



Tobacco Seed Integrity Task Force

Final Report - May 2005

Introduction:

The Tobacco Seed Integrity Task Force was initiated in 2002 to address the needs of CORESTA members for information on the policies, procedures, and terminology used in assuring a consistent and verifiable supply of tobacco seed. In this report, integrity of tobacco seed was assumed to cover issues related to variety approval and registration processes, seed certification, and intellectual property. Each of these topics coincide with other CORESTA initiatives, such as promoting Good Agricultural Practices, and with the trend towards identity preservation that is evident throughout many agricultural commodities including tobacco. It is also hoped that this report will enhance CORESTA members' awareness of seed integrity and its importance to our industry. With that preface, the objectives of the Task Force were:

- 1) Provide clear and concise definitions of selected terms and expressions commonly used and miss-used throughout the seed industry.
- 2) Detail and summarize information on tobacco variety approval processes and seed certification programs by:
 - a. Describing programs in selected countries to include Brazil, Canada, China, France, Greece, India, Italy, Spain, U.S.A., and Zimbabwe.
 - b. Summarizing the common elements of these programs.
 - c. Identifying internet sites that could be linked through the CORESTA website.
- 3) Provide information on existing systems for the intellectual property protection of plant varieties.
- 4) Describe seed testing standards that are used to produce data for the labeling of tobacco seed packages.

We acknowledge that this report provides information that was gathered from public sources and is intended for the use of CORESTA members. It has no official or legal standing, and readers are encouraged to seek other information sources to gain a more in-depth understanding of laws, regulations, and policies that may affect seed importation, production, certification, registration, ownership, labeling, intellectual property, and other related issues.

Section I. Abbreviated Glossary of Terms

This section provides brief descriptions of some of the important terms used by breeders, in the seed industry, and its regulators.

AOSCA – The Association of Seed Certification Agencies (*aosca.org*) comprises member agencies from a number of countries, although most members are from the U.S.A. One typical advantage of membership is that seed certification done by one agency is often recognized by member agencies in other regions or countries.

Certifying Agency – An agency authorized under the law to certify seed and which has procedures and standards approved by a regulatory body to assure the genetic purity and identity of the seed that is certified.

Genetic Purity – The maintenance of genetic purity in seed is the primary objective of seed certification. It means that the all seed contained in a seed lot is homogeneous and contains no seed of another variety or type. The level of genetic purity may often decrease from one generation to the next if appropriate measures are not taken to prevent cross-pollination and seed mixtures.

Hybrid – A hybrid is created from the hybridization or crossing of two purelines. These F₁ generation hybrids are also highly uniform. Other generations, including three-way hybrids, double-cross hybrids and F₂ generation hybrids will typically segregate or be non-uniform for one or more characteristics. Many certification agencies do not permit the certification of varieties or later generation hybrids that are segregating or non-uniform.

ISTA – The International Seed Trade Association (*seedtest.org*) consists of member companies and governmental organizations to address standard procedures for seed sampling and testing. This aids the international commerce of seed used for planting purposes.

OECD – The Organization for Economic Cooperation and Development (*oecd.org*) groups 30 companies under an umbrella of shared interests. It has an international product standards division that maintains a list of varieties eligible for seed certification. However, *Nicotiana tabacum L.* is not among the many plant species for which variety lists are maintained.

Off-type – An off-type tobacco plant is one whose appearance differs notably from the other plants in a field. Its presence in a field produced from a certified seed lot may be due to a mutation, a seed mixture, or outcrossing that occurred during seed production. Under most certification standards a low frequency of off-type plants is allowed if that frequency is described as a normal characteristic of the variety.

PVP – Plant Variety Protection is one mechanism whereby the inventors or breeders may secure a level of intellectual property rights to a variety.

Seed Certification – A process by which an authorized certifying agency ensures the genetic purity and identity of a variety.

Seed Classes – The regeneration of seed is often divided into several stages to retain and track genetic purity and to provide a step-by-step process to increase the amount of seed available to seed producers and growers. In tobacco the following seed classes are most commonly used. They are listed in order of relative decreasing genetic purity.

Breeder Seed – Seed produced by the breeder, company, or agency responsible for developing the variety. Breeder seed is used to produce Foundation Seed.

Foundation Seed – Seed produced from Breeder Seed usually under the direct control of the breeder or the agency responsible for maintaining the variety. Foundation Seed is used to produce certified seed either directly, which is most common in tobacco, or indirectly through Registered Seed.

Registered Seed – Seed produced from Foundation Seed and is used to produce Certified Seed. The Registered Seed class is often used in those crops, such as wheat or soybeans, in which a large volume of certified seed is needed. While seldom used in tobacco, Registered Seed remains a recognized class that may be used to generate certified tobacco seed.

Certified Seed – Certified Seed is seed of a known variety that is produced under strict standards to maintain varietal purity. Certified Seed is used for commercial production, and it is produced from Foundation Seed under the regulation of a legally constituted agency. All certified seed must pass field inspection standards, be processed by an approved seed conditioning plant, sampled appropriately, and pass laboratory tests before it can be sold as certified seed.

Seed Label – In many countries, laws require that a label be affixed to the seed container. The label may or must specify variety name, type of seed, germination percentage, date of germination testing, pure seed percentage, weed seed percentage, inert or foreign matter and seed of other types. The accuracy of the information provided on the label may be subject to regulatory scrutiny and compliance with appropriate seed laws.

Seed Lot – A seed lot is designated by a code number assigned by the seed producer, conditioner, or seller, and it represents a quantity of seed of one variety or hybrid that was maintained as a single unit. The quantity of seed in one lot may vary from a few grams to several hundred kilograms. A seed lot may represent seed produced at one location in one year. However, based upon subsequent cleaning and processing, this original seed lot could be subdivided into additional seed lots at the discretion of the seed producer. A file sample of each seed lot is often maintained by the seed producer for a designated period after sale or distribution of seed from that lot.

TRIPS – Trade-related aspects of Intellectual Property Rights (*wto.org*) was established in 1995 as the TRIPS Council under WTO. It covers a multitude of IPR issues including but not limited to the protection of new varieties of plants.

UPOV – The International Union for the Protection of New Varieties of Plants (*upov.int*) is headquartered in Geneva, Switzerland. It was originally adopted by Convention in Paris in 1961 and was revised in 1972, 1978, and 1991. The objective is to provide mutually agreed upon means for the protection of intellectual property rights of plant varieties. The member countries of UPOV as of 2/10/03 are Argentina, Australia, Austria, Belarus, Belgium, Bolivia, Brazil, Bulgaria, Canada, Chile, China, Colombia, Croatia, Czech Republic, Denmark, Ecuador, Estonia, Finland, France, Germany, Hungary, Ireland, Israel, Italy, Japan, Kenya, Kyrgyzstan, Latvia, Lithuania, Mexico, Netherlands, New Zealand, Nicaragua, Norway, Panama, Paraguay, Poland, Portugal, Republic of Korea, Republic of Moldova, Romania, Russian Federation, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Trinidad and Tobago, Tunisia, Ukraine, United Kingdom, United States of America and Uruguay.

Utility Patent – The intellectual property protection of a plant variety or germplasm that is available to inventors and breeders in some countries. It provides a somewhat different type of protection than PVP.

Variety - In tobacco, the term variety most often refers to purelines that are maintained or reproduced through self-pollination. When done repeatedly over several generations, self-pollination in tobacco results in a variety that is genetically uniform or pure, hence the term “pureline”. Of course, this process requires that proper field practices and breeding procedures

are followed to prevent cross-pollination. In a generic sense, many people make no distinction between the terms variety and hybrid, however, breeders readily acknowledge the difference that is based upon the fact that a pureline is homozygous while a hybrid is heterozygous. Both are homogeneous, i.e. each plant within a hybrid or variety is identical genetically.

UPOV Convention (Article 1(vi)) defines variety as : "a plant grouping within a single botanical taxon of the lowest known rank, which grouping, irrespective of whether the conditions for the grant of a breeder's right are fully met, can be defined by the expression of the characteristics resulting from a given genotype or combination of genotypes, distinguished from any other plant grouping by the expression of at least one of the said characteristics and considered as a unit with regard to its suitability for being propagated unchanged;" This full definition clarifies that a variety must be recognizable by its characteristics, recognizably different from any other variety and remain unchanged through the process of propagation. If a plant variety grouping does not meet these criteria, it is not considered to be a variety within the UPOV system. However, the definition also makes clear that this is irrespective of whether the conditions for the grant of a breeder's right are fully met and this is not, as such, a condition for determining if a variety is eligible for protection.

Variety Registration – The official listing of a variety in a country is called registration. More information about variety registration is provided below.

Section II. What is Variety Approval or Registration?

Variety approval, variety registration, and seed certification can often be confused, and unfortunately, these terms are often used interchangeably when they have completely different meanings. In the following sections, a more detailed explanation of each of these terms or processes is provided than that found in the Section I. All of these processes have been established to ensure genetic purity and to give tobacco producers and their customers the assurance that the seed they are using contains the desired genetics.

Variety Approval

Variety approval practices are generally employed worldwide to ensure that tobacco growers use varieties that have been evaluated for performance and quality criteria. An approved variety may be 1) a variety that has successfully undergone an evaluation process, or 2) it may be a variety that is listed by a government or agency as approved for use in a particular state, province or country. In some countries no evaluation or approval is required, or approval is required only if the seed is actually offered for sale. In others, only seed of an approved variety may be produced or imported. A list of approved varieties may be maintained in a registry, hence variety registration and variety approval may be synonymous in certain countries.

The mechanism of variety approval, as well as the place it takes in the overall process for releasing a new variety, depends on the country. In most cases it is necessary to compare the test variety with standard varieties already used in the country. This is often accomplished using appropriate field testing methods to assess leaf yield, pest resistance, maturity, ripening rates, ease of curing, and leaf quality. Cured leaf may also be analyzed for certain constituents, including nicotine, secondary amine alkaloids, and reducing sugars. Smoke panel evaluations may also be performed to determine the new variety's performance in comparison to existing or standard varieties. This variety approval process may be a private or public activity depending on the organizational structure of the industry in that particular country. Some countries allow reciprocal approvals, wherein, an approval provided in one country means the variety is also accepted in another country.

Membership in certain international organizations may mean that a country must follow that organization's guidelines or regulations regarding certain aspects of seed, including variety approval. Given the apparent breadth and disparity in seed laws and regulations among countries,

this Task Force chose not to attempt a compilation of data from all tobacco producing countries. Rather, we opted for a limited survey that could typify what our member organizations could encounter when trying to track or verify tobacco seed integrity. The results of this survey comprise Section III of this report.

Variety Registration

Variety registration is most commonly regarded as the official recording of the name of the variety in a list kept by a regulatory or governmental agency. This list may serve as the official record of those varieties eligible for sale, importation, or production in that country. It may also include a complete description of the variety in terms of morphological criteria and selected agronomic traits. A list of descriptors for tobacco has been developed under the auspices of UPOV and is available for use by breeders or others as needed to register a variety. Results of our survey indicate some of the countries in which variety registration is required. It should be noted that many countries do not maintain a registry for tobacco varieties, but they may require that a variety is eligible for certification. This is common in the United States where individual states have their own certification eligibility process in the absence of a list kept at the national government level.

Seed Certification

Seed certification is simply a process to ensure the genetic purity of seed that is produced for sale to growers. It is a multi-step procedure: the first of which is to verify the integrity and uniformity of the foundation seed used to grow the plants from which certified seed is to be harvested. Indeed, some certification practices even require adherence to established procedures for the production of Foundation Seed. The remaining steps in seed certification include measuring compliance with required isolation distances between purelines in the field, counting and removing “off-type” plants (those individual plants that have identifiable phenotypic traits that are inconsistent with the variety’s description), establishing the phenotypic similarity of the seed plants with the description of that variety, monitoring compliance with appropriate seed harvest, cleaning and processing practices, and checking the existence of an adequate inventory control system that tracks seed lots, packaging, and labeling. A guarantee of seed certification is evidenced by the inclusion of an official certification tag on each seed package. In this manner purchasers can easily identify whether the seed was produced in a manner consistent with certification standards. It should be noted that seed certification does not normally address issues related to seed health or seed-borne diseases.

Section III. Survey:

Results of a limited survey (see Appendix I for the questionnaire sent to participants) conducted by Task Force members showed wide variation among countries for those practices related to variety approval and registration. The survey focused on only a few key areas so as to provide general information to CORESTA. A more detailed survey would largely have provided a more confusing view as disparities in laws and regulations make summarizing information difficult, plus it may be quickly out-of-date as any country may change regulations and requirements at any moment. Interested parties are encouraged to seek more thorough guidance and up-to-date information about seed and importation laws or regulations in specific countries as needed.

We received completed questionnaires addressing variety approval and registration for 13 countries. Eight of the 13 countries require official approval of a variety at the national level before it can be grown commercially (Table 1). In seven countries the requirement for variety approval applies to all tobacco types, but in Zimbabwe it applies only to burley and flue-cured tobacco varieties.

Table 1. National variety approval and registration requirements in the 13 surveyed countries.

Country	Approval Required	Registration Required
Argentina	Yes	Yes
Brazil	No	Yes
France	No	No
Greece	Yes	Yes
Indonesia	Yes	Yes
Italy	No	No
Japan	No	No
Kazakhstan	Yes	Yes
Malaysia	Yes	Yes
Poland	Yes	Yes
Turkey	Yes	No
USA	No ^a	No
Zimbabwe	Yes	Yes

^aApproval requirement varies by state.

In the 8 countries that require approval, a federal agency or research institute is typically responsible for reviewing and approving variety applications (Table 2). In most cases, data from agronomic performance trials conducted within a country are a required part of the application (Table 3). Indeed, most countries also require data from leaf constituent analyses, smoke panel evaluations, and disease tests. Poland is the only surveyed country that requires variety approval and registration and does not require additional testing. Instead, the applicant is required to submit data as part of the request for variety approval and registration.

Table 2. List of agencies authorized to approve new tobacco varieties in certain countries.

Country	Authorized Approval Agency
Argentina	Secretaria de Agricultura Ganaderia Pesca y Alimentacion
Greece	National Foundation of Agronomic Research (ETHIAGE)
Indonesia	Indonesia Tobacco & Fibrous Plant Research Institute (BALITTAS)
Kazakhstan	Agricultural Variety Tests, State Commission of Ministry of Agriculture
Malaysia	National Tobacco Board, Malaysia Agriculture Research and Development Institute & Agriculture Department
Poland	Research Center for Cultivar Testing, COBORU
Turkey	Agriculture Ministry's Certification Board
Zimbabwe	New Variety Release Committee

Table 3. Data required for variety approval or registration applications in seven surveyed countries.

	Argentina	Greece	Indonesia	Kazakhstan	Malaysia	Poland	Turkey	Zimbabwe
Date requirement								
Field performance tests	No	Yes	Yes	Yes	Yes	No	Yes	Yes
Years of testing	na	3	2	3	2	na	3	4
Leaf quality	No	Yes	Yes	Yes	Yes	No	Yes	Yes
Leaf constituents	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Smoke panel tests	No	Yes	No	No	Yes	No	Yes	Yes
Disease testing	Yes	Yes	Yes	Yes	Yes	No	Yes	No
Variety descriptors	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes

In **Argentina** a tobacco variety must be on the list of registered varieties before seed can be produced, sold, or distributed. This list is only for Argentina and there is no cross-registration with other countries. Photographs of the variety and pedigree information must be part of the registration application along with a statement on whether the variety is genetically modified. Information on the variety's disease resistance and chemical constituents may be supplied by the applicant.

Greece also maintains its own list of registered varieties and requires registration before seed production, sale, or distribution. The Tobacco Institute of Greece performs the field tests and gathers all data on the variety under the supervision of ETHIAGE.

In **Indonesia** the seed importer must supply the information required for approval and registration before seed can be sold or distributed. However, the Indonesia Tobacco and Fibrous Plant Research Institute may perform field tests.

The Agriculture Variety Tests, State Commission of the Ministry of Agriculture in **Kazakhstan** may perform field tests of tobacco, but it also accepts information from the requester upon mutual agreement. Smoke panel evaluations are optional in Kazakhstan.

In **Malaysia** the National Tobacco Board, Malaysia Agriculture Research and Development Institute and Agriculture Department oversees variety approval and registration. Data from three to five crops may be required to gain approval of a variety, but since Malaysia has an environment suitable for tobacco production throughout the year, this may be accomplished in one to two years. The importer has the responsibility to perform these tests. Malaysia also requires a quarantine department analysis of tobacco seed before it is distributed within the country. This analysis is mainly for signs of South American leaf blight that affects rubber trees. Typically, imported varieties must be registered in another country before the National Tobacco Board approves their use in Malaysia.

The Polish Seed Industry Law of Nov. 24, 1995 and other regulations in **Poland** stipulate variety approval and registration requirements. An authorized representative of the breeder meets with COBORU officials to request variety registration and to provide relevant information including descriptors, pedigree, and breeding history.

Officials permit the entry of imported varieties for the purpose of field testing in **Turkey** if information on the variety and test sites are provided to the Tobacco Board and import permission is received from the Ministry of Agriculture. A registered State Agriculture Institute would perform

field trials for at least three years before the variety can be considered for acceptance and registration. Registration is required before certified seed can be sold in Turkey.

The New Variety Release Committee in **Zimbabwe** comprises representatives from the Tobacco Research Board, merchant companies, the appropriate growers' association, Tobacco Industry and Marketing Board, and the New Variety Release Advisory Committee which is a government committee. A prospective new variety must go through 4 years of Cooperative Cultivar Trials (CCT's) before final approval may be granted. The CCT's involve collaborations with growers in a phased or limited production scheme coupled with auction floor assessments, leaf quality evaluations and smoke tests by merchants. Final approval by the New Variety Release Committee is followed by registration with Seed Services, Department of Research & Specialist Services in the Ministry of Lands and Agriculture. One requirement of registration is that plants derived from foundation seed of cultivars, hybrids, and all hybrid parental lines must be screened to eliminate plants that accumulate more than 3% nicotine as a percentage of total alkaloids.

The other five countries for which surveys were completed, Brazil, France, Italy, Japan, and the United States, have either no requirement for approval or have no national system for approval.

Brazil requires registration but has no country-wide approval process. A variety must be registered with the federal Agriculture Ministry to be approved legally for commercialization in Brazil. This ministry bases its acceptance for registration on field performance data and disease resistance. On the other hand, varieties are approved from a quality standpoint by individual companies that produce leaf under contract in Brazil.

France has a voluntary, collaborative approval process involving breeders, ALTADIS-Institut du tabac (<http://www.altadis-bergerac.com/>) and ANITTA (Association Nationale Interprofessionnelle des Techniques du Tabac), an association involving the growers' cooperative, Union des Cooperatives de Producteurs de Tabac (UCAPT), and the French Ministry of Agriculture (see <http://www.france-tabac.com/anitta.htm> for more information). The approval process is initiated by a breeder's proposal, and if accepted, it progresses from a trial network with testing at three to four locations to a small scale release. Smoking tests and sensory evaluation are performed during this process. If justified, UCAPT decides for full release and seed distribution.

Italy has no approval or registration requirement, but it does permit or encourage voluntary registration of a variety to the National Variety Register, Patent and Certification Office. If the seed producer or distributor opts for registration, then agronomic performance data (minimum of 2 years of testing), quality information, constituent analyses, smoke panel evaluations, disease data, and descriptors are required. All of this information must be included with photos of the variety, pedigree and breeding history, legal documents, and the application prior to submission to the National Variety Register.

Japan has no nation-wide variety approval process. However, only one company is allowed to purchase leaf in Japan, and variety development and approval can be considered an in-house operation.

In the **United States** it is more complicated as individual state or quasi-state agencies are empowered to approve new varieties. In Kentucky for instance, a state law requires that only certified tobacco seed can be offered for sale. A variety must therefore become eligible for seed certification before seed is produced and certified. To gain this eligibility, a variety must either: 1) be released by the breeding program at the University of Kentucky; 2) successfully meet requirements of the University of Kentucky Variety Release Committee (includes passing the regional burley variety evaluation committee); 3) have a PVP application or approval; or 4) be approved for certification by another member of AOSCA. In Kentucky, certification is the responsibility of the Kentucky Seed Improvement Association which is a member of AOSCA.

In North Carolina a state law requires that a variety must pass either the burley or flue-cured tobacco regional variety committees before seed of that variety is sold in the state. Members of these committees are from universities (breeders, extension specialists, and test coordinators), seed companies, seed regulatory agencies, manufacturers, leaf dealers, and grower organizations. The committee operates field experiments on university land and on commercial farms. Although agronomic data and disease resistance information may be provided from these tests, it is the minimum leaf quality standards that a variety must meet to gain committee approval. In the first year of tests, these standards include: percent nicotine relative to the mean of the check varieties; ratio of secondary amine alkaloids to total alkaloids; and percent total nitrogen relative to the mean of the check varieties. The flue-cured test also includes total reducing sugars. The second year of testing includes these same measures plus: a visual leaf quality assessment described as “usability” by leaf buyers; and smoke panel evaluations conducted by cigarette manufacturers.

Section IV. Intellectual Property Protection for Tobacco Varieties

Intellectual property rights (IPR) for plants help protect investments made in research and development of new varieties. In turn, this encourages further investment and helps continue the development of new varieties that increases economic returns throughout the tobacco supply chain. Over the past 25 years, an increasing number of governments and international organizations have enacted laws, regulations, or policies that acknowledge the need for IPR. While these provide protection to inventors or breeders, some of them may also recognize a farmer’s exemption for saving seed for their own use.

Internationally, the most prevalent means of protecting plant varieties is through **Plant Variety Protection** (PVP), which is enabled in the 54 countries that are members of the International Union for the Protection of New Varieties of Plants (UPOV, see www.upov.int) which is headquartered in Geneva, Switzerland. Established in 1961 by the International Convention for the Protection of New Plant Varieties, UPOV’s stated mission is “To provide and promote an effective system for plant variety protection, with the aim of encouraging the development of new varieties of plants for the benefit of society”. The current act of the convention was adopted in 1991 and may be found at the website. Key aspects of the Act of 1991 will be described herein, but our summary in no way or form represents a legal opinion. Readers are encouraged to obtain a copy of the most current act of the convention to derive their own interpretation. In addition, readers are encouraged to obtain and review specific individual country requirements.

Key Points of UPOV’s Act of 1991.

The Act of 1991 recognizes breeder’s rights to a variety if the variety is: 1) new; 2) distinct; 3) uniform; and 4) stable. Conditions for the terms used in items 1) to 4) are specified in Articles 6 to 9 of the 1991 Act of the International Convention for the Protection of New Plant Varieties.

The breeder’s rights in the 1991 Act require authorization of the breeder to perform the following:

- 1) production or reproduction (multiplication)
- 2) conditioning for the purpose of propagation,
- 3) offering for sale,
- 4) selling or marketing,
- 5) exporting,
- 6) importing,
- 7) stocking for any purpose mentioned in 1) to 6) above.

Other acts may also require breeder’s authorization including the use of plants or plant parts obtained through the unauthorized uses described in items 1) to 6) above.

Breeder's rights to a variety remain in effect for a period of 20 years from the date on which the rights were granted.

For the first time, the Act of 1991 included protection against "essentially derived" varieties. While this term may be confusing to many, it may be interpreted from the Act of 1991 as extending breeder's rights to any variety that is essentially derived from the protected variety, that is not clearly distinguishable from the protected variety, or which requires repeated use of the protected variety for production purposes.

Examples of the manner in which an essentially derived variety could be developed from a protected variety include:

- 1) the selection of a natural or induced mutant, or of a somaclonal variant,
- 2) the selection of a variant individual from plants of the initial variety,
- 3) backcrossing,
- 4) transformation by genetic engineering

Exceptions to breeder's rights were granted for:

- 1) Acts done privately and for non-commercial purposes,
- 2) Acts done for experimental purposes
- 3) Acts done for the purpose of breeding other varieties, except for the generation of essentially derived varieties.

Patents offer the owner the exclusive right to make, use, sell, offer for sale, or import for those purposes a patented product. It also offers the rights to a patented process and to make, use, sell, offer for sale, or import for those purposes the direct product of the patented process. The ability to patent plant varieties is recognized in some countries, but in many places it is disallowed. To our knowledge there have been few patents granted for tobacco varieties. Court decisions in the United States have permitted the use of utility patents to protect plant varieties, and to date the United States Patent and Trademark Office has issued over 200 utility patents with claims to seeds. European countries that are members of the European Patent Office (EPO) ban the patenting of plant varieties, but recent determinations support patent claims directed to plants of more than one variety. Thus, a utility patent and the ruling by the EPO may suggest a type of broad protection for a novel plant trait that is not recognized under PVP.

Rights granted under patents are also distinguishable from PVP in that exceptions are not allowed for using a patented variety for experiments, breeding purposes, or for private or non-commercial purposes. On the other hand, a patent provides explicit information on the processes and methods used to develop the variety, and it is often tied to a public notification of seed availability once the patent expires. The term of a patent varies across the world, but in the U.S. a utility patent is valid for 20 years after the application date.

Section V. Seed Testing Standards

Tobacco seed quality is an increasingly important component of tobacco production as the industry continues to move to containerized transplant production. In these systems each unit, a cell in a float tray for instance, has an inherent cost whether or not a plant is produced from that unit. Consequently, the ability of each seed to germinate and produce a usable plant is considerably more important than in systems where broadcast type seeding is prevalent.

Seed quality is determined mainly by a seed analysis and through germination tests, and the resulting data may be used for law enforcement (adherence to seed laws), labeling, and as general information needed by producers.

Seed analysis measures composition or purity of the sample. The analysis must be performed on a sample that is representative of the lot from which the sample is derived. Appropriate sampling procedures for seed are available in the Association of Official Seed Analysts (AOSA). Rules for Testing Seeds, and specific procedures for sampling tobacco seed will be presented by the CORESTA Task Force on Sampling. Items determined in purity may include pure seed, seed of other kinds, inert matter, and coating material. Percentages of each item in the sample must be expressed to the nearest 0.01%. In certain countries, information generated from the seed analysis must be included on the seed label, but in other countries only germination data may be required.

Percent germination is defined as: (germinated seeds/total number seeds) x 100 under laboratory conditions. The germination rate that a producer or transplant grower might observe under their own conditions would be expected to vary from that reported for a laboratory test. Tobacco seed is considered to have germinated when the cotyledons are easily visible. Germination counts are usually conducted twice, the first time between seven and 10 days after seed and a second time approximately a week after the first counting. The germination report is valid for a period specified by the country in which the seed is imported or sold. In the U.S.A. a germination test must be conducted within six months of the time it is offered for sale. Requirements in other countries may vary considerably.

The standard laboratory conditions under which germination tests are conducted are critical to the performance of the seed. The International Seed Testing Association (ISTA) has developed standard test conditions for many crops including tobacco. Another organization, AOSA, proscribes testing and analysis standards for member organizations that are located mainly in the U.S.A. and Canada. A comparison between these two common sets of standards is shown in Table 4. There is little difference between the ISTA and AOSA standards except that an additional count is made under the ISTA standard. We reference these test conditions to simply inform readers about the standards. Seed companies may have their own germination or stress tests that have been designed to provide additional information about seed quality.

It must be noted that the germination test results listed on a seed label are from laboratory tests and that seed germination under production conditions may vary considerably.

Table 4. Comparison of ISTA and AOSA standards for tobacco seed germination testing.

Standard	Substrate	Temperature (°C) Day/Night	1 st Count (Days)	2 nd Count (Days)	3 rd Count (Days)	Light (Hrs) Day/Night
ISTA	Paper	30/20	7	10	14	8/16
AOSA	Paper	30/20	7	14	none	8/16

Seed health or phytosanitary issues are of major importance in the international movement of tobacco seed. Each country may impose their own phytosanitary requirements including taking quarantine measures for imported seed. Unfortunately, a complete and up-to-date listing or reference source for these requirements is not readily available. Interested persons will need to obtain phytosanitary requirements from the appropriate agency in the destination country.

Phytosanitary requirements are typically employed to prevent the spread of pathogens, insects and weeds, particularly those pests that are not native to the destination country. Insects and weed seed are easily eliminated from tobacco seed and do not usually cause problems. Plant pathogens present on or in tobacco seed may be more of a problem for seed exporters or importers. Many countries impose biological assays for bacteria, fungi, and viruses, but the relevance of these assays is unknown. General screens, such as for the presence of *Pythium* or *Rhizoctonia* species, are often not specific for pathogenic types or strains and may simply detect common, non-pathogenic types that are ubiquitous. Similarly, most enzyme-linked, immuno-absorbent assays (ELISA) detect viral

coat proteins and not the active forms of the virus. In this case additional pathogen screens would be needed to identify a virus as pathogenic.

Despite the limitations inherent to testing seed for pathogens, phytosanitary requirements remain an important tool in limiting the spread of plant diseases and other pests. To meet these requirements exporters may use seed treatments to eliminate problem pests especially plant pathogens. Indeed, some countries require that seed be treated with specific chemicals before the seed may be imported. The effectiveness of these chemical treatments may vary and their impact on seed quality can be negative. Therefore, it is important to thoroughly evaluate any seed treatment before it is implemented widely.

Appendix I

CORESTA Seed Integrity Task Force

Questionnaire

Variety Release and Registration Practices in Selected Countries

Country (provide country name):

I. Variety Approval Practices

- A. Does a tobacco variety need to be officially approved in this country before it can be grown commercially?

Yes or No (circle one)

Is this true for all tobacco types? **Yes or No** (circle one)

Explain if you answered **No** to this question.

- B. If variety approval is required, what government agency or other authority provides this approval?
-

- C. To determine what may be required to achieve variety approval, please answer the following by circling or writing your response.

Are field performance data (yield tests) required?	Yes	No
If yes, how many years of field test data are required?	_____	
Is a leaf quality evaluation required?	Yes	No
Are any leaf chemical constituents determined?	Yes	No
Are smoke panel evaluations performed?	Yes	No
Is any disease testing required?	Yes	No
Is variety descriptor information required?	Yes	No
Who is responsible for providing all of this information?		

- D. If there is no formal variety approval required, please describe the process whereby new tobacco varieties can be introduced to the growers in this country.

II. Variety Registration

A. Must a tobacco variety be listed on this country's list of registered varieties before seed can be sold or distributed?

Yes or No

B. What agency or authority maintains the List of Registered Varieties?

C. Is this a list in common with any other countries or inter-country organization, such as the EU?

Yes or No

D. Does a tobacco variety have to be on the registered list before certified seed can be produced in this country?

Yes or No

E. Is variety descriptor information a part of the registration process?

Yes or No

F. What other information is required for variety registration?