

References

BARRIL, C. P., VERHAEGEN, D., VIGNERON, PH., BOUVET, J. M. and KREMER, A.: Structure of the specific combining ability between two species of *Eucalyptus*. I. RAPD data. *Theor. Appl. Genet.* **94**: 796–803 (1997). — CASTRO, W. V. C.: Comportamento silvicultural de procedências de *E. camaldulensis* DEHN, *E. pellita* F. V. MUELL., *E. tereticornis* S. M. e *E. urophylla* S. T. BLAKE em duas regiões ecológicas distintas do estado de Rondônia. Piracicaba, S. Paulo. (tese mestrado) (1988). — CRUZ, C. D.: Programa GENES – aplicativo computacional em genética e estatística. Viçosa, MG: UFV. 442 p. (1997). — CRUZ, C. D. and REGAZZI, A. J.: Modelos biométricos aplicados ao melhoramento genético. Viçosa, MG: UFV. 394 p. (1994). — DOYLE, J. J. and DOYLE, J. L.: Isolation of plant DNA from fresh tissue. *Focus* **12**: 13–15 (1990). — DUDLEY, J. W.: Comparison of genetic distance estimators using molecular marker data. In: *Analysis of Molecular Marker Data*. Joint Plant Breeding Symposia Series. Corvallis, Oregon (1994). — ENDO, M. and LAMBERTH, C.: Potencial promisorio del híbrido *E. grandis* x *E. urophylla* em Colômbia. *Invest. Flor.* **152**, 8 p. (1992). — FERREIRA, M. E. and ARAÚJO, A. J.: Procedimentos e recomendações para testes de procedências. EMBRAPA/URPFCS, Curitiba, Paraná. 28 p. (1981). — GRATTAPAGLIA, D., O'MALLEY, D. M. and SEDEROFF, R.: Multiple applications of RAPD markers to genetic analysis in *Eucalyptus* sp. In: *Proceedings of the IUFRO Conference: Breeding Tropical Trees*. Section 2.02-08. Cali, Colômbia (1992). — JACCARD, P.: Nouvelles recherches sur la distribution florale. *Bul. Soc. Vaud. Sci. Nat.* **44**: 223–270 (1908). — KEIL, M.

and GRIFFIN, A. R.: Use of random amplified polymorphic DNA (RAPD) markers in the discrimination and verification of genotypes in *Eucalyptus*. *Theor. Appl. Gen.* **89**: 442–450 (1994). — NEALE, D. B., DEVEY, M. E., JERMSTAD, K. D., AHUJA, M. R., ALOSI, M. C. and MARSHALL, K. A.: Use of DNA makers in forest tree improvement research. *New forests* **6**: 391–407 (1992). — NEI, M. and LI, W.: Mathematical model for studying genetic variation in terms of restriction endonucleases. *Proc. Natl. Acad. Sci. USA* **76**: 5269–5273 (1979). — NESBITT, K. A., POTTS, B. M., VAILLANCOURT, R. E., WEST, A. K. and REID, J. B.: Partitioning and distribution of RAPD variation in a forest tree species, *Eucalyptus globulus* (Myrtaceae). *Heredity* **74**: 628–637 (1995). — N'GORAM, J. A. K., LAURENT, V., RISTERUCCI, A. M. and LANAUD, C.: Comparative genetic diversity studies of *Theobroma cacao* L. using RFLP and RAPD markers. *Heredity* **73**: 589–597 (1994). — RAFALSKI, J. A. and TINGEY, S. V.: Genetic diagnostics in plant breeding: RAPDs, microsatellites and machines. *Trends Genet.* **9**: 275–280 (1993). — SALE, M. M., POTTS, B. M., WEST, A. K. and REID, J. B.: Molecular differentiation within and between *Eucalyptus risdonii*, *E. amygdalina* and their hybrids using RAPD markers. *Aust. J. Bot.* **44**: 595–569 (1996). — WELSH, J. and MCCLELLAND, M.: Fingerprinting genomes using PCR with arbitrary primers. *Nucleic Acids Research* **18**: 7213–7218 (1990). — WILLIAMS, J. G. K., KUBELIK, A. R., LIVAK, K. J. et al.: DNA polymorphisms amplified by arbitrary primers are useful as genetic markers. *Nucleic Acids Research* **18**: 6531–6535 (1990).

The New OECD Scheme for the Certification of Forest Reproductive Materials

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(Received 17th April 2000)

Summary

The old 1974 OECD Scheme has been updated by 1995/96 in order to include new progress in forest tree improvement (OECD, 1997).

Types of Basic Materials are now: Seed Sources, Stands, Seed plantations, Seed orchards, Parents of families, Clones and Clonal mixtures.

Categories of Forest Reproductive Materials produced by these Basic Materials are similarly now: Source Identified (yellow tag), Selected (green), Qualified (pink) and Tested (blue).

This System is explained in simple terms and the synthesis is done by *Table 1*.

Recommendations are given to apply the Scheme as clearly and simply as possible. They are mainly relevant to the structure and subdivisions of the National Catalogue, information to insert in this catalogue and the use of colours.

Though foreseen for international trade, this system can be used within countries as well. Procedure to join the OECD Scheme is also briefly outlined.

Hopefully, the new European Directive should stay fully compatible with the OECD Scheme.

OECD Scheme is also considered as a powerful tool for canalising research, forest tree improvement and conservation programmes into an integrated and efficient global strategy with use of tree seed centres for afforestation programmes.

Varietal outputs of these programmes, themselves commercially produced by national tree seed centres and certified according to the OECD Scheme should permit to realise the large afforestations of high quality that are requested by the great economical and ecological challenges of the XXI th century.

Key words: OECD, certification, Forest Reproductive Materials, Basic Materials, EU Directive, forest tree improvement and research, genetic conservation, tree seed centres, afforestation.

Résumé

L'ancien système de l'OCDE de 1974 a été mis à jour en 1995/96, de façon à intégrer les nouveaux progrès en amélioration des arbres forestiers (OCDE, 1997).

Les Types de Matériels de Base sont maintenant: les Sources de graines, les Peuplements, les Plantations issues de graines, les Vergers à graines, les Parents de familles, les Clones et les Mélanges de clones.

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Paper produced in the frame of the EU/DGXII/FAIR/EUDIREC, Subtask 43, Programme (1995-99), financed by the European Union. The author is grateful to the EU Authorities for their efficient management of the above Programme.

Les Catégories de Matériels forestiers de Reproduction pouvant être produits par ces Matériels de Base sont de même maintenant : Identifiée (étiquette jaune), Sélectionnée (verte), Qualifiée (rose) et Testée (bleue).

Ce système est exposé en termes simples et la synthèse en est faite par la *Table 1*.

Des recommandations sont données pour appliquer le système aussi clairement et simplement que possible. Elles concernent principalement la structure et les subdivisions du Catalogue National, les informations à insérer dans ce catalogue et l'utilisation des couleurs.

Quoique prévu pour le commerce international, ce système peut s'utiliser aussi à l'intérieur des pays. La procédure pour adhérer au Système de l'OCDE est aussi esquissée.

La nouvelle directive européenne devrait rester, espérons-le, entièrement compatible avec le Système de l'OCDE.

Le Système de l'OCDE est considéré comme un puissant facteur d'intégration de la recherche, de l'amélioration des arbres forestiers et de la conservation génétique avec l'utilisation des centres de graines pour les programmes de reboisement.

Les sorties variétales de ces programmes, à leur tour produites commercialement par les centres de graines nationaux et certifiées suivant le système de l'OCDE, doivent permettre les grands reboisements de valeur qu'exigent les grands défis écologiques et économiques du XXI^e siècle.

Mots clés: OCDE, certification, Matériels Forestiers de Reproduction, Matériels de Base, Directive UE, amélioration génétique, conservation génétique, centres de graines forestières, reboisements.

I. Introduction

The purpose of this paper is to provide a brief synthesis of this new Scheme. It is believed to be a useful introduction to the Scheme itself whose reading is much more tedious.

It provides also some personal views in order to clarify its implementation.

The first OECD Scheme for the Certification of Forest Reproductive Material Moving in International Trade has been settled after a tenth of years of conception and of discussion on the 5th March 1974 (OECD, 1974).

It has been adopted by OECD members, i.e. United States of America, Canada and the European Community (at that time: Belgium, Denmark, France, Germany, Ireland, Italy, Luxembourg, Netherlands, United Kingdom). Later, diverse countries of East Europe (Romania, Hungary, Poland, ...) wanted to participate. FAO has recommended its use to developing countries.

In the eighties, has appeared the necessity to take into account progress made in vegetative propagation (cuttings, tissue culture) and in new techniques of seed plantations and seed orchards.

It is the reason why a Group of experts has been created in 1991 in the frame of OECD and in that of the "Legislation Working Party" of IUFRO (W.P. Leader MUHS). This Expert Group was chaired by MUHS, H. et DEBOIS, J. M. (OECD) and was composed of: FLETCHER, A. (GB) who has played a major role, TERRASSON, M. (F), MORANDINI, R. (I), KRUTZSCH, P. (S) and afterwards ACKZELL, L. (S), and NANSON, A. (B).

This group met several times and after an intensive work has finally provided the text of the new regulation. This last has been officially approved by the OECD member states in 1995/96. The texts are referred as OECD (1997) or OCDE (1997) according to the language, either English or French.

The following paper tries to explain simply the new Scheme for tree breeders and foresters. Therefore it does not use necessarily always the official legal rigorous wording that is sometime obscure and difficult to understand.

Afterwards in the discussion, it also provides some personal views on order to clarify its implementation.

II. The New Scheme

Basically, the new Scheme (OECD, 1997) is conserving most of the old one (OECD, 1974) but is broadening its scope to new Types of Basic Materials. It replaces as well the Category "Reproductive material from untested seed orchards" by the "Qualified Category" that is somewhat broadened.

The main points of this new Scheme can be summarised by *Table 1*.

Table 1. – Categories of forest reproductive materials and types of basic materials in the new OECD Scheme (1997).

CATEGORY OF FOREST REPRODUCTIVE MATERIAL				
TYPE OF BASIC MATERIAL	SOURCE IDENTIFIED (Yellow)	SELECTED (Green)	QUALIFIED (Pink)	TESTED (Blue)
Seed Source	X			
Stand	X	X		X
Seed Plantation			X	X
Seed Orchard			X	X
Parents of Family(ies)			X	X
Clone			X	X
Clonal Mixture			X	X

¹) Cross marks are indicating authorised combinations of categories with types.

²) The relevant Designated Authority can approve subsequent multiplication by vegetative propagation of seed certified in the categories selected, qualified and tested. In such a case the material produced will assume the same category as the original seed.

In this synthetic table, the following points have to be distinguished.

II.1. – Categories

1) Source Identified (yellow tag)

At least, The "Region of Provenance", or the "Seed source", or the "Stand" (delineated) with possibly the altitude, must be mentioned on the certificate.

Basic Materials have thus *not been submitted to any selection* and are only "source identified".

For example, douglas fir seed may be collected in the vicinity ("Seed Source") of Darrington, elevation zone 10-15 (altitude 1 000 to 1 500 feet) within the "Seed zone" nr 403 (= Region of Provenance: "Darrington"). This seed is commercialised internationally under the Category "Source identified" (yellow tag).

2) Selected (green label)

The basic material has undergone a *phenotypic selection at the level of the population*.



Figure 1. — Selected Seed Stand of Douglas Fir of “Grande Huqueny”, nr B0088 C, 4.0 ha, 450 m (Region of Provenance : II2 : Ardenne). Planted in 1909, mean annual increment : around $19 \text{ m}^3 \text{ ha}^{-1} \text{ ye}^{-1}$ at 55 years. Is among the best European and American provenances of Douglas Fir in Belgian and French provenance tests (ex. : Peyrat-le-Château : comparative test of 225 provenances where Grande Huqueny rank among the first ones). Photo: NANSON

It is the case of “Seed Stands” that are phenotypically superior to stands of the same Region of Provenance.

Presently, this Category is still representing the major part of the Basic Materials in the world, probably often more than 90% of Basic Materials in national directories.

3) Qualified (pink label)

Components (trees, clones) of relevant Basic Materials must have undergone a *phenotypic selection at the individual level*.

4) Tested (blue label)

Forest Reproductive Materials produced by the relevant Basic Materials must be found *genetically superior*, either through:

a) a foregoing *genetic evaluation* of the components of the Basic Material (e.g.: by *progeny tests* permitting the selection of the superior clones composing an elite Seed Orchard),

b) *comparative experiments of candidate reproductive materials* as compared to “standards”, proving the significant genotypic superiority of the relevant Reproductive Materials.

II.2. – Types of Basic Materials

1) Seed source

Seed is collected within a zone of collection called a seed source. This zone is not necessarily delineated, nor clearly identified. On the contrary, the Region of Provenance where it lies has to be clearly delineated and identified in a Catalogue (maps).

2) Stand

It is a well delineated population of trees possessing sufficient uniformity. It is then referenced in the National Catalogue (optional for the Source Identified Category, compulsory for the Selected Category).

3) Seed Plantation

It is a plantation of seedlings, coming from provenances which may be located in more than one Region of Provenance, in which phenotypic selection in the plantation has been carried out at the provenance and individual tree level.

Two cases can be distinguished:

a) the mixture of provenances is made in a bulk way, no tree being identified by its provenance.

b) every tree is identified by its provenance and the whole is established in the field according to a statistical lay-out. This case correspond to the “Provenance Seedling Seed Orchard” (NANSON, 1972). It is in fact a family seedling seed orchard, except that families are replaced here by provenances.

4) Seed orchard

It is a plantation of selected clones or families which is isolated and managed to avoid or reduce pollination from outside sources, and managed to produce frequent, abundant and easily harvested crops of seed.

There are two main types of Seed Orchards:

a) Clonal Seed Orchards,

b) Family Seedling Seed Orchards.

These last are in fact progeny tests with small plots, the trees of which are later submitted to genetic selective thinnings.

5) Parents of families

They are defined groups of trees (clones) producing open pollinated or controlled pollinated families. These families are afterwards mixed for production. Most often, this mixture of families is vegetatively bulk propagated (e.g.: cuttings of *Picea sitchensis* in Great Britain).

6) Clone

It is a group of individuals (ramets) derived originally from a same single individual (ortet) by vegetative propagation, for example by cuttings or micropropagation. Unless somatic mutation or error, individuals of the same clone have the same genotype.

7) Clonal Mixture

It is a mixture of initially identified clones in defined proportions.

Usually, the ramets of these clones are mixed, bulked and so delivered for afforestation. The clonal identity of the individual ramets is therefore generally lost at the forest stage and often already at the vegetative propagation stage.

In current scientific language, clonal mixtures are usually denominated as “multiclonal varieties” or “polyclonal varieties”.

III. Discussion

After the objective description of the Scheme with a simpler wording, let us consider now some related topics, more or less according to the author's views.

This could be considered as recommendations of the author in order to apply the Scheme as clearly and efficiently as possible.

III.1. – Structure and subdivisions of the National Catalogue²⁾

In our views, every National Catalogue should be subdivided according to the marked cells displayed in *Table 1*. However, since some intersections Category/Type can contain somewhat different topics, some further subdivision should occur in the catalogue so that the customer could be clearly informed.

In the future, such a catalogue will be probably set at the direct disposal of users through Internet.

For a catalogue that could encompass all possible subdivisions (probably scarce), it could be subdivided as follows.

A) Introduction

A general introduction with:

- 1) an abstract of the legal support and regulations with their references
- 2) the subdivision of the country into Regions of Provenance, including its
 - maps and altitudinal subdivisions
 - way of subdivision
 - a brief description of climate, soils and vegetation per Region of Provenance.

B) List of Basic Materials (one colour of page per Category)

1) Source *Identified* (yellow)

- 11) *Seed sources*: the way seed collections are usually done within a Region of Provenance; possibly a list of frequently collected Seed Sources
- 12) *Identified stands* (list on the model of Selected Seed Stands)

2) *Selected* (green)

* *Selected Seed Stands*: per stand description in some rows (e.g.: 4 rows) within an A4 page, with *number* and (short) name (becomes the *Provenance* name) of the stand in bold capital letters (see examples in the Appendix). These last number and name should be the minimal basic data to be reported in labels and certificates since it permits to identify a material univocally.

3) *Qualified* (pink):

- 31) *Seed Plantations*, subdivided in:
 - 311) With unidentified trees
 - 312) With trees identified per provenance
- 32) *Seed Orchards*, subdivided in:
 - 321) Clonal Seed Orchards
 - 322) Family Seedling Seed Orchards
- 33) *Parents of Families*
- 34) *Clones*
- 35) *Clonal Mixtures*

4) *Tested* (blue)

Same subdivisions as for 3) with furthermore the possibility of "Tested Seed Stands".

Within every subdivision, species should be listed according to an certain order, for example, their Latin names or their ascending code number.

Some people are recommending to further subdivide per Region of Provenance within species. Experimented in Belgium, this seems a bit tedious. However, this last question is needing further discussion and is still open.

A general solution could be to organise Catalogues into "data bases" themselves displayed on Internet. Then a lot of different output tables could be designed according to frequently asked questions asked by customers and users. Such a work is presently developed at our Research Centre of Gembloux by DESTEUQC (2000).

Notwithstanding, the edition of a complete official catalogue having the above standard structure is a basic priority. This is not excluding further special lateral outputs from the data base.

III.2. – Information to be inserted in the catalogue

This catalogue would be the backbone of the basic information for the customer.

As said above, the catalogue should be subdivided first per Category and then by Type.

In the case of stands, the usual description as practised in most catalogues (some lines per stand) could be continued.

An example being under development for the Walloon Region (Belgium) is displayed in the appendix, as follows (DESTEUQC, 2000).

The *National Number* and the national *Species Code* are mentioned in bold characters in the first column.

In the second column: are mentioned the geographical coordinates (latitude, longitude, altitude) in degrees, minutes, possibly seconds and meters.

In the third column are: the official name of the *Provenance* (short and in bold characters); the name of the Commune where the Basic Material is standing; a code from the Designated Authority indicating with every successive digit the: Region of provenance, Origin (autochthony), Category and Type of the relevant Basic Material.

In the 4th: Forest District, the Management numbers of Series, Plots and Compartments; the foregoing Provenance of the stand when known.

In the 5th: Origin (Autochthon or not).

In the 6th: Total Area (ha); estimated Effective Area occupied by the species (in case of mixed stands); estimation of the Number of potential flowering Trees.

In the 7th: Year of natural or artificial Regeneration; Year of Selection of the Basic Material.

In the 8th: Overall Score of the stand (productivity, quality, resistance-adaptation); Productivity Class, Mean Annual Increment (MAI) in m³/ha/ye; easiness of Access + Ground cleanliness. Note that some of these informations which are uneasy to obtain may be missing. The Productivity Class and MAI are estimated from the dominant height and the age of the stand through Production Tables. More accurate details could be found in Breeding records (see later).

In the 9th: Ownership; name of the Contact person/Manager with Telephone number where to address.

The 10th and last column is devoted to Remarks and possible references and connections. It should be large enough to put shortly the most important of them.

²⁾ In the author's views, this structure could serve as a proposal of harmonisation of the National Catalogues of the EU countries and possibly of OECD countries as well. The term "Register" is also used as equivalent to "Catalogue" in the OECD Scheme.

In case of Qualified and Tested Categories, i.e. Seed Plantations, Seed Orchards, Parents of Families, Clones, Clonal Mixtures, more information should be placed in the last column of remarks whose width and depth will be therefore larger.

Relevant information would be expressed very shortly with reference to a separated "*Breeding Record*" (one or some pages per Basic Material). This Breeding Record that is another optional document will give all essential additional information about the relevant Basic Material, notably the qualities and defects of the forest reproductive materials it produces. It should contain literature or report short references if any. In the future when Catalogues will be displayed on Internet, hypertext links could be used for seeking breeding records and references from words of the last column of the Catalogue itself.

It is to note that these evolved Basic Materials of the Qualified or Tested Categories are still very few in number in the present catalogues of all countries and that this information will not take presently much space. The structure of these Breeding Records has not yet been debated nor included in the new OECD Scheme.

III.3. – Use of colours

Use of colours is simplifying and clarifying everything and it is easily understood by every one. Therefore its use should not be restricted to seed labels but should be systematically extended to certificates, page of catalogues, etc.

III.4. – Use of the Scheme inside countries

Though it is designed for Forest Reproductive Materials circulating in the international trade, the OECD Scheme can be used with advantages for material circulating within countries. This unification simplifies everything and make the control easier and much more efficient than with the coexistence of different systems.

III.5. – Procedure to join the OECD Scheme

The procedure for the extension of the OECD Scheme to non member countries of the OECD is explained in Appendix VII of the Scheme (OECD, 1997). This can be summarised roughly as follows.

First, a national law organising the certification of Forest Reproductive Materials with the Designated Authority in charge of its application must be elaborated.

Then the country has to be subdivided into "Regions of Provenance" homogeneous on ecological and genetic grounds.

The way according to which Regions of Provenance are delineated and Basic Materials are approved must be explained.

A "National Catalogue" has to be established. It has to contains diverse items.

- a) Summary and reference to laws and technical regulations.
- b) Identity of the Designated Authority, identity of present Tree Seed Centres and possibly of Research Stations approving the Basic Materials.
- c) The maps of the Regions of Provenance with their geographic delineation, a brief description of their climate, soils and natural vegetation.
- d) The list of the Basic Materials subdivided per Category and Type.

When these conditions are fulfilled and that the certification is effectively working, the country may introduce a demand for application to the OECD Secretariat in Paris.

After field inspection, reports, amendments, the agreement of the Member States of OECD and a certain administrative delay, the candidate country may be admitted officially to the OECD Scheme for Forest Reproductive Materials.

Remarks

a) A country has not to present Basic Materials relevant to all categories to be able to apply. Basic Materials relevant to the first categories should be sufficient.

b) A country has not to apply for all species: only a rather limited number suffices.

However, for these species and the displayed materials under the OECD label, the country is responsible for the reliability of its selections and of its control.

III.6. – European Union

A new Directive concerning the commercialisation of forest reproductive materials replacing those of 1966, 1971 and 1975 has been prepared and very rapidly discussed in Brussels (EU, 2000: Directive 199/105/CE).

It is very largely inspired by the OECD Scheme with however some lacking points. For example, the "Seed plantation" Type has been so far omitted with no justification. The author is thinking that this omission is cutting off new varietal outputs that are interesting for at least for a certain number of countries. In the author's views, no member country has any right to oppose others to use it.

More generally, the author is thinking that a complete compatibility between the two Scheme including all Categories and Types of Basic Materials should be assured, even if some Types of Basic Materials are not yet intended to be used by some countries.

To do otherwise will introduce a lot of artificial complications and difficulties for international trade, even within EU.

III.7. – Main role of the OECD Scheme

1) Certification

This has been fully described here above. One of its use can be illustrated as follows.

In the past, many afforestation programmes, among others in the tropics, though very costly have aborted or given poor results because of the bad genetic quality or unadaptation of the reproductive materials used. As a matter of fact, very often no attention was paid to this genetic quality and not even to the provenance.

With the rise of CO₂ in the atmosphere, the global warming and its side effects (violent storms), mass plantations with fast growing better adapted and genetically improved forest reproductive material fixing rapidly CO₂ are becoming more and more necessary. The possibilities of this sink of CO₂ in the earth balance must not be underrated.

The application of the OECD Scheme should now permit the real success of the large afforestation programmes with well categorised forest reproductive materials of good genetic quality and well adapted to the planting site that the economy and the ecology of the planet are needing.

2) Research and forest tree improvement

In many countries, a lot of research and even of development in forest tree improvement and related matters is done in a lot of directions with no clear purpose in mind. Very often the results of such costly research are therefore not applicable or are irrelevant.

On the contrary, for every forest or agro-forest species that is to be improved within a country all over the world, the OECD

Scheme is putting forward the clear objectives of the varietal outputs of *Table 1*. This is the case even for species that are not improved but where the respect of an adequate provenance identity is important for afforestation with well identified material (identified provenance).

Research and development in Forest Tree Breeding should therefore be conceived and canalised along these lines to optimise efforts.

Of course this is not excluding some more or less basic research made outside of these lines on new possible methods and techniques but this should stay secondary for a maximum overall efficiency.

3) Genetic conservation

The same argumentation is valid for genetic conservation as well. Materials with the highest quality or that are endangered should be first conserved according to long range management plans (e.g.: NANSON, 1993) using mainly the OECD Scheme subdivisions.

Finally let us have a dream.

All over the world, every forest country or important forest region is equipped with a Forest Tree Seed Centre using the OECD Scheme for international and national uses.

Upstream of it, a Forest Research Station is developing research and forest tree improvement mainly in order to provide this Tree Seed Centre with the best possible genetic varietal outputs. This adapted material of high quality but also endowed of a sufficient internal genetic diversity is used intensely for afforestation in appropriate environments.

The trace of the genetic identity of major plantations is kept on a database on the basis of which a long term forest genetic conservation is managed.

This integrated sustainable system should permit the great afforestation programmes of high value recommended by the Conferences of Rio de Janeiro (Anon., 1992), of Helsinki (Anon., 1993) and others, and so to meet some major economical and ecological challenges of the XXIth century.

IV. Conclusions

The old 1974 OECD Scheme has been updated by 1995/96 in order to include new progress in forest tree improvement (OECD, 1997).

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The new European Directive underway should stay fully compatible with the OECD Scheme.

OECD Scheme is also considered as a powerful tool for canalising research, forest tree improvement and conservation programmes altogether into an integrated and efficient global strategy with use of tree seed centres for afforestation programmes.

Varietal outputs of these programmes, themselves commercially produced by national tree seed centres and certified according to the OECD Scheme should permit to realise the large afforestations of high quality that are requested by the great economical and ecological challenges of the XXIth century.

References

- Anon.: Resolution 2 of the Ministerial Conference on the protection of Forests in Europe. Strasbourg, Min. Agric. et Forêts, Paris (1990). — Anon.: La déclaration sur les forêts. Agenda 21. Conférence des Nations Unies sur l'environnement et le développement. CNUED-RIO 92, 10 p. (1992). — Anon.: Ministerial Conference on protection of forests in Europe. Helsinki, 16–17 June 1993. General Declaration and four Resolutions. H1.- General Guidelines for the Sustainable Management of Forest in Europe. H2.- General Guidelines for the Conservation of the Biodiversity of European Forests. H3.- Forestry Cooperation with countries with Economies in Transition. H4.- Strategies for a Process of Long-Term Adaptation of Forests in Europe to Climate Change, ~ 30 p. (1993). — DESTEUCCQ, O.: Projet de Catalogue wallon des Matériels de Base. Centre de Recherches sur la Nature, la Forêt et le Bois, Direction de Biologie Forestière, Gembloux, ~ 25 p. (under development) (2000). — EU: Directive 199/105/CE of the Council of 22th Dec. 1999 concerning the commercialisation of forest reproductive materials. *Official Journal of European Communities*, ~ 40 p. (2000). — NANSON, A.: The provenance Seedling Seed Orchard. *Silvae Genetica*, 21, 6, 243–249. (1972). — NANSON, A.: Gestion des ressources génétiques forestières. *Annales Gembloux*, 99, 13–36. (1993). — OCDE: Système de l'OCDE pour le contrôle des matériels forestiers de reproduction destinés au commerce international. OCDE, Paris, 25 p. (1974). — OCDE: Système de l'OCDE pour le contrôle des matériels forestiers destinés au commerce international., OCDE, Paris, Doc. de séance n°1, 42 p. (1997). — OECD: OECD Scheme for the control of forest reproductive material moving in international trade. OECD, Paris, 21 p. (1974). — OECD: OECD Scheme for the Control of Forest Reproductive Material moving in International Trade. Room document n° 1, 28/04/1997, O.E.C.D., Paris, 42 p. (1997).

Appendix – Example of presentation of pages of a Catalogue of Basic Materials, especially for the Type “Stand” (Selected or Identified).

N.B.- Subdivisions of the Catalogue of Basic Materials successively by:

1° Politic Regions (States and/or Regions)

4° Species

2° Categories (pages with the same colour)

5° Possibly by Regions of provenance

3° Types (e.g.: Stands, Seed Orchards)

6° Possibly by ascending number of Basic Materials.

Example: *Picea abies* (Norway Spruce: code A); in Belgium: 59 Seed Stands covering 329 ha.

Region of provenance: II.2.- ARDENNE (code 7): 58 Seed Stands covering 325 ha.

National number Species Code	Latitude Longitude Altitude	PROVENANCE Commune Code SMR	Forest District Series/Plots/ Compartment Provenance	Origin A or NA	Area (ha): Total Effect. N trees	Year: Regener. Select.	Overall Score Productivity Class MAI (m ³ /ha/ye) Access + Ground	Ownership Contact person/ Manager	Remarks
B0031³ A	50° 11' 57" 5° 47' 10" 550 m	CEDROGNE Houffalize 7221	Vielsalm Comp. 32,33,39 Unknown	NA	29,5 ~ 20 ? ~ 4.000	1902 1950	G⁴ to VG > I Class: ~ 18,0 G + RG	CPAS Bruges Cant. Vielsalm Tel 080/21 66 08	Could deserve the Blue Category for growth: NANSON-1971. Mixed with Douglas Fir.
B0045 A	49° 46' 30" 5° 30' 20" 420 m	LAVAUX L'église 7221	Neufchâteau Plot 83 Thüringen ?	NA	2,0 2,0 ~ 300	1895 1970	VG > I Class: ~ 19,0 G + G/RG	Région Wallonne Cant. Neufchâteau Tel 061/22 81 22-23	Deserves the Blue Category for growth and late flushing: NANSON-1971, DESTEUCCQ-1996

Pseudotsuga menziesii (Douglas Fir: code C); in Belgium: 31 Seed Stands covering 135 ha.

Region of provenance: II.- SOUTH SAMBRE and MEUSE (code 2): 31 Seed Stands covering 135 ha.

National number Species Code	Latitude Longitude Altitude	PROVENANCE Commune Code SMR	Forest District Series./Plots/ Compartment Provenance	Origin A or NA	Area (ha): Total Effect. N trees	Year: Regener. Select.	Overall Score Productivity Class MAI (m ³ /ha/ye) Access + Ground	Ownership Contact person/ Manager	Remarks
B0088 C	49° 52' 22" 5° 20' 16" 450 m	GRANDE HUQUENY Neufchâteau 2221	Bertrix - Unknown	NA	4,0 4,0 ~ 600	1909 1958 ?	VG I Class: ~ 19,0 VG + M	Région Wallonne Cant. Bertrix Tel 061/41 13 77	Could deserve the Blue Category for growth: Belgian/French results See Photo.

³ B = Belgium, 0031 = 31 th Seed Stand selected in Belgium, A = Norway Spruce; C = Douglas Fir; P = Beech; AE = Ash.

⁴ Overall Score: VVG = Very Very Good = 10/10; VG = Very Good = 9/10; G = Good = 8/10; RG = Rather Good = 7/10; M = Medium = 6/10; B = Bad = 5/10; VB = Very Bad = 4/10.

Fagus sylvatica (Beech: code P); in Belgium: 24 Seed Stands covering 2.387 ha.

Region of provenance: I.2.- “BRABANT ET HESBAYE” (code 5): 5 Seed Stands covering 1.958 ha.

National number Species Code	Latitude Longitude Altitude	PROVENANCE Commune Code SMR	Forest District Series/Plots/ Compartment Provenance	Origin A or NA	Area (ha): Total Effect. N trees	Year: Regener. Select.	Overall Score Productivity Class MAI (m ³ /ha/ye) Access + Ground	Ownership Contact person/ Manager	Remarks
B0355 P	50° 43' 45" 5° 26' 110 m	FORET DE SOIGNES La Hulpe 5121	Mons Ser. PictonGroup I, C6/1,7/1.8/1 Local	A	73,0 73,0 ~ 7.000	~1800/50 1950	VG > I class: 7 to 11 G + G	Région Wallonne Cant. Mons Tel 065/32 82 49	Could deserve the Blue Category for growth, late flushing: GALOUX-1966
B0289 P	50° 46' 3° 44' 45" 95 m	LA LOUVIERE Flobecq 5121	Mons Comp.011,041,081 ; C1-4-10-8 Local	A	12,5 12,5 ~ 1.500	- 1996	VG/VVG ~ I Class: 7-10 ? VG + VG	Région Wallonne Cant. Mons Tel 065/32 82 49	Phenotype similar to "Forêt de Soignes"

Fraxinus excelsior (Ash: code AE); in Belgium: 4 Seed Stands covering 89 ha.

Region of provenance: II.1.- “BAS PLATEAUX MOSANS” (code 6): 3 Seed Stands covering 75 ha.

National number Species Code	Latitude Longitude Altitude	PROVENANCE Commune Code SMR	Forest District Series/Plots/ Compartment Provenance	Origin A or NA	Area (ha): Total Effect. N trees	Year: Regener. Select.	Overall Score Productivity Class MAI (m ³ /ha/ye) Access + Ground	Ownership Contact person/ Manager	Remarks
B0286 AE	50° 23' 5° 34' 200 m	TIE D'LA LEWE Ferrières 6121	Aywaille Ser. 409010, C1,Comp.15,16,17 Local	A	34,82 ~ 16 ~ 1.500	- 1995	VVG > I Class: 5-14 ? M/RG + M/RG	CPAS Bruxelles Cant. Aywaille Tel 041/384 52 80	Mixed with <i>Acer pseudoplatanus</i> and <i>Quercus robur</i>
B0290 AE	50° 13' 4° 39' 290 m	CROIX DES DAMES Philippeville 6121	Philippeville C6 Local	A	32,68 ~ 13 ~ 2.000	- 1996	VG > I Class: 5-14 ? G/VG + M/RG	Région Wallonne Cant. Philippeville Tel 071/66 64 45	Mixed with <i>Quercus robur</i>