investigaciones Agrarias	Ciruelo *Prunas domestica*	Valencia	Resistencia virus ("plum pox virus") Resistencia Kanamicina	Invierno 1996-1997	1200 m^2 Plantas rodeadas de especies no compatibles como control. Incineración de todos los árboles, restos, raíces, etc…	27/1/1997
B/ES/98/27	Universidad de Málaga.	Álamo (*Populus tremula x*	Andalucía. Granada	Crecimiento rápido	Mayo 1998-2001	6000 m^2 Seguimiento	17/7/98

	Departamento de Biología Vegetal. Facultad de Ciencias	*Populus alba*)				de plantas e incineración	
B/ES/03/39	IVIA	Ciruelo *(Prunus domestica)*	Valencia	Resistencia virus (virus de la sharka,"plum pox virus") + resistencia kanamicina + marcador cromogénico	2003-2007	100 m^2 Cinturón plantas no compatibles. Distancia seguridad (300 m) Destrucción plantación	Renovación de B/ES/96/16
B/ES/05/14	IVIA	Ciruelo *(Prunus domestica*)	Valencia	Resistencia virus (virus de la sharka, "plum pox virus") + resistencia kanamicina + marcador cromogénico	2005-2010	100 m^2 (dentro de una parcela de 1200 m^2) Cinturón plantas no compatibles. Distancia seguridad (300 m) Destrucción plantación	Renovación de B/ES/96/16

La mayoría de los casos son ensayos de árboles frutales (resistencia a virus, generalmente) y casi todos muy preliminares (ensayos de la capacidad de transformación de árboles y su posible posterior marcaje e identificación, con marcadores de antibióticos o cromogénicos). Todos los ensayos experimentales se destruyen tras su finalización y tienen medidas de seguimiento y control.

Toda esta información está recogida también en la web del Ministerio de Biotecnología: http://www.mma.es/calid_amb/seg_bio/index.htm ("Actividades de Liberación Voluntaria llevadas a cabo en España"). Esta dirección, a falta de finalizar el Biosafety Clearing House (BCH) común de la UE (en lo que está trabajando la Comisión y los Estados Miembros), actúa de BCH Español.

Estas son las notificaciones que han pasado por la Comisión Nacional de Bioseguridad, que ha aprobado, basándose en criterios científicos, evaluando sus posibles riesgos y aplicando medidas de gestión apropiadas, el que estos ensayos se pudieran hacer en España.

Por otro lado, también ha habido algunas actividades de uso confinado (en laboratorio), aunque no entrarían dentro del objeto del cuestionario, que se refiere a la liberación al medio. Básicamente son dos (parte A-uso confinado):
Actividad A/ES/94/1- Empresa CEASA, clonación de ADN de Eucalipto, Asturias.
Actividad A/ES/95/5-Universidad de Oviedo, trabajo con *Pinus nigra* para evaluar resistencia a enfermedades.

2. ¿Su país ha desarrollado una red de discusión o un forum, o un comité al nivel nacional etc. que se encargue de árboles modificados genéticamente? (HAS YOUR COUNTRY DEVELOPED ANY PLATFORM/ DISCUSSION FORUM/NATIONAL COMMITTEE ETC. DEALING WITH GMT?)

Todas las notificaciones citadas han sido evaluadas por la Comisión Nacional de Bioseguridad (cuya composición y funcionamiento se define en la ley 9/2003 y el RD 178/2004), de manera que, aunque no haya existido una foro específico para evaluar los árboles MG, estas autorizaciones sí han sido evaluadas por un comité (la CNB). No obstante este comité es de carácter científico, y su evaluación es científica

(está compuesto por diversos ministerios, comunidades autónomas y expertos externos). No se ocupa de cuestiones más sociales, culturales o económicas (no hay sectores sociales representados), aunque actualmente se evalúa la creación de un comité de carácter más socio/económico para evaluar estas cuestiones en relación con los OMG además de la CNB. Todavía no existe, por tanto, un comité de tipo más social, aunque sí científico. La autorización final, no obstante, no la da la CNB si no el Consejo Interministerial de OMG, que es el órgano ejecutivo, tras ver el informe de la CNB (esto para las autorizaciones competencia del Estado, como son todas las autorizaciones de comercialización). Otras autorizaciones son competencia de las CCAA (Art. 3 Ley 9/2003).

3. ¿Su país tiene directrices o reglamentación para minimizar los impactos de los árboles modificados genéticamente con fines científicas o comerciales? (DOES YOUR COUNTRY HAVE ANY GUIDELINES OR REGULATIONS FOR MINIMIZING THE IMPACTS OF GMT FOR SCIENTIFIC AND/OR COMMERCIAL PURPOSES?)

Las directrices o normas que se siguen son las siguientes (se aplican en general para los OMG, incluyendo árboles):

Ley 09/2003 de 25 de Abril sobre BIOTECNOLOGIA (ESPAÑA)
Real Decreto 178/2004 de 30 de Enero sobre BIOTECNOLOGIA (ESPAÑA)

Directiva 1999/105/CE del Consejo de 22 de diciembre de 1999 sobre la comercialización de materiales forestales de reproducción (art. 5)
Real Decreto289/2003 de 7 de marzo, sobre comercialización de los materiales forestales de reproducción (art.4)

Directiva 2001/18/CE (UE)
Reglamento 1830/2003/CE Trazabilidad y Etiquetado OMGs (UE)
Reglamento 1946/2003/CE Movimiento Transfronterizo OMGs (UE)
Reglamento 65/2004/CE Identificador Único OMGs (UE)
Instrumento de Ratificación del Protocolo de Cartagena sobre BIOTECNOLOGIA (Internacional)

La Directiva de la UE y la Ley y el RD español que la transponen incluyen mecanismos de evaluación de riesgos y planes de monitorización de los OMG con el fin de evaluar y minimizar los impactos de los OMG (tanto desde un punto de vista comercial como experimental).

No obstante estas normas se ocupan básicamente de riesgos (y, por tanto, impactos) ambientales. No hay mecanismos o documentos oficiales para evaluar los impactos culturales o socio económicos de los OMG.

ST-VINCENT AND THE GRENADINES

[30 August 2006]
[SUBMISSION:ENGLISH]

"INTRODUCTION

Saint Vincent and the Grenadines is a party of the Convention on Biological Diversity. However, the legislation necessary to incorporate this Convention into local law has at the date of this report not been prepared for enactment.

A National Biodiversity Strategy and Action Plan for Saint Vincent and the Grenadines is however being formulated. The National Biodiversity Strategy and Action Plan is intended to stimulate a far greater involvement by the several agencies involved in natural resources management in Saint Vincent and the Grenadines in the international movement concerning biological diversity conservation than they have hitherto. The Strategy and Action Plan provides a rational for their involvement and provides guidance on how conservation can be achieved.

The Plan outlines the contributions of sectors such as forestry, fisheries, agriculture and land use to biodiversity conservation and what it can continue to do in contributing to national and international conservation efforts. In so doing, it premises its contributions on three main objectives of living resources conservation, viz.:

- To maintain essential ecological processes and life-support systems.

- To preserve genetic diversity.
- To ensure that the species and ecosystems are utilised in a suitable manner.

The Strategy and Action Plan outlines the need for biodiversity conservation, obstacles and threats that must be overcome and proposes fifteen strategies with their related actions for attainable sustainable biodiversity conservation. The proposed strategies and actions are premised on the analysis of the present situation of biodiversity in Saint Vincent and the Grenadines based on the work of sector consultants.

This report will illustrate that several statutes address different aspects of protection, conservation and sustainable use of the environment which are critical elements in biodiversity. The chapters which are quoted refer to the Laws of Saint Vincent and the Grenadines, Revised Edition 1990.

LEGISLATION RELATING TO BIODIVERSITY

Environmental Health Services Act, No.14 of 1991

This Act makes provision for the conservation and maintenance of the environment in the interest of health generally and in particular in relation to places frequented by the public.

The Act establishes an Environmental Health Board with responsibility for advising the Minister on matters relating to environmental health. An Environmental Health Division in the public service is also created. The responsibilities of this Division include promoting the planning, approval, funding and implementation of measures designed to ensure the wise and safe use of the environment.

Fisheries Act, Cap. 52

This Act promotes the management and development of fisheries so as to ensure the optimum utilisation of the fishery resources in the fishery waters for the benefit of Saint Vincent and the Grenadines. It requires the preparation and maintenance of a fisheries management and development plan. A licensing system exists in respect of foreign fishing vessels which will be used for fishing in the fishery waters of Saint Vincent and the Grenadines. Any area of the fishery waters may be declared a marine reserve if special measures are necessary to preserve natural breeding grounds, habitats of aquatic life and to promote scientific study and research in respect of such area. Official permission must be granted in order to undertake research into fisheries in the fishery waters. The Act prohibits the possession of prohibited

fishing gear and certain harmful fishing methods such as the use of noxious substances.

Beach Protection Act, Cap. 321

This Act protects beaches and regulates the removal of sand, coral, stones, shingle, gravel and other materials from the shores of Saint Vincent and the Grenadines and adjoining sea beds. In this regard, mechanisms exist for imposing absolute prohibitions on the removal of materials from specified beaches and granting permission to move material from any beach if it is in the public interest to do so.

Agriculture Act, Cap. 30

This Act seeks to ensure that owners and occupiers of agricultural land fulfill their obligations to the community by managing their land in a manner to prevent erosion of the soil.

Botanical Garden Act, Cap. 56

This Act authorises the framing of rules for the proper regulation of the Botanical Garden.

Botanical Garden Rules, Booklet 1 of Cap. 56

These Rules restrict the handling, picking, gathering, cutting or collecting of any fruit, flower, plant, branch, the carrying away of fallen fruit or the injuring of any tree, plant or shrub growing in any part of the Botanical Garden.

Central Water and Sewerage Authority Act, No. 17 of 1991

This Act makes provisions for the conservation, control, apportionment and use of the water resources of Saint Vincent and the Grenadines and for purposes incidental thereto. In this regard, a corporate body is established, called the Central Water and Sewerage Authority, whose functions include advising the Minister on issues relating to the improvement, preservation, conservation, utilization and apportionment of water resources and examining surface or underground waters in Saint Vincent and the Grenadines to determine whether pollution exists and the causes of such pollution.

Dumping at Sea Act, No. 53 of 2002

This Act implements the Convention on the Prevention of Maritime Pollution by Dumping of Wastes and other Matter, done at London on the 29th day of December, 1972. The Act provides for licensing requirements in relation to:

(a) the deposit of substances or articles within Saint Vincent and the Grenadines' waters, either in the sea or under the sea bed; and

(b) the incineration of substances on a vessel or marine structure.

Authorised officers are empowered to enforce the Act.

Forest Resource Conservation Act, No. 47 of 1992

This Act, when brought into operation, will repeal the Forests Act. It makes provision for the conservation, management and proper use of the forests and watersheds, the declaration of forest reserves, cooperative forests and conservation areas and the prevention and control of forest fires.

Forest Act, Cap. 88

This Act provides for the protection of forests. Under the Act, forest officers may be appointed, forest reserves can be declared and certain offences such as the felling of trees or kindling of fires are created.

Crown Lands Forest Reserves (Provisional) Order

This subsidiary legislation provisionally declares certain Crown land to be forest reserves under the authority of the Forest Act.

Crown Lands (Prohibited Areas) Order

This subsidiary legislation declares certain areas in Saint Vincent and the Grenadines to be prohibited areas under the authority of the Forest Act.

King's Hill Enclosure Act, Cap. 339

This Act reserves and appropriates an area of Saint Vincent and the Grenadines, called King's Hill, for the purpose of attracting rain for the benefit and advantage of the owners and possessors of lands in the neighbourhood of King's Hill. Proprietors of land adjoining King's Hill are obliged to fence between their lands and King's Hill. It is an offence to cut, destroy, take or carry away any trees from King's Hill or to clear, plant or cultivate any part of King's Hill.

Management of Ship-Generated Solid Waste Act, No. 16 of 2002

This Act provides for powers and jurisdiction in relation to pollution of the seas from ships, prevention of pollution from ships, prevention of pollution by solid waste, and other incidental matters. Among the specific issues addressed are restrictions on the disposal of solid waste from certain areas and within special areas, the implementation of management plans and solid waste record books, and surveys which must be conducted in respect of every Saint Vincent and the Grenadines ship that is required to comply with the Act and is engaged in voyages to ports of offshore terminals under the jurisdiction of other MARPOL member states.

Marine Parks Act, No. 9 of 1997

This Act provides for the establishment of marine parks. Persons are prohibited from taking certain action while in a marine park such as fishing, damaging flora or fauna or carrying out unregulated commercial activities. A Marine Parks Board is established to effectively manage marine parks. The functions of the Board are to issue permits, preserve and enhance the natural beauty of marine parks, promote scientific study and research in marine parks, regulate the use of marine parks and be responsible for zoning within marine parks.

Minerals (Vesting) Act, Cap. 343

This Act vests in the Crown all minerals in Saint Vincent and the Grenadines.

National Parks Act, No. 33 of 2002

This Act promotes the establishment of national parks for the preservation, protection, management and development of national, physical and ecological resources and the historical and cultural heritage of Saint Vincent and the Grenadines. To this end, the Act provides for the establishment of the National Parks, Rivers and Beaches Authority whose functions include managing and maintaining national parks, advocating and promoting conservation, fostering the use of natural and historic resources for recreation and tourism and ensuring the permanent protection of species and habitats, especially species which are threatened, rare and endemic.

Oil in Navigable Waters Act, Cap. 366

This Act prohibits the discharge or escape of oil into the territorial waters of Saint Vincent and the Grenadines.

Montreal Protocol (Substances that Deplete the Ozone Layer) Act, No. 49 of 2003

This Act gives effect in Saint Vincent and the Grenadines to the provisions of the Montreal Protocol on Substances that Deplete the Ozone Layer.

Montreal Protocol (Substances that Deplete the Ozone Layer) (Control) Regulations, No. 14 of 2005

The Regulations provide for matters such as restrictions on importation of ozone depleting substances into Saint Vincent and the Grenadines, applications to become a registered importer, quotas, retrofitting and labeling of equipment for local sale.

Plant Protection Act, Cap. 43

This Act provides for the prevention, eradication and control of diseases and pests affecting plants.

Plant Protection Act, No. 16 of 2005

This Act will repeal the Plant Protection Act, Cap. 43 when it comes into operation.

The Act prevents the introduction and controls the spread of plant pests in order to protect plant resources, among other things. It imposes requirements in relation to importation into and exportation from Saint Vincent and the Grenadines of plant and plant products. It also contains provisions for the containment and eradication of pests. The Act essentially reflects the obligations of Saint Vincent and the Grenadines under the International Plant Protection Convention.

Petroleum Act, Cap. 344

This Act regulates the carriage, storage and use of petroleum.

Pesticides Control Act, Cap. 42

This Act provides for the control of the importation, sale, storage and use of pesticides.

Precursor Chemicals Act, No. 2 of 2002

This Act provides for the monitoring and control of precursor chemicals and other chemical substances which are used or capable of being used in any

type of illicit transaction involving narcotic drugs and psychotropic substances or other substances having a similar effect.

Quarries Act, Cap. 346

This Act provides for the regulation and control of quarries. It prescribes that a licence must be granted in order to open a quarry or continue the working of a quarry that is already opened.

Quarries Regulations, Booklet 1, Cap. 346

The Regulations provide for matters such as the storage of explosives, the firing of charges and the giving of warnings before charges are fired.

Radio-Active Minerals Act, Cap. 233

This Act restricts persons in Saint Vincent and the Grenadines from prospecting or mining any radio-active mineral except in accordance with a licence. The export of radio-active minerals is prohibited except in accordance with a permit. If any radio-active mineral is discovered on any land, a report must be submitted to this effect.

Wildlife Protection Act, Cap. 55

By virtue of this Act, all wildlife found in Saint Vincent and the Grenadines are declared to be the property of the Crown. Wildlife reserves may be declared and hunting within those areas is an offence. The Act prescribes closed seasons for certain wildlife, and hunting or possession of species of wildlife during the period of a closed season is an offence.

Animals (Diseases and Importation) Control Act, Cap. 48

This Act controls the importation of animals, birds, reptiles and insects into Saint Vincent and the Grenadines and regulates the treatment and disposal of animals which are suffering or are suspected to be suffering from any disease.

Animals (National and International Movement and Disease Prevention) Act, No. 7 of 1994

This Act controls the movement of animals into and from Saint Vincent and the Grenadines and prevents the introduction and spread of animal diseases within Saint Vincent and the Grenadines and other Member States of the Caribbean Community. In this regard, restrictions are placed on the importation of animal or animal related items, and systems for inspection and quarantines are implemented.

Litter Act, No. 15 of 1991

This Act provides for the regulation and control of littering in Saint Vincent and the Grenadines. The Act creates several offences, including littering in public places and disposing litter from motor vehicles, trailers, ships or boats. The Act is administered by authorised persons who are empowered to issue directions to persons who have contravened the Act to desist, remove or dispose of litter in the manner specified and to apprehend such persons.

Public Health Act, No. 9 of 1977

This Act makes provision for securing and maintaining public health by regulating such matters as communicable diseases, the prevention and destruction of mosquitoes and cemeteries. The Regulations promulgated under this Act regulate matters such as food vending, slaughterhouses, disposal of corpses and sale of milk.

Town and Country Planning Act, No. 45 of 1992

This Act enables the orderly and progressive development of land and the proper planning of town and country areas.

Saint Vincent and the Grenadines National Trust Act, Cap. 329

This Act establishes a body corporate called the Saint Vincent and the Grenadines National Trust, the objectives of which include locating, restoring and conserving areas of beauty, buildings and objects of archaeological, scientific or traditional interest.

Saint Vincent and the Grenadines Port Authority Act, Cap. 373

This Act provides for the establishment of a corporate body called the Saint Vincent and the Grenadines Port Authority and a coordinated and efficient system of port facilities and services."

1. Does your country have any plantations, either commercial or experimental, of genetically modified trees? No
If yes, please answer all remaining questions. If no please state the reason why: The issue has not been considered as a result of staffing, institutional capacity and resource limitations.

2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees:
If yes, please answer the remaining questions. If no, please state the reason why.

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?
If yes, please list them according to the categories below. If no, please explain the reason why here:
Environmental impacts of genetically modified trees (Example: effects on native ecosystems, use of herbicide)
Cultural impacts of genetically modified trees (Example: positive or negative impacts on indigenous and local communities and their traditional knowledge)
Socio-economic impacts of genetically modified trees Example: positive or negative effects on quantity , quality and economic value of forest production, positive or negative impacts on livelihoods of communities)

SWEDEN

[19 November 2007]
[SUBMISSION:ENGLISH]

1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?

Plantations:

Apple rootstocks, 0,16 ha (Location: SLU-Alnarp)

Indoor growth facilities

Hybrid aspen, (Location: Umeå university)
Hybrid aspen, Birch (Location: SLU-Umeå)
Hybrid aspen, (Location: SwedTree genomics-Umeå)
Norway spruce, and Scotch pine (Location: SLU-Uppsala)

Apple rootstocks, Pears rootstocks, (Location: SLU-Alnarp)

If yes, please answer all remaining questions.
If no, please state the reason why:

2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?

The Gene Technology Advisory Board

The Gene Technology Advisory Board monitors development in the field of gene technology, oversees ethical issues, and gives advice on use of gene technology to other government agencies. Thus the Board has an overall responsibility in the field of gene technology. According to its instructions the Board shall keep abreast of the national and international developments in the field of gene technology, in order to be able to evaluate the effect of new applications of gene technology on health and the environment and to be able to make an ethical assessment of new aspects of development. It is to promote an ethically defensible and safe use of gene technology by the provision of advice. The Board shall in that connection take into consideration the importance of maintaining a good research policy climate. The Board shall report to the government if any use, or planned use of gene technology is questionable from ethical or humanitarian point of view or if the range of government supervision needs to be expanded to include questions other than those now subject to public control.

Discussions between the government and NGOs

The Swedish government has continuous discussions and meetings with environmental and industrial organizations. These dialogues take place before the meetings with the Council of the European Union, where the agenda for the meeting is discussed. NGOs and the industry may therefore express their opinions and discuss relevant topics with the government, such as GM-technologies and GM-trees.

If yes, please answer the remaining questions.
If no, please state the reason why:

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?

Yes

If yes, please list them according to the categories below:
If no, please explain the reason why here:

Environmental impacts of genetically modified trees
(Example: effects on native ecosystems, use of herbicide)

EC directives and regulations.

2001/18/EC
Directive on the deliberate release into the environment of genetically modified organisms

Swedish acts and ordinances

The list below provides information on Swedish texts of legislation concerned.

SFS 1998:808 The Swedish Environmental Code, chapter 13

SFS 2002:1086
Genetically Modified Organisms (Deliberate Release) Ordinance. (Implementing directive 2001/18/EC)

SFS 2000:271
Genetically Modified Organisms (Contained Use) Ordinance. (Implementing directive 20/219/EC)

SFS 1998:900

The Swedish Environmental Code (Supervision) Ordinance.

Regulations issued by Swedish authorities

SJVFS 2001:20 The Swedish Board of Agriculture's Regulations on the Contained Use of Genetically Modified Plants

SJVFS 2003:5 The Swedish Board of Agriculture's Regulations on the Deliberate Release of Genetically Modified Plants

SKSFS 1996:1
The National Board of Forestry's Regulations on the Deliberate Release and Placing on the Market of Genetically Modified Forest Trees.

Cultural impacts of genetically modified trees
(Example: positive or negative impacts on indigenous and local communities and their traditional knowledge)

Swedish acts and ordinances

SFS 1998:808
The Swedish Environmental Code, chapter 13

SFS 1994:902
Gene Technology Advisory Board (Duties) Ordinance.

Socio-economic impacts of genetically modified trees
(Example: positive or negative effects on quantity, quality and economic value of forest production; positive or negative impacts on livelihoods of communities)

Swedish acts and ordinances

SFS 1998:808
The Swedish Environmental Code, chapter 13

SFS 1994:902
Gene Technology Advisory Board (Duties) Ordinance.

THAILAND

[24 August 2006]
[SUBMISSION:ENGLISH]

1. Does your country have any plantations, either commercial or experimental, of genetically modified trees? No.
If yes, please answer all remaining questions. If no, please state the reason why: The goverenment policy does not allow any genetically modified tree to be outplanted. And we do not have reached R&D on tree gene transfer yet.

2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?
If yes, please answer the remaining questions. If no, please state the reason why:

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?
If yes, please list them according to the categories below: If no, please explain the reason why here:
Environmental impacts of genetically modified trees (Example: effects on native ecosystems, use of herbicide)
Cultural impacts of genetically modified trees (Example: positive or negative impacts on indigenous and local communities and their traditional knowledge)
Socio-economic impacts of genetically modified trees (Example: positive or negative effects on quantity, quality and economic value of forest production; positive or negative impacts on livelihoods of communities)

UNITED KINGDOM

[19 November 2007]
[SUBMISSION:ENGLISH]

1. **Does your country have any plantations, either commercial or experimental, of genetically modified trees?**

If yes, please answer all remaining questions.
If no, please state the reason why:

There are no plantations of GM trees in the UK in the form of either commercial or experimental releases into the environment.

2. Has your country developed any platform/discussion forum/national committee etc dealing with genetically modified trees?

If yes, please answer all remaining questions.
If no, please state the reason why:

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modifed trees for scientific and/or commercial purposes?

UNITED STATES OF AMERICA

[30 November 2006]
[SUBMISSION:ENGLISH]

The United States is pleased to provide the following information in response to the request from the Secretariat of the Convention on Biological Diversity for information pertaining to the potential impacts of genetically modified trees on forest biological diversity.

1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?

Over 300 confined field trials of genetically engineered (GE) trees have been conducted in the United States since 1989, with no evidence of environmental harm. These experimental trials have been conducted for forest trees as well as ornamental and fruit trees, including pine, eucalyptus, poplar, chestnut, elm, plum, apple, papaya and walnut. A list of field trials conducted in the U.S. is available at http://www.isb.vt.edu/. To date, the only GE tree variety that has been deregulated and that is in commercial production in the United States is papaya that has been engineered to be resistant to the papaya ringspot virus. There are over 1200 acres of GE papaya planted in commercial orchards in Hawaii. The U.S. is also currently reviewing a petition for the deregulation of plum pox-resistant plum.

2. Has your country developed any platform/discussion forum/national committee, etc. dealing with genetically modified tress?

Issues relating to genetically engineered trees have been addressed in a number of different forums in the U.S. The Animal and Plant Health Inspection Service (APHIS) of the U.S. Department of Agriculture (USDA) is responsible for regulatory oversight of environmental releases of GE organisms in the U.S, including GE trees (see Question #3). In addition, if the plant has been engineered to express a pesticidal compound, the Environmental Protection Agency (EPA) also has authority. The regulatory process is transparent and provides opportunity for public comment. A list of all field trials conducted in the U.S. is available on the APHIS website, and any decision to deregulate a GE tree variety includes opportunity for public comment.

In 2001, the US Department of Agriculture (USDA) formed an Advisory Committee on Agricultural Biotechnology (ACAB) to advise the Secretary of Agriculture on policy issues related to agricultural biotechnology. This committee, now referred to as AC21 provides a forum for consideration of the long-term impacts of biotechnology and for discussion of other issues that may be outside the authority of the regulatory agencies. The committee consists of over 25 members from government, industry, university and other stakeholders. AC21 meetings are held regularly and transcripts of those meetings are available

on the USDA website (www.usda.gov). The most recent AC21 report (July 2006), *Opportunities and Challenges in Agricultural Biotechnology: The Decade Ahead*, includes consideration of both forest and fruit trees.

In addition, there have been a number of public meetings over the past several years in the U.S. that included consideration of the scientific, as well as the societal, implications of the environmental release of GE trees.

- The Pew Initiative, along with the Society of American Foresters and the Ecological Society of America, sponsored a conference in 2001 to discuss a wide range of issues surrounding the potential introductions of genetically engineered trees. Participants included scientists, government regulators and non-governmental organizations. The conference proceedings are available at the Pew Agbiotech website (http://pewagbiotech.org/agtopics/index.php?TopicID=7).

- Also in 2001, a number of university, government (USDA/APHIS and Canadian Forest Service) and industry organizations sponsored an International Symposium on Ecological and Societal Aspects of Transgenic Forest Plantations in Washington State. Participants again included scientists, government regulators and NGOs. Presentations addressed not only scientific issues but also issues covering possible global and societal implications of large-scale GE tree plantings. Conference proceedings are available at http://www.fsl.orst.edu/tgerc/iufro2001/eprocd.htm.

- USDA/APHIS Biotechnology Regulatory Services hosted a public meeting in 2003 on Genetically Engineered Forest and Fruit Trees. In addition to the scientific program, an open forum was made available where stakeholders could present their views. Breakout sessions encouraged participants to comment on how USDA/APHIS could best address scientific issues relating to gene flow, weediness/invasiveness and other appropriate information to facilitate a decision on deregulation of a GE tree variety. Attendees included government and industry scientists, regulatory officials from the US and Canada and NGOs. The presentations, written public comments, and other documents are available at http://www.aphis.usda.gov/brs/tree_meeting_2003.html.

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?

In the United States, three Federal agencies share responsibility for regulating plants and plant products developed using genetic engineering. The U.S. Department of Agriculture's (USDA) Animal and Plant Health Inspection Service (APHIS) the Environmental Protection Agency (EPA), and the U.S. Department of Health and Human Services' Food and Drug Administration (FDA). Together, these agencies ensure that the products of modern biotechnology are safe to grow, safe to eat, and safe for the environment. Links to the regulations from each agency can be found at http://nbii.usbiotechreg.gov.

Under the authority of the Plant Protection Act, environmental release of GE trees is regulated by USDA/APHIS. Developers of GE trees must submit an application to APHIS prior to conducting experimental field trials. Based on tree biology, confinement conditions are imposed on trials to minimize the likelihood of establishment and spread of GE trees in the environment, including gene flow to related species or wild relatives. The conditions designed to minimize escape of GE material into the environment can include field trial isolation, prevention of flowering, or any other effective method. In addition, an applicant must control and dispose of plant material such that it does not persist in the environment. Field trials are subject to inspection and monitoring to ensure that applicants are confining the trial and to ensure appropriate disposition of plant material.

Once a developer of a new GE tree variety has sufficient data from laboratory and field trials to demonstrate that the tree is as safe for agriculture and the environment as its traditionally developed counterpart, USDA regulations provide a process by which developers can petition APHIS to grant non-regulated status for that product (http://www.aphis.usda.gov/publications/biotechnology/index.shtml). APHIS scientists review a comprehensive data package submitted by the applicant that includes both a phenotypic and genotypic description of the GE and non-GE variety, typical assessments for plant pest and disease susceptibilities, protein expression assessments, field test reports and other relevant experimental data. During the process of assessing a petition for deregulation, the public is invited to comment on the developer's petition and on APHIS' scientific and environmental assessment of the new product. When a determination of nonregulated status is made, the product and its progeny are no longer subject to APHIS oversight. Thus, trees that have been granted non-regulated status can be grown in the environment without special restrictions such as confinement, as it has been demonstrated that they pose no greater risk than similar non-engineered trees.

GE trees that are engineered to produce a pesticidal substance (any substance intended to prevent, destroy or mitigate any insect, plant or disease pest) would also be subject to oversight by the U.S. Environmental Protection Agency (EPA). For all pesticide products, including genetically engineered pesticides, EPA requires testing of product composition and chemical properties, human health effects, environmental effects on non-target pests, and the fate
of the pesticide in the environment. Through a registration process, EPA regulates the sale, distribution, and use of pesticides, including pesticidal substances produced in GE plants and trees, in order to protect human health and the environment.

U.S government regulatory agencies ensure that the products of modern biotechnology, including trees, are safe to grow, safe to eat, and safe for the environment. People or companies that violate any of these agencies' laws or regulations are subject to high monetary fines and other punitive actions.

ZIMBABWE

[03 October 2006]
[SUBMISSION:ENGLISH]

PILOT ASSESSMENT
On the potential environmental, cultural and socio-economic impacts of genetically modified trees on forest biological diversity

Name of Country: ZIMBABWE

Affiliation: FORESTRY COMMISSION

Contact details of person completing the questionnaire (including e-mail): Cossym@frchigh.co.zw (Cossy M ISOKONYI)

1. Does your country have any plantations, either commercial or experimental, of genetically modified trees? NO

If yes, please answer all remaining questions.
If no, please state the reason why: We have not yet ventured into that type of research, therefore we do not have the methods and appropriate protocols to follow.

2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees? No

If yes, please answer the remaining questions.
If no, please state the reason why: As of now, it is not a national priority given other technologies that we employ. Also, the economics of GMO-technology in forestry needs to be established given less risk technologies at hand.

* 3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes? No

If yes, please list them according to the categories below:
If no, please explain the reason why here: Currently, the emphasis is on agricultural crops and food security for the general populace.

Environmental impacts of genetically modified trees
(Example: effects on native ecosystems, use of herbicide)

N/A

Cultural impacts of genetically modified trees
(Example: positive or negative impacts on indigenous and local communities and their traditional knowledge)

N/A

Socio-economic impacts of genetically modified trees
(Example: positive or negative effects on quantity, quality and economic value of forest production; positive or negative impacts on livelihoods of communities)

N/A

* Guidelines or regulations in general are there but not specifically for forest trees. What exist observe agricultural crops. GOZ amended the Research Act and developed Biosafety Regulations to ensure the safe development, use, application and release of GMOs under supervision of the Biosafety Board. However, in Section 4.7 (Forests) of the National Environmental Policy, the Guiding Principle 15 is silent on GMOs but there is a mention in Section 4.9 (Genetic

SUBMISSIONS FROM ORGANIZATIONS

BRAZILIAN BIOSAFETY ASSOCIATION

[23 August 2006]
[SUBMISSION:ENGLISH]

Dear Mr. Djoghlaf,

I refer to your invitation to Governments, relevant organizations and stakeholders to provide views and information on genetically modified trees, in order to allow the SBSTTA at its 13th meeting to assess the potential environmental, cultural, and socio-economic impacts of genetically modified trees on the conservation and sustainable use of forest biological diversity. We understand that the questionnaire is a first step in the preparation of the assessment, and wish to commend you for this stepwise approach in exploring this complex and important field. As we cannot find on the CBD website when the 13th SBSTTA will take place, please inform us of the planned dates.

The **Brazilian Biosafety Association- ANBio** is a non-profit, scientific non-Governmental Organization in Brazil which has more than 3.000 members, from public and private institutions working with biosafety in modern biotechnology within the country. Some of ANBio's members have actively participated in COP8/MOP3, in Curitiba, under the umbrella of the Public Research and Regulation Initiative (PRRI) and others belonging to the Brazilian Delegation.

A significant portion of the ongoing biotechnology researches in Brazil focuses on trees. Most of these researches are supported by Governmental grants. Those researches have a wide variety of objectives that address stress, yield (wood and fruit) and quality of wood, environmental impacts and maintaining biodiversity. As many of these challenges cannot be solved by conventional techniques alone, the research in this field also includes exploring biotechnology techniques. A particular challenge unique to trees that can be addressed using genetic modification is the long generation time needed for sexual crosses for introduction and testing of agriculturally important traits.

Examples of ongoing research on genetic modification of trees in Brazil include the development of insect and disease resistant trees in for example banana, cocoa, citrus,

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coffee, Eucalyptus and papaya trees, trees that produce hardwood rapidly in Eucalyptus, enhancing abiotic stress tolerance such as drought and saline tolerance, trees with reduced lignin content and other important chemical alterations and also to develop new and more efficient sources of renewable energy.

ANBio believes that it is essential to intensify research on biotechnology in trees that can help address the challenges above, of course with the overarching condition of safeguarding safety to human health and the environment.

We are therefore deeply concerned with the unsubstantiated calls of some groups for a moratorium on research on GM trees. Scientifically there is no reason for such a moratorium. Whether or not GM trees pose potential risks to human health or the environment that outweigh the potential benefits, can only be assessed on a case by case basis, using the principles of risk assessment defined in the CBD with no a priori judgement of the effect of a specific organism on biodiversity and human health and by the Brazilian Biosafety regulation. The principles for effectively contained field trials in trees are well established in Brazil by the Brazilian Biosafety Law - Law 11.105 from 2005. In this context it is also important to know that from the hundreds of field trials with GM trees (or other GM plants) that has been conducted to-date worldwide, there is not one verifiable report of adverse effects on human health or the environment.

Bearing in mind how critically important that research in this field continues, we look at the Secretariat to provide objective, clear, precise and balanced information to the SBSTTA. With this purpose, we have conducted a survey in Brazil to support the response to the CBD transgenic tree questionnaire and the list of the Brazilian institutions working with GM trees which collaborated in this survey is in annex to this document.

The **Brazilian Biosafety Association- ANBio** stands ready to assist in your difficult tasks, and sharing information through our network in Brazil and at our web site www.anbio.org.br .

BRAZILIAN SOCIETY OF PLANT BREEDING

[17 August 2006]
[SUBMISSION: ENGLISH]

To develop those answers an internal survey was run amongst the SBMP members working with biosafety and/or biotechnology in Brazil

1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?
Yes. Brazil has only experimental plantations of GM trees. The species that are being tested are *Eucalyptus* and Papaya.

2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?
Yes. Brazil has a governmental national committee, entitled "National Biosafety Technical Commission" - CTNBio. This committee gives technical support to the Brazilian Federal Government in order to update and apply the National Policy of Genetically Modified Organisms (GMOs) Biosafety. Brazil has also approved a new biosafety law last year.

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?
Yes. Brazil has regulations for minimizing the impacts of GMTs for scientific and commercial purposes, taking into account environmental, health, cultural and socio-economic aspects. There is a specific Biosafety Technical Committee in Brazil that regulates genetically modified organisms. The genetically modified tree projects are submitted for approval under this Committee. The projects are analyzed case-by-case by experts and they are also submitted to ad hoc consultations.
The Brazilian Government has approved, in 2005, the Biosafety law that gives to CTNBio the responsibility to create technical rules that must be followed by the companies and institutions which have activities with GMOs. The first Biosafety Law in Brazil was edited in 1995 and established the case by case analyses of all Genetically Modified Organisms before its use. The main goal of this law is to guarantee the protection of the environment and human health when GMOs experiments are designed.

All Brazilian Institutions or companies that work with GMOs must obtain the "Biosafety Quality Certification" - CQB issued by CTNBio. This certification assures that all GMOs experimental activities carried out by the companies and institutions strongly follow biosafety rules.
Brazil has developed biosafety regulations that are consistent with the risk assessment recommendations in Annex III of the BSP, based on the biology of the species and a case-by-case approach that is flexible enough to be able to address the diverse biology found among all plant species, including trees.
This case-by-case approach is important in order to deal with the diverse biology of tree species: fruit or forestry species; short or long lived, self fertile or self incompatible, insect or wind pollinated, adaptation to specific environments, native or exotic, that would be impractical to address if separate specific guidelines were considered for all trees.

The actual experience with GM plants that has been accumulated shows a perfect safety record. Although activist groups proclaim many negative impacts there is no credible scientific evidence that there have been any harm to humans or to biodiversity. The scientific consensus on appropriate procedures for risk assessment has lead to specific science based regulations that have been put into place in Brazil as well as in countries like Canada, the United States, Argentina, the Philippines, South Africa, and others, based on the indicators of OECD, FAO, UNEP, the US National Academy of Sciences, the UK Royal Society, the Third World Academy of Science, between others.

Environmental impacts of genetically modified trees
Potential environmental impacts are addressed as a key consideration within Brazil’s regulations for all plant species, including GM trees. The biology of the target species is evaluated as well as the impacts of the genes introduced, be they for herbicide tolerance or any other trait. By careful review of the information submitted for a request for a confined field trial, the system allows for the safe testing of genetically modified organisms without undue risk to native ecosystems. Any potential negative impacts must be considered and addressed in order to receive approval for any introduction into the environment.

- Any regulatory system should also allow for the assessment of positive environmental impacts. Technological advances have the potential to reduce pressures on native ecosystems by increasing productivity within existing production areas in order to meet increasing consumer demands. In

addition, reductions in energy consumption and the environmental footprint of production technologies are possible by improving characteristics to allow more efficient processing and reduction in waste streams. Other potential applications include developing efficient feedstocks for biofuels as alternatives to dependency on fossil fuels, together with associated broad global benefits.

Brazil is developing several projects with genetically modified trees, with *Eucalyptus, Papaya* and Citrus. Usually the genetically modified trees are exotic species, like eucalyptus, and they cannot cross with any of the native species.

Cultural impacts of genetically modified trees
(Example: positive or negative impacts on indigenous and local communities and their traditional knowledge)
Positive cultural impacts can be accomplished from reduced pressure on native forest ecosystems. Faster growth or higher fiber yields from plantation forests can help to meet consumer demands. Developing more efficient and more cost effective fiber supply through existing managed plantations could help to significantly reduce logging in native forests and the associated negative environmental and cultural impacts of deforestation.
There are no evidences of negative cultural impacts with the adoption of genetically modified trees in Brazil. *Eucalyptus* and Citrus, are industrial purpose species normally. Different from other planted vegetal species, the commercial forest plantations are predominantly made by companies that are regulated periodically by independent quality control programs and by the state itself, and this results in plantation forests strictly planted according to Brazilian environmental laws. The small producers purchase their plants from professional plants producers or they are supported by the forestry companies. They do not use to make their own plantlets in the farm.

(Example: positive or negative effects on quantity, quality and economic value of forest production; positive or negative impacts on livelihoods of communities).

Economical impacts of genetically modified trees
In other countries the livelihoods of papaya farmers were saved through the introduction of genetically modified virus resistant papaya. Without the genetic modification approach this disease is untreatable and can devastate papaya growing communities. Local communities whose livelihoods depend on a crop that is threatened by disease should be given an opportunity to look to new technologies, including genetic engineering, to combat such threats. It is important that Brazil also has the opportunity to research and develop these kinds of solutions, not just in papaya, but for other tree species that could be threatened by diseases where genetic modification could be the best strategy. Impeding the development and deployment of such new technologies leaves countries and communities at a disadvantage in the global economy.

We ask the Secretariat to account fully for the potential positive effects from genetically modified trees, based on a case by case Biosafety evaluation. Rather than creating barriers to technology based solutions to problems, we should encourage the safe development of new technologies. In addition to protection from diseases, new technologies could allow the development of sustainable energy sources at the local level through higher yields and stress resistance trees. The *failure* to develop such technologies could have significant negative socioeconomic impacts.

DUKE UNIVERSITY

[16 August 2006]
[SUBMISSION: ENGLISH]

Question 1. Does your country have any plantations, either commercial or experimental, of genetically modified [forest] trees?
If yes then give details, e.g. over X number of trials have been safely conducted with no negative effects and no harm to the environment. Trials were approved by and overseen by local regulatory authority. Comments on the rigor of the regulatory process would be useful here. Other comments.

Response: Only as field trials. Field locations are proprietary but other information is maintained in a database managed by Information Systems for Biotechnology based at Virginia Polytechnic Institute and State University (http://www.isb.vt.edu/) and directly from the US Department of Agriculture, on request.

If yes, please answer all remaining questions. [As this question is structured it would imply that a no answer also means that none of the remaining questions are to be answered. However, this should not preclude additional notes or comments on the remaining questions where there are relevant issues to be addressed.]

If no, please state the reason why:

GM technology for forest trees is so recent that neither benefits nor risk data are published in peer-review journals. Mainly interest has been in DNA constructs which change wood properties and discovering these genes has been a slow process.

Question 2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?

[Note that the question does not relate to regulations – see question 3 for that.]

Two conferences on this topic have been comprehensive enough that they invited NGO groups: Oregon State University's Bioengineered Forests (Steve Strauss and Toby Bradshaw) and Duke University's Landscapes, Genomics and Transgenic Conifers (Claire Williams).

If yes, please answer the remaining questions. [Although the question structure implies that a no answer also means that none of the remaining questions are to be answered, where there is relevant information to later questions this should be provided.] This question is not just restricted to national government sponsorship of the above platforms, etc.

While this is a simple Yes/No question it gives an opportunity to describe local efforts in these areas. Example responses:

If no, please state the reason why:

A. See answers to Question 1 above. In addition, list other factors which might be relevant.

NGO groups have been open to informal discussions; some are better prepared for framing scientific questions than others. I maintain open communications and ongoing dialogue with biotechnology firms, NGO groups and timber companies in several countries for both forestry and agriculture.

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?
[This question implies that any impacts will be negative and so need to be 'minimized'. Responses should point out this inappropriate bias in the questionnaire and highlight the many far reaching potential positive economic and environmental impacts and discuss the need to 'maximize' positive impacts.]

USDA APHIS is presently undergoing regulatory reform. My research is funded through the USDA Biotechnology Risk Assessment Program so my findings must be relevant to APHIS. I present my research annually to APHIS.

If yes, please list them according to the categories below: We need to provide documentation of the benefits associated with biotech trees and the factors that need to be considered for risk analysis and what make a risk a not acceptable risk.

See answers from above. In addition:

No benefits data are available at this time especially for reproductive traits or harvest age wood products.

If no, please explain the reason why here:

Environmental ***impacts of genetically modified trees***
(Example: effects on native ecosystems, use of herbicide)

We are collecting risk data for GM conifers and will complete additional peer-reviewed manuscripts by mid-2007. Results are relevant to this question.

Cultural ***impacts of genetically modified trees***
(Example: positive or negative impacts on indigenous and local communities and their traditional knowledge)

The largest forest landowners in the US South, the timber-growing regions, are individual or families. They comprise 90% of all forest land ownerships yet they are the group least likely to adopt this technology because it requires taking high levels of investment risk. Their lands are adjacent to timber companies some of whom want to adopt this technology. Clash between adjacent landowners can be expected given that gene flow from GM plantations moves on the scale of kilometers.

Socio-economic ***impacts of genetically modified trees***
(Example: positive or negative effects on quantity, quality and economic value of forest production; positive or negative impacts on livelihoods of communities)

Forest trees have a marginal effect relative to agriculture. At this time, no apparent impacts are expected given that forest trees in the US require decades between planting and harvest.

STATE UNIVERSITY OF NEW YORK, COLLEGE OF ENVIRONMENTAL SCIENCE AND FORESTRY

[06 September 2006]
[SUBMISSION: ENGLISH]

We welcome the opportunity to explain our position that a moratorium on testing and deployment of genetically enhanced trees would, in the case of the American chestnut (*Castanea dentata*), further erode biodiversity.

At the College of Environmental Science and Forestry, we have spent more than 16 years developing transformation procedures and identifying potential resistance genes for one of the most ecologically devastating diseases to ever strike the forests of North America. Chestnut blight, caused by the introduced pathogen *Cryphonectria parasitica*, destroyed between 3 and 5 billion American chestnut trees and severely affected the ecology and economy of the entire Appalachian region. Much of the depletion of ecosystem services occurred in the first half of the 20th century before economists and ecologists routinely gathered data on such problems, but antidotal evidence puts the total economic losses in the billions of dollars. The direct and indirect ecological impacts on wildlife populations were equally devastating.

Our research has evolved into the American Chestnut Research and Restoration Project (http://www.esf.edu/chestnut). After more than 16 years of laboratory research, we established our first field trial of transgenic chestnut trees on June 7, 2006 (USDA APHIS BRS Notification #: 06-090-21n). We expect to spend the next five years establishing additional field tests and screening different gene constructs for blight resistance. Preliminary screening will be conducted in the greenhouse, but the durability of the various blight resistance genes can only be evaluated in field trials.

A moratorium on such field trials would, at best, freeze the American Chestnut Research and Restoration Project for the duration of the moratorium. Quite possibly such a moratorium would kill it outright because of the "perishable" nature of a research team (students graduate, co-workers take other positions or retire, sponsors lose interest, etc.) and of the transgenic embryo cultures themselves, which need constant upkeep until they can be regenerated and planted in the field.

The Chestnut Project directly supports the primary mission of the Convention on Biological Diversity: conserving and, where possible, restoring ecosystem services. Halting the project at this critical point would allow this once-magnificent species to continue spiraling toward extinction.

Thank you for considering our position.

ECONEXUS

[01 December 2006]
[SUBMISSION: ENGLISH]

EcoNexus Submission re Assessment of Genetically Modified (GM) Trees

Decision VIII/19-11 of the Conference of the Parties to the Convention on Biological Diversity recognises the uncertainties related to the impacts of genetically modified trees. Among these are potential environmental and socio-economic impacts, including long-term and trans-boundary impacts, on global forest biological diversity, as well as on the livelihoods of indigenous and local communities. It also recognises the absence of reliable data in order to undertake risk assessments and to evaluate those potential impacts.

In order for SBSTTA to consider and assess "potential environmental, cultural, and socio-economic impacts of genetically modified trees on the conservation and sustainable use of forest biological diversity, and to report to the ninth meeting of the Conference of the Parties", Decision VIII/19-11 invites parties, other governments and relevant organisations, including indigenous and local communities, as well as relevant stakeholders, to provide relevant views and information to the Secretariat for inclusion in this assessment.

EcoNexus has screened the peer reviewed scientific literature to ascertain to what extent data is available and/or has been provided and used to perform risk assessments and impact assessments of transgenic trees on global forest biodiversity as well as on the livelihoods of indigenous and local communities.

We conclude that there is little data and few assessments available to this end. Before any further releases of genetically engineered trees, the international community needs to gather far more "background" information about trees and forests, how the various elements of each behave and interact, more information about pollen, pollen flow and pollinators, about pests and their predators, about nutrients, stress and disease, about soil and forest soil ecology, as well as about climate and water in the context of plantations and forests. Such information is vital to any realistic assessment of potential impacts. We are hopeful that further data and assessments might be made available to the Secretariat in the current process of submissions, or in the run-up to SBSTTA 13. However, we suspect that more time will be required for this stage, as the issues are highly complex as well as little understood.

The Federation of German Scientists stated at CBD-COP8, Working Group I:

"There is general agreement, amongst scientists and parties alike, that no genetically engineered organism should be released into the environment without an adequate risk assessment.

A risk assessment relies on sufficient and reliable data as well as on adequate hazard assessment and the assessment of potential impacts, including direct and indirect impacts. Part of this is also the drawing up and investigation of risk scenarios – e.g. what would be the consequences should genes or traits for insect resistance (e.g. Bt-endotoxin), low lignin, cold adaptation or fast growth spread from tree plantations to forest ecosystems on local, national, regional and international levels.

At present, there are many gaps in our knowledge, including a lack of impact assessments and investigations of risk scenarios. To date, for example, no studies have been carried out on trees for the mutational effects of genetic engineering and transformation technologies. Studies in annual crop plants revealed the effects of genome scrambling and a high degree of transformation induced mutations. Without sufficient data, no meaningful risk assessment can be performed by anyone. This is not a matter of lack of capacity. It is a matter of lack of information and data.

Parties are in agreement that collation of existing information, including peer-reviewed published literature, regarding the potential impacts of transgenic (GM) trees has to form the basis for the evaluation of current knowledge. SBSTTA 13 is – according to CRP3, article 4g - to consider the information and advise COP 9 on the matter. Should SBSTTA13 not be satisfied with the data and assessments available or find that impact assessments are missing and further studies are required, it will advise COP 9 accordingly.

It is good scientific practice to apply the precautionary principle in the event of lack of sufficient data or potential negative impacts. Consequently, it is in line with CBD objectives and the precautionary approach established in the CBD to refrain from releases of transgenic trees into the environment until SBSTTA has had the chance to do its work and advise the parties at the next COP."

Unarguably, at present, we are facing a massive problem with the lack of scientific knowledge:

- at the level of interaction of these genetically engineered trees with the ecosystems into which they are intentionally or unintentionally introduced.

- at the level of the introduction (or transfer) of novel genes into the tree genome.
- but also at the level of the transformation process itself. It is known that this process is prone to cause thousands of mutations in addition to substantial genome scrambling.10

Therefore, a lot of scientific research is still pending at all three levels. Given the long life span of trees, there is no quick way to assess the impacts of genetic engineering and novel genes on tree performance, behaviour and interaction within ecosystems.

Should seeds or pollen from GE trees – or propagules, i.e. other parts of trees capable of rooting – find their way into forests, potential impacts are enormous.

The global distribution patterns of forest trees makes it necessary to carry out global risk assessment. The Cartagena Protocol on Biosafety covers unintentional transboundary movement of LMOs (living modified organisms) but, so far, falls short of providing an instrument for regional and global risk assessments and, indeed, for requiring Advanced Informed Agreements from all parties potentially impacted by the release of GE trees.

Any progress towards reliable risk and/or impact assessments of transgenic trees on global forest biodiversity, as well as on the livelihoods of indigenous and local communities, can only be as good as

a) the knowledge at the given time,

b) the data provided and

c) the questions asked and investigated.

As there is clearly a lack of knowledge and more data is required and will need to be assessed, we regard a series of questions to form the basis of the assessment as the most important component of the current investigation.

Our submission is thus in form of questions – questions that require answers if we are to fulfil our obligations, such as to protect global forest ecosystems, global forest biodiversity, and their sustainable use.

Series of Questions:

1) Before any genetically engineered tree is released into the environment, the question has to be: Is there sufficient knowledge and data on the tree species itself, e.g.

   a) its role within the forest ecosystem(s),

   b) its interaction within the forest ecology and its different components, such as micro-organisms, soil-organisms, fungi, plants, insects, pests, pathogens, herbivores, mammals, birds etc.

   c) its genome, transcriptome, proteome and metabolic profile (i.e. functional genomics)

   in order to be able to recognise any changes and predict and understand the potential consequences?

2) How does the tree species (non-GE) behave outside its natural habitat?

3) When genetically modifying trees, for any transformation event, which other traits or characteristics - with regards to behaviour and interaction with forest ecosytem(s)/biodiversity, disease, pests, as well as phenotype, genotype to functional genomics (Haggman and Julkunen-Tiitto 2006) - are being affected other than the intended trait:

10 Wilson A, Latham J and Steinbrecher R (2004). Genome Scrambling – Myth or Reality? Transformation-Induced Mutations in Transgenic Crop Plants. *EcoNexus Technical Report*. The full 36 p report or the 4 p summary are freely available at www.econexus.info.

a) through the genetic engineering / transformation process - i.e. transformation induced mutations, genome scrambling (Wilson et al., 2004)

b) through synergistic effects

c) through interruption of, or changes in, biochemical / metabolic pathways (incl. altered rate of expression)

d) through pleiotropic effects

e) through chosen regulatory sequence (e.g. promoter)

Unpredictable effects have been observed in other transgenic plants (e.g. Arabidopsis, soya bean, sun flower, maize, tomato, potato, squash etc.)

4) How reliable and effective is the genetic modification (e.g. male sterility, production of Bt toxin, lignin reduction) and what are the potential effects and impacts of the introduced genes and trait?

   a) over a decade

   b) over the life time of a tree

   c) over generations

   d) through changing stress conditions (e.g. heat, cold, drought, storm, flooding, etc.)

   Related to this are gene silencing and epigenetic changes. Little is so far known about these phenomena in trees.

5) Regarding gene flow, gene escape and "tree escape" - for the unaltered as well as the transgenic tree:

   a. Can branches of the tree species/sub-species be used for grafting? If not, experimental evidence is required. What are potential consequences?

   b. Can branches, cuttings or fragments placed into soil then produce roots and grow into a tree, and if so, under which conditions? If not, experimental evidence is required.

   c. Can shoots develop from roots? Under which conditions? Is this common? If not, experimental evidence is required.

   d. Is the tree known for invasive qualities?

6) Regarding pollen and cross-pollination of the unaltered tree and for the transgenic tree (without release into the environment):

   a) How long does pollen survive (experimental data required, including different conditions for different parameters, such as temperature, moisture and atmospheric pressure).

   b) How far can pollen travel?

      i. under normal conditions;

      ii. during storms and tropical storms (e.g. hurricanes, tornadoes). Hurricane Ivan, for example, is thought to have blown spores of Asian Rust disease to the US from South America.

7) How does the **intended trait** affect - over time and at different life cycle stages and conditions:

   - the performance of the tree?

   - the interaction between tree and soil and its organisms?

   - nutrient uptake

   - carbon sequestration

- speed of growth
- water uptake
- growth of root system
- interaction of tree with insects, pests, beneficial organisms, other plants, other trees etc.
- the role of the tree in its natural forest ecosystem? (e.g. food source, shelter, prevention of erosion)
- the food chain?
- other organisms?
- the speed of decay?
- the speed of nutrient cycling?
- balance of population in relation to other trees in ecosystem?

8) How do the **unintended traits** (changes due to transformation induced mutations, synergistic effects, altered gene expression rate etc.) affect all the above?

9) What are the effects of the tree species (non-GE) being grown in monocultures, such as plantations, on:

   a) Resources
   b) soil
   c) water table
   d) water quality
   e) wildlife
   f) use of land
   g) people (see sublist under questions regarding communities below)
   h) biodiversity

   Effects should be classified into neutral, positive or negative with regards to protection of biodiversity and its sustainable use, land rights and use, indigenous and local communities, farmers, etc.

10) Is the transgenic tree to be grown as a monoculture – and if so - will this exacerbate or alleviate the negative effects of conventional monocultures (plantations), will it contribute to additional negative effects?

11) What are the potential negative consequences of gene flow into natural ecosystems, especially forest ecosystems, if gene escape were to take place?

    - to wildlife, biodiversity, soils, communities.

12) How could GE trees be contained if they escaped into native ecosystems?

13) How will we know if GE trees have escaped into native ecosystems?

14) How can GE trees be recognised? How can they be cleaned up? Who will pay for clean up and compensation?

15) What are the benefits of the transgenic tree as compared to the conventional tree for the forest ecosystem, biological diversity and its sustainable use?

16) With regards to potential impacts on indigenous and local communities, the following might be useful as questions:

What role and use do trees/forests have in the community?

Is the community located near monoculture tree plantations?

If yes, what effects is the community experiencing due to these tree plantations?

- socio-economic
- cultural/ spiritual
- food availability/ quality
- water availability/ quality
- health impacts due to pesticides spraying, etc
- shelter
- land

17) How might the/your community be affected if these plantations included trees genetically engineered to, for example:

- kill insects
- be herbicide resistant
- grow faster
- have reduced lignin
- be sterile

References

Haggman H, Julkunen-Tiitto R (2006). Metabolic profiling for transgenic forest trees. In: Williams CG, ed. Landscape, Genomics and Transgenic Conifers. Springer 2006.

Wilson A, Latham J and Steinbrecher R (2004). Genome Scrambling – Myth or Reality? Transformation-Induced Mutations in Transgenic Crop Plants. *EcoNexus Technical Report*. The full 36p report or the 4p summary are available at www.econexus.info.

ENSIS GENETICS

[06 September 2006]
[SUBMISSION: ENGLISH]

Question 1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?

No.

If yes, please answer all remaining questions.
If no, please state the reason why:

The two major forest plantation species in Australia are native temperate eucalypts and exotic pine species. There is a national regulatory organization (Office of Gene Technology Regulator) established to monitor approval of field trials of GM plants. At this stage there have been no applications for commercial or experimental field trials of GM trees.

It is likely that OGTR's major concern about GM trees would be focused on the likelihood of movement of transgenes into native populations and the ecological consequences of this, in particular the affect of the transgene on weediness and the consequent impacts on biodiversity. With eucalypts the concern is about movement of transgenes into surrounding forests containing interfertile species. Pines are considered a weed species in some environments so increased weediness would be an issue.

Application of GM technology in Australia is hindered by a number of factors, including the size of the forest industry, the perception that there is likely to be strong public opposition to GM trees, and the anticipated cost of obtaining approval for commercial release after extensive and expensive field trials. In addition, it is likely that total sterility will be a requirement for some or most GM trees in Australia, placing an additional research/application costs on the relatively small industry. While Australia grapples with these issues, other countries are beginning to establish commercial trials. It is likely that the Australian industry will eventually feel considerable pressure to adopt GM trees in order to remain competitive in the global economy. There is some concern that these pressures may eventually result in movement of fertile GM eucalypts into Australia via illegal routes.

Question 2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?

To the best of our knowledge there has not been a national initiative dealing with GM trees. This is probably because the industry is not pushing for the uptake of this technology yet. There is discussion between scientists in national research organizations. CSIRO/Ensis supports the responsible uptake of GM technology and CSIRO scientists have held a public forum to discuss GM technology in forestry (Talkback Science @ CSIRO Discovery forum on 'Forestry Biotechnology: Has it a home among the gum trees (and pine trees)? CSIRO Discovery – Thursday 22nd June 2006). At a Federal government level, the Department of Agriculture, Fisheries & Forestry has started work on a status report on GM trees in terms of the issue of GM forest technology in the context of the Convention on Biological Diversity, and Australia's position thereof.

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?

No. The OGTR does not have in place guidelines specific for forestry. Whatever the OGTR decides in relation to forestry will be in direct response to specific applications for release of GM trees after consultation with its scientific and ethics committees. Australia's regulatory system focuses on the specific biology of the target species and the engineered trait on a case-by-case basis, allowing for the assessment of a wide range of characteristics across all plant species, including forest trees.

Environmental *impacts of genetically modified trees*
(Example: effects on native ecosystems, use of herbicide)

Possible environmental impacts are key considerations within OGTR guidelines and regulations for all plant species, including trees. The biology of the target species is evaluated as well as the impacts of the genes introduced, be they for herbicide tolerance or any other trait. Potential negative impacts must be considered and addressed in applications for release in order to receive approval for any introduction into the environment.

Cultural ***impacts of genetically modified trees***
(Example: positive or negative impacts on indigenous and local communities and their traditional knowledge)
If GM trees were approved in Australia it is unlikely that they would have any impact on local communities beyond the impact that non-GM plantation forestry is having. We are not in position to comment on the impact or the response of Aboriginal communities to GM trees.

Socio-economic ***impacts of genetically modified trees***
(Example: positive or negative effects on quantity, quality and economic value of forest production; positive or negative impacts on livelihoods of communities)
It is likely that the Australian industry will eventually feel considerable pressure to adopt GM trees in order to remain competitive in the global economy.

FORESTRY SCIENCE AND RESEARCH INSTITUTE

[01 September 2006]
[SUBMISSION: ENGLISH]

PILOT ASSESSMENT
On the potential environmental, cultural and socio-economic impacts of genetically modified trees on forest biological diversity

Name of Country: Brazil

Affiliation: Forestry Science and Research Institute

Contact details of person completing the questionnaire (including e-mail): Dr. Luiz Ernesto George Barrichelo – E-Mail: diretoria@ipef.br

1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?
Yes. Brazil has only experimental plantations that have been analyzed and approved by the National Biosafety Technical Commission (CTNBio) according to Brazilian legislation and international agreements involving Genetically Modified Trees (GMT).
The species that are being tested are Eucalyptus and Papaya.
All of these processes are for research purposes. All approved trials have been for *Eucalyptus.*

12 Field Release Processes in Brazil (1999-2006)

Granted and Concluded	Granted and in progress	In Analysis	Deferred
02 (1999)	03 (2004)	05 (2005 and 2006)	02 (2003 and 2006)

* source - CTNBio - Comissão Técnica Nacional de Biossegurança, 2006 (www.ctnbio.gov.br) .
** There are, at least, 04 new processes in line to be analyzed in 2006.

None of these have produced any observations of negative impacts or harm to the environment or biodiversity, demonstrating that trials of genetically modified trees are not difficult to perform safely. Details on field trials in Brazil are available in the Official Federal Gazette ("Diário Oficial"), which is available to the public.

2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?
Yes. Brazil has a governmental national committee, entitled "National Biosafety Technical Commission" - CTNBio. This committee gives technical support to the Brazilian Federal Government in order to update and apply the National Policy of Genetically Modified Organisms (GMOs) Biosafety.

CTNBio is composed of a team of professionals that is responsible for all GMOs biosafety analysis in Brazil. CTNBio only accepts GMOs experimental activity with the guarantee that the natural resources and human health will not be disturbed.
Besides that, there have been multiple meetings and discussion forum and workshops on genetically modified trees. There is a Forest Biosafey Project at São Paulo University, coordinated by Dr. Luciana Di Ciero. There is a site of the project that is used as a contact, forum discussions. The site is http://www.bioflor.esalq.usp.br. There is a biosafety network of Brazilian Company for Agricultural for Papaya research among others crops.
Follow some examples:

- Forum: Importância da Biotecnologia
Ministério do Desenvolvimento, Indústria e Comércio Exterior

- Forum de Competitividade em Biotecnologia
See references at ANBIO web site: www.anbio.org.br

- BIOWORK I, II, III, IV, V, VI and VII - Biotecnologia & Meio Ambiente
Universidade Federal de Viçosa

- I, II, III and IV Congresso Brasileiro de Biossegurança/ IV Simpósio Latino-Americano de Produtos Transgênicos
See references at ANBIO web site: www.anbio.org.br

- I, II and III Encontro de Presidentes de Comissões Internas de Biossegurança – CIBios - MCT/CTNBio and ANBIO See references at ANBio web site: www.anbio.org.br

In addition there have been several international discussion forum that have been opened to the public. (For example – FAO: Electronic forum on biotechnology – Forestry Sector, April 25 to June 30, 2000 (http://www.fao.org/Biotech/Conf2.htm), and several Workshops on Forest Biotechnology organized by IPEF and São Paulo University, since 2002.

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?
Yes. Brazil has regulations for minimizing the impacts of GMTs for scientific and commercial purposes, taking into account environmental, health, cultural and socio-economic aspects. There is a specific Biosafety Technical Committee in Brazil that regulates genetically modified organisms. The genetically modified trees projects are submitted for approval under this Committee. The projects are analyzed case-by-case by experts and they are also submitted to ad hoc consultations.
The Brazilian Government has approved, in 2005, the Biosafety law that gives to CTNBio the responsibility to create technical rules that must be followed by the companies and institutions which have activities with GMOs. The first Biosafety Law in Brazil was edited in 1995 and established case by case analyses of all Genetically Modified Organisms before its use. The main goal of this law is to guarantee the protection of the environment and human health when GMOs experiments are designed.
All Brazilian Institutions or companies that work with GMOs must obtain the "Biosafety Quality Certification" - CQB issued by CTNBio. This certification assures that all GMOs

experimental activities carried out by the companies and institutions strongly follow biosafety rules.
Brazil has developed biosafety regulations that are consistent with the risk assessment recommendations in Annex III of the BSP, based on the biology of the species and a case-by-case approach that is flexible enough to be able to address the diverse biology found among all plant species, including trees.
This case-by-case approach is important in order to deal with the diverse biology of tree species: fruit or forestry species; short or long lived, self fertile or self incompatible, insect or wind pollinated, adaptation to specific environments, native or exotic, that would be impractical to address if separate specific guidelines were considered for all trees.

The actual experience with GM plants that has been accumulated shows a perfect safety record. Although activist groups proclaim many negative impacts there is no credible scientific evidence that there have been any harm to humans or to biodiversity. The scientific consensus on appropriate procedures for risk assessment has lead to specific science based regulations that have been put into place in Brazil as well as in countries like Canada, the United States, Argentina, the Philippines, South Africa, and others, based on the indicators of OECD, FAO, UNEP, the US National Academy of Sciences, the UK Royal Society, the Third World Academy of Science, between others.

Environmental impacts of genetically modified trees
Potential environmental impacts are addressed as a key consideration within Brazil's regulations for all plant species, including GM trees. The biology of the target species is evaluated as well as the impacts of the genes introduced, be they for herbicide tolerance or any other trait. By careful review of the information submitted for a request for a confined field trial, the system allows for the safe testing of genetically modified organisms without undue risk to native ecosystems. Any potential negative impacts must be considered and addressed in order to receive approval for any introduction into the environment.

- Any regulatory system should also allow for the assessment of positive environmental impacts. Technological advances have the potential to reduce pressures on native ecosystems by increasing productivity within existing production areas in order to meet increasing consumer demands. In addition, reductions in energy consumption and the environmental footprint of production technologies are possible by improving characteristics to allow more efficient processing and reduction in waste streams. Other potential applications include developing efficient feedstocks for biofuels as alternatives to dependency on fossil fuels, together with associated broad global benefits.

Brazil is developing some projects with genetically modified trees, with *Eucalyptus, Papaya* and Citrus. Usually the genetically modified trees are exotic species, like eucalyptus, and they can't cross with any of the native species. *Eucalyptus* is an exotic tree, *Myrtaceae* and sub-family Eugeniaceae. The first genetic material came from Australia and South Africa to Brazil. Native *Myrtaceae* plants in Brazil belong to another sub-families. There is no evidence and it is unlike that there is cross pollination among

Eucalyptus and Native *Myrtaceae* in Brazil because the evolutive distances among the sub-families.
The gene flow among *Eucalyptus* can occur between plants of the same group. *Eucalyptus* is pollinated mainly by insects (generally honey bees). The distance used for *Eucalyptus* seeds orchards in Brazil is 500m, but there is a significant pollination reduction in *Eucalyptus saligna* at 300 ms from the source pollen (Pacheco et al. 1986).

There are some traits that the Forest Companies are interested, which the goal is productivity and pulp yield. There are some genes that are being used to transform for low lignin content *Eucalyptus* and to improve *Eucalyptus* growth.
There is some experience with low lignin content *Eucalyptus* clones, not genetically modified. Some companies uses for a long time such clones in the environment with no harmful impact evidence. Besides that, there is in fact, a wide natural variation in lignin content in trees that we can get some experience (Talukder, K. 2005).
The low lignin content benefits the environment because the industry uses less toxic chemicals and far less energy to extract the lignin from the wood.

Eucalyptus in Brazil is extensively improved by breeders and hundreds of species, varieties and clones have been tested in the environment. Brazil has conditions to assess and use genetically modified varieties of these plants with no more risks than other breeding technology.

Cultural impacts of genetically modified trees
(Example: positive or negative impacts on indigenous and local communities and their traditional knowledge)
Positive cultural impacts can be accomplished from reduced pressure on native forest ecosystems. Faster growth or higher fiber yields from plantation forests can help to meet consumer demands. Developing more efficient and more cost effective fiber supply through existing managed plantations could help to significantly reduce logging in native forests and the associated negative environmental and cultural impacts of deforestation.
There are no evidences of negative cultural impacts with the adoption of genetically modified trees in Brazil. *Eucalyptus* and Citrus, are industrial purpose species normally. Different from other planted vegetal species, the commercial eucalyptus plantations are predominantly made by big companies that are regulated periodically by independent quality control programs and by the state itself, and this results in eucalyptus forests strictly planted according to Brazilian environmental laws. The small producers purchase their plants in professional plants producers or they are supported by the forestry companies. They do not use to make their own plantlets in the farm. Eucalyptus seeds are produced by the company or by trustable producers, as Forest Research Institute (IPEF). In addition, 80 to 90 % of the *Eucalyptus* fields are clones (vegetative propagation).

(Example: positive or negative effects on quantity, quality and economic value of forest production; positive or negative impacts on livelihoods of communities).

Economical impacts of genetically modified trees
In other countries the livelihoods of papaya farmers were saved through the introduction of genetically modified virus resistant papaya. Without the genetic modification approach this

disease is untreatable and can devastate papaya growing communities. Local communities whose livelihoods depend on a crop that is threatened by disease should be given an opportunity to look to new technologies, including genetic engineering, to combat such threats. It is important that Brazil also has the opportunity to research and develop these kinds of solutions, not just in papaya, but for other tree species that could be threatened by diseases where genetic modification could be the best strategy. In addition to protection from diseases, new technologies could allow the development of sustainable renewable energy sources at the local level through higher yields and stress resistance trees. Impeding the development and deployment of such new technologies leaves countries and communities at a disadvantage in the global economy. The *failure* to develop such technologies could have significant negative socioeconomic impacts as well as losing the potential environmental benefits like: reduced pressure on natural forests, reduced use of chemicals in forests and in processing, reduced erosion, forest restoration, and others.

We ask the Secretariat to fully consider the potential social, environmental and economical benefits from genetically modified trees as much as their possible risks. Based on a case by case evaluation, the safe development of new technologies should be encouraged. The testing under safe conditions is necessary to address the potential issues and develop strategies to deal with it, rather than creating barriers to development of technology based solutions.

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GE FREE NELSON

[27 November 2006]
[SUBMISSION: ENGLISH]

In New Zealand there is a fair amount of genetic engineering research into trees and there have already been open air trials into pine trees and fruit trees. These have gone ahead despite huge public concern and the majority of New Zealanders opposing trials. The public are allowed to make submissions in New Zealand and many made submissions to oppose the pine trees.

It is of concern because pine trees interact with soil organisms as they are mycorrhizal and there is evidence that genetic constructs can be shared with microrganisms. The strong winds in New Zealand

also mean that if pollen is accidentally produced during the trials it could be spread the length and breadth of New Zealand resulting in GE pine trees throughout the country. (At the ERMA hearing it was stated that pollen could travel up to 1000k). Wilding pines are already a problem in New Zealand and the Department of Conservation are doing their utmost to control the problem without much success.

As a result of tamarillo trials there is now a contaminated site where although the Crown Research Institute are prepared to ameliorate any problem, there is no effective means of ensuring that genetic constructs introduced via the trial will not persist. Our concerns are that any genetic pollution may ultimately change the biological chemistry of the soils and that these changes may not be beneficial.

The pine trees also contain antibiotic resistant genes, one specific gene causing resistance to ampicillin is of extreme concern since this is a safe antibiotic used for small children for common childhood illnesses. Since the antibiotic resistant gene will be contained in every cell of the plant, resistance could be passed from workers on the plants to their family, or if pollen were to escape cause similar effects to others outside any direct contact with the trial.

The pine trees also have a sterility gene the effects of which have not been tested and are so far unknown.

In New Zealand a great proportion of our native indigenous forests have been destroyed to make way for forestry enterprise. The crop is grown until the soils are exhausted, the trees use up huge amounts of groundwater, erosion from periodic clear felling causes damage to soil structure and water courses and leaves acid soils which take a long time to regenerate. Faster growing GE trees could exacerbate the problem.

Economically pine trees make up a high percentage of our primary exports so any damage to either our crop or our reputation could impact significantly on the forestry industry. Since no studies have been made on the impacts of sawdust/pollen or any other GE pine derived product it is difficult to say what effects there could be on human or animal health. Suffice it to say that crops of ampicillin resistant GE maize reportedly have had some serious impacts on the health of agricultural workers in France causing respiratory problems.

There are many native podocarps in New Zealand as well as other native conifers and many birds and insects that are forest dwelling and indigenous to New Zealand alone. No research studies into the effects on these organisms and biodiversity in general have been undertaken.

Most of the GE research in New Zealand is carried out with public funds together often with overseas funding by Forest Research Institute www.scionresearch.com and further information can be found on their site. Information regarding the application and approval of the GE pines can be found on ERMA NZ website www.ermanz.govt.nz and other information about GE applications for contained experimentation on trees.There was also a breach of conditions imposed by ERMA when unplanted trees were flowering unexpectedly presumably as a result of stress to the plant. This shows that the unexpected and unanticipated can result with what is considered to be strict controls.

Please take a precautionary approach and declare a ban on the release of GE trees.

GENETIC FOUNDATIONS

[29 August 2006]
[SUBMISSION: ENGLISH]

1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?

Yes, the US has several hundred experimental plantings of GM trees. A detailed listing of these plantings can be found on a public database maintained by Information Systems for Biotechnology at Virginia Polytechnic Institute and State University (http://www.isb.vt.edu/). Many of these are relatively small field trials, and some species have been more extensively studied than others. However, none of these trials have posed any negative environmental consequences.

In terms of commercial plantings, I am aware only of papaya orchards in Hawaii, with trees being engineered for resistance to the exotic papaya ringspot virus. I understand that these resistant trees are responsible for the survival of a viable commercial papaya industry in Hawaii.

2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?

Yes, there have been a number of meetings devoted to GM trees, organized by many organizations. Historically speaking, the International Union of Forestry Research Organizations (IUFRO) has taken the lead in engaging forest biologists in discussions of GM trees, as well as the supporting disciplines of tree genomics, tissue culture, and micropropagation. These meetings began in the 1970's or so, and have taken place both in the US and abroad. Other meetings have been organized by the USDA Biotechnology Regulatory Service (e.g. July, 2003, see http://www.aphis.usda.gov/brs/tree_meeting_2003.html), an agency that also periodically schedules stakeholder sessions, including some on forest trees (http://www.aphis.usda.gov/brs/pdf/BRS_stake_051020.pdf provides an example with Weyerhaeuser Company). Many other discussions, often informal, are held at international meetings such as the annual Plant and Animal Genome Meeting in San Diego. In brief, scientific discussions of GM trees are generally common.

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?

Before answering this question, I would like to point out an apparent bias in the question itself. The bias may be unintentional, but it is there nonetheless. It is understandable that the *negative impacts of GM trees should be minimized*, but it's entirely possible that the *positive impacts should be maximized*.

Regarding biosafety regulations (including environmental impacts) for testing and evaluation, yes, the US has a separate regulatory process for laboratory experiments, field trials, and a "deregulation" process prior to commercial use. The lead agency on this is the USDA Animal and Plant Health Inspection Service (APHIS, http://www.aphis.usda.gov/brs/). Additional agencies such as the Food and Drug Administration (FDA) or the Environmental Protection Agency (EPA) could also be involved, depending on the species and trait(s) of interest. The biological principles for trees are the same as for other species. In all cases, intrinsic factors such as mode of reproduction, mating system, flower and fruit characteristics, pollen and seed dispersal, weediness, vegetative habits, etc, are carefully examined on a case-by-case basis.

Regarding cultural and socioeconomic impacts (both *positive and negative*), it is certainly appropriate to pose such questions, since as I mention in my cover letter, there is much more to forests than the trees themselves. The Hawaiian papaya industry is probably the best current example of a tree-based industry saved by GM technology. Skeptics will argue that GM papayas have not lived up to expectations, but I believe the weight of the evidence suggests that GM papayas have proved to be both a cultural and

commercial success. Of course, this example concerns consequences of an exotic pest attacking an introduced crop.

Perhaps a more fitting example would be to imagine for a moment what might have happened if GM technology were available in the mid1900' s to combat Dutch elm disease and chestnut blight. The socioeconomic and cultural impacts of these exotic diseases on North American elms and chestnut were substantial! I strongly suspect that if effective GM-based protective counter measures had then been available, they would have been enthusiastically embraced by the American public. But this is only speculation.

In broad terms, and on a global scale, both cultural and socioeconomic impacts of all forestry-related technologies should be considered, as well as the consequences of using alternative, perhaps less efficacious, methods. Such concerns should not be restricted to GM technologies alone. It is fitting and appropriate for the CBD to consider such questions, but in my view, whether or not GM technologies are used is a minor question within the broader purview of all other forest management activities.

GLOBAL JUSTICE ECOLOGY PROJECT

[SUBMISSION:ENGLISH]

Dear CBD Secretariat,

In preparation for the upcoming SBSTTA-13, I am sending you some information pertaining to the question of environmental, social and cultural impacts of genetically engineered [modified] trees.

Our overall analysis of the research done to assess these risks is that it is utterly inadequate. Projections can be made as to some of these risks based on the destructive impacts of other genetically engineered plants, however, the vast majority of these have been annual plants with no wild relatives, where GE trees are perennials with vast numbers of wild relatives. The lack of research on the specific risks of GE trees means moving forward with the commercialization of this technology is irresponsible. Irreversible contamination of native forests by GE trees is impossible to prevent. Even researchers themselves share this concern. In the FAO's Review of Forest Biotechnology Including Genetic Modification, when GE tree researchers were questioned about their top concerns about the technology, their second greatest concern was contamination of non-target ecosystems. Their greatest fear was public opinion.

Industry's assertion that intensively managed trees will take pressure off of native forests has no basis in reality. Increasing demand for forest products is already driving deforestation to clear land for plantation expansion. The primary reason that tree genetic engineering is being pursued is increased corporate profit. Given the potential for ecological and social disaster that could result from the commercial release of GE trees, enhancing the bottom line of a select group of corporations is certainly not worth the risk.

The discussion about GE Trees at the CBD is especially important today given the rising emphasis on the commercialization of genetically engineered trees for pulp and paper as well as cellulosic ethanol.

With concerns mounting about the competition between food and fuel due to crop-based agrofuels, the cellulosic ethanol industry is heavily promoting fuel produced from woody sources as the solution to this conflict, with fast-growing, easily digested genetically engineered trees a major focus of the research.

The claim that these so-called 'second generation' cellulosic feedstocks will eliminate food-fuel competition, however, is false. In many countries of the world, industrial timber plantations already compete with agricultural land. The rising economic incentive to grow tree monocultures resulting from

the enormous increase in demand for wood generated by cellulosic ethanol will only worsen the conflicts between communities who need land for food, and companies who want the land to grow trees.

Additionally, the development of even more profitable, faster-growing genetically engineered trees will increase this conflict over land and create new incentives to destroy natural forests to make room for more profitable GE tree plantations. This direct destruction of forests, combined with the inevitable and irreversible contamination of native forests will have disastrous consequences for forest biological diversity and rural and indigenous communities.

Both the contamination of forests by GE trees and the outright destruction of forests for GE tree plantations will also exacerbate global warming by destroying critically important carbon sinks and through the direct release of carbon through the deforestation process. Global warming is the greatest threat to biodiversity on the Earth today. Commercial release of genetically engineered trees is a giant step in the wrong direction. A ban on the commercial release of GE trees is absolutely critical. The dangers are too great to do otherwise.

Sincerely,

Anne E. Petermann
Co-Director

Background Information on The Environmental and Social Impacts of GM Trees

Contamination of Native Forests

Among those trees receiving the greatest attention from industry scientists is the *Populus* family. Valued for their fast growth and easily manipulated genome, genetically engineered low-lignin poplars are an obvious choice for the development of cellulosic ethanol and paper pulp. However, *Populus* are also some of the more dangerous trees being engineered, with regard to contamination. Richard Meilan, a faculty member at Purdue University points out that *"The genus* Populus *includes about 30 species that grow across a wide climatic range from the subtropics in Florida to subalpine areas in Alaska, northern Canada and Europe."*11/ This raises a serious red flag concerning the potential genetic contamination that could be caused by the commercial release of a GE tree with such a large and widespread population of wild relatives.

Our understanding of the contamination potential from future plantings of GE trees is largely based on known contamination incidents from GE food crops and experimental plantings of engineered grasses. Since 2005, Greenpeace, in collaboration with GeneWatch in the UK, has maintained an online database of GMO contamination incidents, known as the GM Contamination Register.12/ Their 2006 report lists 142 publicly documented incidents, in 43 countries, since the introduction of commercial GE crops in 1996.

These incidents of contamination demonstrate that gene escape and GE contamination cannot be prevented once GE trees are released. GE trees would over time lead to a persistent contamination of the world's native forests, with disruptive ecological consequences.

An additional problem with GE tree plantations is that (unlike most crops) they are likely to be grown in the vicinity of genetically similar native and uncultivated tree populations. In these instances, well-documented cases of GE contamination of wild relatives are of particular relevance.

11/ ibid.

12/ http://www.gmcontaminationregister.org/

Highly relevant to our understanding of the potential threat from GE trees is a carefully studied instance of native grass contamination in the US state of Oregon, from a test plot of creeping bentgrass genetically engineered for glyphosate resistance. In 2004, researchers from the US Environmental Protection Agency found numerous grasses within 2 km of the experimental plot—as well as two samples 14 and 21 km away—that were contaminated by the GE grass.

Through further DNA analysis, they determined that the contamination had been caused by a combination of pollen and GE seed dispersal. As tree pollens can potentially travel two orders of magnitude farther than grass pollen, these experiments suggest that preventing contamination of native forests with pollen from native tree species that have been genetically engineered is virtually impossible. The impacts of this contamination, however, would depend to a large extent on the traits involved.

Nevertheless, irrespective of the specific traits, the genetic manipulation itself gives rise to risks. Several researchers have reviewed the ecologically disruptive character of genetic modifications, in terms of gene expression, ecological fitness and the production of potentially dangerous new metabolites. David Schubert of the Salk Institute also writes that, "unintended consequences arising from the random and extensive mutagenesis caused by GE techniques opens far wider possibilities of producing novel, toxic or mutagenic compounds in all sorts of crops."13/

In a detailed analysis of over 200 published studies, researchers at EcoNexus in the UK documented significant increases in genetic instability, higher mutation rates, large-scale deletions and translocations of DNA, and other disturbing effects at the site of artificial gene insertion.14/ These disruptions in gene expression are also likely to have unpredictable impacts on native species that become contaminated via cross-pollination with GE varieties.

Low-Lignin Trees

The threat of GE trees contaminating native forests is especially serious in the case of trees manipulated for decreased lignin production, a trait being promoted to facilitate the production of cellulosic ethanol or paper pulp. Lignin is an important structural polymer that is also significantly responsible for trees' high levels of insect and disease resistance. The very fact that it is difficult to break down lignin has been shown to be essential to the resiliency of native tree species in the wild. Thus the consequences of a reduced lignin trait spreading from agrofuel plantations to native forests could be severe and irreversible.

Low lignin trees also have implications for the climate, according to the UK-based Institute for Science in Society, "*Aspen (*Populus tremuloides*) modified for reduced stem lignin … had reduced root carbon and greatly reduced soil carbon accumulation compared to unmodified aspen. The trees accumulated 30% less plant carbon and 70% less new soil carbon than unmodified trees.15/ This makes the transgenic tree highly undesirable in terms of reducing carbon in the atmosphere."*16/

13/ David Schubert, *"Regulatory regimes for transgenic crops"*, *Nature Biotechnology* Vol. 23, pp. 785 – 787, July 2005.

14/ Allison Wilson, *et al., "Genome Scrambling - Myth or Reality? Transformation-Induced Mutations in Transgenic Crop Plants"*, Brighton, UK: Econexus, October 2004, at http://www.econexus.info/pdf/ENx-Genome-Scrambling-Report.pdf. See also Jonathan R. Latham, et al., *"The Mutational Consequences of Plant Transformation", Journal of Biomedicine and Biotechnology*, Vol. 2006, pp. 1-7, 2006.

15/ Hancock J.E., et. al., *"Plant growth, biomass partitioning and soil carbon formation in response to altered lignin biosynthesis in Populus tremuloides," New Phytol*., 2007, 173(4), 732-42.

16/ Cummins J. and Ho, Mae-Wan, *"Unregulated Release of GM Poplars and Hybrids"*, report submitted to the USDA APHIS in response to a permit application (06-250-01r) from Oregon State University for field tests of transgenic Populus Alba and Populus hybrids, August, 2007.

Disease and Insect Resistance

Because lignin naturally protects trees from insects and disease, trees with modified lignin will probably have to be engineered with additional traits for disease and insect resistance, which leads to additional concerns, should these genes escape.

The UK research organization, The Corner House, notes, *"trees genetically modified for resistance to disease are likely to cause fresh epidemics"*17 by encouraging the survival of diseases resistant to the genetic modification. They also state, *"fungicide production engineered into GM trees to help them counter such afflictions as leaf rust and leaf spot diseases may dangerously alter soil ecology, decay processes and the ability for the GM trees to efficiently take up nutrients…"*. Fungicides engineered into trees are likely to exude from the roots, killing beneficial soil fungi and damaging soil ecology.

Another significant concern is that the evolution of new, more pathogenic viruses may be accelerated by GE tree viral resistance traits. Ricarda Steinbrecher elaborates, *"The potential of such newly recombined viruses to overcome the defenses of related wild plants, or even be able to infect new host plants, is a serious concern. In laboratory experiments infecting viruses have also swapped their protein coat for that of another virus that had been engineered into a plant...the new coat enabled a virus to travel between plants, carried by aphids."*18/

Insect resistance also conveys serious concerns. In China, more than one million GE poplars genetically engineered for the production of the *Bacillus thuringiensis* (Bt) toxin, an insecticide that targets the caterpillars of *Lepidoptera* (butterflies and moths) have been planted. The Nanjing Institute of Environmental Science in 2004 reported that the Bt poplars were already contaminating native poplars.19/

The escape of the Bt trait into native forests is problematic for numerous reasons. Insects have evolved with forest ecosystems for millions of years and the ecological implications of eradicating certain species of insects has not been assessed. The insects targeted by Bt trees are also an important food source for nesting songbirds, as well as other wildlife. Studies have found that Bt-toxin remains active and lethal after ingested and can make its way up the food chain and will actually bind to the intestines of non-target organisms, causing *"significant structural disturbances and intestinal growths"*.20/ Deployment of Bt trees on a large scale could devastate pollinator populations.21 Additionally, Bt toxins leaching out of pollen and other plant tissues that wash into streams are lethal to caddisflies, the most diverse order of aquatic insects and an important food source for fish and amphibians.22

17/ Viola Sampson and Larry Lohmann, *Corner House Briefing 21: Genetically Modified Trees*, December, 2000, p. 8

18/ Ricarda Steinbrecher, *"The Ecological Consequences of Genetic Engineering"*, in Brian Tokar, ed.., Redesigning Life? The Worldwide Challenge to Genetic Engineering, London: Zed Books, 2001, p. 89-90.

19/ F. Pearce "Altered Trees Hide Out with the Poplars", *New Scientist*, 9/19/04, P.7

20/ C. Brown, S. Connor and M. McCarthy, "The End for GM Crops: Final British Trial Confirms Threat to Wildlife," 3/22/05, http://news.independent.co.uk/ low_res/story.jsp?story=622479&host=3&dir=58

21/ J. Losey et. al., "Transgenic pollen harms monarch larvae," Nature 399, 1999, p. 6733; and Hansen L. and Obrycki, J., "non-target effects of Bt-corn pollen on the Monarch butterfly (Lepidoptera: Danaidae), Abstract, North Central Branch meeting of the Entomological Society of America, March 1999; and Malone, L.A. et al., "In vivo responses of honey bee midgut proteases to two protease inhibitors from potato," *Journal of Insect Physiology* 44(2), 1998, pp. 141-147.

22/ E. J. Rosi-Marshall, et al., "Toxins in transgenic crop byproducts may affect headwater stream ecosystems," Proc. Nat. Acad. Sci. USA vol. 104 no. 41, October 9, 2007, pp. 16204 –16208.

Beyond the impacts on forests and wildlife, however, are the impacts of Bt pollen on humans. Airborne Bt pollen may be toxic when inhaled.232425/ This could have serious ramifications for communities living in the proximity of GE tree plantations. This potential health impact has not been adequately studied.

In summary, the long-term consequences of the use of Bt trees or the escape of this trait into forests has not been adequately assessed.

Genetically modified poplars used in biofuel plantations may also be engineered to become sterile. Proponents of genetic engineering claim that adding a sterility trait to GE trees would help prevent contamination of non-engineered trees. Because of the complex nature of plant reproduction and gene regulation, however, and the genetic changes trees experience as they age, it is highly unlikely that any sterility in trees can be reliably sustained. This means that contamination by seed or pollen would continue to be a threat. It also means there is the potential for stands of native trees themselves to become partially sterile through cross-pollination, or become impaired in their development of flowers or seeds. Sterile trees would also be able to spread their transgenes through vegetative propagation.

Furthermore, the sterility modification itself has ramifications. Foremost are the likely impacts on native wildlife. Sterile trees do not provide food (seeds, pollen or nectar) for insects, animals or birds, which means that large monocultures of GE trees will displace a wide variety of native species. In addition, the trees themselves may be toxic.26/

Introduction of Non-Native Invasive Plants for Cellulosic Ethanol

GE tree escape, via seed or vegetative propagation, is possible even from non-native species without wild relatives. The case of bentgrass contamination is instructive here, as it describes contamination resulting from seed dispersal. GE eucalyptus is one tree being proposed by tree engineers as a potential feedstock for pulp mills or cellulosic ethanol plants. Eucalyptus, native only to Australia, is already a favorite species for pulpwood plantations worldwide. It is notoriously invasive and often out-competes native plant species. The invasive nature of eucalyptus has been extensively documented in South Africa and California.

The company ArborGen is currently engineering eucalyptus for cold tolerance so that it could survive at temperatures as low as -20ºc, which would greatly expand its potential range27 and create significant threats to forests in those climates. Extending the range of eucalyptus makes it possible for companies to replace slower-growing, less economically profitable (but carbon rich) native forests with fast-growing (but carbon poor) GE eucalyptus plantations in climates that were previously off-limits to these destructive actions. In his 2006 year-end report to stockholders, Rubicon CEO Luke Moriarty explains the economic potential: *"The excellent results of the best performers in the field trials would suggest that the*

23/ Kleter, G.A. and A.A.C.M Peijnenburg. 2002. Screening of transgenic proteins expressed in transgenic food crops for the presence of short amino acid sequences identical to potential, IgE-binding linear epitopes of allergens. *BMC Structural Biology*, 2: 8. At www.biomedcentral.com/1472-6807/2/8

24/ Vazque-Padron, R.I., et al. 2000. Cry1Ac protoxin from *Bacillus thuringiensis* sp. kurstaki HD73 binds to surface proteins in the mouse small intestine. *Biochemical and Biophysical Research Communications* 271, pp. 54-58

25/ Vazquez-Padron RI, et.al. 1999b. *Bacillus thuringiensis* Cry1Ac protoxin is a potent systemic and mucosal adjuvant. *Scandinavian J Immunology* 49: 578-584

26/ J. Cummins et. al.,

27/ Stephen Kasnet and Luke Moriarty, "*Rubicon Interim Report"*, Rubicon. 02/28/07 (Rubicon is a joint owner of ArborGen)

*level of cold tolerance can be extended even further, thus offering a broader geographic market for this new hardwood product than originally anticipated."*28

Besides direct clearing of native forests for eucalyptus plantations, the use of cold-adapted eucalyptus could result in the escape of these GE trees (via seed or asexual vegetative reproduction) into ecosystems and forests where they could out-compete native vegetation and displace wildlife.

ArborGen forsees millions of dollars in profits from sale of its GE low-lignin eucalyptus pulp, due to the fact that it is projected to be less expensive to process.29/ Eucalyptus is already a serious problem in Brazil, where plantations have replaced vast stretches of the *Mata Atlantica* coastal forest ecosystem. Increasing demand for eucalyptus for cellulosic ethanol, in addition to paper pulp, will most probably lead to the expansion of these eucalyptus plantations and the use of GE low-lignin eucalyptus, posing further threats to ecosystems like the *Mata Atlantica*.

GE Jatropha and Oil Palm

Beyond genetically engineering trees for cellulosic ethanol production, researchers are also exploring ways to engineer Jatropha and oil palm trees so that their oil-bearing seeds produce better biodiesel, as well as other oil-based products. India has identified eleven million hectares of land for future jatropha plantations. China is moving forward with plans for more than 13 million hectares of jatropha and other biofuel feedstocks, on sensitive, biologically rich native forestlands in southwestern China.30/

Oil palm is being modified in Indonesia and Malaysia to change the composition of its oil. They also want to increase the oil content of the seeds. Because of its susceptibility to some insects, oil palm is also being engineered for insect resistance and is being engineered for resistance to the herbicide glufosinate.31/ Jatropha is being engineered to increase production and improve the oil content of the seeds.32/

Conclusion

The pursuit of a global energy strategy that features wood as a major agrofuel feedstock on top of the already growing demand for pulp and paper products clearly poses a variety of potential problems. Use of genetically engineered trees for agrofuel and pulp production would significantly increase this risk, with serious implications for the world's forests and forest-dependent peoples.

The already rising demand for wood is accelerating the conversion of native forests into faster-growing tree plantations and escalating rates of illegal logging. Further increasing the demand for wood to feed cellulosic ethanol plants will exacerbate these already serious problems and add to them by increasing the demand for genetically engineered trees. All of this will in turn severely threaten the ecological integrity and biological diversity of native forests, soils, and water, as well as forest-dependent indigenous and rural communities.

28/ ibid.

29/ ibid.

30/ Yingling Liu, *"Chinese Biofuels Expansion Threatens Ecological Disaster"*, Worldwatch Institute, March 13, 2007, http://www.worldwatch.org/node/4959

31/ UN FAO GMO registry.

32/ Qing Liu, Surinder Singh & Allan Green, "Genetic Modification of Vegetable Oils for Potential Use as Biodiesel," CSIRO Plant Industry presentation, May 2007, http://www.thaijatropha.com/9.pdf

This cumulative erosion of the world's forest ecosystems will also have significant impacts on climate, belying the argument that faster-growing GE trees will take the pressure off of native forests or be part of the solution to global warming.

Simply put, genetically engineered trees are one of the foremost threats to forest biological diversity and forest-dependent peoples across the globe.

GLOBAL FOREST COALLITION

[02 November 2006]
[SUBMISSION: ENGLISH]

Genetically Engineered Trees are an Unnecessary Threat to Biodiversity

The Global Forest Coalition (GFC) thinks that the release into the environment of genetically engineered (GE) trees is bound to harm biodiversity in multiple ways and with predictable catastrophic consequences for nature and human populations. Therefore, the release of GE trees is an unnecessary threat to biodiversity.

The known effects of GE trees on biodiversity are generally negative. It is well known to the scientific community engineering tree varieties that leases of GE trees into the environment will be likely to cause negative effects on biodiversity and nature in general. The scientific community engaged in this research admits serious uncertainties as to how GE trees may affect nature, giving no reasonably reliable safety guaranties to justify their use. This position is only realistic, as trees are basically uncontrollable, for they grow massive, live for decades - even centuries -, produce enormous amounts of pollen and some reproduce asexually; guaranteeing constant dissemination of the transgenes for as long as they live.

The use of *Agrobacterium* as the main transfer agent for the transgenes involved should be sufficient to ban any prospect of GE trees be released into nature. Until quite recently, the genetic engineering community has assumed that *Agrobacterium* does not infect animal cells, and certainly would not transfer genes into them. But this has been proved wrong. Kunik *et al* (2001) reported that T-DNA[33] can be transferred to the chromosomes of human cancer cells (Kunik *et al*, 2001).

Other widely recognized negative aspects of genetic engineering of trees – that may justify banning them all together - is that they are mainly developed to express glyphosate resistance, insect resistance and lignin reduction or modification. If traits like these – as they likely may - find pathways for vertical or horizontal transfer, we would be facing irreversible damage to potentially all biota.

Trees engineered for glyphosate resistance, for instance, would promote the emergence of glyphosate resistant weeds. Recent studies conducted in various US states, show that the number of resistant weed species has increased across the country and that farmers need to resort back to herbicides such as Dicamba, Paraquat and 2,4-D (Southeast Farm Press, October 19 2006). Phasing out these herbicides was a key reason for engineering Round-Up Ready[34] plants.

GE trees designed to contain less lignin than their species normal content, to speed up growth or as a means to improve pulp yield or absorb more (and faster) carbon, would be more vulnerable to pest

[33] T-DNA is transfer DNA from the pathogenic bacteria *Agrobacterium tumefaciens.*

[34] Round-Up Ready plants are resistant to the herbicide Round-Up manufactured exclusively by the Monsanto Co.

attacks and, as experienced in a field trial by the Toyota Corporation, they consume disproportionately more water than normal trees (Rautner 2001).

The greatest threat to biodiversity emanating from GE trees is the spread of the insecticidal traits, induced by transgenes naturally occurring in *Bacillus thuringiensis* (Bt), to forests trees. Beneficial insect predators that fed on insect pests feeding on Bt plants produced in GE crops were harmed even when the pests themselves were not affected by the toxins (Dutton *et al* 2002). One class of Bt toxins (Cry1A) was found to harm butterflies, lacewings and mice (Ho and Cummins, 2005). Another class (Cry3A) acts against insects belonging to the Order Coleoptera (beetles, weevils and stylopids) (Wu *et al*, 2000), which contains some 28,600 species. Bt toxins are known to leach out of the roots into the soil, with potentially huge impacts on the soil biota (Ho and Cummins, 2005).

The risks posed by this scenario are awesome and may include widespread extinctions of flora and fauna, collapse of agricultural systems, and diseases in animals, including humans.

The GFC believes that the Convention on Biological Diversity must intervene to avoid the release into nature of GE trees by urging parties to apply the Precautionary Principle to ban this technology within their jurisdictions.

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GOLDAMER CONSULTING

[28 August 2006]
[SUBMISSION: ENGLISH]

1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?

No, but we have GM cotton, maize and soybean. There is a need (i) to produce GM trees that will grow in areas that are presently considered to be marginal for forest plantations, (ii) to exploit the benefits of GM trees to control pests and diseases, (iii) to establish suitable and appropriate renewable resources, and (iv) to improve the quality of the products currently produced from forested areas in South Africa.
If yes, please answer all remaining questions.
If no, please state the reason why: No organization/institution has yet applied for a permit under the GMO Act to undertake laboratory or contained field trials.

2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?

Yes, South Africa has the necessary legislative framework to accommodate the testing, evaluation and introduction of GM trees. The SA Forestry industry also has a national forum where this matter can be discussed.
If yes, please answer all remaining questions.
If no, please state the reason why:

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?

Yes, there is a legal framework in place which includes the GMO Act and the Environmental Management Act.
If yes, please list them according to the categories below: The Genetically Modified Organisms Act, 1997 (Act No. 15 of 1997), Plant Improvement Act, 1976 (Act No. 53 of 1976), Plant Breeders' Rights Act, 1976 (Act No.15of 1976)
If no, please explain the reason why here:

Environmental impacts of genetically modified trees (Example: effects on native ecosystems, use of herbicide) The National Environmental Management Act, 1998 (Act No. 117 of 1998). The NEMA: Biodiversity Act, 2004 (Act No. 10 of 2004) which replaces the Forest Act, 1984 (Act No. 122 of 1984).

Cultural impacts of genetically modified trees (Example: positive or negative impacts on indigenous and local communities and their traditional knowledge)

Socio-economic impacts of genetically modified trees (Example: positive or negative effects on quantity, quality and economic value of forest production; positive or negative impacts on livelihoods of communities)
There are no GM trees being commercially grown in SA at present, however, socio-economic studies have been conducted on the cultivation of GM cotton.

GREENPEACE INTERNATIONAL

[01 September 2006]
[SUBMISSION: ENGLISH]

Introduction

In 2002 the first transgenic forest trees were marketed in China. Over 250 experimental releases of transgenic forest trees have been conducted worldwide to date. The research is driven primarily by private companies from developed nations, including some of the world's largest companies in the pulp and paper industry. These companies also hold most of the patents on engineering methods and genetic resources. The focus of present research is on species that can be marketed on a global scale, and on properties to increase productivity of tree plantations and facilitate pulp and paper production.

There is wide spread concern about detrimental effects of genetically engineered trees on the environment. Transgenic annual crops are already known to have detrimental effects on wild-life communities and ecosystems. For a number of reasons, the risk of harmful environmental effects is considerably greater in the case of transgenic forest trees.

- forest trees have very long lifespans (up to several hundreds of years),

- forest trees are relatively undomesticated and can thrive in natural environments without human intervention,

- forest trees often produce copious amounts of seeds and pollen, which will travel long distances,

- some forest trees can reproduce vegetatively,

- most forest trees are outbreeders and interbreed with related wild species,

- forest trees are often dominant species in their ecosystem and support a large web of organisms that rely on them, either directly or indirectly, as their ultimate source of nutrients.

Transgenic forest trees are very likely to have long-term impacts on the environment and biodiversity. This submission provides evidence on ecological risks associated with transgenic forest trees, which are significant and likely to prove unmanageable and irreversible.

Greenpeace is opposed to the release of genetically engineered organisms into the environment at the present state of knowledge and calls for a ban on the release of transgenic trees. As an interim measure a global moratorium on commercial releases and on larger scale experimental releases is recommended.

Environmental impacts of transgenic forest trees

Outcrossing and propagation

Although transgenic forest trees are largely intended to be grown on plantations, their effects will not be confined to these. Since they propagate via seeds as well as vegetatively via shoots, pass on their genes to wild relatives by hybridisation and could also transfer their transgenes to micro-organisms, the direct impact of transgenic trees will not be confined to plantations, but also affect semi-natural and natural ecosystems. Once they have escaped the original confinements, it will not longer be possible to retrieve transgenic forest trees and their foreign genes.

Invasion through seed dispersal

Trees used for forestry purposes are largely undomesticated, having been subjected to little breeding activities, and are therefore highly capable of surviving in natural or semi-natural ecosystems without human intervention. There are numerous examples of coniferous and deciduous trees from plantations invading unmanaged habitats (e.g. Johnson & Kirby 2001, Richardson 1998). This led to ecological problems, particularly when the species involved were not indigenous to the region. Some of the most widespread and harmful invasive trees include species of the genera *Pinus*, *Pseudotsuga*, *Robinia* and *Salix* (Richardson & Petit 2006). Species of these genera are among those subject to genetic engineering research and experiments.

Experiences with non-indigenous trees suggest that transgenic trees will escape from plantations and cause problems in natural and semi-natural habitats. Especially where trees are intentionally or unintentionally altered with transgenes that may increase their fitness they could become more invasive, invade new habitats and cause a loss in biodiversity and ecosystem functions (Andow & Zwahlen 2006).

The escape of transgenic trees can be neither prevented nor controlled. Trees usually produce a very large number of seeds. While the majority of these seeds is usually deposited in the closer vicinity smaller amounts can spread across very large distances.

Wind and water can carry seeds from trees across great distances. Birds, bats, squirrels and red deer also help trees to conquer distant habitats (Nathan 2006, Richardson et al. 2000). In this way, conifer seeds can travel dozens of kilometres (Nathan et al. 2002). Loblolly pine (*Pinus taeda*) seeds can be carried up to 30 kilometres by the wind (Williams et al. 2006).

Long-distance escape via pollen flow

While transgene dispersal via seeds is worrying, the potential spread of foreign genes through hybridisation with wild relatives is even more alarming (Trakhtenbrot et al. 2005). The escape of transgenes into wild populations could alter the genetic resources of wild relatives and thereby contaminate native germplasm that ought to be protected (Williams 2005, Vanden Broeck et al. 2005). Hybridisation with wild relatives could lead to increased weediness or the invasion of new habitats by the wild population. In addition, native species with which the wild plant interacts (including herbivores and other plant species in the community) could be adversely affected by transgenic-wild plants (Pilson & Prendeville 2004).

There is a high risk of transgenic forest trees hybridising with their wild relatives, mainly for three reasons:

(1) most forest tree species are undomesticated outbreeders that will readily interbreed with related species;

(2) gene flow is often mediated by a copious production of wind-borne pollen that may travel large distances;

(3) transgenics are likely to be used in close proximity to interfertile populations of natural or feral origin (van Frankenhuyzen & Beardmore 2004).

Several authors indicate that pollen of some tree species can travel hundreds of kilometres. Birch pollen has been found on the treeless Shetland Islands, originating from forests more than 250 kilometres away and across the sea (Tyldesley 1973). Long-distance dispersal of coniferous seed can occur as far as 600 to 1200 km from the source (Katul et al. 2006, OECD 1999, Di-Giovanni et al. 1996). For pine and spruce pollen, transport distances of up to 3000 km have been recorded under rare conditions (Campbell et al. 1999).

As experimental data on the viability of pollen dispersed over long distances are lacking for most tree species, it remains unclear whether the effective pollination distance is lower than the recorded travel distances (Katul et al. 2006, Williams 2006). For Norway spruce (*Picea abies*) and Scots pine (*Pinus sylvestris*), available data indicate that pollen in the atmosphere remains viable long enough to permit long-distance gene flow through pollen migration (OECD 2002). In the case of pine and spruce it is very likely that large amounts of pollen will remain viable at least after mesoscale transport of around 60 km (Katul et al. 2006, Di-Giovanni et al. 1996).

Transgene escape to microbes

Since plant DNA can be released into the soil through decomposing plant tissue (such as pollen, leaves and roots), transgenes may escape from genetically modified trees to soil microbes. In transgenic annual crops, horizontal gene transfer from plants to microbes has been shown to be possible under favourable experimental conditions, though at a low frequency (e.g. de Vries et al. 2004, Kay et al 2002, Nielsen et al 2000, Gebhard & Smalla 1998). Since monitoring efforts so far have failed to observe such transfer events in the field, horizontal gene flow from plants to microbes is believed to be rare in nature. However, current methods for monitoring horizontal gene transfer are fraught with difficulty and too

insensitive to detect transfer events. Hence, corresponding frequencies and risks may be higher than assumed (Nielsen & Townsend 2004, Heinemann & Traavik 2004). Since DNA from long-living trees will enter the soil far more often than that of annual plants, the probability of gene transfer may be increased. A single study regarding tree to microorganism horizontal gene transfer has been published so far. This study investigated whether the genes of transgenic poplars were transferred to a single microorganism, the ectomycorrhizal fungus *Amanita muscaria* (Zhang et al. 2005). In this case, no evidence of gene transfer was found. In view of the vast number of known and unknown soil bacteria and symbiotic microorganisms which may be in direct or indirect contact with a tree over its live span, this may not be reassuring.

One pathway of gene transfer from trees to microbes is via *Agrobacterium tumefaciens*. *A. tumefaciens*-mediated transformation methods have been developed for a number of important forest species (e.g. *Pinus radiata*, *P. strobus*, *P. glauca*, *Picea abies*, *Betula pendula*, *Populus nigra*, Eucalyptus species). Previous studies with crops have shown that *A. tumefaciens* can persist in transgenic plants after transformation (e.g. Domínguez et al. 2004, Barrett et al. 1997, Matzk et al. 1996, Mogilner et al. 1993). It has been shown with non-recombinant bacteria that horizontal gene transfer is possible from inoculated bacteria to endophytic bacteria associated with poplars (Taghavi et al. 2005). In field-grown transgenic trees, persistent recombinant agrobacteria could transfer their transgene(s) to other microorganisms, especially to endophytic bacteria and, if released via the roots, to soil bacteria. As the probability of horizontal gene transfer increases over time, the persistence of *A. tumefaciens* in transgenic trees is of significant ecological relevance, as the may persist in the environment of plantation forests for several decades.

So far, only one study has been published dealing with the persistence of *A. tumefaciens* in transgenic trees. In this small study with transgenic spruce and pine, no *Agrobacteria* were detectable in the plant tissue. However, the authors were unable to rule out that some *Agrobacteria* remained undetected (Charity & Klimaszewska 2005). In a literature review, Ulrich et al. (2006) mention unpublished results showing that recombinant *A. tumefaciens* can persist in transgenic poplars for at least one year after transformation.

Biocontainment

In order to prevent transgene ecsape, various attempts have been made to prevent trees from forming either pollen or seeds. Although the development of sterile trees is as yet in its infancy, it is questionable wheter such containment systems will ever be able to completely prevent gene escape once transgenics are deployed over large acreages and in full rotation (van Frankenhuyzen & Beardmore 2004, Mayer 2004). Due to the potential instability of transgenes, total sterility of every single tree in large plantations is highly unlikely even where the stability of transgenes is generally very high. Especially where the transgenic trait confers a fitness advantage, only a few escaped seedlings can cause colonization and transgene introgression into wild populations may occur even where gene flow is extremely limited (Richardson & Petit 2006, Lee & Natesan 2006, Williams & Davis 2005).

Ecosystem impacts

Although studies on annual transgenic crop plants are limited, they have shown that environmental impacts on ecosystems above and below ground are possible (Snow et al. 2005). Potential impacts on communities and ecosystems could be especially severe when caused by dominant species such as trees. Forest trees often dominate natural habitats or forest ecosystems and support large webs of organisms which rely on them, either directly or indirectly, as their ultimate source of nutrients. Thus, transgenes in tree species are likely to have cascading effects on the rest of the community and the ecosystem.

Experiments on the environmental impacts of transgenic trees have been rare. But data on non-transgenic *Populus*, *Eucalyptus* and *Pinus* species show that genes from individuals and populations have an "extended phenotype", meaning that their genetic makeup can affect communities and ecosystems (for reviews see Whitham et al. 2006, 2003).

Negative impacts on ecosystems may also result from forest plantation practices. Plantation forests are often less favourable as habitats for a wide range of wild species, particularly in the case of even-aged, single-species stands involving exotic species (Hartley 2002). Some of the consequences of plantations for the environment will be affected by attributes of the tree species used. Many consequences will also depend on plantation practices. Forest biotechnology may become another driver for inappropriate plantation development and transgenic trees may exacerbate the ecological consequences of current forestry practices. For example, converting native forests to transgenic plantations will have negative implications for biodiversity. Similarly, the conversion of native grasslands or savannah to transgenic plantations would have negative effects on biodiversity (Hayes 2001).

Potential environmental impacts of the most frequently engineered traits in forest trees are discussed below.

Low-lignin trees

Lignin-reduced transgenic trees are likely to have multiple environmental side effects since lignin has diverse functions in forests.

Changes in lignin content could affect soil structure and fertility by accelerating the decomposition of organic matter (Talukder 2006, Campbell & Asante-Owusu 2001). This may result in increased CO_2 emissions and may negatively affect below-ground carbon sequestration, possibly contributing to atmospheric concentrations of greenhouse gases (Talukder 2006). Furthermore, more rapid decomposition of transgenic low-lignin organic material could negatively affect populations of organisms colonising slowly-rotting timber (Talukder 2006).

Increased invasiveness may be another result. At least one set of gene constructs used for lignin modification has been reported to enhance growth in transgenic aspen trees (see *Secondary phenotypic effects*).

Reduced lignin content may also lead to increased population growth of insect defoliators. This could negatively affect biodiversity and also increase the need for agrochemical use (Johnson & Kirby 2001).

So far, two field studies have been published dealing with the ecological risks of a low-lignin transgenic tree. In a field trial with transgenic poplars, interactions with leaf-feeding insects, microbial pathogens and soil organisms were unaltered, but, as expected, the rate of decomposition of transgenic roots was enhanced (Pilate et al. 2002). No changes in decomposition were found with woody trunk material from the same field trial, but the results of this study are tentative, because the data were limited (Tilston et al. 2004).

Fast-growing trees

Fast-growing transgenic trees allowing for shorter rotation management in plantations may decrease the opportunities for colonisation by poorly dispersed, late-successional plant species. Short rotations could also limit the extent to which structurally complex understorey development will occur, which may in turn limit the suitability of plantations for certain wildlife species. In addition, fast-growing trees may well sequester more, and therefore recycle fewer, nutrients and water, and this could have a deleterious long-term effect on site productivity (Asante-Owusu 1999).

Insect-resistant trees

A number of transgenic insect-resistant forest trees have been developed so far, and two such varieties of poplar have been commercialised in China. No peer-reviewed publications are available about their potential effects on non-target organisms. The fact that such effects are possible is apparent from experiences with annual crop plants. Laboratory trials suggest that insect-resistant transgenic crops often have a significant harmful effect on natural enemies such as predators and parasitoids (Lövei & Arpaia 2005). Similar effects have also been observed in the soil. Bt-crops can affect the bacterial community, the establishment of ectomycorrhizal fungi, earthworms and soil respiration (Castaldini et al. 2005, Zwahlen et al. 2003). Compared to annual crop plants, insect-resistant trees offer scope for new harmful scenarios. If transgenic Bt-poplars were planted in riparian areas, their leaves would enter the rivers and streams, with unforeseeable consequences for the aquatic communities there (LeRoy et al. 2006, Close 2005).

There at least two ways in which transgenic insect-resistant trees might lead to increased pesticide use. First, although target pest populations may be reduced by a transgenic insect-resistant trait, this might allow other, previously rare, secondary pest species to flourish, leading to an increased need for chemical control (Johnson & Kirby 2001). This issue has received very little attention within the forestry context to date.

Second, a trend towards increased insecticide use may also result when target insects develop resistance (Johnson & Kirby 2001). In long-lived forest trees, selective pressure will be strong and more difficult to manage than in annual crops (van Frankenhuyzen & Beardmore 2004). The only two studies involving a forest insect (the poplar pest *Chrysomela tremulae*), showed an initial frequency of the allele conferring resistance to be surprisingly high, suggesting that without management strategies resistance may be rapidly selected (Wenes et al. 2006, Génissel et al. 2003).

Fungi-resistant trees

It is possible that the introduction of non-specific fungal resistance in transgenic trees could affect decomposer ecosystems in plantations (Johnson & Kirby 2001). To date, only one field trial has been published dealing with non-target impacts of fungi-resistant trees. Vauramo et al. (2006) analysed the decomposition process of leafs from chitinase transgenic silver birches and the effects on the decomposer populations. No effects were detected on the decomposability of the litter in the soil. However, the duration of the experiment may well have been too short to reveal long-term differences in decomposition (Vauramo et al. 2006).

Herbicide-tolerant trees

Residual native vegetation within planted forest stands is most important to biodiversity (Hartley 2002). Herbicides affect forest biodiversity by causing a decline in plant species diversity, altering the vegetative structure, and potentially changing plant successional trajectories. Until now, some plantations contain a high proportion of the native woody plant species found on unplanted stands, due to incomplete elimination (Hartley 2002). This could well change in the future, if genetically modified trees tolerant to broad-spectrum herbicides were to be widely used. Such plantations would be less attractive for species of birds and invertebrates that rely on the habitat of young plantations, with its combination of young planted trees and diverse wild plants that support the food webs on which they rely (Johnson & Kirby 2001).

Sterile trees

Sterile transgenic trees raise new concerns in terms of their impact on biodiversity (Valenzuela et al. 2006). Pollen, nectar, seeds and fruits of plantation trees are elements of the woodland food web and are important in maintaining biodiversity. Plantations of sterile trees will be devoid of birds, insects and

mammals that rely on seeds, pollen or nectar for food. Thus, sterility could result in cascading ecological effects and could disrupt population dynamics, with severe repercussions for neighbouring natural ecosystems (Mayer 2004, Hayes 2001, Johnson & Kirby 2001).

Research into sterile seed production would also contradict Decision V/5, section III (Genetic use restriction technologies) of the 5th Conference of Parties, as confirmed by the 8th Conference of Parties in Decision VIII/23.

Secondary phenotypic effects of genetic modification

An issue that is particularly relevant for long-lived plants like trees is the possibility of inadvertent effects arising from the transformation process. These unintended effects can be caused by the transgene's location in the genome, by effects of the transgene on other traits (pleiotropy), by interactions between the transgene and native genes (epistasis), and by somaclonal mutations that occur during tissue culture (NRC 2004). Effects may be subtle and may not appear until a particular stage of growth or in response to specific environmental conditions (RSC 2001). Most importantly, secondary phenotypic effects are unpredictable and may cause unintended environmental side effects.

Several examples of unintended phenotypic effects in genetically modified trees are known. For example, in transgenic aspens which had been downregulated in their expression of a gene for the lignin biosynthetic pathway, Hu et al. (1999) made the surprising observation that the transgenic trees displayed substantially enhanced growth compared with wild-type plants. The enhanced growth rate may enhance the invasiveness of the transgenic aspen trees (Talukder 2006).

Transgenic hybrid aspens that overexpressed a key regulatory gene in the biosynthesis of gibberellin had improved growth rate and biomass, as expected, but they also had more numerous and longer xylem fibres than the wild-type plants (Eriksson et al. 2000).

Ralph et al. (2001) reported the production of unanticipated benzodioxane structures in lignins of transgenic O-methyltransferase-deficient poplars. Changes in lignin structures as a result of genetic modifications could have a detrimental effect on natural forests where microbial degradation of plant materials (i.e. leaves, roots, limbs etc.) is an important aspect of the nutrient cycle (Sariyildiz 2003).

In the first field study on mycorrhization in transgenic trees, one of the transgenic aspen clones displayed depressed mycorrhization because of minute physiological modifications not directly related to the function of the inserted gene (Kaldorf et al. 2002; see also Hoenicka & Fladung 2006). These results indicate that secondary phenotypic alterations can result in unpredictable changes in the tree's ability to form mycorrhizal associations.

Tiimonen et al. (2005) have produced transgenic silver birch lines in order to modify lignin biosynthesis. In controlled feeding experiments, the leaves of the transgenic birch lines were fed to insect herbivores. The feeding preferences of these herbivores differed between the tested lines, however these differences could not be directly linked with lignin modification. They may, however be caused by transgene side effects (Tiimonen et al. 2005).

In microcosm experiments with leaves of birches (*Betula pendula*) transformed to produce chitinase from sugar beet, Kotilainen et al. (2005) observed a higher decomposition rate of transgenic leaves and a negative response of nematodes to transgenic leaf litter. The explanation for these observations remains open, but it seems that the genetic modification has a pleiotropic effect on the chitinase leaves, thus altering the structural components of the leaves. Pleiotropic effects influencing the quality of plant litter can result in significant changes in the ecosystem, since the functioning of soil processes reflects the growth of above-ground biota (Wardle et al. 2004, Donegan et al. 1997).

Unintended changes in plant physiology, anatomy and metabolism as a result of the genetic engineering process challenge the risk assessment procedures for transgenic trees, since tests cannot rule out unexpected and unpredictable secondary phenotypic effects. For example, small unintended effects may remain undetected because they may depend on cumulative action, specific environmental conditions, or introgression into different genetic backgrounds. Ecological consequences may not be evident until after several years of growth.

Short case studies

Transgenic poplars – uncontrollable long-distance distribution

The commercial era of genetically modified trees began in 2002, when two transgenic poplars were licensed for sale in China – a black poplar (*Populus nigra*) with a Bt gene (Hu et al. 2001) and a double transgenic hybrid poplar having both a Bt gene and a proteinase inhibitor gene (Tian et al. 2000). Some 1.4 million cuttings are reported to have been planted. However it is no longer possible to determine precisely where the transgenic poplars are now growing. Their cultivation seems to be no longer under systematic control (Wang 2004, Pearce 2004).

Poplar varieties are the most common species worldwide to be genetically modified (FAO 2004). The reason they are the tree of choice is that they can be vegetatively propagated, they grow rapidly and have a world wide geographic distribution (Mayer 2004). If transgenic poplars are commercialised and used, their biology will inevitably lead to their escaping into natural or semi-natural habitats. Poplars are dioecious and must therefore necessarily outcross. As they are wind-pollinated, outcrossing occurs over long distances. Natural hybrids are regularly found wherever different species of poplar come into contact with each other (Vanden Broeck et al. 2005, OECD 2000).

A fully-grown poplar tree can produce up to 50 million seeds a year (OECD 2000). The seeds are primarily carried by wind and water, and are designed so as to be widely distributed and hence permit large migration rates (OECD 2000). The possibility of vegetative propagation is also important for its spreading. Thus poplars can spread through sprouting from roots and stumps, as well as adventitious shoots and root suckers, and so colonise new habitats (Fladung et al. 2003). In some poplar species there is also evidence of cladoptosis, in which short shoots abscise and can be carried long distances on watercourses and subsequently take root (Vanden Broeck et al. 2005). In short: transgenic poplars will spread in an uncontrolled fashion, covering large distances in the course of time. In the United States, for example, introgression has been observed across distances of over 100 km (Martinsen et al. 2001).

Although the first transgenic poplars have already been commercialised, hardly any data have yet been collected as to what environmental effects this might have. However it is known from non-transgenic poplars that their genetic make-up does not only determine the tree's phenotype but also affects the environment, changing the composition of insect populations (Wimp et al. 2005, 2004), influencing the feeding preferences of beavers (Bailey et al. 2004b) or affecting decomposition processes in the soil (Schweitzer et al. 2004). Where the leaves of poplars are able to enter lakes and rivers, effects on aquatic communities may also occur (LeRoy et al. 2006).

The introduction of transgenic poplars could therefore have unpredictable effects on terrestrial and aquatic communities (LeRoy et al. 2006, Close 2005; see also Whitham et al. 2006). Another major concern associated with the growing of transgenic poplars is that foreign genes could enter indigenous poplars via hybridisation, contaminating genetic resources that ought to be protected (Vanden Broeck et al. 2005).

Transgenic pines – indefinite persistence of foreign genes

In economic terms, the genus *Pinus* is the most important group of trees in the world. Hence pine species are the second most frequently genetically engineered trees, after poplars. To date, no transgenic

species of the genus *Pinus* has been commercialised, however companies like Arborgen, Scion and Genfor are working towards this goal. Genfor hopes to market transgenic Monterey pines in Chile in 2008 (Richardson & Petit 2006).

If transgenic pines are commercialised and grown on large areas, they will inevitably spread into natural and semi-natural habitats. Pines produce vast quantities of pollen and seeds, which can travel large distances. In the case of the Loblolly pine, for example, seeds are believed to spread more than 30 kilometres, and pollen up to 60 kilometres (Williams et al. 2006, Katul et al. 2006). The consequences of such spreading could be very serious – both in the northern hemisphere, where pines are indigenous, and in the south, where pines are often used in plantations.

In the north, pine species are among the ecologically most important trees. They play an important role in net primary production, forest structure, biogeochemical processes and water flow, and are in addition an important component of the food web (Richardson & Petit 2006). Since pine species therefore play a dominant role, escaped transgenes could have a cascading effect on the other communities and the ecosystem as a whole. The following, worrying example demonstrates just how far-reaching the effects could be: in non-transgenic *Pinus* it has been found that resistance and susceptibility traits to a keystone moth affects the distribution of nearly 1000 other species including insects, mammals, birds, mycorrhizal fungi and decomposers (Kuske et al. 2003, Witham et al. 2003, Brown et al. 2001).

In the southern hemisphere, a commercial utilisation of transgenic pines would in particular bear the potential risk of harmful invasions. Many pine species are highly invasive and no other gymnosperm family includes as many invasive species as the *Pinus* genus (Richardson & Reimánek 2004). One of the most harmful and aggressive species is the Monterey pine. It has already invaded native ecosystems in several regions in the southern hemisphere (Bustamante & Simonetti 2005, Richardson & Petit 2006). Nevertheless, Genfor is planning to market transgenic Monterey pines in Chile.

Huge Monterey pine plantations already exist there today. In Central Chile, for instance, the countryside is an artificial mosaic, in which patches of residual remnants of natural forest are surrounded by Monterey pine plantations (Bustamante & Simonetti 2005). If transgenic pines were used here, there would be a risk of their becoming even more invasive and penetrating into new habitats, where they could cause a loss in biodiversity and ecosystem functions (see also Ojeda 2005).

Pines demonstrate well the time dimensions over which possible environmental effects of transgenic plants need to be considered. Claire Williams of Duke University writes (Williams 2006): “Pines, among the oldest seed plant lineage on earth, have persisted for nearly 200 million years. Few advocates of transgenic pine plantations in the 21st century have considered this decision from the perspective of evolution. Many pine species have an open-ended hybridization system, so conditions can favor indefinite persistence of transgenes in neighboring or sympatric species.”

Conclusions

The pursuit of genetic engineering in forest research is primarily corporate, shaped by the imperatives of private investment, market forces and government regulatory institutions (Williams 2005). As shown above, the commercial use of transgenic forestry may have detrimental impacts on biodiversity. Forest trees produce large amounts of seeds and pollen, and long-distance and transboundary movement of transgenes will be inevitable. Transgenes could be passed on to wild conspecific populations and to wild relatives, thereby triggering new invasions and causing changes in communities and ecosystems. Furthermore, escaping transgenes may threaten valuable genetic resources by contaminating indigenous tree germplasm. Negative impacts on biodiversity may result also from non-target effects of transgenic tree plantations.

In addition to ecological impacts, transgenic plantations will also have social consequences (Mayer 2004, Baily et al. 2002a). The technological and economic power associated with transgenic forestry is likely to have consequences similar to those experienced in agriculture, where the number of producers typically declines and a few large corporations control the production system. Ownership of gene technology will provide forestry corporations with even greater decision-making powers than today. Furthermore, being heavily mechanised and centralised, transgenic plantations will offer little in terms of local employment and profit. Where commodities from natural forests and transgenic plantations compete, the latter could actively undermine wood prices and discourage incentives for natural forest management. As indigenous people are often the largest landowners of naturally managed forests, transgenic plantations could lead to a decline in the income of poor people. Moreover, given that the spread of transgenic seeds will be inevitable, the coexistence between transgenic tree plantations and less intensively managed public and private forestlands will pose new economic and liability problems, especially in landscapes made up of a mosaic of public forests, corporate timberlands, wildlife refuges and family timberlands.

Many questions about transgenic trees remain unanswered, in particular those related to their impact on biodiversity. Some of the ecological questions could be answered by laboratory and greenhouse experiments and by small-scale field tests. But, because of the long lifespan of forest trees, most of the questions relevant for an adequate risk assessment will remain unanswered. For example, the data necessary to determine genetic stability, the extent and rate of gene flow, and the persistence and invasiveness of transgenic trees would have to involve experiments lasting over several generations of the plant, conducted under different environmental conditions. The relevant timescale for appropriate risk research exceeds the life of individual scientists and regulators as well as the typical lifespan of the corporations involved in transgenic forestry.

The various ecological risks of transgenic forest trees are significant and are likely to prove unpredictable, unmanageable and irreversible. While potential benefits will accrue to some shareholders, the ecological and social risks of transgenic forest trees are likely to be shared by everyone.

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HAMBURG UNIVERSITY, INSTITUTE FOR FOREST GENETICS AND FOREST TREE BREEDING

[01 September 2006]
[SUBMISSION: ENGLISH]

Question 1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?

If yes then give details, e.g. over X number of trials have been safely conducted with no negative effects and no harm to the environment. Trials were approved by and overseen by local regulatory authority. Comments on the rigor of the regulatory process would be useful here. Other comments.

Yes. Germany has performed three field trials with GM trees between 1996 and 2004. Currently, however, no GM tree field trial is ongoing in Germany. The reasons for this are manifold but I try to summarize few of them:

- The risk that the field trial will be destroyed by activist groups is very high. The problem here is a high level of misinformation
- The location of the field trial is public accessible via internet
- In response to unfounded negative effects speculated by activist groups local grower/producer certification schemes have adopted policies that discourage new technologies including biotechnology

- Establishing a field trial with GM trees is difficult in Germany because of the high level of regulations
- Finally, in Germany the current law regulating the gene technique is very strict regarding liability issues

If yes, please answer all remaining questions. [As this question is structured it would imply that a no answer also means that none of the remaining questions are to be answered. However, this should not preclude additional notes or comments on the remaining questions where there are relevant issues to be addressed.]

Question 2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?

[Note that the question does not relate to regulations – see question 3 for that.]

Yes. In Germany there have been multiple public discussion fora dealing with genetically modified trees. For instance, the BFH has informed the local public (Hamburg, Grosshansdorf) in uncounted meetings about benefits and risks of transgenic trees. Also, a high number of information leaflets describing the potential negative or positive impacts of GM trees were produced and distributed.

A web-based information center informs about all past and ongoing projects on transgenic trees including field trials (http://www.biosicherheit.de/de/gehoelze/). This page is also available in English. A discussion forum has been initiated where questions from the public are answered by experts working in the field (http://www.biosicherheit.de/de/forum/). Also a number of national and international meetings were held, and books published treating the topics of benefits and risks of transgenic trees on a scientific basis. In addition there have been several international discussion forums that have been open to the public, for example – FAO: Electronic forum on biotechnology – Forestry Sector, (http://www.fao.org/Biotech/Conf2.htm)

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?

At my knowledge the answer is no. In case such guideline would exist this doesn't make any sense. Guidelines would be necessary in case that impacts are only negative but this has not been shown so far. In opposite, impacts of GM trees could also be positive and, thus, any guideline to minimize a positive impact would be nonsense.

A high number of field trials have been performed to screen for positive and negative impacts of released GM trees. A key conclusion of these field trials is that no observations of negative impacts have been made so far. Also no harm of the biodiversity or the environment could be observed demonstrating that trials of GM trees are not difficult to perform safely.

Environmental *impacts of genetically modified trees*
(Example: effects on native ecosystems, use of herbicide)

In Germany there have been a high number of scientific projects dealing with environmental impacts of GM trees. In particular targeted and non-targeted effects of GM trees have been investigated. So far, no indications of a negative effect have been found.

Cultural *impacts of genetically modified trees*

(Example: positive or negative impacts on indigenous and local communities and their traditional knowledge)

I don't see any cultural impact for German communities because the German consumer is habituated to a high number of exotic food (e.g. import of vegetables, fruits etc. from all over the world) and consumer goods (furniture's, electronic goods and so on). It has to be avoided that ideological issues dominate the discussion of this topic.

Socio-economic *impacts of genetically modified trees*
(Example: positive or negative effects on quantity, quality and economic value of forest production; positive or negative impacts on livelihoods of communities)

Medicine biotech has provided many significant socio-economic benefits on communities even these were not seen when discussing the risks versus benefits of this techniques in the past. Nowadays, nobody doubts about the benefits. The same I expect for GM trees when these trees are commercially planted in plantations one day and benefits are seen e.g. in respect to protection of native forests, increase of renewable resources or positive effects on climate.

INSTITUTE FOR FOREST BIOTECHNOLOGY

[24 August 2006]
[SUBMISSION: ENGLISH]

Responses to CBD Questionnaire on Transgenic Trees from the Institute of Forest Biotechnology

Question 1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?

- From 1988 – 2002 there have been over 200 field trials of genetically modified trees across 15 countries.
- More than 20 species have been modified, with eleven traits being investigated.
- All field trials have been grown within all safety precautions with no negative impacts.
- Sources:
  - www.fao.org/docrep/008/ae574e/ae574e00.htm
  - Forest Biotechnology in Latin America, Institute of Forest Biotechnology, March 2-5, 2004, Concepcion, Chile.

Question 2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?

Many international discussion forums exits

- IUFRO Sponsored 'Tree Biotechnology in the New Millennium' July 22-27, 2001, Stevenson, Washington, USA.
- IUFRO Tree Biotechnology 2005, November 6 – 11, 2005, Pretoria, South Africa.
- The Institute for Forest Biotechnology has held four international meetings:
  - Forest Biotechnology in Europe: Impending Barriers, Policy, and Implications, September 12 – 13, 2002, Edinburgh, Scotland
  - Forest Biotechnology in Latin America, March 2 – 5, 2004, Concepción, Chile
  - New Century, New Trees: Biotechnology as a Tool for Forestry in North America, November 16-17, 2004, Research Triangle Park, NC, USA
  - Growing Trees & Stemming Risks: Ecological Impacts Associated with the Practice and Products of Forest Biotechnology, March 20-21, 2006, Vancouver, BC, Canada
- Several international discussion forums have been open to the public and sponsored by OECD and FAO such as the FAO: Electronic forum on biotechnology – Forestry Sector, April 25 to June 30, 2000 (http://www.fao.org/Biotech/Conf2.htm)

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?

If yes, please list them according to the categories below:

Environmental ***impacts of genetically modified trees***
(Example: effects on native ecosystems, use of herbicide)

- Existing biosafety regulations and guidelines allow for the effective assessment of a wide variety of species, including tree species, using a case-by-case approach (consistent with the risk assessment recommendations in Annex III of the BSP) based on the biology of the species. They are flexible enough to address the diverse biology found among tree species as well as non-tree species.

- In addition, a regulatory system might also allow for the assessment of positive environmental impacts such as reducing pressures on native ecosystems, reductions in energy consumption and the environmental footprint of production technologies, and the impact of efficient feedstocks for biofuels as alternatives to dependency on fossil fuels.

Cultural ***impacts of genetically modified trees***
(Example: positive or negative impacts on indigenous and local communities and their traditional knowledge)

- Restoration of endangered tree species such as American chestnut and Elm in the US, Kauri in New Zealand, and Quele in Chile.

Socio-economic ***impacts of genetically modified trees***
(Example: positive or negative effects on quantity, quality and economic value of forest production; positive or negative impacts on livelihoods of communities)

- GM papayas preserved a significant economic advantage for Hawaiian farmers who compete with papaya growers in other parts of the tropics.
- By replacing infected orchards with resistant trees the prevalence of the virus was reduced to allow for continued production of non-genetically modified varieties that would otherwise have been lost.
- The ***failure*** to develop such technologies could have significant negative socioeconomic impacts on local communities whose livelihoods depend on a crop threatened by disease. By employing new technologies, including genetic engineering, this approach is now being explored in other parts of the world where papaya farmers face similar threats. Impeding the development and deployment of such new technologies leaves countries and communities at a disadvantage in the global economy.

INSTITUTO NACIONAL DE TECNOLOGIA AGROPECURIA

[09 January 2007]
[SUBMISSION: SPANISH]

Tengo el agrado de dirigirme a usted en respuesta a su Letra Digma 1903/2006, con motivo de la notificación del Convenio sobre la Diversidad Biológica en la cual el Secretario Ejecutivo Sr. Ahmed Djoghalf, solicita información para la Revisión en Profundidad de la Implementación del Programa de Trabajo sobre Biodiversidad Forestal.

Al respecto, luego de haber consultado con profesionales del INTA, referentes de la temática, se desea informar que el Grupo de Ecología Forestal de la estación Experimental Agropecuaria del INTA en Bariloche, trabaja desde el año 1998 en la formulación de propuestas para incluir aspectos de la Conservación de la Biodiversidad en el Manejo Forestal, mientras que el Grupo de Genética Forestal evalúa aspectos de la Diversidad Genética.

En relación al primer tema, las propuestas metodológicas y los resultados de las investigaciones están siendo aplicados en la Provincia de Chubut, existiendo iniciativas de incorporación de las mismas a la Provincia de Río Negro. A través del Proyecto "Análisis de los factores críticos de las plantaciones forestales", a su vez, se está trabajando en este tipo de temáticas en las Estaciones Experimentales Agropecuarias de Montecarlo, Concordia y Delta del Paraná y sus zonas de influencia.

Estas propuestas son en dos tipos de sistemas productivos: Bosques Nativos y Plantaciones Forestales. Incluyen la consideración de Sitios, Ambientes y Especies prioritarias para la Conservación de la Biodiversidad. Para el caso de Bosques Nativos se considera también el mantenimiento de especies clave en el sistema y en las plantaciones, el diseño de las mismas (tanto en la cobertura del dosel como en el diseño del paisaje). Este tipo de marco conceptual podría ser aplicado a sistemas agrícolas u otros sistemas antropizados.

Con respecto a la implementación de las propuestas antes mencionadas, el manejo de los sistemas de bosques de lenga en Chubut se rigen actualmente por normativas derivadas de un sistema de Criterios e Indicadores de Sustentabilidad. Además existen propuestas para el manejo de bosques de fiires, que son superadoras por contemplar el análisis de representatividad de los sistemas dentro de áreas protegidas, pero que aún no se han podido llevar a la práctica.

En cuanto a las plantaciones, se han realizado estudios de recopilación y análisis profundo de la información que define la línea de base de Biodiversidad en la Región del noroeste de la Patagonia Argentina.

INTERNATIONAL UNION OF FOREST RESEARCH ORGANIZATIONS

[24 August 2006]
[SUBMISSION: ENGLISH]

Question 1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?

• From 1988 – 2002 there have been over 200 field trials of genetically modified trees across 15 countries.
• More than 20 species have been modified, with eleven traits being investigated.
• Sources: www.fao.org/docrep/008/ae574e/ae574e00.htm; Forest Biotechnology in Latin America, Institute of Forest Biotechnology, March 2-5, 2004, Concepcion, Chile.

Question 2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?

• IUFRO Sponsored 'Tree Biotechnology in the New Millennium' July 22-27, 2001, Stevenson, Washington, USA.
• IUFRO Tree Biotechnology 2005, November 6 – 11, 2005, Pretoria, South Africa.
• Numerous national and international meetings routinely hold sessions dealing with genetically modified trees. A google search for the term "forestry biotechnology meeting" produces 4.81 million hits.

• In addition there have been several international discussion forums that have been open to the public. (OECD, and FAO fora) FAO: Electronic forum on biotechnology – Forestry Sector, April 25 to June 30, 2000 (http://www.fao.org/Biotech/Conf2.htm)

Question 3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?
If yes, please list them according to the categories below:

Environmental ***impacts of genetically modified trees (Example: effects on native ecosystems, use of herbicide)***

• Existing biosafety regulations and guidelines already allow for the effective assessment of a wide variety of species, including tree species, using a case-bycase approach (consistent with the risk assessment recommendations in Annex III of the BSP) based on the biology of the species. They are flexible enough to address the diverse biology found among tree species as well as non-tree species.
• In addition a regulatory system might also allow for the assessment of positive environmental impacts such as reducing pressures on native ecosystems, reductions in energy consumption and the environmental footprint of production technologies (bioremediation), and the impact of efficient feedstocks for biofuels as alternatives to dependency on fossil fuels.

Cultural ***impacts of genetically modified trees (Example: positive or negative impacts on indigenous and local communities and their traditional knowledge)***

• Restoration of endangered tree species such as American chestnut and Elm in the US, Kauri in New Zealand, and Quele in Chile.
• The negative impact could not be assessed due to the lack of long term trials; however, the Chinese experiment on poplar should be carefully and closely monitored to allow such assessments.

Socio-economic ***impacts of genetically modified trees (Example: positive or negative effects on quantity, quality and economic value of forest production; positive or negative impacts on livelihoods of communities)***

• GM papayas preserved a significant economic advantage for Hawaiian farmers who compete with papaya growers in other parts of the tropics.
• By replacing infected orchards with resistant trees the prevalence of the virus was reduced to low enough levels to allow for continued production of non-genetically modified varieties that would otherwise have been lost.
• The ***failure*** to develop such technologies could have significant negative socioeconomic impacts on local communities whose livelihoods depend on a crop threatened by disease. By employing new technologies, including genetic engineering, the livelihoods of papaya farmers in Hawaii have been protected. Based on this success this approach is now being explored in other parts of the world where papaya farmers face similar threats. Impeding the development and deployment of such new technologies leaves countries and communities at a disadvantage in the global economy.

OREGON STATE UNIVERSITY

[29 August 2006]
[SUBMISSION: ENGLISH]

Question 1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?

YES. There have been a large number of plantations, mostly small in size, of GM trees. The large majority are research field trials; the only commercialized tree is virus-resistant GM papaya, which is widely grown in Hawaii, USA. The full list of field trials, of which there have been hundreds, can be found on several web sites, including http://www.isb.vt.edu/ *Despite the very large number of trials, I am aware of no reports of adverse ecological consequences of any kind.*

Question 2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?

YES. The USA has hosted many national meetings, and taken part officially as host, or by sending scientific or government officials, to numerous international meetings where GM trees and their science, benefits, and safety have been main topics. I have been a speaker in several of them. See below for a partial list (those I have taken part in).

The USDA Biotechnology Regulatory Service (http://www.aphis.usda.gov/brs/) and the Institute for Biotechnology (http://www.forestbiotech.org/) have organized national meetings on a wide range of science, environmental, and cultural issues surrounding GM trees.

I helped organize and have taken part in several meetings as Chairman, International Union of Forestry Research Organizations Working Party on Molecular Genetics of Forest Trees, S.04-06, 1995-1999. The most prominent meeting—which dealt with science, regulation, and cultural issues—and the one from which a book was produced that I co-edited, was:

- ♦ Meeting: International Symposia on Ecological and Societal Aspects of Transgenic Plantations, and International Organization of Forest Research Organizations (IUFRO) Section on Molecular Biology of Forest Trees. Stevenson, Washington, USA, 2001.
- ♦ Book: Strauss, S.H., and H.D. Bradshaw (Editors). 2004. The Bioengineered Forest: Challenges to Science and Society. Resources for the Future, Washington, D.C. 245 pp. (http://www.rff.org/rff/rff_press/bookdetail.cfm?outputid=7659)

A number of scientists, representing many different countries, produced a position statement that was published in the international leading journal *Nature Biotechnology* (attached). It emphasized the need for field research to study benefits and risks in a scientifically meaningful way. It states: “Field trials are crucial for all … research objectives, and can be done with a high degree of environmental safety.” The reference to this paper, and a public lecture on the position statement, are:

- ♦ Strauss, S., W. Boerjan, J. Cairney, M. Campbell, J. Dean, D. Ellis, L. Jouanin, and B. Sandberg. 1999. Forest biotechnology makes its position known. *Nature Biotechnology* 17:1145.

- ♦ Strauss, S.H. 1999. Lessons from the IUFRO position statement on transgenic forest plantations. Proceedings of the OECD (Organization for Economic Cooperation and Development) Workshop on Environmental Considerations of Genetically Modified Trees. Norwegian Institute for Nature Research, Trondheim, Norway, September 13-15, 1999.

Examples of other significant meetings that have taken place in the USA that dealt with GM tree issues, and at which I have spoken, are:

- ♦ Workshop on Horticultural, Urban Forestry, Health and Environmental Benefits of Flowering Modification in Transgenic Trees, *Institute for Forest Biotechnology*/North Carolina Biotechnology Center, February 2003. (Chair)
- ♦ Forest biotechnology symposium at United Nations (UNIDO) Global Forum on Biotechnology, Conception, Chile, March 2004. (organized by *Institute of Forest Biotechnology*)

♦ National meeting on regulation of genetically engineered trees, Greenbelt, MD, July 2003. Organized by *USDA APHIS Biotechnology Regulatory Services.*

There have also been extensive discussion forums carried on via publications in the biotechnology and forestry literature. Some examples that I have taken a direct role in follow:
Publications: Regulatory policy analysis/discussion

1. Bradford, K., N. Gutterson, A. Van Deynze, W. Parrott, and S.H. Strauss. 2005. Response to letters on "Regulating biotech crops sensibly: Lessons from plant breeding, biotechnology and genomics." *Nature Biotechnol.* 23:439-444.

2. Valenzuela, S., and S.H. Strauss. 2005. Lost in the woods. *Nature Biotechnol.* 23:532-533.

3. Strauss, S.H., S. DiFazio, and R. Meilan. 2001. Genetically modified poplars in context. *Forestry Chron.* 77(2):1-9.

4. Strauss, S.H. 2002. A biological view of field testing: Familarity and scale provide high levels of environmental safety during field trials of RMS transgenic plants. *In* Proceedings of Workshop on "Criteria for Field Testing of Plants with Engineered Regulatory, Metabolic and Signaling Pathways," L.L. Wolfenbarger (Ed.), Information Systems for Biotechnology, Virginia Polytechnic and State University, Blacksburg, VA. Pp. 69-73. http://www.isb.vt.edu/isb_publications.cfm.

5. Strauss, S.H., S. DiFazio, and R. Meilan. 2000. Challenges to commercial uses of transgenic trees in forest plantations: The case of poplars. Pp. 191-195 In Proceedings of the 6th International Symposium on Biosafety of Genetically Modified Organisms, C. Fairbairn, G. Scoles, and A. McHughen, Eds., University of Extension Press, University of Saskatchewan, Saskatoon, Canada.

6. Strauss, S.H., J. Davis, J. Eaton, R. Hall, G. Newcombe, and G. Tuskan. 1999. Report of the poplar working group: p. 105-112 in: Proceedings, workshop on ecological effects of pest resistance genes in managed ecosystems, eds P.L. Traynor and J.H. Westwood, January 31 - February 3, 1999, Bethesda, Maryland. Information Systems for Biotechnology, Virginia Polytechnic Univ. (http://www.nbiap.vt.edu/)

Publications: Science and technology development

7. Strauss, S.H. 2004. Forest biotechnology – thriving despite controversy. Review of "Molecular Genetics and Breeding of Forest Trees" by S. Kumar and M. Fladung. *New Phytol.* 163:9-11.

8. Campbell, M.M., A.M. Brunner, H.M. Jones, and S. H. Strauss. 2003. Forestry's Fertile Crescent: The application of biotechnology to forest trees. *Plant Biotech. J.* 1:141-154.

9. Adams, J.M., G. Piovesan, S.H. Strauss, and S. Brown. 2002. Genetic engineering of forest trees against introduced pests and diseases. *Conserv. Biol.* 16:874-879.

10. Bradshaw, H.D., Jr., and S.H. Strauss. 2000. Breeding strategies for the 21st century: Domestication of poplar. In: Dickmann, D.I., Isebrands, J.G., Eckenwalder, J.E. and Richardson, J. (eds.). Poplar Culture in North America, Part 2, Chapter 14. NRC Research Press, National Research Council of Canada, Ottawa, ON K1A 0R6, Canada, p. 383-394.

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?

YES. We have guidelines for both minimizing adverse impacts while allowing critical field research on the many benefits that GM trees can provide. There are separate guidelines for laboratory research, contained field trials, and deregulation/commercial use. The USDA APHIS (http://www.aphis.usda.gov/brs/) regulates field uses of GM trees along with other types of crops, and

their regulations continue to be improved and made more rigorous so there is a reasonable balance of benefit from field research and risk. I interact with USDA APHIS regularly because of our many field trials of GM trees, and personally have seen the rigor of their regulations increase a great deal in recent years. In all cases, regulations vary greatly depending on the trait, on a case-by-case basis; in the USA there is clear consensus based on advice from the National Academics of Science and the Ecological Society of America that the trait, rather than the method of genetic modification, should be the focus of regulation and benefit/risk assessments. For example, see:

1. Snow AA, Andow DA, Gepts P, Hallerman EM, Power A, Tiedje JM, Wolfenbarger LL (2005) Genetically engineered organisms and the environment: current status and recommendations. Ecol Appl 15:377-404

Environmental impacts of genetically modified trees

There are both substantial environmental benefits as well as risks. A major environmental benefit is production of more wood, biomass, or energy on less land, reducing pressure for further plantations or farms. Direct benefits of GM trees, that have been widely discussed include:

- Reduced pesticide/herbicide ecotoxicological impacts
- Increased soil quality/reduced erosion from low-tillage practices for weed control
- Improved bioremediation of toxins and excess nutrients
- Reduced effluent from pulping/bioenergy processing
- Reduced energy use in processing from trees with modified chemistry

The issues surrounding GM trees, environmental issues, and genetic containment have been discussed in several recent national/international meetings. Recent examples of meetings where I have spoken are given below:

1. Genetic containment of poplar plantations. International Poplar Symposium IV, Nanjing, China. 2006.
2. Genetic engineering approaches to breeding sterility and reduced invasiveness. USDA-ARS floral and nursery crops workshop, Portland, OR. 2006.
3. Genetic containment of forest plantations. In Growing Trees and Stemming Risks: Symposium on Ecological Impacts Associated with the Products and Practices of Forest Biotechnology. Institute of Forest Biotechnology, Vancouver, British Columbia, Canada. 2006.
4. Domestication of poplar for bioenergy: Can genomics and transformation change the rules? Department of Energy/British Petroleum Joint Workshop on Plant Genomics, Washington, DC. 2005.
5. Environmental benfits and risks of genetically modified trees. Austrian College of Agriculture-US Land Grant College Consortium, Vienna. 2005.
6. Proposal to establish a public biotech crop trait program (BCTP) to assist in regulatory approval for “minor” biotech crops. USDA Workshop on Public Research and Regulatory Review of Small-Market Biotechnology-Derived Crops, Washington, DC. 2004.
7. Genetic engineering as a conservation tool: The case for tree biotechnology. Biotechnology & Biodiversity Symposium, Society for Conservation Biology Annual Meeting, Columbia University, New York City. 2004.
8. Managing gene flow in transgenic and exotic poplars. Brussolera-Branca Foundation Workshop on Biodiversity and Management of Poplars, Milan, Italy. 2004.
9. Gene flow control in trees: Technology development in transgenic poplars. Society for In Vitro Biology Congress, Portland, Oregon. 2003.

We have published a general review of environmental issues, as well as a specific study of the benefits and risks from herbicide tolerant GM trees:

1. James, R., S. DiFazio, A. Brunner, and S.H. Strauss. 1998. Environmental effects of genetically engineered woody biomass crops. Biomass & Bioenergy 14:403-414.

2. Strauss, S.H., S.A. Knowe, and J. Jenkins. 1997. Benefits and risk of transgenic, Roundup Ready® cottonwoods. J. Forestry 95(5):12-19.

We have published a number of analyses and reviews of issues surrounding gene dispersal from from GM trees:

1. DiFazio, S.P., G.T. Slavov, J. Burczyk, S. Leonardi, and S.H. Strauss. 2004. Gene flow from tree plantations and implications for transgenic risk assessment. In C. Walter and M. Carson (eds.) Plantation Forest Biotechnology for the 21st Century. Research Signpost, Kerala, India, p. 405-422.

2. Slavov, G.T., S.P. DiFazio, and S.H. Strauss. 2003. Gene flow in forest trees: Gene migration patterns and landscape modeling of transgene dispersion in hybrid poplar. In H.C.M den Nijs, D. Bartsch and J. Sweet (Eds.), Introgression from Genetically Modified Plants into Wild Relatives, CAB International, UK, pp. 89-106

3. Slavov, G.T., S.P. DiFazio, and S.H. Strauss. 2002. Gene flow in transgenic trees: From empirical estimates to transgenic risk assessment. *In* Proceedings of Consequences of Gene Flow, A Scientific Methods Workshop: Ecological and Agronomic Consequences of Gene Flow from Transgenic Crops to Wild Relatives. Ohio State University, Columbus, March 5-6, 2002. Pp. 94-114. http://www.biosci.ohio-state.edu/~lspencer/Proceedings.pdf

4. DiFazio. S.P., S.Leonardi, S. Cheng, and S.H. Strauss. 1999. Assessing potential risks of transgene escape from fiber plantations. In P.W. Lutman (ed.) Gene flow and agriculture: relevance for transgenic crops. Symposium Proceedings No. 72. British Crop Protection Council, Farnham, UK. pp. 171-176.

We have published a number of review/analyses of means to alleviate environmental impacts via genetic confinement technologies:

1. Brunner, A., A. Elias, K. Van Wormer, J. Li, H. Wei, O. Shevchenko, R. Mohamed, B. Montgomery, S.P. DiFazio, & S.H. Strauss. 2006. Genetic containment of forest plantations. *Tree Genetics & Genomes* (in press)

2. Meilan, R., A. Brunner, J. Skinner, and S.H. Strauss. 2001. Modification of flowering in transgenic trees. In: Molecular Breeding of Woody Plants. Progress in Biotechnology Series. A. Komamine and N. Morohoshi, editors. Elsevier Science BV, Amsterdam. pp. 247-256.

3. Brunner, A.M., R. Mohamed, R. Meilan, L.A. Sheppard, W.H. Rottmann, and S.H. Strauss. 1998. Genetic engineering of sexual sterility in shade trees. *J. Arboricult.* 24(5):263-273.

4. Strauss, S.H., W.H. Rottmann, A.M. Brunner, L.A. Sheppard. 1995. Genetic engineering of reproductive sterility in forest trees. *Molec. Breed.* 1:5-26.

5. Strauss, S.H., G. Howe, and B. Goldfarb. 1991. Prospects for genetic engineering of insect resistance in forest trees. *For. Ecol. Manag*. 43:181-209.

Cultural impacts of genetically modified trees

We have published on ethical issues surrounding GM trees, and on their social and environmental certification standards. Our analyses have suggested that there is likely to be strong ethical support in the USA and many other countries for well-motivated applications of GM trees.

1. Strauss, S.H., M.M. Campbell, S.N. Pryor, P. Coventry, and J. Burley. 2001. Plantation certification and genetic engineering: Banning research is counterproductive. *J. Forestry* 99(12):4-7.

2. Strauss, S.H., P. Coventry, M.M. Campbell, S.N. Pryor, and J. Burley. 2001. Certification of genetically modified forest plantations. *Internat. Forestry Rev.* 3(2):87-104.

3. Thompson, P.B., and S.H. Strauss. 2000. Research ethics for molecular silviculture. P. 585-611 In: Molecular Biology of Woody Plants, S.M. Jain & S.C. Minocha, Eds., Kluwer Academic Publishers, The Netherlands.

4. Strauss, S.H., K. Raffa and P. List. 2000. Ethics and transgenic plantations. *J. Forestry* 98(7):47-48.

Socio-economic impacts of genetically modified trees

The economic benefits from GE trees have been discussed as part of our papers on certification in relationship to GE, as well as with respect to herbicide and insect tolerance traits. In both of the latter cases, deployment of these technologies has substantial economic benefits, but requires that highly effective containment technologies are in place, intellectual property issues be settled, and that social consensus re. ethical acceptability be explored and a decision reached. Both the scientific research and social discussions are ongoing in the USA.

1. Strauss, S.H., P. Coventry, M.M. Campbell, S.N. Pryor, and J. Burley. 2001. Certification of genetically modified forest plantations. *Internat. Forestry Rev.* 3(2):87-104.

2. Strauss, S.H., S.A. Knowe, and J. Jenkins. 1997. Benefits and risk of transgenic, Roundup Ready cottonwoods. J. Forestry 95(5):12-19.

3. Meilan, R., Ma, C., Cheng, S., Eaton, J.A., Miller, L.K., Crockett, R.P., DiFazio, S.P., and Strauss, S.H. 2000. High levels of Roundup® and leaf-beetle resistance in genetically engineered hybrid cottonwoods. In: K.A. Blatner, J.D. Johnson, and D.M. Baumgartner, eds., Hybrid Poplars in the Pacific Northwest: Culture, Commerce and Capability. Washington State University Cooperative Extension Bulletin MISC0272, Pullman, WA. pp. 29-38.

Many of the publications cited above can be viewed or downloaded at this web site:
http://www.cof.orst.edu/coops/tbgrc/Staff/strauss/publications.htm

STATE UNIVERSITY OF NEW YORK

[03 August 2006]
[SUBMISSION: ENGLISH]

1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?

YES

If yes, please answer all remaining questions.

In the United States the establishment of field trials with genetically enhanced plants, including trees, is conducted under the oversight of the US Department of Agriculture, Animal and Plant Health Inspection Service (APHIS). Recently a sub-department entitled
Biotechnology Regulatory Services (BRS) has been given oversight of transgenic plant field trials. Having been through the permit process three times I can attest to the rigor of both the written reporting requirements and the field inspections. In addition to USDA oversight, two other federal agencies (the Food and Drug Administration and the Environmental Protection Agency) may become involved, depending on the intended use of the transgenic trees (food, feed or fiber) and the type of trait influenced be the transgene(s) introduced.

2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?

YES

If yes, please answer the remaining questions. If no, please state the reason why:

Several years ago, the BRS held a one-day workshop to get input on the need for changes in the testing and release process for transgenic trees. The Institute of Forest Biotechnology serves as an information exchange for the use of genetically enhanced trees. Other forums have included numerous workshops sponsored by such organizations as the Society for In Vitro Biology, various regional Forest Tree Improvement Conferences and the North American Forest Biology Workshop.

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?
YES
If yes, please list them according to the categories below:
If no, please explain the reason why here:
Environmental impacts of genetically modified trees
The main focus of the field test permit and the shorter version, the notification letter, is to minimize the chances of the test organism escaping the confines of the test plots. Detailed descriptions are required of how the researcher plans to minimize any chance of escape during all phases of the test. These plans must begin with how the plants or seeds will be packaged for shipment to the test site, how the test trees will be prevented from flowering (or the resulting seeds and pollen contained to the test site) for the duration of the test and how far away any sexually compatible species are located. The termination of the study requires equally detailed descriptions. All test plants must be destroyed and the site monitored for resprouting or seed germination for several growing seasons. Field tests are inspected on short notice throughout the process. This rigorous oversight of test plantings at small-scale field trial stage reduces to a minimum any chance for the accidental release into a broader environment before the transgenic trees can be properly evaluated. I have no direct experience with the process leading up to full release (determination of “non-regulated status”), but based on scanning the documentation provided for genetically enhanced plum, it appears that the process is even more rigorous.
Cultural impacts of genetically modified trees
To the best of my knowledge, the potential cultural impacts of the testing or deployment of genetically enhanced plants or specifically trees is considered to be beyond the authority of the regulatory agency (APHIS, BRL). However, they are extensively considered by the Institute of Forest Biotechnology.
Socio-economic impacts of genetically modified trees
The large positive socio-economic impact of generically enhanced papaya was certainly a strong consideration in the APHIS, BRS determination of non-regulated status in Hawaii. Based on the statements in the Environmental Assessment for the C5 plum variety it is also a strong consideration in this case too.

UNITED STATES COUNCIL FOR INTERNATIONAL BUSINESS

[01 September 2006]
[SUBMISSION: ENGLISH]

Question 1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?
The USCIB is glad to provide the SBSTTA with global information concerning both the plantations of GM trees and other important additional information that will help put these values into perspective. Firstly, GM trees have the potential to add value in forestry, row crop/orchard applications, ecosystem restoration and bioremediation. We encourage the SBSTTA to consider the following scientific articles: Cheliak et al., Can. J. For. Res., 20, 452
(1990); Pilate et al, Nature Biotechnology 20, 607 (2002); Gonsalves, D. NABC Report 15, pp. 223 (2003); Merkle, NABC Report 17, pp. 117-120 (2005); and Hinchee et al, NABC Report 17, pp. 133-137 (2005).

There have been and continue to be trials of GM trees in many countries around the world. The 2004 FAO report "Preliminary review of biotechnology in forestry, including genetic modification" identified over 210 field trials of genetically modified (forest) trees in 16 countries, with research in the genetic modification of forest trees occurring in at least 35 countries. More recent data are available at a variety of internet databases. The EU database of environmental releases of GMOs lists 21 different tree species (both forest trees and fruit trees) in a total of 55 field trials through May of 2006 http://biotech.jrc.it/deliberate/dbplants.asp). The Information Systems for Biotechnology website (http://www.isb.vt.edu/cfdocs/globalfieldtests.cfm) provides links to several country-specific databases. The majority of field tests have been conducted in the United States with a search at the ISB site showing over 400 requests for permission to conduct field tests representing thirty different species of trees. U.S. universities conducting biotechnology research on trees include: Oregon State University (OSU), Purdue, North Carolina State University (NCSU), University of Georgia (GA), State University of New York - College of Environment Science & Forestry (SUNY), Michigan Technological University (MTU), and Michigan State University. The OECD Biotrack Database of field trials (http://webdomino1.oecd.org/ehs/biotrack.nsf), while including records only until 1999, lists additional historical data on field trials that is not captured in some more recent databases.

Only two countries have commercial plantings of GM trees, China and the U.S. China is reported to have several large plantings of poplar trees modified for insect resistance. The U.S. has deregulated genetically modified papaya that is resistant to papaya ring spot virus. In 2005 approximately 2,400 acres of papaya plantations were grown in Hawaii (up 20% from 2004), with between 50 and 60% of the area planted with genetically engineered papaya. (U.S. National Agricultural Statistics Service: http://www.nass.usda.gov/hi/fruit/annpap.htm). The U.S. is currently considering the deregulation of a second tree species, plum trees engineered for resistance to plum pox virus.

Importantly, a key conclusion is that none of these field tests or commercial releases has produced any observations of negative impacts or harm to the environment or biodiversity.

If yes, please answer all remaining questions.

The USCIB believes that the extensive plantings of GM trees around the world are indicative of widespread recognition of the potential value these products could bring. Furthermore, the continued field releases demonstrate that experiments and commercial release can be done safely and in compliance with the Protocol using science-based, case-by-case risk assessment processes that have been used with other GM plants.

If no, please state the reason why:

USCIB reminds the SBSTTA that there are numerous reasons why releases of GM trees may not have occurred. We encourage the SBSTTA to focus only on those reasons where scientific justification has been given. One example of a scientific reason for not conducting field trials is that active research is ongoing but has not yet advanced to the stage of field testing. Many countries have fledgling biotechnology efforts that are directed at solutions for crops or issues specific to their country needs. Several examples can be found, including:

1) News reports recently circulated by the CBD Secretariat as part of their CBD News Headlines e-mail,

2) Malaysian work on papaya, bananas and oil palms (http://biz.thestar.com.my/news/story.asp?file=/2006/7/31/business/14942050&sec=business),

3) The African Union and the New Partnership for Africa's Development report (http://www.scidev.net/news/index.cfm?fuseaction=readnews&itemid=3013&language=1, and http://www.nepadst.org/doclibrary/pdfs/abp_july2006.pdf) which calls for African countries to 'upgrade and expand (their) limited forestry biotechnology programs.'

Non-scientific reasons for not conducting trials include:

1) In some countries, activists opposed to genetic modification have created an atmosphere where researchers cannot perform field tests for fear that the test will be destroyed. Such incidents are well

documented (for examples see http://flag.blackened.net/global/1199arwtotrees.htm and http://www.connectotel.com/gmfood/ge120799.txt).
2) In several parts of the world, economic forces discourage the development of GM products.

Question 2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?
USCIB supports a scientifically based approach which recognizes that valid risk assessment approaches have been developed for organisms broadly. These principles are noted in Annex III of the Protocol. Furthermore, we support using the great body of experience developed through the evaluation of GM plants. It should be recognized that trees are plants, and as such, require no special handling in regards to risk assessment. Developing tree-specific guidance is unnecessary and unwarranted based on basic principles of biology and risk assessment.
The U.S. system for oversight and regulation of plants derived through biotechnology has worked effectively for over 20 years to ensure the safety of these products and protection of environment. During this time, over 70 agricultural products have been given deregulated status, and many have been widely adopted by farmers. In 1986, the U.S. developed the Coordinated Framework for Regulation of Biotechnology. Under this framework USDA
APHIS (United States Department of Agriculture, Animal and Plant Health Inspection Service), FDA (Food and Drug Administration) and EPA (Environmental Protection Agency) coordinate the regulation of GM crop products. In 2002 APHIS further enhanced the regulatory process by creating the Biotechnology Regulatory Services (BRS) unit within the Agency that now administers all USDA authorities related to GM organisms (www.aphis.usda.gov/brs/).
The many discussions and meetings held to address issues of GM trees are too numerous to list here. Just a few examples include: public meetings sponsored by regulatory agencies (e.g. USDA APHIS BRS public meeting on regulatory oversight for GM trees held July 8-9, 2003); ongoing series of biosafety symposia sponsored by biotechnology associations (e.g. Brazilian Congress on Biosafety, I through IV, sponsored by ANBio (National Association of Biosafety) in Brasil); and international meetings addressing GM trees (e.g. meetings organized by the Institute of Forest Biotechnology and held in Chile, Canada and the UK).
An important consideration is the setting for these discussions, particularly in the context of science-based debate. Frequent national and international meetings routinely hold sessions dealing with genetically modified trees, including the 'Plant and Animal Genome' meetings, held annually since 1989, and IUFRO (International Union of Forest Research Organizations) Tree Biotechnology meetings held biannually, among others. In addition there have been several international discussion forums that have been open to the public. (For example – FAO: Electronic forum on biotechnology – Forestry Sector, April 25 to June 30, 2000 http://www.fao.org/Biotech/Conf2.htm) Finally, OECD has published internationally peer-reviewed Consensus Documents on the biology of tree species, including poplars, spruce, papaya and prunus among others, that allow for the thorough scientific understanding of these species when considering GM products in these species (http://www.oecd.org/document/51/0,2340,en_2649_37437_1889395_1_1_1_37437,00.html).

If yes, please answer the remaining questions.
If no, please state the reason why:

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?

We are deeply concerned that this question implicitly suggests that the impacts of GM trees will be negative, and therefore must be minimized, and this question may unintentionally bias answers towards negative responses. From the experience to date (see above), there is no scientifically based reason to believe that GM trees pose greater risks than their traditional counterparts. Also, this question skips the critical step of risk assessment and mentions only the risk management/mitigation. It is equally important that the potential positive economic and environmental impacts of GM trees should be considered in

balance with possible negative impacts. Where potential positive impacts from **any** technology can benefit the biodiversity goals of the CBD, we would sincerely hope that all stakeholders can come to an agreement that such impacts should be **maximized**.

It is critical that guidelines and regulations are flexible enough to be able to address the diverse biology found among all plants including tree species. As far as we are aware, countries have not developed regulations specific to GM trees and we strongly advocate against any such proposal. Rather, regulatory guidance should focus firstly on the nature of the plant, the nature of the trait, the likely receiving environment and interactions among these for any GM product. It would be discriminatory, impractical and unmanageable to consider regulatory regimes that would be sufficiently broad enough to accommodate the diverse biology of tree species: short or long lived, self fertile or self incompatible, insect or wind pollinated, native or exotic. Consider also the different uses of trees: fruit, forestry, fuel or ornamental. Developing tree-specific guidance creates an unnecessary distinction between trees and other plants, which could create a perception that there is an a priori greater risk associated with trees. This is not scientifically justifiable.

In the U.S., APHIS conducts in-depth analyses as part of the permitting process and review of petitions for non-regulated status in fulfillment of its obligations under the United States National Environmental Policy Act (NEPA). Tests have been conducted by multiple entities including both industry and universities, and in multiple species with multiple traits. Through USDA funding, Virginia Tech maintains an independent database of all plants that are in tests or that have been deregulated, including tree species (http://www.isb.vt.edu/biomon/datacat.cfm).

U.S. government agencies, universities, foundations, and forest products and paper companies have invested significant funding in forest biotechnology research during the past 20 years. Forest biotechnology is evolving in concert with biotechnology in human health, agriculture, bioremediation, carbon sequestration, drug manufacture, and bioenergy, and has the potential for great advances in a number of areas. Researchers are cautiously proceeding and developing the science necessary to ensure the safe and appropriate uses for forest biotechnology. Forest biotechnology has potential for a multitude of benefits, including the restoration of depleted tree species, bio-remediation of chemically contaminated soils, filtration of greenhouse gases from the atmosphere, tolerance to pests, control of invasive species and altered cell formation allowing wood manufacturing with reduced environmental impacts.

Traits being researched and developed include (for various tree uses): virus resistance, herbicide tolerance, insect resistance, fungal resistance, bacterial resistance, improved growth rates and wood quality, modified lignin, biomass production, biofuels, phyto-remediation and modified fertility. It is anticipated that commercial forest trees are 5-10 years or so away from commercialization and deployment in the U.S., where they will be of interest to commercial high-production plantation owners.

If yes, please list them according to the categories below:

If no, please explain the reason why here:

Environmental impacts of genetically modified trees

(Example: effects on native ecosystems, use of herbicide)

Consideration for minimizing potential negative impacts is a key component in the biosafety regulations for all plant species in those countries where GM trees are being tested. The biology of the target species is evaluated as well as possible impacts of the genes introduced, be they for herbicide tolerance or any other trait. By establishing defined criteria for confined field trials, using a case-by-case approach consistent with the risk assessment recommendations in Annex III of the Protocol, rigorous yet effective systems allow for the safe testing of genetically modified organisms without undue risk to native ecosystems. Evidence for the effectiveness of this approach can be seen in that there are no documented cases where any of the several hundred trials conducted to date had any negative environmental impacts.

Regulatory decisions should also allow for the consideration of positive environmental impacts after commercialization. In particular, the use of forest biotechnology, specifically transgenics, offers the opportunity for restoring species at risk due to introduced pathogens. For example, development of rapid transportation in the late nineteenth century began eroding the effectiveness of the natural barriers protecting the U.S. forest. One of the first uses of forest related transgenics in the United States will likely

be for saving or restoring species threatened with extinction, such as the American chestnut (Castenea dentata) and American elm (Ulmus Americana). These populations were decimated in the last century by introduced pathogens, and identifying genes that improve resistance against diseases will make it possible to restore them. As regulatory and safety issues are resolved with one or more of those species, the practice will move to operational reforestation in as little as five years.

In addition to developing pathogen resistance in trees, U.S. transgenic research is showing promise developing means of controlling introduced insects such as gypsy moth (Porthetria dispar) and hemlock wooley adelgid (Adelges Tsuga Annand).

Pressures on native ecosystems can potentially be reduced by technological advances that allow increased productivity. Improving characteristics to allow more efficient processing could reduce energy demands and reduction in waste streams, leading to smaller environmental footprint of production technologies. Potential applications in developing efficient feedstocks for biofuels as alternatives to fossil fuels could also bring broad global benefits.

Cultural impacts of genetically modified trees

(Example: positive or negative impacts on indigenous and local communities and their traditional knowledge)

Positive cultural impacts can also be accomplished from reduced pressure on native ecosystems. In many regions in the developing world, deforestation is driven by local use of wood as fuel. Qualities such as faster growth and improved stress resistance would likely

increase sustainability of fuel sources, creating direct environmental benefits through reducing deforestation, and positively impacting local communities by reducing time and effort allocated to wood-gathering.

Socio-economic impacts of genetically modified trees

(Example: positive or negative effects on quantity, quality and economic value of forest production; positive or negative impacts on livelihoods of communities)

Numerous reports now exist that document the positive socio-economic impacts of GM crops on communities. These include maintaining soil quality through no till farming techniques, reduced exposure to pesticides and protection of the crop from potentially devastating pathogens. Experience with GM crops is indicative that similar benefits could be gained through the use of GM trees.

Papaya farmers in the United States faced tremendous losses when their crop was attacked by an untreatable, exotic viral disease. Only through the introduction of genetically modified papaya were these farmers able to maintain their livelihoods. It is worth noting that not all papayas grown today in Hawaii are genetically modified. Replacing infected orchards with resistant trees has significantly reduced the prevalence of the virus allowing for continued production of non-genetically modified varieties that otherwise would likely have been lost. Any local community which depends on a crop that is threatened by disease or other stresses should be given an opportunity to look to new technologies, including genetic modification, to combat such threats. Impeding the development and deployment of such new technologies leaves countries and communities at a disadvantage in the global economy.

Many potential products are also in the research pipeline for possible commercialization. A large number of the traits under development for commercial forest trees will provide benefits to growers, manufacturing operations and the environment. Much of this research is focused on quality traits in plantation trees. By enhancing these traits, it will be possible to produce lumber that better meets manufacturing specifications, significantly reducing wood waste. These traits will also allow forest owners to grow trees that are straighter and more disease resistant, reducing environmental and cost impacts associated with harvesting and reforesting.

By increasing productivity, reducing disease, and enhancing wood content, plantation forests become much more efficient overall. This increased efficiency can reduce the need to harvest in forests that have special characteristics, and allow them to be managed in accordance with forest conservation programs. More land could be left in natural condition, protected or used for conservation purposes. With a human population that is projected to increase to 9 billion people by 2050, the demand for wood fiber for its

many uses will increase proportionally. To meet this demand, plantation forestry will have to use every technology available.
We recognize the high importance of economic impacts and therefore ask the Executive Secretary to account fully for the potential positive effects from genetically modified trees. Rather than creating barriers to technology based solutions to problems, we should look to encourage the safe development of such technologies. The **failure** to develop such technologies could have significant and widespread negative socioeconomic impacts.
USCIB would be pleased to discuss further any of the points raised in this submission; please do not hesitate to contact us if you have any queries.

UNIVERSITY OF WESTERN ONTARIO

[23 November 2006]
[SUBMISSION: ENGLISH]

No Commercial Approval of GM Trees

Genetically modified (GM) trees have all the hazards of GM crops only worse; they are larger and longer lived and therefore can spread transgenes further and wider, while their extensive root systems are a hotbed for horizontal gene transfer and recombination. GM forest trees, in particular, are the ultimate threat to people and planet, and should be banned.

Prof. Joe Cummins and **Dr. Mae-Wan Ho** update the ecological and health risks since ISIS' last comprehensive review (GM Forest Trees - The Ultimate Threat, *SiS* 26)

Genetically modified trees without caution

There is growing pressure to commercialize the numerous GM tree species that have been modified with a variety of transgenes. One major reason is that GM trees have been proposed for plantations, on the mistaken assumption that they can offset carbon emissions and hence qualify for subsidies under the Kyoto Protocol's Clean Development Mechanism. In the rush to exploit GM trees, caution will be scattered to the winds, like the pollen of the GM trees currently being tested.

Commercial releases and field tests
Even though the first GM tree, papaya, was approved for commercial release ten years ago there have been only two petitions for non-regulated status, one for another papaya GM event and the other for virus resistant plums [1]. However, the United States has undertaken about 264 field test releases of numerous GM trees spread over most of the states and possession. Modified species include tropical trees (banana, avocado, grapefruit, lime, papaya and coffee), horticultural fruits (apple, plum, pear and walnut), and numerous forest and shade trees such as eucalyptus, American chestnut, American elm, poplar, cottonwood, aspen, white spruce and pine. Transgenic traits range from disease or insect resistance and herbicide tolerance, to lignin modifications, sterility, and bioremediation [2].

Canada has undertaken 33 field trial releases of GM trees mainly near Quebec City; and these are limited to insect resistant or herbicide tolerant poplar, black spruce and white spruce [3].

Of the 205 permit applications listed at the end of 2003, 73.5 percent originated in the USA, 23 percent in other OECD member nations (in particular, Belgium, Canada, France, Finland, New Zealand, Norway, Portugal, Spain and Sweden) and 3.5 percent elsewhere (Brazil, China, Chile, South Africa and Uruguay) [4]. Four traits accounted for 80 percent of the permit applications: herbicide tolerance (32 percent), marker genes (27 percent), insect resistance (12 percent), and lignin modification (9 percent). Of the tree species involved, *Populus*, *Pinus*, *Liquidambar* (Sweet Gum Tree) and *Eucalyptus* account for 85 percent of applications.

Belated environmental impact studies

ISIS alerted the public to the serious environmental impacts of GM trees in forestry [4] (GM Forest Trees - The Ultimate Threat, *SiS* 26) and earlier, in bioremediation and low lignin applications [5] (GM Trees Alert, *SiS* 16). Numerous field releases were approved in the absence of information on the spread of pollen and seed in forest and orchard ecology. Only recently have models of pollen dispersal from forest trees begun to appear. Significant amounts of oak pollen were deposited up to 30 km downstream from a stand of oak trees, and lower quantities deposited up to 100 km [6]. Earlier, it was claimed that conifer pollen dispersed to between 6 and 800 m from a source; but a more comprehensive study revised this figure upwards to between 8 and 33 km [7, 8].

Eucalyptus pollen is spread by small insects, which can carry pollen to distances of 1.6 km, although most of the hybridization is found within 200 m of the plantation [9]. It is essentially impossible to contain GM trees; the probability of spreading transgenes from GM conifers is 100 percent at a distance of one km from a source [10]. Pine seeds, too, are transported over a great distances, the probability that seeds are transported further than one km from a source was nearly 100 percent [11]. Canadian regulators, recognizing that transgene containment is not possible for GM forest trees, are now suggesting that regulations should be altered to accommodate the uncontrolled release of GM trees with transgenes for herbicide tolerance, insect resistance or low lignin content [12]!

The low lignin trait is one much desired by foresters as it provides greatly reduced costs in preparing fibre for paper. However, reduced lignin results in reduced strength to resist wind damage in the GM trees, and tends to make the trees susceptible to disease [13] (Low Lignin GM Trees and Forage Crops, *SiS* 23). A recent field study showed that the trees with reduced lignin decomposed more rapidly in the soil and that decay was associated with major restructuring of the soil micro flora and micro fauna, the adverse impacts of which have yet to be fully evaluated [14].

Terminator trees no answer

'Terminator trees' are trees genetically modified to produce either no flowers or no pollen. For the most part, the methods to control flowering interfere with the genetic programme for floral development, or kill cells involved in floral development [15] (Terminator Trees, *SiS* 26). Controlled cell killing is achieved using an enzyme barnase that breaks down RNA, in combination with a specific inhibitor called barstar [16]. The barnase–barstar system has been approved for some transgenic food crops, but its toxicity and immunogenicity have been ignored or dismissed.

Efforts are being made to produce male-sterile or sterile modification events to prevent spread of the transgenes. A male-cone specific promoter from *Pinus radiata* was used to drive a stilbene synthase gene from grape transferred to tobacco (as a first step to modifying pine), leading to greatly decreased pollen viability in the transgenic tobacco. The stilbene synthase inhibits flavonol synthesis resulting in sterile pollen [17]. The system is still in preliminary development and seems quite 'leaky' in that viable pollen is produced. The killing gene used in this male-sterile system is far less toxic to humans and animals than are many of the others, but this means that the male-sterility trait will more readily spread to contaminate non-GM crops and natural species.

If and when GM trees are released for commercial use, many releases are likely to employ terminator genes. Such genes, regardless of their inherent toxicity, will produce trees that do not sustain many mammal, bird and insect species that eat seeds or pollen. The plantations and contaminated natural forests will both become huge green desserts for the ecosystem.

Gene therapy for trees could bring nightmares

Gene therapy uses vectors to deliver genes to treat disease or to enhance growth in humans or animals. Viral gene vectors have also been developed to rapidly produce large quantities of pharmaceutical proteins in plants. A locally replicating gene-silencing vector based on Poplar mosaic virus was developed to deliver gene-silencing RNA sequences [18]. Gene silencing provides a means of regulating metabolic pathways and controlling plant diseases, and small synthetic RNA molecules have been

developed to control plant viruses [19, 20]. Such synthetic RNA molecules are readily delivered using viral vectors, which could be sprayed onto forest stands from helicopters, for example, similarly to the current delivery of herbicides and fertilizers. Small RNA molecules require careful and extensive safety evaluations, as mice receiving 'gene therapy' from small interfering RNA died in droves recently [21, 22] (Gene Therapy Nightmare for Mice, *SiS* 31). Forests sprayed with small RNA vectors could have devastating effects on bystander plants and animals including humans.

New modifications of forest trees

The main focus of genetic modifications in forest trees has been on herbicide tolerance, insect resistance, and flowering discussed earlier [4, 13, 15], but there are some other new developments.

Trangenic poplar with enhanced growth was constructed using a maize uridinediphosphoglycosyltransferase gene accompanied by an *Arabidopsis* gene for acyl-CoA-binding protein, which enhanced production of the growth hormone indoleacetic acid. The transgenic poplar grew much faster than the unmodified poplar [23].

An alcohol (ethanol) inducible promoter from the fungus *Aspergillus* driving a GUS color marker gene was used to transform aspen. Ethanol or ethanol vapour at concentrations as low as 0.5 percent induced the marker gene [24], and this presumably has applications in both the laboratory and in the field.

A bacterial gene for producing mannitol from fructose was used to induce salt tolerance in Chinese white poplar (*Populus tomentosa*). The transgenic poplar grew about half as fast both in the presence and absence of high salt levels, but the untransformed poplar did not survive in the high salt environment [25].

Transformation of a poplar hybrid with the tryptophan decarboxylase gene from *Camptotheca acuminate* (tree of life, cancer tree) caused the gene to over-express . The tryptophan decarboxylase converts tryptophan into trptamine, which provides resistance to caterpillars of *Malacosoma disstria* [26]. The excess of tryptamine may result in producing hallucinogenic tryptamines, but that aspect was not explored in the report.

A transcription factor from *Capsicum annuum* (pepper) transferred to pine trees resulted in enhanced multiple stress tolerance (drought, salt and freezing). The transcription factor increases polyamine biosynthesis [27, 28]. But polyamines such as putresine and cadaverine are toxic to humans.

China has planted over one million transgenic poplars since 2002. The plantations are located mainly in the northwest regions of Xinjang province, while a further 400,000 trees are planted in the headlands of the Yellow and Yangtze rivers [29] (GM Trees Lost in China's Forests, *SiS* 26). China has an extensive program of poplar genetic improvement including transgenic technology and marker assisted selection. Poplars modified with the Bt Cry1Ac gene or with a Cry1Ac gene fusion with the cowpea protease inhibitor gene have been most extensively deployed in China. The level of resistance of the transgenic trees to the main target insects has not dropped since deployment, but some insect pests are tolerant to the transgenic trees [30]. There have been no reports on whether or not the resistant insect pests have proliferated following demise of competing pests.

Transgenic fruit trees

Fruit trees are much targeted by genetic engineers. Papaya and plum trees resistant to virus were the first trees approved, or petitioned, for commercial release in the United States, with flagrant disregard of safety [31, 32] (Allergenic GM Papaya Scandal, *SiS* 18; USDA Proposes to Deregulate Its Own Transgenic Plum, *SiS* 31).

A long term study of transgenic marker gene stability in Higan weeping cherry (*Prunus subhirtella*) showed that the markers were relatively stable but 91 percent of the transformation events also contained various lengths of the bacterial plasmid vector backbone, as *Agrobacterium* transformation is far from precise [33].

A grape stilbene synthase gene accompanied by a bar gene for herbicide tolerance was used to transform apple to enhance picied (reveratrol glucoside) production in the apple. Picied is both a phytoelexin for pest control and a health-promoting antioxidant [34].

Bacterial fire blight disease is a significant problem in pear and apple. Pears were transformed with a gene from a bacteria phage that dissolves the extracellular polysaccharide of the bacterial pest. The transgenic pears were only partially resistant to the bacterial pathogen but researchers thought improvements in the process might be possible [35].

In a pilot experiment, transgenic orange trees with a GUS marker gene driven by a CaMV promoter accompanied by a neomycin antibiotic resistance gene bore fruit that was harvested. The fruit was processed to make juice, to which was added bacterial plasmid DNA, yeast DNA and additional transgenic orange DNA. The orange juice-DNA soup was then pasteurized and stored. The pasteurization and acidic environment of the orange juice degraded all of the added and endogenous DNA molecules to molecular sizes smaller than the size required for bacterial transformation [36]. The experiment would have been more informative if the ability of the transgenic orange juice to actually transform bacteria was investigated.

Trifoliate orange (*Poncirus trifoliate*) is a member of the family Rutaceae closely related to Citrus, and sometimes included in that genus, being sufficiently closely related for it to be used as a rootstock for Citrus. The plant is fairly hardy and will tolerate moderate frost and snow, making a large shrub or small tree 4-8 m tall. Because of the relative hardiness of *Poncirus*, citrus grafted onto it are usually hardier than when grown on their own roots. A gene from *Arabidopsis* CiFT that promotes transition from vegetative to floral development was transferred to trifoliate orange. The transgenic trifoliate oranges flowered as early as 12 weeks of growth in a green house while the untransformed plants takes several years [37]. Reducing the generation time can greatly facilitate genetic improvement of the rootstock for commercial citrus production, subject to satisfactory safety assessment.

The biotechnology of temperate fruit trees and grapevines was reviewed in 2005 along with marker-assisted selection [38]. It seems likely that marker assisted selection may provide the most long lasting and best fruit-tree improvement.

No commercial approval now for all GM trees and GM forest trees should be banned

In conclusion, even though most of the work on transgenic forest and fruit trees is well meant and promises rich financial reward, no GM trees should be commercialized at this time, and GM forest trees, in particular, should be banned. The inevitable spread of transgenes in pollen and seed cannot be prevented. Sterile trees promise no real remedy, as sterile forests will be green desserts at best, at worst, it will turn them from effective carbon sinks into massive carbon sources, thereby greatly exacerbating global warming [4].

Modified fruit trees require much more careful scrutiny than was the case for the first commercial release of GM food and feed crops, which resulted in widespread genetic pollution of native stocks. A moratorium on commercial release of all GM trees is essential at this time.

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Question 1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?

No.

If yes, please answer all remaining questions.

If no, please state the reason why:

No GM tree plantations in the UK at this time.

In the UK a total of five GM Tree Field trials have been carried out. The first two trials were successfully concluded. The last three trials, using fruit trees and a poplar hybrid were destroyed by genetic terrorists prior to completion. This last act of genetic terrorism (approx 2000) was particularly misguided, as it was claimed to be to ensure that the GM poplars did not form pollen, which would not have occurred since the trees were all female!

Other forest biotechnology research interests in the UK would like to proceed at least as far as small scale field trials, but the misguided actions of genetic terrorism groups would prevent trials from reaching fruition, even for trees designed for increased pathogen resistance, e.g. *Ophiostoma* fungal resistance, for which there is no current alternative, despite 35 years of conventional tree breeding in Europe.

The current EU Directives do not encourage research into GM technologies. This acts as a disincentive for scientific investment and has lead to many able researchers leaving Europe for more liberal regulatory climates. Although there are some early signs of a more positive agenda based upon the need for scientific evidence, the climate of public opinion in the UK and indeed much of EU, remains negative towards GM trees, in response to media frenzies and environmental activist scare stories, frequently, perhaps even always, lacking any basis in scientific evidence or fact, as prime examples of closed minds and categorically negative prejudice.

There is a clear need to accumulate biosafety and performance data on GM trees in Europe, or developed as a product of European research activity. This can best be done by allowing controlled field trials in the environment to take place. Any move to prohibit all GM tree release into the environment lacks logic, especially when, for example, species such as English elm, which does not normally set seed in the UK climate, is considered and is therefore unlikely to represent any risk of potential genetic contamination. Questions relating to potential contamination should better address whether any potential pollen escapes are of any ecological or economic consequence, or simply going to be diluted out, as the vast majority of traits studied to date have no, or slightly negative, reproductive fitness effects.

The closed and restrictive approach to certification adopted by the Forestry Stewardship Council, which prohibits any certificated use of land associated with GM trees adds to the constraints on scientific investigation of GM trees and the products of forest biotechnology in general.

Question 2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?

Within the UK, the Institute of Forest Biotechnology (IFB) and University of Abertay Dundee, Scotland have hosted a successful European Forest Biotechnology Conference, encouraging discussions between all parties and open dialogue about what the potential benefits, risks or consequences of developing and if considered appropriate, deploying the products of forest biotechnology might be. The ‘European Forest Biotechnology Conference’ including representatives from green groups, Universities, European industry and research institutes, as well as government regulators and was chaired by Prof Kevan MA Gartland, a Director of IFB. Several other meetings and dialogues have been sponsored by IFB in this regard globally, including successful events in Chile on ‘Forest Biotechnology in Latin America’, N Carolina on ‘New Century New Trees’ and Vancouver, Canada on ‘Growing Trees and Stemming Risks - a Forum for Ecological Risk Assessment Dialogue’.

Conducting these types of open dialogue meetings requires all points of view to be prepared to participate in the discussions, however, this has proved very difficult to achieve as a number of deep ecologists and fundamentalist green activists refuse to partake in dialogue or constructive and balanced discussions.

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?

This question is fundamentally flawed, as it appears to make the assumption that any scientific and/or commercial impacts or purposes of GM trees must require to be minimized. There is no logical or scientific evidence basis for this erroneous presumption. Many of the potential impacts of GM trees may have positive aspects, eg reductions in chemical or energy required for industrial processing, cheaper construction materials, higher calorific value fuels, pathogen resistant trees etc. There is at least as much, and almost certainly more, evidence for potentially positive impacts as for negative impacts needing to be minimized.

The UK has an Advisory committee on Release into the Environment (ACRE) which advises the relevant Secretaries of State as to potential deliberate release into the environment applications for all GM plants. Relevant legislation, reflecting EU Directives on environmental release guide these regulations. At the present time, the regulatory hurdles erected and the activities of genetic terrorists are such as to make it exceedingly difficult for Universities or small scale companies to meet the evidence requirements before any release application might be approved, or the trials conducted without acts of wanton vandalism taking place.

The European approach of assessing risk by regulating the process of GM itself, rather than a case by case carefully considered approach concentrating on the product itself and genetic similarity is holding back innovations in biotechnology. The European Union has recently commissioned the development of 'Plants for the Future' a Strategic Research Agenda coordinated by EuropaBio, pointing the way towards activities needed for a bio-based economy to reach fruition across Europe by 2025. This Strategic Research Agenda development process has involved interest groups from many different points of view and includes environmental sustainability as well as plant productivity and biodiversity interest groups.

Regulatory systems which consider only potentially negative impacts are, of necessity, flawed, as they appear to ignore the possibility of deployment of the products of new technology having any positive or favourable consequences, eg maintaining threatened tree species, preserving ecologically damaged landscapes, allowing areas of concentrated production to support forest and biodiversity refugia, using GM trees as enhanced biofuels or sustainable green job generators etc.

The Secretariat should also consider the adverse effects of not developing or deploying GM tree products, which may severely disadvantage developing country or disadvantaged regional economies. Decision support systems for GM trees must adequately consider ecological, societal and economic aspects of proposals, rather than remain the plaything of fundamentalist environmental groups.

MAX PLANCK INSTITUTE FOR CHEMICAL ECOLOGY

[22 November 2007]
[SUBMISSION: ENGLISH]

Question 1. So far as I am aware, there are no field trials of transgenic trees of any kind underway in Germany at this time. My colleague Dr Matthias Fladung of the Institut für Forstgenetik und Forstpflanzenzüchtung in Grosshansdorf, will be able to provide a more definitive answer, however.

The regulatory framework in Germany for applying for such a trial (with trees or any other plants) is such that I would not even consider attempting to organise such a trial within the EU zone at the current time.

The effort needed to maintain the necessary security to protect any such trial from vandalism would also be significant deterrant.

NZBIO

[31 August 2006]
[SUBMISSION: ENGLISH]

1. New Zealand does have an experimental plantation of genetically modified trees. This is a contained field trial subject to government regulation. The field trial comprises of Pinus radiata, an exotic species to New Zealand. New Zealand is home to some of the worlds' largest, and most intensively managed, sustainable, production pine plantations. Worth NZ$5 billion in outputs in 2004, forestry and wood processing is one of New Zealand's largest industries, contributing almost 4% of GDP and employing 26,576 people in forestry and first-stage processing, with exports of NZ$3.3 billion. Genetically modified trees may have an important role in the future of this major New Zealand industry.

2. New Zealand undertook significant discussion and review of genetic modification at a national level during 2000/01 and concluded that it has a role in the development of forest trees (and other crops). A regulatory framework was developed to mitigate potential risks and provide an application process for the research and development of genetically modified organisms. Applications are assessed on a case-by-case basis that weighs scientific, public, and indigenous views.

3. New Zealand has comprehensive legislative regulations that apply to all genetically modified organisms, including trees. The Hazardous Substances and New Organisms (HSNO) Act 1996 gives a Government Department responsibility for approval of applications to research, test, import or release genetically modified trees, crops, animals and other living things. Approvals can be conditional or non-conditional based on a broad assessment of the overall balance of risks against benefits for New Zealand (and potential loss to New Zealand from declining an application). The approval process includes consideration of environmental, cultural and socio-economic impacts and benefits.

NZBio considers that the New Zealand Government has taken a cautious and pragmatic approach to the research, development and commercialisation of genetically modified organisms (including trees). NZBio advocates for the regulatory response to new fields of scientific endeavour to be relative and appropriate to the scientifically ascertained risk. Genetically modified trees are likely to have an important role in the development of the national economy, reduce negative environmental effects of existing cropping techniques and increase wider environmental benefits (ascertained on a national and international basis).

NZBio considers that genetically modified trees are likely to impact positively on the conservation and sustainable use of forest biological diversity where regulation exists that is appropriate and relative to the scientifically ascertained risk. NZBio supports initiatives from the Conference of the Parties to the Convention on Biological Diversity that are consistent with New Zealand’s approach and strongly advocates against any initiative that is not appropriate when balanced against a scientific assessment of any risks associated with genetically modified trees.

PUBLIC RESEARCH AND REGULATION INITIATIVE

[13 November 2007]

[SUBMISSION: ENGLISH]

We understand that several members of the Public Research and Regulation Initiative (PRRI) intend to send the Secretariat individual submissions with specific information and views on GM Trees. We therefore limit our response to the general – but in our view crucial – observations below.

Public research groups in government institutes, academia and international organisations in developed and developing countries all over the world dedicate their knowledge, time and resources conducting research to strengthen sustainable production of food, feed and fibre; overcome limiting resources such as water; improve health care; and preserve the environment.

A significant portion of the ongoing public research focuses on forest trees and fruit trees. As many of the above challenges cannot be solved by conventional techniques alone, public research in this field also includes exploring biotechnology techniques of many kinds, including the use of GM trees. A unique advantage of biotechnology is that it may help overcome the long generation time, and other difficult breeding constraints that hamper the use of sexual crosses for introduction and testing of economically and environmentally important traits.

Examples of ongoing public research on genetic modification of trees include:
− Developing resistance against phytophagous insects and pathogenic microganisms in trees such as banana, citrus, coffee, plums, poplar and papaya, thereby reducing economic losses, reducing pesticide use, and reducing the risks of disease outbreaks.
− Developing trees with reduced lignin content, thereby reducing chemical pollution and energy consumption during pulp and paper manufacturing, and facilitating the production of ethanol via fermentation from wood sources at the many new biofuels production facilities that are being developed around the world.
− Understanding biological processes underlying growth and development in trees, to produce new knowledge of benefit to crop and tree production for all humanity, and to enhance the efficacy and environmental values from trees (e.g.,. in offsetting environmental degradation from deforestation).
− Developing trees for phytoremediation of soils contaminated by heavy metals such as mercury and cadmium, and for degradation of hydrocarbon pollutants, that are widespread around the world as a result of industrial and roadway-associated deposits. For example, trees have been produced that can bioremediate toxic hydrocarbons and mercury at rates up to 100-fold above that of non-GM trees.
− Restoring threatened species, such as American Chestnut, to the natural landscape, thus increasing current levels of tree and forest ecosystem biodiversity.
− Developing rapidly growing trees such as poplar and eucalyptus, to improve wood productivity, wood quality, and associated bioenergy.
− Enhancing drought and salt tolerance in trees to make better use of limited water resources, and to make use of marginal lands unfit for agricultural crops. For example, a salt tolerant poplar has been produced in China that is able to grow on salt encrusted soils where unimproved poplars and most other species cannot survive.
− Developing new and more efficient sources of renewable energy and novel biological materials, including biofuels and renewable replacements for fossil-fuel plastics.
− Developing biosensor trees that can detect and signal the presence of key environmental variables such as the presence of land mines and soil contaminants, and which can be viewed via remote sensing (airplanes, satellites).

PRRI plans to make a detailed overview of this and other ongoing research and post them on our web site during the upcoming year.

Because of the numerous and diverse potential benefits from GM trees, the PRRI believes that it is essential to not only maintain, but indeed to intensify, biotechnology research in trees to help address

societal challenges such as those mentioned above. Because many of the processes of interest in trees cannot be readily studied in the laboratory or greenhouse, the ability to conduct field research is essential.

We are therefore deeply concerned with calls for a moratorium on field research with GM trees. We feel there is no scientific justification for such a moratorium and that these calls are unsubstantiated. Indeed, there are valid questions regarding biosafety and environmental impacts of GM trees. Rather than abandoning research, questions such as these can only be answered using thoughtful and well-designed scientific studies, which often require a field component to be ecologically meaningful. To be scientifically credible, hence socially responsible, potential benefits and risks of GM trees need to be carefully examined on a case-by-case basis, just as they do for other types of GM plants. Generalities about benefit and risk simply based on how new varieties of trees were created have been long discredited by leading scientific societies.

We note that because of their stature and longevity, confinement of GM trees is often raised as an issue of concern. In fact, the principles for effective confinement of GM field trials are already well established. Trees often take several years to become sexually mature, and therefore confined field studies with trees are therefore significantly *easier* to conduct than they are for many annual crops.

Bearing in mind how critically important it is that research with GM trees continues, and also realizing how disruptive misinformation in this domain has been in the past, we look to the Secretariat to provide objective, clear, precise and balanced information.

In this respect we are concerned about the questionnaire itself. For example, the very first question addressing potential impacts of genetically modified trees states “Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?” This suggests that the main impacts of GM trees will be negative and therefore should be mitigated. For a questionnaire as visible and important as this one, such a perceived bias is certainly unwelcome. We doubt this bias was intentional, and so we urge you to strive for both clarity and objectivity in subsequent questionnaires.

More generally, we feel that this questionnaire overlooks an opportunity to gather relevant information on other types of research with GM trees. For example, the questionnaire only seeks information on *plantations* of GM trees. Plantations of GM trees, while perhaps more visible, are the culmination of years of laboratory and greenhouse trials. Hence, the existing questionnaire fails to encompass the largest ongoing body of research on GM trees—most of which is conducted prior to the establishment of any plantations. Plantation trials will generally only be conducted when there has been a decision to seek commercial use, which is an extremely small proportion of all field research with GM trees. Apart from commercialized GM papaya, we know of only one commercial scale plantation of GM trees in the world, which is in China.
If the SBSTTA is to come to a fully informed assessment of research with GM trees, it needs to be thoroughly apprised of the complete spectrum of ongoing and planned research, what it is intended to achieve, and why it is justified. We encourage the Secretariat to consider broadening the scope of its questions so that research on GM trees is properly understood in its full societal context.

As before, the PRRI stands ready to assist in your difficult tasks. I am pleased to inform you that we will draw upon our network of public sector researchers to provide a detailed overview of ongoing and planned research on GM trees, including the nature of the research itself, as well as its justification.

RUBICON LIMITED

[30 August 2006]

[SUBMISSION: ENGLISH]

1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?

Yes.

New Zealand has a contained field test of genetically-modified forest trees that is being undertaken by Scion, a Crown (government-owned) Research Institute, formerly the Forest Research Institute (www.scionresearch.com/cell+wall+ biotechnology+centre.aspx). The number of modified trees and cuttings from them, is in the order of 200.

Our understanding of the field test is summarised here but Scion is also responding to the CBD questionnaire and will obviously have precise information.

The contained field test comprises Pinus radiata (Radiata pine)[35] trees that have been modified for

- Reporter genes (nptII and uidA) in order to research some of the potential environmental impacts of genetically-modified trees, and
- Additional copies of the Radiata pine Leafy-like gene, a gene involved in reproductive development.

Radiata pine is an exotic to New Zealand and is the predominant plantation forest species, accounting for 89 per cent of the planted forest area. Essentially all of New Zealand's timber harvest comes from planted forests.

The contained field tests are an intermediate step between laboratory/glasshouse tests and the expected eventual commercial deployment of genetically-modified trees.

Part of Scion's research entails collaboration with AgResearch and HortResearch (also Crown Research Institutes, focusing on agriculture and horticulture respectively) to generate data on the impact of genetically-modified needles on selected native (feeding) insect species and on selected micro-organisms in the soil.

Scion also has regulatory approval for contained field tests involving herbicide resistance but has not proceeded yet.

There have been many laboratory and/or glasshouse tests of genetically-modified forest trees in New Zealand, some of which Rubicon is connected to through its half-ownership of Horizon, a tree improvement business[36].

2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?

Yes.

New Zealand held a Royal Commission on Genetic Modification in 2000/01 to assess the future role of GMOs in the country (www.mfe.govt.nz/publications/ organisms/royal-commission-gm/)[37]. The Royal Commission was a Government-appointed but independent inquiry that commissioned research, received

35 A field test of 16 Picea abies (Norway spruce) trees has come to an end and the trees destroyed

36 Rubicon is also a one-third partner in the US tree biotechnology company, ArborGen

37 See also www.gm.govt.nz

public submissions, and held public hearings on GMOs, and made recommendations to Government. Forest trees were a significant focus for the inquiry because of the importance of plantation forestry to the New Zealand economy and the advanced stage of laboratory research in New Zealand on genetically-modified trees.

The Commission concluded that genetic modification has a role in the development of forest trees (among other crops), subject to conditions to mitigate potential risks. It confirmed the existing regulatory approach whereby applications for genetically-modified trees (and other GMOs) are to be treated on a case-by-case basis.

The case-by-case approach recognises the widely differing potential risks depending on the biology of the tree, the type of genetic modification, and how it is deployed in the field. For example, whether the modification entails:

- An introduced exotic tree species that does not have any native wild relatives
- Domestication traits that reduce the ability of a planted tree to survive in the wild
- Traits that are familiar and/or are those that are manipulated in conventional breeding.

The Royal Commission recommended also that for proposals to develop genetically-modified forest trees for commercial release, there be an ecological assessment to determine the effects of the modification on the soil and environmental ecology, including effects on soil micro-organisms, weediness, insect and animal life, and biodiversity. Scion is undertaking such research.

A further recommendation of the Commission was the research and development of genes that could prevent flowering as tools to mitigate potential environmental risks where appropriate.

Arising from the Royal Commission, Toi te Taiao: the Bioethics Council (www.bioethics.govt.nz) was established by the New Zealand Government in December 2003 and charged with providing advice and promoting dialogue on spiritual, cultural and ethical issues in current and future biotechnology research and development. Its activities have focussed mainly on the human side to date.

The regulatory framework for approving or declining GMO applications (discussed below) entails public notification and submissions for all but low-risk applications, and extensive consultation with Maori.

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?

Yes.

The Hazardous Substances and New Organisms (HSNO) Act 1996 (www.legislation.govt.nz/browse_vw.asp?content-set=pal_statutes) gives the Environmental Risk Management Authority (ERMA) responsibility for approving or declining proposals to research, test, import or release genetically modified trees, crops, animals and other living things[38]. The Hazardous Substances and New Organisms (Methodology) Order 1998 sets out the decision-making process that ERMA must follow in considering applications (www.ermanz.govt.nz/resources/publications/pdfs/me089801.pdf).

There are three different types of approval that ERMA can grant:

38 The exception is some designated low-risk situations where Institutional Biological Safety Committees are delegated authority by ERMA

1. Containment (including field tests). Containment entails restricting a GMO to a secure facility (laboratory or glasshouse) or location, to prevent escape. There are strict controls and full monitoring.

Conditions are imposed on field tests to prevent the GMO escaping into the environment or affecting other organisms, and all GMOs are retrieved or destroyed at the end of the field test.

The Ministry of Agriculture and Forestry (MAF) inspects research facilities and field tests to ensure that organisms are properly contained and the controls are being followed.

2. Conditional release. ERMA can approve the release of GMOs into the wider environment but subject to controls to manage potential risks. MAF is responsible for ensuring the controls are complied with.

3. Full release. The GMO is no longer subject to the HSNO Act and so can be grown, used or held anywhere in New Zealand, without government monitoring or controls.

ERMA's decision to approve or decline an application is based on an assessment of the overall balance of risks and costs against benefits for New Zealand.

Failure to obtain the necessary approvals or to comply with the controls set down are offences that incur strict civil liabilities and large civil penalties.

The HSNO (Methodology) Order 1998 sets out decision-making criteria in relation to environmental (including human health), cultural, social and economic impacts which are discussed under the respective headings further on. There are also cross-cutting or over-riding criteria, for example[39]:

§12 When evaluating assessment of risks associated with the substance or organism in an application, the Authority must take into account–

a. The nature of the adverse effects; and

b. The probability of occurrence and the magnitude of each adverse effect; and

c. The risk assessed as a combination of the magnitude of the adverse effect and the probability of its occurrence; and

d. The options and proposals for managing the risks identified; and

e. The uncertainty bounds on the information contained in the assessment expressed quantitatively where possible, but otherwise through narrative statements

§13 When evaluating the assessments of costs and benefits associated with the … [GMO] in an application, the Authority must take into account–

a. The costs and benefits associated with the application and whether the costs and benefits are monetary or non-monetary; and

b. The magnitude or expected value of the costs and benefits and the uncertainty bounds on the expected value; and

39 The sections in italics are quoting the HSNO (Methodology) Order

c. The distributional effects of the costs and benefits over time, space, and groups in the community.

Relevant costs and benefits can include those that would not occur if an application was declined (the opportunity cost).

Environmental impacts of genetically modified trees (Example: effects on native ecosystems, use of herbicide)

The HSNO (Methodology) Order 1998 requires that ERMA

§9 a Recognise risks, costs, benefits and other impacts associated with the … [GMO] in an application which relate to the safeguarding of the life-supporting capacity of air, water, soil, and ecosystems, and provide for this principle;

§9 c Take into account risks, costs, benefits, and other impacts associated with the … [GMO] in an application which relate to–
i. The sustainability of all native and valued introduced flora and fauna; and
ii. The intrinsic value of ecosystems; and
iii. Public health; and ….
vi. New Zealand's international obligations.

§10 … the Authority must also evaluate the information provided on the risks, costs, benefits, and any other impacts which relate to–
a. The significant displacement of any native species within its natural habitat;
b. The significant deterioration of natural habitats;
c. The significant adverse affects on human health and safety;
d. Significant adverse effects on New Zealand's inherent genetic diversity;
e. The ability of the organism to establish an undesirable self-sustaining population anywhere in New Zealand;
f. The ease with which the organism could be eradicated if it established an undesirable self-sustaining population;
g. The ability to cause disease, be parasitic, or become a vector for human, animal or plant disease

Applicants may also present information relating to the risks, costs and benefits of not introducing the new GMO.

Examples of the environmental benefits cited (and the trait involved) include:

1. Reducing the amount of land required for production forestry (through higher yield)
2. Increased carbon sequestration (through faster growth and higher wood density)
3. Better soil and water conservation (through modified tree architecture)
4. Preventing escape into the wild as currently occurs from planted production forests (flowering control)
5. Reducing pollen which is a cause of allergens for people (flowering control)
6. Less harsh pulping processes (lower and modified lignin)

7. Displacement of energy-intensive building materials such as steel and cement (higher wood density and higher yield)

The potential environmental risks that are cited include:

1. Unanticipated gene expression
2. Horizontal gene transfer to soil micro-organisms
3. Development of antibiotic resistance
4. Development of super-weeds
5. Reduced feed sources for birds and insects

The above assumes that some form of biological confinement (e.g. flowering control) is incorporated to address the risk of cross-pollination.

In field tests being undertaken by Scion, the current findings are that genes are being expressed as expected and there is no evidence of horizontal gene transfer. In other research the transformation vector Agrobacterium tumefaciens has not been found to persist in transgenic conifers[40].

To manage risks, ERMA is able to impose conditions on laboratory and field tests and wider releases. For example, to ensure that trees from Scion's current field test do not escape, the controls include destroying most trees at a maximum age of six years or sooner if they start producing pine cones and limiting the number of trees kept beyond this age; removing all male cones before they shed pollen and limiting female cones to 10 per tree; and destroying all trees once they are no longer needed for research.

The application of plantation forestry means that less than one per cent of New Zealand's timber harvest is from indigenous forests. The bulk of New Zealand's Radiata harvest is exported and displaces softwoods and hardwoods that would otherwise be harvested largely from natural forests in other parts of the world.

The 1991 New Zealand Forest Accord protects indigenous vegetation from being replaced by plantation forests. Since then there has also been much greater focus on the many indigenous plants and species that live in New Zealand's plantation forests. The certification of forests and the release of the New Zealand Biodiversity Strategy in 2000 (which calls for the management of productive land to be sympathetic to indigenous biodiversity) have been important factors here.

There is often a significant understorey of plants and animals in Radiata plantation forests.[41] Reduced feed sources due to genetically-modified trees can be mitigated by the interspersion of regenerating or planted indigenous vegetation.

Cultural impacts of genetically modified trees (Example: positive or negative impacts on indigenous and local communities and their traditional knowledge)

The HSNO (Methodology) Order 1998 requires evaluation of the effects associated with Maori culture, including the

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40 Charity, J.A. and K. Klimaszewska. 2005. Persistence of Agrobacterium tumefaciens in transformed conifers. Environmental Biosafety Research, 4, 167-177.
41 Brockerhoff, E.G. 2005. Biodiversity in plantation forests. In M. Colley (ed). Forest Handbook. New Zealand Institute of Forestry, Christchurch.

relationship of Maori and their culture and traditions with their ancestral lands, water, sites, wahi tapu [sites and places sacred to Maori people in the traditional, religious, ritual or mythological sense], valued flora and fauna, and other taonga [treasured things].

Impacts on Maori communities are also considered under social and economic effects, as Maori are significant owners of plantation forests and account for high proportions of the population in the forestry towns that have grown up in response to the development of the planted forest industry.

The HSNO Act gives a statutory basis to Nga Kaihautu Tikanga Taiao, a body that advises ERMA on Maori issues. Also, applicants are required to consult early with Maori in the development of research and other programmes that are expected to lead to an application to ERMA. When Maori want special conditions to be incorporated for cultural reasons, then those requests are complied with as far as practicable.

Scion has established Te Aroturuki, a roopu (group), to advise on and monitor use of plant gene technologies (PGT) for Maori. Te Aroturuki has been developing a values-based framework to guide the application of PGT in plantation forestry in a culturally appropriate way.

Socio-economic impacts of genetically modified trees (Example: positive or negative effects on quantity, quality and economic value of forest production; positive or negative impacts on livelihoods of communities)

The HSNO (Methodology) Order 1998 requires that ERMA

§9 b Recognise and provide for the principle of maintenance and enhancement of the capacity of people and communities to provide for–

i. Their own economic, social, and cultural wellbeing; and

ii. The reasonably foreseeable needs of future generations; and

§9 c Take into account risks, costs, benefits, and other impacts associated with the … [GMO] in an application which relate to–

v. The economic and related benefits to be derived from the use of a particular … [GMO].

Instances of the economic and social benefits include:

1. The acquisition of scientific knowledge and the reduction of risk and uncertainty
2. Lower costs of forest establishment and silviculture
3. Greater pest and disease resistance
4. Shorter rotations through faster tree growth
5. Better wood properties
6. Lower cost of processing in pulp mills and sawmills

Potential risks that have been proposed include:

1. Reduced access to international trade
2. Loss of organic markets for some agricultural/horticultural crops
3. Impacts on the health of non-GMO planted forests.

New Zealand has long been a leader in key areas of plantation forestry and tree biotechnology. It has a longer history of intensively-managed plantation forests than any other country and has built a detailed understanding of the relationship between site properties, silvicultural regimes, and wood out-turn for Radiata pine. New Zealand Radiata has been through more breeding cycles than any other softwood and the country is a long-standing innovator in tree selection and propagation techniques. Still, land in plantation forestry in New Zealand is for the first time being converted (often back to) farmland, reflecting the faster rate of productivity growth in farming than in forestry.

The potential for genetic modification to lift forest productivity is considered important to the competitiveness of planted forests in New Zealand, relative to (i) timber harvested from natural forests overseas; (ii) competing rural land uses within New Zealand, mainly pastoral farming; and (iii) other, typically energy-intensive building materials.

Genetically-modified forest trees may also open the opportunity for a radical shift away from the present carbon economy:

Trait	**Elaboration**
	Growing costs and silvicultural traits
Increased yield	Less land; lower growing and harvesting costs
Herbicide tolerance	Lower herbicide use; higher survival rates and faster early growth due to reduced competition from weeds
Insect resistance	e.g. increased oleoresin production in foliage
Stress tolerance	Increased tolerance to drought, cold and salinity, allowing trees to be grown on otherwise non-productive land.
	Processing attributes
Low and modified lignin trees	Increased pulp yield; lower energy and chemical costs; reduced air and water emissions
Increased stiffness; less juvenile wood	Greater proportion of higher-value structural and dimensionally-stable lumber; shorter rotation length
Small knots (branch diameter)	Trees for lower initial stockings that retain small knot size
	Beyond forestry
Bioremediation	Use of trees to clean up chemically contaminated sites
Soil and water conservation	Modified tree architecture e.g. better rooting
Higher cellulose content	Increase suitability of trees as a feedstock for liquid fuels and chemicals
Higher lignin content	Increase suitability of trees as a feedstock for combustion (electricity and heat)
Fine chemicals, “self-pulping” trees	Altering secondary metabolites in trees to increase the recovery of fine chemicals, or to increase the concentration of chemicals that act as catalysts during pulping
More effective resource use	Shifting growth from roots, branches, foliage to tree stem; shifting stem growth from height to diameter

SCION

[30 August 2006]

[SUBMISSION: ENGLISH]

Question 1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?

Yes.

An experimental field trial of 51 transgenic and five non-transgenic control pine trees is being conducted by Scion, a New Zealand Crown Research Institute.(http://www.scionresearch.com/environmental+risk+and+management.aspx). One hundred twenty eight cuttings from the 51 transgenic trees are also present in pots on the site. This trial was initiated in 2003 in a secure facility on the Scion campus in Rotorua, with the express purpose of assessing the impacts, if any, of transgenic trees on the environment. Additionally, the field trial was established to examine the long-term stability of transgene expression, which would be required in any commercial application of transgenic forestry. The field trial application was examined and approved by the New Zealand Environmental and Risk Management Authority (ERMA). The trial is audited on a biannual basis by Biosecurity New Zealand (http://www.biosecurity.govt.nz/), the regulatory agency within the Ministry of Agriculture and Forestry (MAF), charged with ensuring compliance under the Hazardous Substances and New Organisms (HSNO) Act (1996) (www.legislation.govt.nz/browse_vw.asp?content-set=pal_statutes). The trees contain the antibiotic resistance gene neomycin phosphotransferase (nptII), used as a marker for the initial selection of the genetically modified trees and as an expressed gene to assess the stability of gene expression. The trial is also an integral part of a New Zealand-wide initiative to assess and understand the environmental impacts of modern biotechnologies (also see Q3a).

Scion also has regulatory approval to conduct field trials on genetically modified trees for herbicide tolerance as well as suppression of development of male reproductive organs. However, the genetically modified plants have only recently been generated and are not yet ready for planting in the field trial site.

Scion (then Forest Research) also conducted a field trial of 33 transgenic trees and 3 non-transgenic controls between 1997 and 2002 for the purpose of the assessment of the stability of transgene expression in transgenic trees. Like the current field trial, the 1997 trial was conducted on the Rotorua campus under the oversight of ERMA. These trees contained the nptII transgene as described above, as well as the gene uidA, which encodes the enzyme _-glucuronidase, a common “reporter” enzyme used in plants (Jefferson et al., 1987). This trial was terminated in 2002, in compliance with its approved term.

Question 2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?

Yes.

Royal Commission

In 2000/2001, the New Zealand government appointed a Royal Commission on Genetic Modification of Organisms (GMOs), including forestry trees. The Commission held 13 weeks of formal hearings, read more than 10,000 written submissions from the public and considered evidence from experts in New Zealand and overseas. After 14 months of deliberation, the findings and recommendations of the Royal Commission to the New Zealand government were published in 2002 and are available at

http://www.mfe.govt.nz/publications/organisms/royal-commissiongm/index.html. A key finding of the Commission was that there is nothing inherently unsafe about genetic modification and that the application, not the methodology, is the key risk issue. The commission concluded genetic modification "holds exciting promise, not only for conquering diseases, eliminating pests and contributing to the knowledge economy, but of enhancing the international competitiveness of the primary industries so important for our country's economic well being. We would be unwise to turn our back on the potential advantages on offer, but we should proceed carefully, minimising and managing risks."

The Commission also concluded that New Zealand should keep its options open in developing plant and medical biotechnology based on GMOs and proceed carefully, minimizing and managing risks. The Government of New Zealand accepted this conclusion and has subsequently implemented many of the Commission's recommendations (http://www.mfe.govt.nz/issues/organisms/lawchanges/commission/index.html), including the call for more research on the potential environmental impacts of this technology. Since 2002, several programmes of such research have been funded by the New Zealand Government's Foundation for Research, Science and Technology (FRST). The Scion field test of genetically modified trees is one of these programmes. The result is that we now have a robust, certain and transparent process for consideration of issues about release of GMOs into the environment.

Life Science Network

In addition to the Royal Commission, scientists representing many of the Crown Research Organisations, Universities, other research organisations, food growers and manufacturers established The Life Sciences Network. This was a nationally coordinated discussion forum and was instrumental in shifting the public and policy debate onto a much sounder basis by balancing arguments with factually-based information. (See www.lifesciencenetwork.com)

Public engagement and outputs

Finally, although not co-ordinated nationally, scientists from many organisations have been available to their local communities for public debates, seminars and disseminating information to interested parties about their research on GM. Scion research scientists have also published their opinions and research on the impact of genetic engineering on forestry (eg Walter 2004; Walter and Fenning, 2004; Charity 2003; Charity and Klimazsewska 2006).

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?
Yes.
(We note that Question 3, by addressing only the issue of minimizing impacts, assumes that the only impacts of genetically modified trees will be negative. The Scion field trial is specifically designed to address many of the questions regarding the potential positive or negative environmental impacts of transgenic forestry, including impacts on biodiversity. We further note that such field trials are being conducted because transgenic forestry offers a huge potential, recognized worldwide, for positive environmental, social, cultural and economic impacts. Our view is supported by the FAO Panel of Experts on Forest Gene Resources who reviewed the relevance and feasibility of biotechnology in forestry, globally, summarized at the following link: http://www.fao.org/docrep/008/ae574e/ae574e00.htm. We request that the Secretariat recognize that positive impacts can also result from the application of transgenic forestry such as addressing the fundamental and urgently needed criteria of long-term sustainability in the commercial forestry context.)

New Zealand is thought to have some of the strictest guidelines and regulations in the world. The Hazardous Substances and New Organisms (HSNO) Act (1996) is the all-encompassing legislation that

was brought in to protect the environment, people and communities from the adverse effects of hazardous substances and new organisms (including new plant, animal or micro-organisms developed through genetic modification). New Zealand's HSNO Act covers all aspects of the use of GMOs in this country, from research with GMOs that is confined to laboratories, through research in greenhouses and in the field, to the potential use of such organisms for commercial purposes. The Act is administered by ERMA and specifically requires this regulatory authority to take into account:
(a) the sustainability of all native and valued introduced flora and fauna;
(b) the intrinsic value of ecosystems;
(c) public health;
(d) the relationship of Maori (New Zealand's indigenous people) and their culture and traditions with their ancestral lands, water, sites, waahi tapu, valued flora and fauna and other taonga;
(e) the economic and related benefits to be derived from the use of a particular hazardous substance or new organism (including GMOs); and
(f) New Zealand's international obligations.

Any development of transgenic trees in New Zealand must satisfy ERMA before it can proceed, and these are the conditions under which our field trial with transgenic pine trees is being conducted.

The main presiding body that makes decisions on applications to import, develop, or field test new organisms under the HSNO Act (1996) is the Environmental Risk Management Authority (ERMA). The Authority is required to consider and weigh up the adverse and beneficial effects of a new organism or substance on society, the environment and public health etc. The intention of the Authority is to make decisions in a way that recognizes that there are benefits as well as risks associated with new organisms and hazardous substances.

To mitigate any risks ERMA may apply controls (where relevant and possible) to the application (for example, housing the organism or substance in a specially designed laboratory).

The enforcement agency for ERMA is Biosecurity New Zealand (http://www.biosecurity.govt.nz/), a regulatory agency within the Ministry of Agriculture and Forestry (MAF)

If yes, please list them according to the categories below:

3a Environmental impacts of genetically modified trees (Example: effects on native ecosystems, use of herbicide)

The HSNO Act specifically requires that all applications to research or use GM technology in New Zealand have been first subjected to a stringent risk assessment procedure by ERMA (www.ermanz.govt.nz). This procedure places great importance on preserving the sustainability of New Zealand's productive and wild ecosystems and requires applicants to provide extensive information on the potential environmental impacts of any GMO, even if it is only for research purposes, before permission is given for their use.

For the field trial of transgenic trees noted in the response to Question 1, there are a number of regulatory requirements to which we adhere:
1. The trees were required to be transformed by a means other than by use of Agrobacterium-based methods.
The trees in our field trial were transformed by means of biolistic transformation technology
2. The trees are limited to five metres in height.
None of the trees in our field trial have yet reached this height
3. Only one main shoot is allowed to elongate above the length of 3 metres.

Others must be trimmed.
Trees are monitored weekly (see 5 below) and trimming is performed as required
4. The trees are to be destroyed if any evidence of male reproductive organs is found, and only one female reproductive cone is permitted on any given tree. This structure is not to be allowed to mature or produce viable seed.
None of the trees in our field trial have yet shown any evidence of reproductive growth
5. The trees are to be monitored individually on a weekly basis to ensure that compliance with conditions 2-5 is being maintained.
The observations are recorded accurately in logbooks.
6. Staff and visitors are required to undertake specific training before entering the trial site, or be accompanied at all times by a person so trained. The field trial is maintained securely behind a four metre tall electrified security fence with a locked gate. The security of the fence is monitored by a local security company and any potential breaches of the perimeter would be immediately relayed to security personnel. As such, all visitors have been accompanied by a trained staff member. Training of staff members is carried out on an "as needed" basis.
7. A written record of visitors to the field trial site is to be maintained.
Names of visitors to the field trial are recorded accurately in logbooks.
8. The field trial is audited biannually by MAF to ensure compliance.
Audits of the field trial are conducted on a twice-yearly basis. All audits to date have been found to be compliant with the regulations.
9. The material must be destroyed by incineration or autoclaving at the completion of the field trial.
All trimmed and cut material from the trees is also incinerated on an "as needed" basis

Regulation 1 was established to prevent the possible introduction of a transgenic soil bacterium into the environment. However, recent studies have demonstrated that the risk of such introduction of Agrobacterium into the environment is essentially zero (Charity and Klimaszewska, 2005).
Regulations 2-5 were established to eliminate the possibility that transgenic pollen or seed could spread into the environment.

This field trial is an integral part of a New Zealand-wide initiative to assess and understand the environmental impacts of the presence of an antibiotic resistance gene. Assessments of the effects of the transgenic trees on soil microorganism populations have shown that to date we have observed no differences between control trees and transgenic trees (C. Walter, J. Lottman, M. O'Callaghan, unpublished data). Although we realize that horizontal gene transfer (HGT) is rare and difficult to detect, HGT has not been detected from transgenic pines to the surrounding microorganisms in our studies so far (C. Walter, T. Glare, unpublished data). The field trial is also assessing the long-term stability of gene expression, which is essential for the successful introduction of transgenic forestry on a commercial scale. To date, the expression of the transgene has been stable in transgenic trees tested at weekly intervals over a two year time period. This is an important result since it indicates the continued expression of transgenes over a long period of time which is a prerequisite to commercial forestry. All of the environmental and long-term gene studies are continuing.

The field trial research is also supported by a number of laboratory- and greenhouse-based research projects which have established contained systems for measuring the impacts of transgenic pine foliage on a variety of non-target and beneficial invertebrates from pine forests, e.g. the native herbivorous lepidopterans, the pine looper and several leafroller species, a hymenopteran parasitoid, and a carabid beetle predator. "Worst-case scenario" experiments with transgenic pine and other non forestry tree plants expressing a variety of proteins have shown no unexpected non-target impacts on these invertebrates (e.g. Burgess et al., 2004. Impacts of genetically modified pine (Pinus radiata) seedlings on native New Zealand leafrollers. Research Report commissioned by Forest Research (Scion)). This research, and

related invertebrate studies at Scion's field site (FRST Programme C10X0601; administered by HortResearch), is ongoing.

3b Cultural impacts of genetically modified trees
(Example: positive or negative impacts on indigenous and local communities and their traditional knowledge)

The HSNO Act (1996), like many New Zealand laws, makes specific reference to the principles of the Treaty of Waitangi (a treaty between the indigenous people of New Zealand (Maori) and early British colonists) which give present-day guidance to government on cultural matters in this country. The Act specifically requires ERMA to include consideration of the impacts of any GMO research, use or development on Maori culture. It particularly notes the relationship of Maori (New Zealand's indigenous people) and their culture and traditions with their ancestral lands, water, sites, waahi tapu (sacred sites), valued flora and fauna and other taonga (treasures or useful items).

Scion has actively engaged with and communicated to Maori, with regard to the potential risks and benefits of genetic modification technology and its field trial, as part of its FRST-funded research programme (C04X0207). This was particularly important since both our 1997 and our 2003 field trials were planted on land belonging to local Maori. Scion has the support of the Mana Whenua hapu,(the local tribe) including the blessing of the current field trial by a local kaumatua (chief). This is supported by additional research in a separate FRST-funded programme (C06X0222; administered by HortResearch) in which a model for selecting species for non-target biosafety testing is being constructed. The model uses the pine forest ecosystem as an example and takes into consideration not only the potential ecological consequences of impacts on a non-target organism, but also the anthropocentric value placed on each organism, including special consideration of species valued by Maori.

In addition, as part of the Foundation of Research, Science and Technology (FRST)-funded research programme, Forest Genetics for the Future – from the lab bench to the Forest (FRST programme number C04X0207), Scion scientists engage with and advise Maori, as to the potential risks and benefits of transgenic forestry to Maori and the wider New Zealand context. In 2002, Scion established a national advisory committee "Te Aroturuki", which is working with scientists to develop a tikanga (values)-based framework for the engagement of scientists with Maori and of Maori with scientists, regarding the risks and benefits of new and controversial technologies, including genetic modification. The programme has produced a booklet, "Te Maramatanga o te Tipuranga – An update of Forest Research's Field Trial of Genetically Engineered Trees" written for Maori, by a Scion-employed Maori student, which describes genetic modification and its potential risks and benefits, primarily in a forestry context. The booklet can be accessed at the following link:
http://www.scionresearch.com/Portals/0/CWBErinaBook.pdf

3c Socio-economic impacts of genetically modified trees
(Example: positive or negative effects on quantity, quality and economic value of forest production; positive or negative impacts on livelihoods of communities)

The socio-economic impacts of the study, development or use of any GMO in New Zealand are investigated by ERMA as part of it risk assessment and management procedures. The HSNO Act specifically requires that the "the economic and related benefits to be derived from the use of a particular hazardous substance or new organism (including GMOs)" be considered in any risk assessment.

Social research with public

A tender was let by the NZ Foundation for Research Science and Technology on "Public Perceptions of Biotechnology" in 1997. A three year programme of research was funded which involved a large range of stakeholders. This was led by programme leader Ms Sue Muggleston, HortResearch. The programme involved technical providers, Food and Agriculture policy makers, environmental groups (eg Greenpeace), industry associations, science educators, social science interest groups (eg allergy groups), growers and producer groups and the public. The final report was presented in 2000 and was widely discussed and distributed in different media and public fora.

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UNIVERSITY CHEIKH ANTA DIOP

[04 September 2006]
[SUBMISSION:ENGLISH]

Question 1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?

If yes then give details, e.g. over X number of trials have been safely conducted with no negative effects and no harm to the environment. Trials were approved by and overseen by local regulatory authority. Comments on the rigor of the regulatory process would be useful here. Other comments.

NO

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If yes, please answer all remaining questions. [As this question is structured it would imply that a no answer also means that none of the remaining questions are to be answered. However, this should not preclude additional notes or comments on the remaining questions where there are relevant issues to be addressed.]

If no, please state the reason why:

Countries responding "no" here could include among the more detailed elements of their response points like the following, or more:
1) research not yet advanced enough for field testing,
2) concerns about property or personal injury from those with extreme anti biotech tree sentiments,
3) lack of regulatory infrastructure,
4) highly precautionary approach by regulatory infrastructure, and
5) marketing reasons (certification or trade associations may not allow use of genetically modified organism).

Example responses:

- **Research not yet advance enough for field testing and lack of regulatory infrastructure**

Question 2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?

[Note that the question does not relate to regulations – see question 3 for that.]

A national committee is under the way to be developed.

If yes, please answer the remaining questions. [Although the question structure implies that a no answer also means that none of the remaining questions are to be answered, where there is relevant information to later questions this should be provided.] This question is not just restricted to national government sponsorship of the above platforms, etc.

While this is a simple Yes/No question it gives an opportunity to describe local efforts in these areas. Example responses:

- Yes. There have been multiple public meetings and discussion fora. (List and give details if possible).

[It would be valuable to give as comprehensive a list as possible. This list could include specific meetings held on this subject sponsored by regulators (such as APHIS sponsored meetings in the US), industry associations and NGO sponsored meetings such as the Institute for Forest Biotechnology meetings held in the UK, Canada and Chile. This could also include meetings held by research co-operatives, formal or informal Biosafety training/awareness programs as well as scientific meetings with sessions on genetically modified trees. Web sites, or other resources could also be listed.]

- In addition there have been several international discussion forums that have been open to the public. (For example – FAO: Electronic forum on biotechnology – Forestry Sector, April 25 to June 30, 2000 (http://www.fao.org/Biotech/Conf2.htm)

If no, please state the reason why:

B. See answers to Question 1 above. In addition, list other factors which might be relevant.

- Contrary to all experience and data the unsupported activist claims have created a negative climate which has effectively discouraged (or, made it difficult/impossible to stimulate an opportunity for) balanced discussion.

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?

[This question implies that any impacts will be negative and so need to be 'minimized'. Responses should point out this inappropriate bias in the questionnaire and highlight the many far reaching potential positive economic and environmental impacts and discuss the need to 'maximize' positive impacts.]

It should be noted by the Secretariat that the above question presupposes that impacts of genetically modified trees will be negative and so must be minimized. We would ask that the Secretariat recognize the potential positive impacts that could be accomplished with genetically modified trees and we have listed some examples below.

Also, it is important to clearly identify those impacts that are relevant criteria for the scientific consideration of safety, such as possible environmental impacts, and distinguish these from cultural or socioeconomic impacts that are not germane to the issue of biodiversity impacts, which is the provenance of work done under the authority of the CBD. Nevertheless, we similarly identify the potential for positive cultural and socioeconomic impacts in our response below.

If yes, please list them according to the categories below:

[Provide documentation of the likely benefits associated with biotech trees].

See answers from above. In addition:

The diverse biology of tree species: fruit or forestry species; short or long lived, self fertile or self incompatible, insect or wind pollinated, adaptation to specific environments, native or exotic, means that it would be impractical to develop sufficiently flexible guidelines that just deal with all trees. Rather, regulatory systems should focus on the specific biology of the target species and the engineered trait on a case-by-case basis, allowing for the assessment of a wide range of characteristics across all plant species, inclusive of trees

If no, please explain the reason why here:

If there are no guidelines or regulations in effect in the country of the respondent, the response to this question should note the extensive international scientific consensus that has accrued over the past several decades as to how safety for field trials and commercial plantings of transgenic crops can be achieved, and the vast body of actual experience that has been accumulated with so far a perfect safety record – even in cases where mistakes have been made (StarLink, ProdiGene) no harm to any humans nor to biodiversity have been observed. The scientific consensus on appropriate procedures for risk assessment culminates in the specific science based regulations that have been put into place in countries like Canada, the United States, Argentina, the Philippines, South Africa, and more, building on the work of OECD, FAO, UNEP, the US National Academy of Sciences, the UK Royal Society, the Third World Academy of Science, and more.

Environmental *impacts of genetically modified trees*
(Example: effects on native ecosystems, use of herbicide)

A national regulation draft is already sent to our parliament for approbation.

- Any regulatory system should also allow for the assessment of positive environmental impacts. Technological advances have the potential to reduce pressures on native ecosystems by increasing productivity within existing production areas in order to meet increasing consumer demands. In addition, reductions in energy consumption and the environmental footprint of production technologies are possible by improving characteristics to allow more efficient processing and reduction in waste streams. Other potential applications include developing efficient feedstocks for biofuels as alternatives to dependency on fossil fuels, together with associated broad global benefits.

Cultural ***impacts of genetically modified trees***
(Example: positive or negative impacts on indigenous and local communities and their traditional knowledge)

Positive cultural impacts can also be accomplished from reduced pressure on native ecosystems. In many regions in the developing world, deforestation is driven by local use of wood as fuel. In many of these regions fuel wood needs of indigenous and local communities could be met through faster growth and improved stress resistance. The development of consistent and sustainable fuel sources can help support cultures where depletion of traditional fuel sources now necessitate disproportionate time and effort spent on scavenging for fuel, while also promising significantly to ameliorate the associated negative environmental impacts of deforestation.

Socio-economic ***impacts of genetically modified trees***
(Example: positive or negative effects on quantity, quality and economic value of forest production; positive or negative impacts on livelihoods of communities)

As noted above, socioeconomic impacts are not appropriate criteria in any assessment of safety. We nevertheless recognize the supreme importance of economic impacts and the difficulty of ensuring that policies do not entrench the advantage of existing but obsolete technologies. We therefore ask the Secretariat to account fully for the potential positive effects from genetically modified trees. Rather than creating barriers to technology based solutions to problems, we should look to encourage the safe development of new technologies. For example new technologies could allow for sustainable energy sources at the local level through higher yields and stress resistance in trees. The ***failure*** to develop such technologies could have significant negative socioeconomic impacts.
Local communities whose livelihoods depend on a crop that is threatened by disease should be given an opportunity to look to new technologies, including genetic engineering, to combat such threats. The livelihoods of papaya farmers in Hawaii have been protected by employing genetic engineering to prevent the devastating effects of a virus for which no other treatment was available. Based on this success this approach is now being explored in other parts of the world where papaya farmers face similar threats. Impeding the development and deployment of such new technologies leaves countries and communities at a disadvantage in the global economy.

UNIVERSITY OF CONCEPCION

[28 August 2006]

[SUBMISSION: ENGLISH]

1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?

No, there has been one assay carried out in 1995, by Shell where Eucalypts tolerant to herbicide where tested for a period of 6 months. After this assay all material was destroyed.
If no, please state the reason why:
There is no current regulatory system in the country, not even for GM-crops. Therefore the assays for GM-trees are currently forbidden, unless a special permit is given the SAG (agriculture service)

2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?
At the local level we have made some discussion regarding the use of transgenic trees. Some of this discussion was held in the Global Biotechnology Forum, carried out at Concepcion, from March 3rd to the 7th, 2004. Within this Forum, there was a 2.5 day Workshop, where the different aspects regarding the use of biotechnology in forestry, also aspects of GM-trees and as well biosafety aspects of the release of GM-trees.
Other local talks have been given to general public thru a seminar held in March 2003 (Biotecnología: una herramienta de desarrollo para la region del Bío-Bío), at Concepción, Chile.
Personally, I have participated in several discussion panels regarding the use of GM-crops and trees, in the past 4 years, at a national level.
As well we have participated in the international forums held by FAO.

3. *Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?*
Currently there is no regulation regarding neither GM-trees, nor GM-crops within our country. However we have made a proposal to the CONAMA (Comisión Nacional del Medio Ambiente, Chile), giving some guidelines to be included for the assessment of GM-trees. (Funded by a PNUD-GEF project, February, 2005).
However, the use of GM-trees should not be associated with potential negative impacts, but also seen as having beneficial impacts. Some of these are less use of herbicide, insecticide, such as with GM-crops, but as well increase in cellulose content (more cellulose/ha, therefore less ha required per year), faster growth rate, among others.

Environmental impacts of genetically modified trees
Regarding the environmental aspects, specifically in Chile, this should be minimum, since the main species used for plantations are exotics. As pointed out above, it will as well imply savings on the use of herbicides and pesticides, less plantation areas (higher yield).

Cultural impacts of genetically modified trees
(Example: positive or negative impacts on indigenous and local communities and their traditional knowledge)
Mainly positive impacts can be foreseen. For example re-insertion of endangered species by pests can be engineered and micropropagated to increase the number of plantations. Another example, which is the specific case for Chile, could be to improve biomass in a native specie to be used for bioethanol production.

Socio-economic impacts of genetically modified trees
(Example: positive or negative effects on quantity, quality and economic value of forest production; positive or negative impacts on livelihoods of communities)

Again mainly positive impacts can be seen. As example

a) Reduce use of herbicides and pesticides will have a significant economic impact on the large plantations held in Chile.

b) If trees can be modified to have increased cellulose, then the areas required for plantations will be reduced, having as well a positive impact on the environment and less pressure for lands.
c) Modifying trees to be planted in marginal areas, will also be beneficial, since it will give work to foresters in small lands and increase the value of the land.

FEDERAL UNIVERSITY OF VIÇOSA

[17 August 2006]

[SUBMISSION: ENGLISH]

1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?
Yes. Brazil has only experimental plantations that have been analyzed and approved by the National Biosafety Technical Commission (CTNBio) according to Brazilian legislation and international agreements involving Genetically Modified Trees (GMT). The species that are being tested are Eucalyptus and Papaya.
All of these processes are for research purposes. All approved trials have been for *Eucalyptus.*

12 Field Release Processes in Brazil (1999-2006)

Granted and Concluded	Granted and in progress	In Analysis	Deferred
02 (1999)	03 (2004)	05 (2005 and 2006)	02 (2003 and 2006)

* source - CTNBio - Comissão Técnica Nacional de Biossegurança, 2006 (www.ctnbio.gov.br) .
** There are, at least, 04 new processes in line to be analyzed in 2006.

None of these have produced any observations of negative impacts or harm to the environment or biodiversity, demonstrating that trials of genetically modified trees are not difficult to perform safely. Details on field trials in Brazil are available in the Official Federal Gazette ("Diário Oficial"), which is available to the public.

2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?
Yes. Brazil has a governmental national committee, entitled "National Biosafety Technical Commission" - CTNBio. This committee gives technical support to the Brazilian Federal Government in order to update and apply the National Policy of Genetically Modified Organisms (GMOs) Biosafety.
CTNBio is composed of a team of professionals that is responsible for all GMO biosafety analysis in Brazil. CTNBio only accepts GMO experimental activity with the guarantee that the natural recourses and human health will not be disturbed.
Besides that, there have been multiple meetings and discussion forum and workshops on genetically modified trees. There is a Forest Biosafey Project at São Paulo University, coordinated by Dr. Luciana Di Ciero. There is a web site for the project that is used as a contact and a forum for discussions. The site is http://www.bioflor.esalq.usp.br. There is a biosafety network of Brazilian Companies for Agricultural for Papaya research among others crops.
Following are additional examples:
- Forum: Importância da Biotecnologia

Ministério do Desenvolvimento, Indústria e Comércio Exterior
- Forum de Competitividade em Biotecnologia
See references at ANBIO web site: www.anbio.org.br
- BIOWORK I, II, III, IV, V, VI and VII - Biotecnologia & Meio Ambiente
Universidade Federal de Viçosa
- I, II, III and IV Congresso Brasileiro de Biossegurança/ IV Simpósio Latino-Americano de Produtos Transgênicos
See references at ANBIO web site: www.anbio.org.br

- I, II and III Encontro de Presidentes de Comissões Internas de Biossegurança – CIBios - MCT/CTNBio and ANBIO See references at ANBio web site: www.anbio.org.br

In addition there have been several international discussion forums that have been opened to the public. (For example – FAO: Electronic forum on biotechnology – Forestry Sector, April 25 to June 30, 2000 (http://www.fao.org/Biotech/Conf2.htm)

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?
Yes. Brazil has regulations for minimizing the impacts of GMTs for scientific and commercial purposes, taking into account environmental, health, cultural and socio-economic aspects. There is a specific Biosafety Technical Committee in Brazil that regulates genetically modified organisms. The genetically modified tree projects are submitted for approval under this Committee. The projects are analyzed case-by-case by experts and they are also submitted to ad hoc consultations.
The Brazilian Government has approved, in 2005, the Biosafety law that gives to CTNBio the responsibility to create technical rules that must be followed by the companies and institutions which have activities with GMOs. The first Biosafety Law in Brazil was edited in 1995 and established the case by case analyses of all Genetically Modified Organisms before its use. The main goal of this law is to guarantee the protection of the environment and human health when GMOs experiments are designed.
All Brazilian Institutions or companies that work with GMOs must obtain the "Biosafety Quality Certification" - CQB issued by CTNBio. This certification assures that all GMOs experimental activities carried out by the companies and institutions strongly follow biosafety rules.
Brazil has developed biosafety regulations that are consistent with the risk assessment recommendations in Annex III of the BSP, based on the biology of the species and a case-by-case approach that is flexible enough to be able to address the diverse biology found among all plant species, including trees.
This case-by-case approach is important in order to deal with the diverse biology of tree species: fruit or forestry species; short or long lived, self fertile or self incompatible, insect or wind pollinated, adaptation to specific environments, native or exotic, that would be impractical to address if separate specific guidelines were considered for all trees.

The actual experience with GM plants that has been accumulated shows a perfect safety record. Although activist groups proclaim many negative impacts there is no credible scientific evidence that there have been any harm to humans or to biodiversity. The scientific consensus on appropriate procedures for risk assessment has lead to specific science based regulations that have been put into place in Brazil as well as in countries like Canada, the United States, Argentina, the Philippines, South Africa, and others, based on the indicators of OECD, FAO, UNEP, the US National Academy of Sciences, the UK Royal Society, the Third World Academy of Science, between others.

Environmental impacts of genetically modified trees
Potential environmental impacts are addressed as a key consideration within Brazil's regulations for all plant species, including GM trees. The biology of the target species is evaluated as well as the impacts of the genes introduced, be they for herbicide tolerance or any other trait. By careful review of the information submitted for a request for a confined field trial, the system allows for the safe testing of

genetically modified organisms without undue risk to native ecosystems. Any potential negative impacts must be considered and addressed in order to receive approval for any introduction into the environment.

- Any regulatory system should also allow for the assessment of positive environmental impacts. Technological advances have the potential to reduce pressures on native ecosystems by increasing productivity within existing production areas in order to meet increasing consumer demands. In addition, reductions in energy consumption and the environmental footprint of production technologies are possible by improving characteristics to allow more efficient processing and reduction in waste streams. Other potential applications include developing efficient feedstocks for biofuels as alternatives to dependency on fossil fuels, together with associated broad global benefits.

Brazil is developing several projects with genetically modified trees, with *Eucalyptus*, *Papaya* and Citrus. Usually the genetically modified trees are exotic species, like eucalyptus, and they cannot cross with any of the native species.

Cultural impacts of genetically modified trees
(Example: positive or negative impacts on indigenous and local communities and their traditional knowledge)

Positive cultural impacts can be accomplished from reduced pressure on native forest ecosystems. Faster growth or higher fiber yields from plantation forests can help to meet consumer demands. Developing more efficient and more cost effective fiber supply through existing managed plantations could help to significantly reduce logging in native forests and the associated negative environmental and cultural impacts of deforestation.
There are no evidences of negative cultural impacts with the adoption of genetically modified trees in Brazil. *Eucalyptus* and Citrus, are industrial purpose species normally. Different from other planted vegetal species, the commercial forest plantations are predominantly made by companies that are regulated periodically by independent quality control programs and by the state itself, and this results in plantation forests strictly planted according to Brazilian environmental laws. The small producers purchase their plants from professional plants producers or they are supported by the forestry companies. They do not use to make their own plantlets in the farm.

(Example: positive or negative effects on quantity, quality and economic value of forest production; positive or negative impacts on livelihoods of communities).

Economical impacts of genetically modified trees

In other countries the livelihoods of papaya farmers were saved through the introduction of genetically modified virus resistant papaya. Without the genetic modification approach this disease is untreatable and can devastate papaya growing communities. Local communities whose livelihoods depend on a crop that is threatened by disease should be given an opportunity to look to new technologies, including genetic engineering, to combat such threats. It is important that Brazil also has the opportunity to research and develop these kinds of solutions, not just in papaya, but for other tree species that could be threatened by diseases where genetic modification could be the best strategy. Impeding the development and deployment of such new technologies leaves countries and communities at a disadvantage in the global economy.
We ask the Secretariat to account fully for the potential positive effects from genetically modified trees, based on a case by case Biosafety evaluation. Rather than creating barriers to technology based solutions to problems, we should encourage the safe development of new technologies. In addition to protection from diseases, new technologies could allow the development of sustainable energy sources at the local

level through higher yields and stress resistance trees. The *failure* to develop such technologies could have significant negative socioeconomic impacts.

COLLEGE OF ENVIRONMENTAL SCIENCE AND FORESTRY

[13 November 2007]

[SUBMISSION: ENGLISH]

Question 1. Does your country have any plantations, either commercial or experimental, of genetically modified trees?

Yes. I am conducting research on *Castanea dentata* (American chestnut), *Ulmus Americana* (American elm), and hybrid poplar in efforts to enhance resistance to exotic pathogens introduced into this country. Transgenic trees from each of these species are currently being field tested. These are just a part of the over 350 field trials representing over 20 species of transgenic trees approved by the United States Department of Agriculture. In addition to these field trials, the U.S. has deregulated genetically engineered papaya that is resistant to papaya ring spot virus. This transgenic tree has been widely planted in Hawaii and is benefiting the small farmer. Soon a second tree species is expected to be deregulated, plum trees engineered to be resistant to plum pox virus. It is our hopes that within the next five to six years, transgenic American chestnut, engineered to be resistant to chestnut blight, and transgenic American elm, engineered to be resistant to Dutch-elm disease and elm yellows, will be deregulated. We can then use these to help restore these heritage tree species that were devastated by exotic pathogens.

Among all these various field trials, I have not seen any reputable reports of negative impacts or harm to the environment or biodiversity, indicating that trials of genetically modified trees can be performed safely with current regulations. In fact, our research goals to restore tree species driven to the brink of extinction by exotic pathogens will eventually restore biodiversity and benefit the environment. Details on field trials are available to the public at http://www.isb.vt.edu/ and from the US Department of Agriculture.

If yes, please answer all remaining questions.
If no, please state the reason why:

Question 2. Has your country developed any platform/discussion forum/national committee etc. dealing with genetically modified trees?

Yes. I have held many open debates at the SUNY College of Environmental
Science and Forestry and I know this is a common practice among professors in this field of study. Nationally, there has been several open forums, some of which I have attended and some that I have missed. The ones I know of include: USDA APHIS meeting held July 8-9, 2003 IUFRO Sponsored 'Tree Biotechnology in the New Millennium' (July 22-27, 2001) The Institute for Forest Biotechnology sponsored meetings: 'Modifying Reproduction in Urban Trees (February 12-13, 2003) New Century, New Trees' (November 16-17, 2004) Growing Trees & Stemming Risks (March 20-21, 2006). Professional societies have often held special sessions to discuss genetically modified trees at their annual or semi-annual meetings, including the Society of In-Vitro Biology, Southern Forest Tree Improvement Conference, and IUFRO Tree Biotechnology, among others.

If yes, please answer the remaining questions
If no, please state the reason why:

3. Does your country have any guidelines or regulations for minimizing the impacts of genetically modified trees for scientific and/or commercial purposes?

Unfortunately this is a biased question. Guidelines should look at both the risks and benefits of genetically modified trees. It should not be assumed that there are only risks. In fact, not developing a genetically modified tree can have its own risks. For example, in my research, not developing pathogen resistant trees could lead to extinction of the species and have a negative impact on all the organisms that use these trees.

So I ask that the Secretariat to also recognize the positive impacts of genetically modified trees. These can include species restoration, detoxifying pollution, alternative fuels, enhancing food production, among many others.

To answer the question above, yes, the United States has a very good system to regulate the process from moving trees from the research lab into field trials and then deregulation.

If yes, please list them according to the categories below: We need to provide documentation of the benefits associated with biotech trees and the factors that need to be considered for risk analysis and what make a risk a not acceptable risk.
If no, please explain the reason why here:

Environmental ***impacts of genetically modified trees (Example: effects on native ecosystems, use of herbicide)***

I will use the example I know best, the development of genetically modified *Castanea dentata* (American chestnut) to be resistant to chestnut blight. Before the introduction of this exotic disease there were an estimated three to six billion *C. dentata* trees in the eastern United States and Canada. Within 50 years, the blight decimated these trees so that today only a few million survive as nonreproducing stump sprouts. As the trees died during the epidemic, there was also a decline in many wildlife species that used the nuts from these trees to survive the winter. The eastern U.S. forests have returned, but much different, with oaks and maples replacing the spaces once occupied by the chestnut. These new trees do not produce as large or as consistent a mast crop as the chestnut and therefore the forest cannot support as many organisms as in the past. The restoration of the American chestnut tree through the use of genetic engineering will benefit the forest by allowing larger numbers of wildlife and a more diverse forest to return.

Cultural ***impacts of genetically modified trees (Example: positive or negative impacts on indigenous and local communities and their traditional knowledge)***

The American chestnut was widely used by the indigenous peoples of the United States. In fact, as the native Americans originally migrated from the west into the east, their impacts on the environment increased the chestnuts portions in the forest from about 10% of the mature trees to 25% of the mature trees. The European settlers in the United States relied on the American chestnut to feed their livestock and for building materials. The restoration of the American chestnut tree through the use of genetic engineering will benefit both the indigenous peoples as well as society as a whole.

Socio-economic ***impacts of genetically modified trees (Example: positive or negative effects on quantity, quality and economic value of forest production; positive or negative impacts on livelihoods of communities)***

Restoration of the American chestnut by genetic engineering will also benefit the quality and economics of the forest. In addition to its nut crop, which can be used as food, feed, or feedstock for biofuels, the chestnut wood is highly valued. It is a fairly fast growing hardwood species with strait grain and highly rot resistant wood. Therefore the return of this tree would benefit the economics of the small and large farmer alike. I only used the American chestnut in this answer, but similar benefits as well as unique other benefits can been applied to other genetically engineered trees.
