

I. THE NEED AND PURPOSE FOR SEED CERTIFICATION

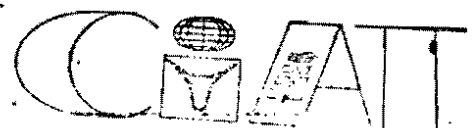
Little need exists for a seed certification system in traditional agriculture or in crops where improved varieties do not exist. In this situation the farmer uses a traditional variety or unidentified kind of seed and seldom changes. He saves his own seed or may occasionally purchase seed from a neighbor.

In a modernizing agriculture the research programs start identifying new and superior varieties or hybrids. If the result of this experimentation is to be used by farmers, seed must be multiplied in such a way to assure that the identity of this new scientific development is not lost. Experiences in the USA in the early 1900's indicated the kind of problem and frustration that could result without a system of seed increase. As was pointed out in a brief History - International Crop Improvement Association Incorporated ⁽¹⁾ " Probably the most serious problem faced by the agronomic research worker in the arly 1900's was his inability to find supplies of relatively pure seed of the new variety which had been produced, tested and released by the experiment station. Plant breeders and others working with crop varieties around the turn of the century found to their dismay that a new variety could become so completely contaminated in three or four years after its release that its identity and value were essentially lost to the seed buying public . "

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Considerable reaming of varieties has occurred in the past after the release of a variety . This results in confusion. Scientists and public research institutions involved in developing new varieties and hybrids must have as their primary objective the use of these improvements by the farmer. However, it is also beyond the scope of these institutions to undertake a large scale multiplication of seed. The lack of staff and facilities both limit their opportunities in this regard because of their need to concentrate on research oriented activities. It is better for them not to have the additional responsibility of seed increase. Nevertheless, because of the researcher's interest in being sure that the fruits of this labor actually reach the farmer, he must assist in evolving a method for systematically increasing the material produced. Traditionally, plant breeders and agronomists in both North America and Europe recognized this need and were often the leaders in developing systems for seed multiplication. These systems have evolved into what is commonly called Seed Certification.

Seed Certification thus has become the link between the researcher who is interested in having his variety used and the farmer who is interested in obtaining good seed of specific varieties properly identified.

Objectives To Be Accomplished

A system of Seed Certification can accomplish three primary objectives .

- 1) It provides for a systematic initial increase of improved varieties and hybrids.
- 2) It provides for the identification of new varieties and their rapid spread under an appropriate and accepted name.

3) It provides for a steady supply of genetically pure seed of comparable varieties and hybrids through the continued increase and maintenance of them.

A more formal definition used to indicate the purposes of Seed Certification is as follows : The purpose of Seed Certification should be to maintain and make available to the public high quality seeds and propagating material of improved crop plant varieties in such a way that they may be grown and distributed to insure their genetic identity and genetic purity . The 1961 USDA Yearbook of Agriculture Seeds ⁽²⁾ further clarifies the nature of Seed Certification by " Seed Certification is the system used to keep pedigree records for crop varieties and to make available sources of genetically pure seed and propagating materials for general distribution " .

II. COMPONENTS OF A SEED CERTIFICATION PROGRAM

The components of a seed certification program include :

- 1) Improved varieties
- 2) Standards of quality
- 3) Systematic seed multiplications
- 4) Timely inspections
- 5) Sampling and quality testing
- 6) Labeling of seed as " certified "
- 7) Education and information

Recognizing that Seed Certification is designed to provide a method of increasing and distributing new and improved varieties, it must of necessity be based upon research programs that are screening varieties and identifying those worthy of further increase. This normally results in a method of recognizing or identifying varieties through some kind of a "release" or listing of those eligible for seed certification.

Since certain criteria must be met by seed which is increased through the system, standards need to be established by the concerned authority against which the seed will be checked.

The production of certified seed requires a series of multiplication steps

(generations) starting with the production of breeder seed. These generations have been given different names in various countries. For purposes of this paper, the terms breeder seed, basic seed and certified seed will be used. The term registered seed, is used in North America and refers to a type of seed which is intermediate between basic and certified seed. However, this term is not used in Europe. Perhaps, it would be much easier to have different types of certified seed such as certified 1, certified 2, etc. The three primary classes can be defined as follows :

Breeder Seed : This seed is produced under the supervision of the plant breeder or originator of the variety, is controlled by that person or institution and is the source of the initial or recurring increases of Basic Seed.

Basic Seed : This seed results from the multiplication of breeder seed. It is multiplied in a way which preserves its genetic identity and purity and is used to produce Certified Seed (or registered seed if that class of seed is used) .

Certified Seed : This is the progeny of BasicSeed, Registered Seed or CertifiedSeed and is produced in a way which preserves its genetic identity and purity and may be used to produce other Certified Seed or a commercial crop.

To assure that the production steps are done in a way to achieve the prescribed standards of quality, a series of timely inspections are necessary (both in the field and laboratory) . Ultimately, labels are issued to indicate that the seed has met the prescribed standards Educational activities are often a part of these programs .

Some programs of Seed Certification include trueness of variety testing of some of all seed lots to provide a further check for genetic purity on the total system. These are commonly called pre-control or post-control tests, and are used most extensively in the European systems of Seed Certification.

In summary, the operational steps normally included in the Seed Certification process contain the following :

- 1) Verification of the source of seed used to assure that it is eligible for increase in the system.
- 2) Inspections of the growing crop in the field primarily to verify the authenticity of the variety.
- 3) Inspections and sampling of seed in the processing plant.
- 4) Subsequent seed quality tests in an approved laboratory.
- 5) Authorization of the use of a label on the seed to properly identify it as Certified Seed and to assure that its identity is maintained.

III. ESTABLISHING SEED CERTIFICATION

A meaningful Seed Certification program will not develop automatically. It requires careful planning and the development of the specific components. The Ministry of Agriculture, a research institution, and/or a special seed development authority would normally assure that each segment develops in a way that a comprehensive Seed Certification program can be set in motion. In considering how to establish seed certification special attention should be given to : 1) responsibilities of the crop research program, 2) developing an authority to certify seeds and 3) the responsibility of the seed certifying authority

Responsibilities of Crop Research Program

The strength of a seed certification program rests upon the effectiveness of the crop research programs in developing improved varieties. However, the responsibility of the crop research program goes beyond this. It also must help demonstrate the value of the improved variety, multiply and maintain breeders seed supplies, provide good variety description. In addition it can help train selected personnel and assist in initiating seed enterprises. A closer examination of each of these responsibilities is desirable.

If new, improved varieties are developed through the breeding and testing activities, the seed certification program has significant value and useful work to do. Deciding which varieties or hybrids to certify is a first step. Many

programs use a special " variety review and release committee " for this purpose. Such a committee may function on a national level, at a state or province level or within research institutions. The group should not be large, but include adequate representation of those organizations and groups that are most concerned with research, extension, and seed multiplication. The committee is usually composed of plant breeders, pathologists, entomologists, agronomists, extension personnel, economists associated with crop research programs, and a person responsible for breeder and for basic seed increases.

The functions of a variety review and release committee would normally include the following :

- 1) Evolve procedures and criteria for the assessment and release of varieties and hybrids submitted to them.
- 2) Be responsible for the release of new varieties.
- 3) Determine the suitability of varieties for the seed certification program unless a " Seed Certifying Authority " has a way to make this decision.
- 4) Remove obsolete varieties and hybrids from a list of those eligible for seed certification.
- 5) Assure that a person or an institution is responsible for the maintenance of stock seed or breeder seed of those varieties and hybrids released .
- 6) Assure that appropriate morphological descriptions are available for use by the Seed Certifying Authority.

The responsibility for supplies of Breeder Seed and often Basic Seed fall on the shoulders of the crop researcher. He may find ways to shift some of this work to a special unit or to an organization for meeting this need; however, the final responsibility still rests on the crop research programs.

If the varieties are better, the crop research program must clearly demonstrate this to seed multipliers and the transfer of technology staff. The crops researchers needs to interpret research results and put them into a clear, concise form for seed multipliers and information people.

Good descriptions of varieties are needed for seed certification purposes and for seed multipliers. The primary responsibility for these descriptions rests with the plant breeder.

The descriptions must then become meaningful through training to seed certification personnel and those involved in maintaining and multiplying the variety. Again, the crop research program has a major responsibility to assure that this job is done well.

Many seed enterprises have been formed by crops research people who saw a need and worked to meet that need. Many seed enterprises are managed by former crop research personnel. After all, they are often the most capable and well-trained people available. To initiate and build a seed enterprise is a challenge as interesting as developing new varieties.

Developing an Agency or Authority to Certify Seed

Identifying or developing a suitable seed certifying agency or authority needs careful consideration. The nature of this authority will vary from country to country depending upon the organizational arrangement for the research program, the organization or organizations responsible for seed multiplication and the interest and availability of leadership. Seed certification authorities may go through a transitional stage before evolving into a final pattern. For example, the National Seed Corporation, a foundation seed organization in India, was initially charged with responsibility for Seed Certification because no other suitable authority was available. Nevertheless, as the program grew, this responsibility shifted to a new authority. Emphasis in that case was placed on maintaining national uniformity of standards and of quality of seed multiplied through the program while at the same time providing for a degree of state level autonomy in actual implementation. Similarly, in the USA many of the early seed certification programs were closely associated with Agricultural Universities. The University staff members actually did some of the inspection work. As programs grew and developed, the responsibility for such inspections was gradually shifted to Crop Improvement Associations that were primarily responsible in many states for actually executing the program.

In order to build a strong Seed Certification program and have a suitable authority for carrying it out, certain objectives need to be achieved :

- 1) A clear separation must exist between those responsible for the production and marketing of seed and the authority charged with seed certification.
- 2) The authority must have adequate flexibility to assure that timely and

thorough inspections are made.

3) The authority should be able to build and maintain a staff of " seed specialists " since seed certification is work that cannot be handled by many unqualified and untrained generalists.

4) The program should be service oriented so that it does win the interest, support, and confidence of seed growers, enterprises, sellers and buyers.

5) The service should be accepted and used voluntarily and not offered as a mandatory regulation.

6) It should assure that achievable standards are developed and uniformly applied and that the program operates so certified seed can move not only within the country but outside with ease.

7) The authority should assure that a reputation is built and maintained for certified seed so it is readily accepted by the public.

8) The program should be built in such a way that it can be accepted internationally.

Meeting all of these objectives may be somewhat difficult. Nevertheless, if the authority responsible for Seed Certification is to fulfill its purpose, these objectives need to be met. In an effort to meet the objectives countries have organized their Seed Certification systems in different ways. One of the most critical questions to be answered is " shall it be within or outside the Ministry of Agriculture ? ". In the Netherlands for example, the Seed Certification work has been entrusted to the Netherlands General Inspection Service commonly known as the " NAK ". It operates

under a Board which co-operates fully with the Government, but it is a self supporting organization and is not subsidized by Government. In the USA the seed certification programs are at the state level and organized under independent Crop Improvement Associations which are often closely linked to agricultural universities. They may have legal authority for seed certification, but are basically separated from Government operations. A few states do have programs organized by the Department of Agriculture. In Canada, the Canadian Seed Growers Association carries special responsibility for a nationwide seed certification. They work closely with the Government's Department of Agriculture but are basically a separate organization. Several European countries operate their seed certification programs through Governmental personnel.

If the seed certification, seed law enforcement and seed testing activities are going to be limited in scope, all of this work could be organized under one official with central authority. For example they could be grouped into a " National Seed Center " that is the focal point for all seed quality and seed developmental activities.

In newly developed programs, it becomes especially important to have the seed certifying authority separate from the Government operations when the Government is directly involved in seed production and distribution. Having the seed certifying authority separate from Government and seed law enforcement, but organized under a managing board, offers an opportunity for clear objectivity and flexibility of operation - both of which are very important in developing a meaningful program . The board could be composed of representatives from Government, from the agricultural colleges or universities and seed growers, seed enterprises, and users. This method of organization

is also desirable when the program has the potential for becoming large.

If a board is used to guide the seed certifying authority it could elect its own officers, adopt by-laws and appoint such sub-committees as may be necessary to give proper attention to specific problems that may arise from time to time.

Responsibilities of the Seed Certifying Authority

A Seed Certifying Authority, regardless of how it is formed, has a broad responsibility to "Certify Seeds". However, to fulfill this responsibility it must establish standards of quality; have a staff capable of evaluating if the growing crop and the seed are equal to or above the standards; cooperate with other agencies, seed growers and seed enterprises; and assure that the certified seed has a good reputation and can be identified by the public.

A few points related to these specific responsibilities follow:

1) Establishing Seed Certification Standards. - Minimum levels acceptable for seed certified need to be developed by the authority designated for executing a Seed Certification program or by a national body which may have special responsibility for the overall development of the seed program. Such "minimum seed certification standards" should be uniform throughout a country and in so far as possible be comparable to standards used in neighboring countries.

A more detailed discussion of the Association of Official Seed Certifying Agencies and the OECD Seed Certification Schemes will be covered later. Nevertheless,

these groups do have minimum standards with special emphasis on genetic purity. The Association of Official Seed Certifying Agencies also has minimum seed quality standards. Since these programs are well established, it is recognized that their standards may not be suitable for a program in the early stages of development. It is very important that seed certification standards be developed in such a way that they are realistic for the conditions of the country concerned. It is unwise to have standards which "look good on paper" but cannot be achieved in practice. On the other hand, seed certification standards do need to be at a level sufficiently high to have the seed accepted as "good seed" by farmers. It is normally better to set minimum seed certification standards at a reasonable and lower level with the intention of adjusting them upward as experience is gained and as the quality of seed increases.

As stated in the FAO technical guideline Control of Production and Distribution of Seeds ⁽³⁾: "These standards should be set at such a level as to maintain proper seed supply and may be subject to amendment under exceptional circumstances". Points of emphasis normally included in standards are given in the following FAO Table ⁽³⁾:

Activity	Standard
Field Inspection	Varietal purity, isolation, seed-borne diseases, weeds.
Pre- and Post- Control Tests	Varietal purity and seed-borne diseases.
Seed Quality Tests in the Laboratory	Varietal purity (as far as possible), analytical purity (including particularly weed and other crop seeds), seed health, germination and moisture content.

In establishing minimum standards it must be recognized that it may not be necessary or desirable to provide for standards for all factors on all crops. For example, if a particular crop does not have any seed-borne diseases that can be detected in the field, it is pointless to include a standard for this factor. Similarly, weeds which are not seed bearing at the time of harvest normally should not be included in standards because they have no effect on the quality of seed produced. In some crops varietal purity cannot be detected in a seed testing laboratory. Therefore, the seed standards need to recognize this limitation. Seed health standards have no value if the facilities available cannot adequately test the seed for pathogens. Where facilities are available, such tests are of most value where a particular disease can be controlled through identifying it in the laboratory. In other words, seed health standards per se without the means for testing, or without specific objectives in mind, serve little purpose.

2) Staff Capable of Evaluating the Growing Crop and Processed Seeds.

Identifying and training a competent staff is a prime responsibility. The work to be done will require people with special competence, skills and dedication. They will need special training. In addition, to make timely field inspections and to visit seed processing facilities regularly, they will require transportation. It is far better to have a small, mobile staff than a large group without the means to move effectively and do their work.

3) Cooperation with other Groups

Since the Seed Certifying Authority must function as a service group, it has value only as it works with others. A clear responsibility exists to identify,

train and guide seed growers, seed enterprises and other seed production and marketing groups cooperating in the program.

Links with the crop research programs and those involved in the transfer of technology are vital. Developing ties to seed certifying groups in neighboring countries, provinces, states and regional and international associations is also important and can contribute to the movement of certified seed from one area to another. A seed certifying authority that cannot work with others is of limited value.

4) Establishing and Maintaining the Reputation for Certified Seed

Certified Seed only has value when it is used. Thus, farmers, and the seed buying public in general must be able to identify Certified Seed and have confidence in it. Information and education activities can help to achieve this objective. However, the basic responsibility rests upon assuring that a good reputation is established and maintained for Certified Seed. This is a shared responsibility between the Seed Certifying Authority and those persons and enterprises cooperating in the program.

IV. INTERNATIONAL SYSTEMS OF SEED CERTIFICATION

Following World War II, a number of countries felt the desirability of providing for a more uniform system of seed certification that would be accepted by a large number of countries. This program was developed through the Organization for Economic Co-operation and Development (OECD). The scheme initially concentrated on herbage seeds and was developed on a voluntary basis. The primary emphasis in the

scheme is genetic purity on seeds moving in international trade. No seed quality standards with regard to germination and physical purity are provided. The scheme does require that varieties be recognized as distinct and with definite planting value. All certified seed produced must be traceable to authentic Basic Seed. Adequate provisions for production and processing must be insured in addition to satisfactory field inspection and post-control tests. (4) (5)

Countries may become members of the OECD program if they have the required personnel and seed certification expertise to adequately assure that the requirements of the program are being met. Obviously, the scheme has primary value in those situations where certified seed is to move from one country to another. If a country is neither importing nor exporting certified seed, it would serve little purpose to be a part of the OECD scheme. The present program has been enlarged to include small grains and vegetables.

In North America, the Association of Official Seed Certifying Agencies (AOSCA) formerly known as the International Crop Improvement Association, provides the common link with all individual seed certifying agencies within the United States and Canada. The AOSCA has developed minimum genetic purity standards. In addition they also operate with minimum germination and physical purity requirements. The Agency has been instrumental in helping the certifying agencies in the United States and Canada achieve as much uniformity as possible. The Agency does not exclude other countries. It may ultimately also serve as a good international forum for achieving uniform standards and procedures in seed certification. AOSCA meets annually, and publishes reports of areas certified and a Certification Handbook in English. (6)

V. CONCLUSION

Planning a seed certification program is not enough. It requires hard work, and the means to adjust to needs. Seed certification is only one part of a seed program - it is not the whole program.

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