CERTIFICATION . REGISTRATION AND RELEASE OF TREE AND SHRUB REPRODUCTIVE MATERIAL

Richard A. Cunningham
Research Geneticist
USDA, Agricultural Research Service
Mandan, North Dakota

INTRODUCTION

Nurserymen, foresters, farmers, ranchers and homeowners are becoming aware of benefits gained by planting genetically improved trees and shrubs. Bad experiences with poorly adapted planting stock have dramatically illustrated the consequences of ignoring genetic variation. The increasing demand for genetically improved seed and planting stock is forcing nurserymen, seed collectors, seed dealers, tree improvement foresters and research geneticists to become more familiar with the policy and procedures available for certifying, registering and releasing genetically improved tree and shrub reproductive material. Much of this information, as it concerns trees and shrubs, is scattered over a variety of state, federal and international handbooks, policy statements, laws, schemes and agreements. In this paper, I will try to consolidate the pertinent rules, regulations and procedures governing tree and shrub certification, registration and release. Primarily, I wish to clarify the steps involved in getting improved material into mass production and use. This paper will serve as a general guide to a state agency or organization that wishes to develop and implement a system for certifying, registering and releasing genetically improved tree and shrub reproductive material.

Figure 1 diagramatically represents the various stages and alternatives involved in moving improved reproductive material from wild germplasm into mass propagation.

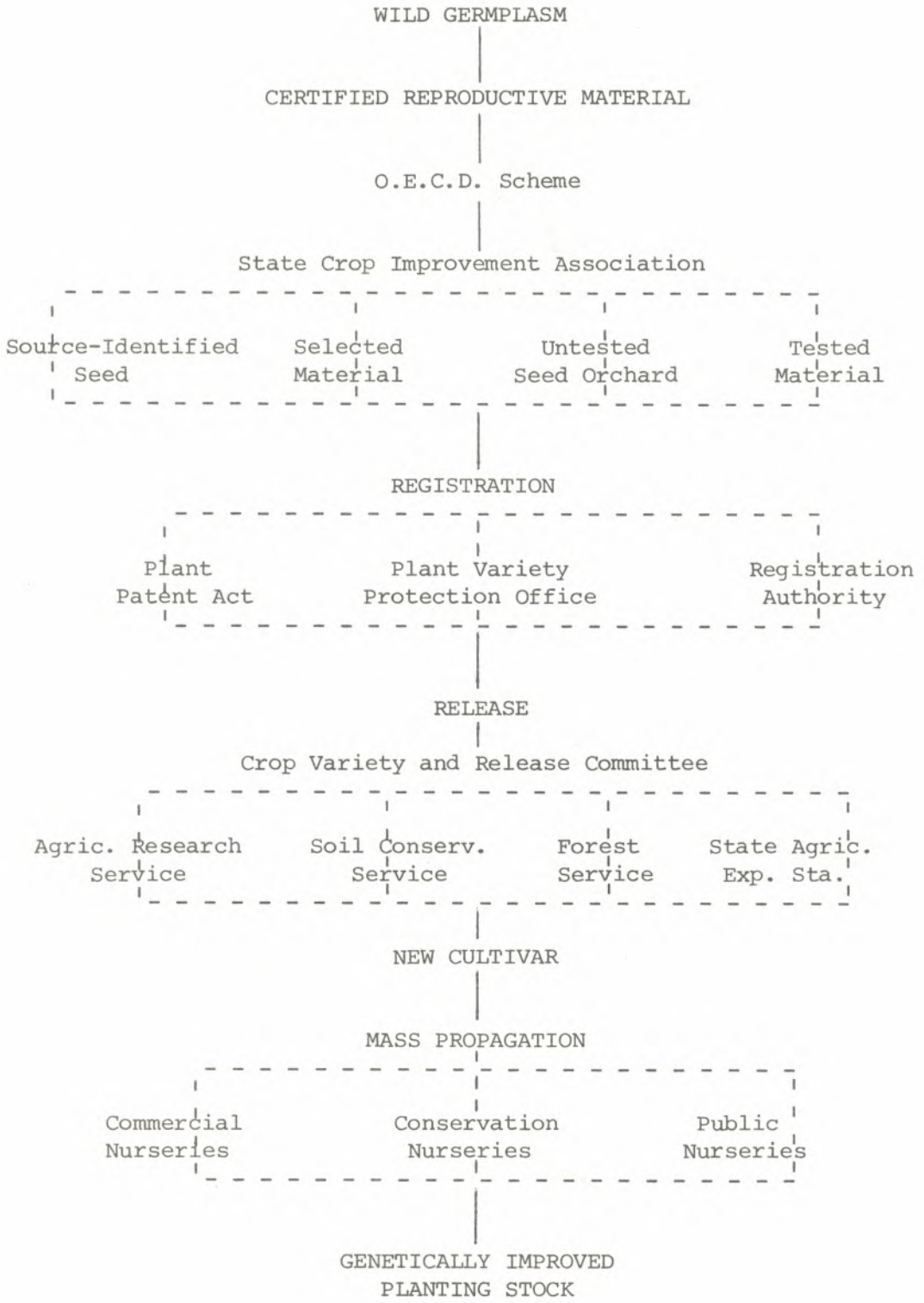

FIGURE 1. Diagramatic representation of the steps involved in certifying, registering, and releasing genetically improved tree and shrub reproductive materials. (Dotted line indicates alternative paths.)

CERTIFICATION OF REPRODUCTIVE MATERIAL

Objective

The objective of seed (or reproductive materials) certification programs is the assurance that "what you see is what you get." In other words, it is a means for guaranteeing that seed offered on the open market is truly the product it is advertised to be. Standards and procedures for collection, handling, development, testing, processing and distribution of seed are specified by the certification program. These standards and procedures are the machinery for insuring the proper identity and genetic purity of seed offered for sale.

Historical Perspective

Agricultural crop seeds have been certified for decades. Since the certification standards in each state are primarily based on those recommended by the Association of Official Seed Certifying Agencies (AOSCA, 1971), their certification programs are virtually identical. Tree and shrub seed has a much shorter history of seed certification than agricultural seed has. Only within the last decade has increased interest in certification stimulated development of programs designed specifically for tree and shrub seed.

Current Guidelines

The most universally accepted authority for guidelines pertaining to certification of tree and shrub reproductive materials is the Organization for Economic Cooperation and Development (OECD). In an effort to encourage the production and use of certified reproductive materials (particularly in international trade), the Directorate for Agriculture and Food of this international organization developed a recommended scheme for certification and control of reproductive materials moving in international trade. The recommended scheme was published in 1974 (OECD, 1974). The Forest Service, USDA was assigned to be the Designated Authority in the United States responsible for implementing the OECD scheme in cooperation with the official state seed certifying agencies. Memorandums of Understandings between the Forest Service and the official State seed certifying agencies authorize such agencies to use the official OECD certification label. Nineteen states have signed such memorandums of understanding.

Uniform Standards

Use of the recommended OECD scheme as the basis for writing individual state certification standards will facilitate the exchange of certified seed among states as well as into international trade. While the standards of individual states will likely differ in details, the basic provisions of the OECD scheme should be compatible with any state's program.

Basic Provisions of OECD Scheme

The following is a summary of the basic provisions of the OECD scheme. A state seed certification program conforming with these provisions would be in basic compliance with the OECD scheme. More complete details may be found in OECD (1974).

OECD SCHEME

Definitions of Specific Terms1/

Reproductive material: 1) Seeds--cones, fruits and seeds intended for the production of plants; 2) parts of plants--stem, leaf and root cuttings, scions and layers intended for the production of plants; 3) plants--plants raised by means of seeds or parts of plants, including natural regeneration.

Forest reproductive material. Reproductive material of genera and species of trees which will be used for forestry.

Basic material. Trees from which reproductive material is obtained.

Designated authority. An authority designated by and responsible to the government of a country participating in the OECD scheme for Forest Reproductive Material for the purpose of implementing these rules on its behalf.

Provenance. The provenance of reproductive materials is the geographical location of the immediate parent trees of the material.

In a derived sense: the reproductive material forthcoming from this location and environment.

Origin. The origin of reproductive material is the geographical location to which the ancestors of that material are native and within which their genetic constitution has developed through natural selection.

Region of provenance (Seed collection zone). For a non-indigenous species, or distinct variety, the area, or group of areas, subject to relatively uniform ecological conditions.

Region of origin (Seed collection zone). For an indigenous species, sub-species, or distinct variety, the area or group of areas subject to uniform ecological conditions and on which are found stands of that indigenous species, sub-species, or distinct variety.

Forest stand. A community of trees possessing significant uniformity in composition, constitution, age, spatial arrangement, and condition, to be distinguishable from adjacent communities, and so, forming a silvicultural or management entity.

1/ Taken from OECD (1974) as modified by Barner and Koster (1976).

Indigenous stand. A stand native to a specified area, or region, or one raised artificially from stands native to the area or region.

Selected stand. A clearly defined stand, phenotypically superior to the accepted mean for the prevailing ecological conditions, when judged by the criteria set out.

To comply with the required standards, the approval could be dependent on removal of abnormal trees.

Seed stand. A plus stand, or plantation, isolated, if necessary, from contaminating pollen, derived from a desirable source, which is upgraded and thinned by removal of undesirable trees and then managed for early and abundant seed production.

Seed orchard. A plantation established for the production of seed, and: 1) consisting of selected clones or progenies; 2) established and managed in such a way as to minimize selfing and unwanted combinations between components; 3) in which each component will be identified; 4) isolated and managed to avoid or reduce pollination from outside sources; 5) progeny tested, followed by removal of genetically undesirable components; and 6) managed to produce frequent, abundant and easily harvested crops of seed.

Categories of Reproductive Material

Source--identified reproductive material (Yellow tag). Reproductive material identified as to the region of provenance, or region of origin, and collected, processed, stored and plants grown under the control of a Designated Authority.

Selected reproductive material (Green tag). Reproductive material meeting the requirements of category 1 and derived from stands or cultivars selected as phenotypically superior to the accepted mean for the prevailing ecological conditions when judged by the criteria set out.

Reproductive material from untested seed orchards (Pink tag). Reproductive material derived from seed orchards that meet the requirements of category 4, with the exception of those regarding proof of genetic superiority.

Tested reproductive material (Blue tag). Reproductive material that originated from seed orchards, stands or cultivars whose genetic superiority to appropriate standards for one or more important characters has been proved by comparative tests conducted in specified environments and approved by the Designated Authority.

Field Inspection

Inspection of basic material. Inspection before approval is required for all categories except Source-Identified. Re-inspection may be scheduled at intervals specified by the Designated Authority.

Inspection of reproductive material. Before collection, the Designated Authority must be informed of the proposals and arrangements for seed collection. Instructions for collection in seed orchards may be given. During collection, the collectors shall be registered and records must be kept and must be available for inspection. Collection must be inspected at least by random checking.

Certificates of provenance and clonal identity. All categories of forest reproductive material must be accompanied by a certificate of clonal identity for material reproduced vegetatively.

Testing Requirements

Characters to be examined. Tests must be designed to assess specified characters that have been designated for each test.

Experimental design. Reproductive material must be arranged in a replicated, random layout in both the progagative phase and in the test plantation phase.

Sample size and the number of replications must be sufficient to provide a satisfactory degree of statistical accuracy to permit the evaluation of the individual characteristics under examination.

Experimental technique. All reproductive materials and standards must be treated in an identical way throughout the test.

Care should be taken to ensure that the reproductive material, includinc the standards, is representative of the basic material being studied.

Analysis of results. The results of the tests are to be presented in the form of numerical data.

Each unit of reproductive material must be classified for each character, for each environment under test.

The significance level of difference is to be shown.

The age of the reproductive material at which the character was evaluated should be indicated.

The methodology used for the test and the detailed results obtained are to be made freely available.

Records must describe the test sites.

The region of probable adaptation within the country in which the test was carried out must be given.

Certificate of Provenance or Clonal Identity

All categories of forest reproductive material shall be accompanied by a certificate of provenance for material reproduced by sexual means, or a certificate of clonal identity for material reproduced vegetatively. An example of these certificates may be found in Appendix I. These certificates provide information regarding the geographic location of the basic material, its origin, and the year the reproductive material was collected.

REGISTRATION OF NEW VARIETIES

Type of Material

Tree or shrub reproductive material that is distinctly superior to existing varieties in one or more important characteristics should be registered. Material certified in the selected, untested seed orchard or tested classes would generally merit registration.

Registration Authorities

A single registration authority for tree and shrub seed does not exist. The International Bureau for Plant Taxonomy and Nomenclature (IBPTN) developed the International Code of Nomenclature of Cultivated Plants. The latest edition of the code was published in 1969 (IBPTN, 1969). It sets forth the rules for naming and registering new cultivars, with primary emphasis on asexually propagated plants. The code urges registration of new varieties with one of the official Registration Authorities that it recognizes. The authorities are professional, or quasi-professional, plant societies specializing in particular plants. Approximately 75 plant groups are now assigned to 44 International Registration Authorities. The plant groups are generally based on individual genera, but in some cases are botanical families and miscellaneous collections. Reasonably complete lists are available for orchids, tulips, daffodils, hemerocallis, rhododendron, azaleas, camellias, hollies, dahlias, iris, gladiolus, and dwarf conifers. About 19 of the groups include tree or shrub species. Unfortunately, many of our important tree and shrub species have no official Registration Authority. The Arnold Arboretum has been appointed Registrar for new cultivars of woody genera for which no authority has been designated.

The Plant Patent Act of 1930, amended 1954, allows a plant breeder or grower to obtain exclusive rights to the propagation and sale of asexually produced plants (U.S. Govt., 1956). The Plant Variety Protection Act of 1970 grants protection to breeders or growers of new varieties propagated sexually from seed (U.S. Govt., 1970). The Plant Variety Protection Office is currently developing objective descriptions of varieties for the plants that can be protected under the Act. The registry of protected varieties should begin soon and a list of these will be published in the official Journal of the Plant Variety Protection Office (USDA, 1973).

RELEASE OF NEW VARIETIES

Basic Policies

Agronomists and horticulturists have standardized thei5 methods for releasing new varieties to the extent that there is very little variation in their procedures among states. The basic policy followed by public-agency breeders may be found in the document (dated June 26, 1972) entitled "A Statement of Responsibilities and Policies Relating to the Development, Release and Multiplication of Publicly Developed Varieties of Seed Propagated Crops" (ESCOP, 1972). It was jointly prepared by the Experiment Station Committee on Organization and Policy (ESCOP) and the Agricultural Research Service and the Soil Conservation Service, agencies of the USDA. The policy is restricted to seed studies of field and horticultural crops and does not include material that is propagated vegetatively. The policy statement covers such topics as breeding to develop superior varieties, testing and evaluating experimental varieties, release and registration, maintenance and increase of seed stocks, and publicity policy on new releases.

Release Procedures

Each State Agricultural Experiment Station has a crop variety and release committee that recommends the release of new varieties. The Experiment Station Director then approves the release. If other cooperating agencies are involved such as the ARS and/or the SCS, the release is made jointly. The local committees generally include representatives of the seed industry, various state organizations, the Extension Service and the Agricultural Experiment Station.

SUMMARY

The foregoing is an attempt to summarize the steps involved in certifying, registering, and releasing genetically improved tree and shrub reproductive material. The legal and administrative machinery to do so is not available in all states. To date, 15 states have certification programs for tree and shrub reproductive materials. Of those states having programs, not all are fully compatible with the OECD scheme. People such as ourselves who have an interest, and a stake in seed certification, need to exert our collective influence and efforts to see that uniform certification programs are adopted in all 50 states.

We also need to encourage registration authorities to expand their coverage to include all of our important tree and shrub species. Registration groups for our conifer species *(Pinus, Abies, Picea)* are specifically needed. Schoenike (1973) proposed that the Society of American Foresters' Working Group on Tree Genetics and Improvement establish a registration committee for improved forest tree varieties. I endorse that suggestion and I hope others will too. Since nothing has happened along these lines since 1973, I think it is time we started to actively pursue the establishment of such a committee.

Finally, we need to become more familiar with the agronomists' and horticulturists' techniques for releasing and publicizing new improved varieties. Such publicity will have a two-fold effect, for as the public becomes more aware of the value of genetically improved trees and shrubs, they will not only use such improved material to a greater extent, but will also demand genetic improvement in other species and varieties. Such demands will help keep people in our professions working for a long time.

APPENDIX I

SPECIMEN
CERTIFICATE OF PROVENANCE (+)
CERTIFICATE OF CLONAL IDENTITY (+)

Issued in accordance with the OECD Scheme for Forest Reproductive Material.

(Certificates must contain all the information outlined below, but the exact arrangement of the text is at the discretion of the Designated Authority.)

..... Reference No. .....
(Country)

It is certified that the forest reproductive material described below has been produced in accordance with the OECD Scheme for Forest Reproductive Material:

1. Category of Reproductive material: Source-Identified/Selected/Untested Seed Orchard/Tested (+)

2. Nature of produce: seed/parts of plants/plants (+)

3. Genus, species, sub-species, botanical variety, cultivar (+)

   (a) Common name .....

   (b) Latin name .....

4. Provenance or Region of Provenance: (reference number, short title and altitude from National List)

5. Indigenous/Unknown/Introduced from ..... (+)
(place)

6. Stand/seed orchard/cultivar (reference number and short title from National List) (+) .....

7. Year of ripening of seed .....

8. Length of time in nursery as seedlings or transplants (+) .....

9. Quantity .....

(+) Delete the words that do not apply. Item 6 refers only to tested reproductive material.

10. Number and nature of packages .....

11. Optional information: (reference numbers of stands from which selected seed has been collected)

.....

.....

(Stamp of Designated Authority)

..... 19....
(Place and date)

.....
(Signature)

.....
(Rank)

BIBLIOGRAPHY

Association of Official Seed Certifying Agencies. 1971.
AOSCA Certification Handbook. Publication No. 233, 170 pp. Washington, D.C.

Barner, H. and R. Koster. 1976.
IUFRO WORKING PARTY S 2-10-2 Terminology and Definitions to be used in Certification Schemes for Forest Reproductive Materials.

Experiment Station Committee on Organization and Policy. 1972.
A statement of responsibilities and policies relating to development, release, and multiplication of publicly developed varieties of seed-propagated crops. Experiment Station Section of the Association of State Universities and Land Grant Colleges, and the Agricultural Research and Soil Conservation Service of U.S.D.A. Mimeo, 10 pp.

International Bureau for Plant Taxonomy and Nomenclature. 1969.
International Code of Nomenclature of Cultivated Plants, 4th ed., Utrecht, Netherlands.

Organization for Economic Cooperation and Development. 1974.
O.E.C.D. Scheme for the Control of Forest Reproductive Material Moving in International Trade. Paris, 24 pp. (Mimeo).

Schoenike, R. E. 1973.
Registration and Release of Improved Forest Tree Materials. IN: Proc. 12th So. For. Tree Imp. Conf., Baton Rouge, LA, June 1973.

U.S. Government. 1956.
Plant Patent Act of 1930, amended 1954. Public Law 83-775 (1954) Washington, D.C.

U.S. Government. 1970.
Plant Variety Protection Act. Public Law 91-577 (1970) Washington, D.C.

U.S. Dept. of Agr. 1973.
Official Journal of the Plant Variety Protection Office. Agricultural Marketing Service. Washington, D.C.