**RISK ASSESSMENT OF LIVING MODIFIED TREES**

This guidance complements the Roadmap for Risk Assessment of LMOs giving emphasis to issues that are of particular relevance to the risk assessment of LM trees. As such, risk assessments of this type of LM plants also follow the general principles outlined in the Roadmap, but take into account the specific characteristics of perennial long-living trees.

**Background**

 According to the Food and Agriculture Organisation of the United Nations (FAO), a tree is: “a woody perennial with a single main stem, or, in the case of coppice, with several stems, having a more or less definite crown”. Further according to the FAO, bamboos, palms and other woody plants are included into the definition of a tree if they meet the definition above.[[1]](#footnote-2) Tree species belong to many different taxonomic orders and families of angiosperms (flowering plants; e.g. mahogany, poplar, apple) and gymnosperms (“naked seed” plants; e.g. pine, spruce, cedar).

**Introduction**

Trees used in landscaping, orchards, forests and plantations. Risk assessments may vary depending on how and when the LM tree is used. It is key to consider how the tree will be managed in its setting, how it will be propagated and how intensively its growth will be managed over time. For example, a forest tree modified for increased biomass production may rely on strategies for delaying or avoiding flowering (e.g. fast-growing trees for lumber production being cut before reaching the reproductive phase) and bioconfinement (e.g. induction of male sterility or flower ablation). Conversely, management of LM fruit trees may call for early flowering for accelerated breeding strategies.  *Current experience with LM trees*

Currently about 30 to 40 different tree species have been modified through modern biotechnology, mainly through the insertion of transgenes, and have been introduced into the environment for field trials (FAO 2004, Verwer et al. 2010). The majority of these LM trees are, , modified in an attempt to improve traits related to one of the following: resistance to pests and diseases, herbicide tolerance, wood composition (e.g. lignin), growth rates and phenology (including flowering and fruiting), or abiotic stress tolerance. By far, poplars make up most of the LM trees that have been subjected to field trials, (Canada Norway Workshop 2007), followed by eucalyptus and pine. LM apples and papaya make up most of the fruit trees approved for field trials (Gessler&Patocchi, 2007; Hanke & Flachowski 2010). Poplars are the only transgenic forest trees planted on a commercial scale (in China, Ewald et al. 2006). Two different types of fruit trees, papaya and plum, have been approved for unconfined release (in the United States[[2]](#footnote-3)).

**scope of this Guidance**

This guidance focuses on perennial woody plants as defined by FAO (2005). In addition to forest, plantation and fruit trees, this guidance will thus include bamboos, palms and other woody plants if they meet the definition of a tree (see above).

**Overarching issues in the risk assessment process** (*see “Overarching issues in the risk assessment process”**in**the Roadmap)*

**Transboundary movements of LM trees and the Cartagena Protocol**

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**Planning Phase of a Risk Assessment of transgenic trees**

**The Comparative approach - aspects of implementation** *(see “Planning Phase of the Risk Assessment”, “The choice of comparators” in the Roadmap)*

*Rationale*

The OECD Working Group on Harmonization of Regulatory Oversight has published consensus documents on the biology of certain species that may be useful when choosing comparators.[[3]](#footnote-4)

**CONDUCTING The risk assessment**

**Transformation and propagation methods** *(see “Step 1”, “Point to consider (b)” in the Roadmap)*

 **Genetic and phenotypic characterisation of the LM tree***(see “Step 1”, “Point to consider (d) and (e)” in the Roadmap)*

*Rationale*

When conducting a risk assessment for LM trees the most relevant characteristic to consider is the phenotype. The importance of the phenotype is not unique to LM trees. The molecular characterization is not predictive although it can help focus the questions to address about the LM tree phenotype. In many ways the risk assessment evaluates the consequences of the loss or change of the phenotype. In some cases the loss or change of the phenotype will have little or no effect on the way the LM tree interacts with the environment.

 **Dispersal mechanisms** *(see “Step 1”, “Step 2”, “Point to consider (e) and (f)” in the Roadmap)*

**The likely potential receiving environment(s)** *(see “Step 1”, “Points to consider (f) and (g)”,” Step 2”,”Points to consider (b), (d) (f) and (g) and )”,” Step 3”,”Points to consider (a) and (e) in the Roadmap)*

**Exposure of the ecosystem to LM trees** *(see “Step 2”, “Points to consider (e)to (h)” n the Roadmap)*

**Risk management strategies** *(see “Step 4”, “Point to consider (d)” and “Step 5” in the Roadmap)*

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1. [http://www.fao.forestry/site/24690/en](http://www.fao.forestry/site/24690/en%20) [↑](#footnote-ref-2)
2. See <http://www.isb.vt.edu/search-petition-data.aspx>. [↑](#footnote-ref-3)
3. Currently 13 tree species consensus documents on their biology have been developed to support an environmental risk assessment. These documents can be found at [http://www.oecd.org/document/15/0,3746,en\_2649\_34385\_37336335\_1\_1\_1\_1,00.html](http://www.oecd.org/document/15/0%2C3746%2Cen_2649_34385_37336335_1_1_1_1%2C00.html) [↑](#footnote-ref-4)