



National Training
on
SEED LAW ENFORCEMENT
(September 05-09, 2022)

Training Manual



Organized by:

Government of India
Ministry of Agriculture & Farmers Welfare
Department of Agriculture & Farmers Welfare

National Seed Research and Training Centre
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कृषि एवं किसान कल्याण मंत्रालय
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FOREWORD

Seed is a primary determinant of future plant development and the most vital input in agricultural production. In fact it is the most cost efficient means of increasing agricultural production and productivity. Quality seeds alone in good soil can increase agricultural production significantly.

I am happy that National Seed Research and Training Centre, Varanasi has organized a National Training Programme on “Seed Law Enforcement” during September 05-09, 2022. The objective of this training programme is to update the knowledge of all participants engaged in policy making on the issues related to Seed Law Enforcement & Seed Quality Regulation in their respective areas and to provide a forum to discuss and exchange their experience.

The training course is designed to suit the need of officials from Central/State Government Institutions, Public Sector Undertakings, Private sector and others who are engaged in Seed Law Enforcement & Seed Quality Regulation Programme and to update the knowledge of Seed Inspectors and Seed Quality Managers at field level.

This training manual comprises of all the latest information pertaining to Seed Law Enforcement and Seed Quality Regulation System in the country. I hope this compilation will serve as a useful resource book and guide to all concerned.

(Dr. M. P. Yadav)
Coordinator to Director

Date : 09.09.2022

Place : Varanasi

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NSRTC at a glance.....

National Seed Research and Training Centre (NSRTC), Varanasi established under Govt. of India, Ministry of Agriculture & Farmers Welfare, Department of Agriculture and Farmers Welfare, during October 2005.

The prime objective of establishment NSRTC is to have a separate National Seed Quality Control Laboratory, which is serving as **Central Seed Testing Laboratory (CSTL)** as well as to act as **Referral laboratory** for hon'ble court of the entire country.

Further, this **CSTL** has to coordinate and monitor the functioning of all the **notified State Seed Testing Laboratories** presently available in our country in order to obtain Uniformity in Seed quality Regulation at National level.

More importantly for facilitating International seed Movement, our **CSTL** the member laboratory of International Seed Testing Association (ISTA), ZURICH, Switzerland and expected to become accredited Laboratory very soon and thereafter will be eligible for issuing International seed movement certificates on behalf of Government of India.

NSRTC is the National Centre for Training Human resources for the officials who are all involved in the **Seed Quality Control, Seed Law Enforcement and stake holders of Seed Industry**.

In order to fulfill the mandate, NSRTC organize National trainings, workshops, National seed congress for the benefit of personnel involved in seed development and quality control programme and stakeholders of seed industry for updating their knowledge and skills.

The NSRTC is situated under greater periphery of the Holy city Varanasi, which is located 7 KM away from heart of city towards south - west on Varanasi - Allahabad GT road, Collectry farm, surrounded by Banaras Hindu University (6 km), Indian Institute of Vegetable Research (20kms) and well linked by Air, Train and Road.

PRIME OBJECTIVES:

- To have a separate National Seed Quality Control Laboratory, which is serving as **Central Seed Testing Laboratory (CSTL)**.
- To act as **Referral laboratory** for hon'ble court for the entire country w.e.f 1.4.2007 onwards.
- Member laboratory of **International Seed Testing Association (ISTA)**, Switzerland,
- Center for testing all transgenic crop seeds etc., in future
- **To organize National and International seed related conferences, symposium and trainings** for the benefit of personnel who are involved in seed development and quality control programme and stakeholders of seed industry.
- Centre for training human resource on all seed related aspects.

VISION:

Our vision is to

- Contribute integrated approach towards quality seed availability.
- Have separate National Seed Quality Control Laboratory as **CSTL**.
- Maintain uniformity in seed testing and seed quality control at National level.
- Make Seed Industry in India globally competitive.

MISSION:

Our mission is to lead and engage in downstream programmes on Seed Science and Quality Control to disseminate the values of seed production and availability of quality seed to the need of National and International seed community.

STRATEGY:

NSRTC pursues its Mission and Goals through:

- Integrated approach and system -based programs on seed quality control and act as Referral Lab for the hon'ble Court.
- Strengthening Seed Technological Research in seed production disciplines of major crops.
- Total seed quality management through systemic seed certification and law enforcement process.
- Interaction with stake holders of seed industry, officials of seed certification and law enforcement, seed producers and other seed organizations that share's NSRTC mission.
- Continued efforts in improving / updating knowledge and skill of human resources involved in seed certification and quality control as a training human resource on all seed related aspects
- In order to meet out these vision and missions strategy the NSRTC is housed in a modern building with all latest infrastructural facilities, equipments and machineries, excellent conference/ seminar hall, workshop /class rooms, exclusive ISTA member laboratories, museum, well stocked library.

Staff strength:

The Ministry of Finance sanctioned of 23 posts for National Seed Research and Training Centre, Varanasi for making the centre functional so as to meet out the mandate. The sanctioned staff strength is as follows:

| S.N. | Name of Post | Staff strength |
|-------|--------------------------------------|----------------|
| 1. | Director | 1 |
| 2. | Chief Seed Analyst | 1 |
| 3. | Seed Processing Engineer | 1 |
| 4. | Seed Technologist | 3 |
| 5. | Sr. Seed Analyst | 2 |
| 6. | Administrative/ Accounts Officer | 1 |
| 7. | Jr. Seed Analyst | 5 |
| 8. | Private Secretary | 1 |
| 9. | Stenographer | 2 |
| 10. | Librarian | 1 |
| 11. | Assistant (Administration/ Accounts) | 1 |
| 12. | Caretaker cum Sorekeeper | 1 |
| 13. | Lower Division Clerk | 1 |
| 14. | Laboratory Attendant | 2 |
| Total | | 23 |

NSRTC is especially designed for continuous dissemination of knowledge of seed and thereby improve skill, competency and scientific soundness of individuals engaged in seed development programme. NSRTC regularly organizes training on various aspects of seed for the officials working in Seed Certification Agencies (25 in number), Seed Testing Laboratory

(147 in number), Seed Law Enforcement Agencies, Agricultural Universities and other institutes dealing with seeds. The NSRTC, Central Seed Testing Laboratory acts as a referral lab under clause 4(1) of the Seeds Act, 1966. CSTL, NSRTC is testing more than 20,000 samples per year and performs at par with ISTA (International Seed Testing Association) with regard to seed testing net work in the country.

National Seed Testing Laboratory as Central Seed Testing Laboratory

The testing of seed material will be flowing from different State Seed Corporations as well as Seed Producing Organizations for physical purity, seed health and at later stage genetic purity that is mostly required in referral cases. At present the mandate of Central Seed Testing Laboratory (CSTL) is to receive 5% samples from seed producing organizations all over the country. In addition, CSTL act as a Nodal centre for coordinating the activities of Seed Quality Control programmes on behalf of Government of India in accordance with the Act and Rules with the State Notified Seed Testing Laboratories.

Grow Out Test

NSRTC have been allotted 10 hectares of land out of which the office premises have been constructed in about 2.5 hectares of land and remaining land have been kept reserve for organizing Grow Out Test for which Green House/Poly House and other necessary facilities have been created.

NSRTC is geared to go Global

NSRTC is a globally competitive Institute in Seed Science and Quality control, marching ahead with:

- To promote the availability of quality seed to meet the challenges of Science based Agriculture.
- Making of promising Technologies reach the seed entrepreneurs and other stakeholders through innovative Trainings, Conferences, Workshops & Symposia.
- Establishing uniformity in Seed production & Quality Control programmes at National level.
- Innovative curriculum planning and implementation to make Seed Science & Research more vibrant and responsible to match the vision and needs of present and future.

Dr. M. P. Yadav
Coordinator to Director

Overview of PPV & FR Act, 2001

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Preface-

In order to provide for the establishment of an effective system for the protection of plant varieties, the rights of farmers and plant breeders and to encourage the development of new varieties of plants it has been considered necessary to recognize and to protect the rights of the farmers in respect of their contributions made at any time in conserving, improving and making available plant genetic resources for the development of new plant varieties. The Govt. of India enacted "The Protection of Plant Varieties and Farmers' Rights (PPV&FR) Act, 2001" adopting sui generis system. Indian legislation is not only in conformity with International Union for the Protection of New Varieties of Plants (UPOV), 1978, but also have sufficient provisions to protect the interests of public sector breeding institutions and the farmers. The legislation recognizes the contributions of both commercial plant breeders and farmers in plant breeding activity and also provides to implement TRIPs in a way that supports the specific socio-economic interests of all the stakeholders including private, public sectors and research institutions, as well as resource-constrained farmers.

Aims & Objectives of the PPV & FR Act, 2001

1. To establish an effective system for the protection of plant varieties, the rights of farmers and plant breeders and to encourage the development of new varieties of plants.
2. To recognize and protect the rights of farmers in respect of their contributions made at any time in conserving, improving and making available plant genetic resources for the development of new plant varieties.
3. To accelerate agricultural development in the country, protect plant breeders' rights; stimulate investment for research and development both in public & private sector for the development new of plant varieties.
4. Facilitate the growth of seed industry in the country which will ensure the availability of high quality seeds and planting material to the farmers.

Rights under the Act

1. **Breeders' Rights** : Breeders will have exclusive rights to produce, sell, market, distribute, import or export the protected variety. Breeder can appoint agent/ licensee and may exercise for civil remedy in case of infringement of rights.
2. **Researchers' Rights** : Researcher can use any of the registered variety under the Act for conducting experiment or research. This includes the use of a variety as an initial source of variety for the purpose of developing another variety but repeated use needs prior permission of the registered breeder.
3. **Farmers' Rights**: The Protection of Plant Varieties and Farmers' Rights Act (PPV&FR Act) seeks to address the rights of plant breeders and farmers on an equal footing. It affirms the necessity of recognizing and protecting the rights of farmers with respect to the contribution

they make in conserving, improving and making Plant Genetic Resources (PGR) available for the development of new plant varieties.

The PPV&FR Act recognizes the multiple roles played by farmers in cultivating, conserving, developing and selecting varieties. With regard to developing or selecting varieties, the Act refers to the value added by farmers to wild species or traditional varieties/ landraces through selection and identification for their economic traits. Accordingly, farmers' rights encompass the roles of farmers as users, conservers and breeders. Farmers are granted nine specific rights, which are as under:

Right 1: Access to seed [Section 39(1)(iv)]

Farmers are entitled to save, use, sow, re-sow, exchange, share or sell their farm produce, including seed of protected varieties, in the same manner as they were entitled to before the coming into force to the PPV&FR Act. However, farmers are not entitled to sell branded seed of a variety protected under this Act. Farmers can use farm saved seed from a crop cultivated in their own.

Right 2: Benefit sharing [Section 26]

Plant breeders and legal entities including farmers who provide Plant Genetic Resources (PGR) to breeders for developing new varieties shall receive a fair share of benefit from the commercial gains of the registered varieties. Out of all the national plant variety protection laws enacted since 2001, the PPV&FR Act is the first that integrates a provision for access and benefit-sharing (ABS) along with Plant Breeder's Rights (PBRs). Accession of the genetic resource used in breeding is permitted under the Biological Diversity Act, 2002. However, the PPV&FR Act requires a breeder to make a sworn declaration on the geographical origin of the genetic resources used in the pedigree of the new variety, and its accession.

Right 3: Compensation [Section 39(2)]

Registered seed must be sold with the full disclosure of their agronomic performance under recommended management conditions. When such seed is sold to farmers but fails to provide the expected performance under recommended management conditions, the farmer is eligible to claim compensation from the breeder through the intervention of the PPV&FR Authority.

Right 4: Reasonable seed price [Section 47]

Farmers have the right to access seed of registered varieties at a reasonable and remunerative price. When this condition is not met, the breeder's exclusive right over the variety is suspended under the provision concerning compulsory licensing, and the breeder is obligated to license the seed production, distribution and sales of the variety to a competent legal entity. Most of the laws for plant variety protection have provisions on compulsory licensing of protected varieties to ensure adequate seed supply to farmers, and several of them also use unfair pricing as grounds for compulsory licensing.

Right 5: Farmers' recognition and reward for contributing to conservation [Section 39(i)(iii) & Section 45(2)(C)]

Farmers who have been engaged in PGR conservation and crop improvement, and who have made substantial contributions in providing genetic resources for crop improvement, receive recognition and rewards from the national gene fund. The gene fund receives resources from the implementation of the Act, which in turn are complemented by contribution from national and international organizations. The expenditures of the fund are earmarked to support the conservation and sustainable use of PGR, and in this way it can be considered to be a national equivalent to the global benefit-sharing fund operating within the International Treaty on Plant Genetic Resources for Food and Agriculture.

Since 2007, the Plant Genome Saviour/Community awards, associated with the national gene fund, has been rewarding farming communities and individual farmers for their contribution to *in-situ* and on farm conservation to the selection of PGR. The Authority in consultation with Government of India, has established five Plant Genome Saviour Community Awards of Rs 10 Lakh each along with citation and memento to be conferred every year to the farming communities for their contribution in the conservation of Plant Genetic Resources.

In accordance with the Protection of Plant Varieties and Farmers' Rights (Recognition and Rewards from the Gene Fund) Rules, 2010 the Authority also setup ten Plant Genome Saviour Farmer Reward of Rs 1 Lakh each with citation & memento and also twenty Plant Genome Saviour Farmer Recognition annually from 2012-13 to the farmers engaged in the conservation of the Genetic Resources of the landraces and wild relatives of economics plants and their improvement through selection and preservation.

Right 6: Registration of farmers' varieties [Section 39(1)(iii)]

The PPV&FR Act allows for the registration of existing farmers' varieties that fulfill requirements for distinctness, uniformity, stability and denomination, but does not include that of novelty. This right provides farmers with a one-off opportunity for a limited period of time, from the moment when a crop species is included in the crop portfolio under the PPV&FR Act for registration. Once registered, these varieties are entitled to all PBRs.

Right 7: Prior authorization for the commercialization of essentially derived varieties [Section 28 (6)]

When farmers' varieties, whether extant or new, are used by a third party as source material for the development of an essentially derived variety, the farmers need to provide prior authorization for its commercialization. Such a process can allow farmers to negotiate the terms of authorization with the breeder, which may include royalties, benefit-sharing, etc.

Right 8: Exemption from registration fees for farmers [Section 44]

Under PPV&FR Act, farmers have the privilege of being completely exempted from payment of any kind of fees or other payments that are normally payable for variety registration; tests for distinctness, uniformity and stability (DUS), and other services rendered by the PPV&FR Authority; as well as for legal proceedings related to infringement or other causes in courts, tribunal, etc.

Right 9: Farmer protection from innocent infringement [Section 42]

If a farmer can prove before court that he or she was not aware of the existence of any rights at the time of an infringement on any such rights, as detailed in the PPV&FR Act, he or she will

not be charged. This provision is made in consideration of the centuries-old unrestrained rights that the farmers had over the seed of all varieties, the novel nature of the PPV&FR Act and the poor legal literacy of farmers.

Implementation of the Act

To implement the provisions of the Act the Department of Agriculture, Cooperation and Farmers Welfare, Ministry of Agriculture and Farmers Welfare established the Protection of Plant Varieties and Farmers' Rights Authority on 11th November, 2005. The Chairperson is the Chief Executive of the Authority. Besides the Chairperson, the Authority has 15 members, as notified by the Government of India (GOI). Eight of them are ex-officio members representing various Departments/ Ministries, three from SAUs and the State Governments, one representative each for farmers, tribal organization, seed industry and women organization associated with agricultural activities are nominated by the Central Government. The Registrar General is the ex-officio Member Secretary of the Authority.

General Functions of the Authority

1. Registration of new plant varieties, essentially derived varieties (EDV), extant varieties;
2. Developing DUS (Distinctiveness, Uniformity and Stability) test guidelines for new plant species;
3. Developing characterization and documentation of varieties registered;
4. Compulsory cataloging facilities for all variety of plants;
5. Documentation, indexing and cataloguing of farmers' varieties;
6. Recognizing and rewarding farmers, community of farmers, particularly tribal and rural community engaged in conservation and improvement;
7. Preservation of plant genetic resources of economic plants and their wild relatives;
8. Maintenance of the National Register of Plant Varieties and
9. Maintenance of National Gene Bank.

Registration of varieties

A variety is eligible for registration under the Act if it essentially fulfills the criteria of Distinctiveness, Uniformity and Stability (DUS). The Central Government issues notification in official Gazettes specifying the genera and species for the purpose of registration of varieties. So far, the Central Government has notified 157 crop species for the purpose of registration. To access the list, The PPV&FR Authority has developed "

Fees for registration

| S.No | Types of Variety | Fees for Registration |
|------|--|-----------------------|
| 1 | Extant Variety notified under section 5 of the Seeds Act, 1966 | Rs 2000/- |

| | | |
|----|---|--|
| 2. | New Variety/Essentially Derived Variety (EDV)/ Extant Variety about which there is common knowledge (VCK) | <ul style="list-style-type: none"> • Individual Rs. 7000/- • Educational Rs.10000/- • Commercial Rs.50000/- |
| 3. | Farmers Varieties | No Fee |

Application for registration of plant varieties should be accompanied with the fee of registration prescribed by the Authority. Fee for registration for different types of variety is as under:

The Registration of a variety is renewable subject to payment of annual and renewal fee as notified in the Plant Variety Journal of India of the Authority and Gazette of India dated 15.06.2015.

DUS Test Centers

Authority has notified DUS test Centers for different crops with a mandate for maintaining and multiplication of reference collection, example varieties and generation of database for DUS descriptors as per DUS guidelines of respective crops. To access the list of DUS test Centers.

Certificate of Registration

The certificate of registration issued will be valid for nine years in case of trees and vines and six years in case of other crops. It may be reviewed and renewed for the remaining period on payment of renewal fees subject to the condition that total period of validity shall not exceed eighteen years in case of trees and vines from the date of registration of the variety, fifteen years from the date of notification of variety under the Seeds Act, 1966 and in other cases fifteen years from the date of registration of the variety.

Benefit Sharing

The benefit sharing is one of the most important ingredients of the farmers' rights. Section 26 provides benefits sharing and the claims can be submitted by the citizens of India or firms or non-governmental organization (NGOs) formed or established in India. Depending upon the extent and nature of the use of genetic material of the claimant in the development of the variety along with commercial utility and demand in the market of the variety breeder will deposit the amount in the Gene Fund. The amount deposited will be paid to the claimant from National Gene Fund. The Authority also publishes the contents of the certificate in the PVJI for the purpose of inviting claims for benefits sharing.

Rights of Community

1. It is compensation to village or local communities for their significant contribution in the evolution of variety which has been registered under the Act.
2. Any person/group of persons/governmental or non- governmental organization, on behalf of any village/local community in India, can file in any notified centre, claim for contribution in the evolution of any variety.

Convention countries

Convention country means a country which has acceded to an international convention for the protection of plant varieties to which India has also acceded or a country which has law of protection of plant varieties on the basis of which India has entered into an agreements for granting plant breeders' rights to the citizen of both the countries. Any person if applies for the registration of a variety in India within twelve months after the date on which the application was made in the convention country, such variety shall, if registered under this Act, be registered as of the date on which the application was made in convention country and that date shall be deemed for the purpose of this Act to be the date of registration.

Plant Varieties Protection Appellate Tribunal

There is transitory provision by which it is provided that till the PVPAT is established the Intellectual Property Appellate Board (IPAB) will exercise the jurisdiction of PVPAT. Consequently the Plant Varieties Protection Appellate Tribunal (PVPAT) has been established by appointing Technical Member. All orders or decisions of the Registrar of Authority relating to registration of variety and orders or decisions of the Registrar relating to registration as agent or licensee can be appealed in the Tribunal. Further, all orders or decisions of Authority relating to benefit sharing, revocation of compulsory license and payment of compensation can also be appealed in the Tribunal. The decisions of the PVPAT can be challenged in High Court. The Tribunal shall dispose of the appeal within one year.

Seed Legislation System in India

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Introduction

Seed is the fundamental and important input for a successful agriculture production. Agricultural sector is very much dependent on the timely availability and quality of seeds for a fruitful harvest. Quality seed alone is estimated to contribute 15-20% to total crop production. In India, agriculture is the main occupation, and thus provide rich opportunities for the seed market. India is one of the largest potential seed market in the world. According to a report, the Indian seeds market reached a value of US\$ 3.6 Billion in 2017, exhibiting a CAGR of around 17% during 2010-2017, which is further expected to grow at a CAGR of 14.3% during 2018-2023, reaching a value of more than US\$ 8 Billion by 2023. The Indian seed industry is the fifth largest seed market in the world, accounting for 4.4% of global seed market after the U.S. (27%), China (20%), France (8%) and Brazil (6%). In terms of global trade, India is almost self-sufficient in flower, fruits and vegetables and field crops seeds. Thus, it is essential to increase the production and distribution of quality seeds. Seed quality gets more significance in view of emerging biotic and abiotic stresses, issues related to quality and phytosanitary measures, competition in domestic/international markets and emerging food needs.

It is important to maintain its purity and quality through various stages of seed production i.e. Breeder, foundation, registered and certified seed. Measures of seed legislation with respect to quantity and quality were initiated in the country by establishment of NSC (1963) under Ministry of Agriculture (seed sector was majorly under public sector). Government of India had framed and brought out different legislations to protect the quality of seeds and planting materials - Seeds Act (1966), Seed Rules (1968), Seed (Control) Order (1983), New Policy on Seed Development (1988), Plants, Fruits & Seeds (Regulation of import into India), 1989, The PPV & FR Act (2001), Essential Commodities Act including Seeds (1955), National Seed Policy (2002) and Seed Bill (2004) to take care of seeds right from the production to marking, labeling and marketing levels to maintain the quality standards as prescribed. These laws are framed in order to make available quality seeds to a common farmer and train them to approach authority for justice.

Seed Legislations by Government of India

Seeds Act (1966)

The Seeds Act (1966) has a total of 25 Sections, mentioned as under:

1. Enacted by Parliament for the whole of India to regulate seeds.
2. Definitions and seeds of food crops, oil crops, cotton seeds, seeds of cattle fodder and all types of vegetative propagating material are included (16 Clauses).

Clause 11 says - "seed" means any of the following classes of seeds used for sowing or planting-

- (i) seeds of food crops including edible oil seeds and seeds of fruits and vegetables;
- (ii) cotton seeds;

(iii) seeds of cattle fodder;

and includes seedlings, and tubers, bulbs, rhizomes, roots, cuttings, all types of grafts and their vegetatively propagated material, of food crops or cattle fodder.

Amendment of Section 2 of 1966

The Seeds (Amendment) ACT, 1972 [9th September, 1972]

In section 2 of the Seeds Act, 1966, in clause (11), after sub-clause (iii), the following sub-clause shall be inserted, namely:- (iv) jute seeds.

3. Constitution of a **Central Seed Committee** to advise the Central and State Governments on matters arising out of the administration of this act and carry out other functions assigned to it by the Act.

There are 7 clauses in this section -

Clause 2: The Committee shall consist of the following members, namely:-

- i. A Chairman to be nominated by the Central Government;
- ii. 8 persons to be nominated by the Central Government to represent such interests that Government thinks fit, of whom not less than two persons shall be representatives of growers of seed;
- iii. One person to be nominated by the Government of each of the States.
- iv. Other clauses deals with the formation of sub-committees, their tenure, making bye-laws for fixing the quorum and regulating its own procedure, etc.
- v. Establishing a Central Seed Laboratory as well as State Seed Laboratory to carry out seed analysis of notified variety. [2 clauses - State Govt. may establish or declare State Seed Lab.].
3. Empowerment of the Central Seed Committee to notify any variety found suitable as per the Act after notification in the Official Gazette for different states or different areas.
4. Empowerment of the committee to fix the minimum limits of germination and purity of seed for a variety to be notified as well as for marking or labeling a seed lot to be sold commercially.
5. Regulation of sale of seeds of notified varieties by compulsory labeling, revealing the true identity of the variety, germination as well as purity.
6. Constituting a certification agency for undertaking the process of certification. The State Government or the Central Government in consultation with the State Government may establish a certification agency for the State to carry out the functions entrusted to the certification agency by or under this Act.

The Seeds (Amendment) ACT, 1972 [9th September, 1972]

Insertion of new sections 8A to 8E

After section 8 of the principal Act, the following sections shall be inserted, namely:

The Central Seed Certification Board

8A.(1) The Central Government shall establish a Central Seed Certification Board (hereinafter referred as Board) to advise the Central Government and the State Governments on all matters

relating to certification and to co-ordinate the functioning of the agencies established under section 8.

8A. (2) The Board shall consist of the following members, namely:-

- (i) A Chairman, to be nominated by the Central Government;
- (ii) Four members, to be nominated by the GoI from the persons employed by the State Governments as Directors of Agriculture;
- (iii) Three members, to be nominated by the GoI from the persons employed by the AUs as Directors of Research;
- (iv) 13 persons, to be nominated by the GoI to represent such interests as that Government thinks fit, of whom not less than 4 persons shall be representatives of seed producers or tradesmen.

8A. (3) A member of the Board shall, (unless his seat becomes vacant either by resignation or otherwise,) be entitled to hold office for two years from the date of his nomination:

Provided that a person nominated under clause (ii) or clause (iii) of sub-section (2) shall hold office only for so long as he holds the appointment by virtue of which his nomination was made.

Other Committees

8B. The Board may appoint as many Committees as it deems fit consisting wholly of the members of the Board or wholly of other persons or partly of members of the Board and partly of other persons as it thinks fit to exercise such powers and perform such duties as may be delegated to them, subject to such conditions as it may think fit, by the Board.

8C. No proceeding of the Board or any Committee thereof shall become invalid merely by reason of the existence of any vacancy therein or any defect in the constitution thereof.

Procedure for Board

8D. The Board may, (subject to the previous approval of the Central Government), make bye-laws for the purpose of regulating its own procedure and the procedure of any Committee thereof and the conduct of all business to be transacted by it or such Committee.

Secretary and other officers

8E. The Central Government shall-

- (i) appoint a person to be the Secretary of the Board, and
- (ii) provide the Board with such technical and other staff as the Central Govt. considers necessary."

- 9. Power of certification agency to recommend notification of suitable variety and grant of notification certificate provided the seed meets minimum limits of germination and purity.

Section 9 has 3 sub-sections:

The Seeds (Amendment) ACT, 1972 [9th September, 1972]

Amendment of section 9

In section 9 of the principal Act,-

- (i) in sub-section (3), for the words, brackets, letter and figure "minimum limits of germination and purity specified for that seed under clause (a) of section 6", the words "prescribed standards" shall be substituted;
- (ii) to sub-section (3), the following proviso shall be added, namely:-

"Provided that such standards shall not be lower than the minimum limits of germination and purity specified for that seed under clause (a) of section 6."

- 10. Empowerment to the Certification agency for **revocation of certificate** if the agency is convinced that holder has obtained certificate (under Sec. 9) by misrepresentation or not complied with the conditions.

Opportunity of show cause is given.

- 11. Provision for an appeal by the holder on payment basis to express before an appellate authority. (Sec 11 has 3 sub-sections).

Any person aggrieved by a decision of a certification agency under Sec 9 or Sec 10, may appeal to authority specified by the State Govt. within thirty days from the date on which the decision is communicated to him and on payment of such fees as may be prescribed:

On receipt of an appeal under sub-section (1), the appellate authority shall, after giving the appellant an opportunity of being heard, dispose of the appeal as expeditiously as possible.

Every order of the appellate authority under this section shall be final.

- 12. Appointment of a seed analyst to undertake seed testing.
- 13. Appointment of seed inspector who is deemed to be a public servant within the meaning of section 21 of the Indian Penal Code (45 of 1860).
- 14. Empowerment of seed inspector to draw samples from any seller or a purchaser and verify the quality by sending samples to a seed analyst in the seed testing laboratory. (5 sub-sections & 5 Clauses). Examine records, registers, docs... seize.

Where the Seed Inspector takes any action under clause (a) of sub-section (1), he shall call at least two persons to be present at the time when such action is taken and take their signatures on a memorandum to be prepared in the prescribed form and manner.

The provisions of the Code of Criminal Procedure, 1898 (5 of 1898), shall, apply to any search or seizure under this section as they apply to any search or seizure made under the authority of a warrant issued under section 98 of the said Code.

- 15. Laying-out of procedure for seed sample collection and other rules. The section also entrust inspector with the power to break open any seed container or door of any premises where such seed may be kept for sale, under those circumstances when owner

refuses to cooperate. The whole operation has to be done in presence of two witnesses with their signatures on a memorandum. (5 sub-sections).

16. Responsibility of Seed analyst to report the results in a specified format after analysis of the seed samples to Seed Inspector as well as the seller/ purchaser. Complainant if dissatisfied with the result can apply to the court for sending samples to Central Seed Testing Laboratory. Central seed laboratory shall thereupon send its report to the court in the prescribed format within one month from the date of receipt of the sample. The report sent by the Central Seed Laboratory shall supersede the report given by the Seed Analyst.

17. Restriction on import and export of seeds of notified varieties. Any variety imported or exported should meet the minimum limits of seed germination and purity marked or labeled on the container.

18. The Central Govt., on recommendation of the Committee, Recognize seed certification agencies of foreign countries for the purpose of this act.

19. Penalty or punishment or both for those who do not comply with the provisions of the act and also prevent seed inspectors from executing his power.

First offence with fine which may extend to **five hundred rupees**, and if previously convicted, imprisonment up to 6 months, or fine of Rs.1000/- or both.

17. Forfeiture of property (seeds) belonging to any person convicted under this act, due to contravention (breach) of the procedures under this act.

18. Punishment for offences committed by companies or any corporate. All who was in-charge of, when the time the offence was committed and was responsible to the company shall be deemed to be guilty of the offence and punished accordingly.

19. Protection of Government action taken in good faith, i.e. no prosecution or legal proceeding will lie against Government or any Government Officer for anything that is done in good faith.

20. Power for Central Govt. to give directions to any state govt. for smooth conduct of the act.

21. **Exemption** - Non-application of the act to the seed exchange by the farmers without any brand name.

22. Power of Government to make rules to carry out various functions of Central Seed Committee, Central Seed Laboratory, Certification Agency and Seed Inspectors.

The Seeds (Amendment) ACT, 1972 [9th September, 1972]

Amendment of section 25

In section 25 of the principal Act,-

(a) in sub-section (2), after clause (f), the following clause shall be inserted, namely:-

“(ff) the standards to which seeds should conform,”;

(f) the form of application for the grant of a certificate under section 9, the particulars it may contain, the fees which should accompany it, the form of the certificate and the conditions subject to which the certificate may be granted;

(b) in sub-section (3), for the words "in two successive sessions, and if, before the expiry of the session in which it is so laid or the session immediately following", the words "in two or more successive sessions, and if, before the expiry of the session immediately following the session or the successive sessions aforesaid" shall be substituted.

Seed Rules, 1968

The rules were framed to implement various legislations given under Seeds Act, 1966. It contain **11 sections (39 rules)**.

I. Preliminary (Rules 1 to 2: Short titles & Definitions)

This section provides short title, definitions of various terminology used under the seed rule.

II. Central Seed committee (Rules 3 to 4: Functions of the Central Seed Committee & Travelling and Daily Allowances Payable to Members of the Committee and its sub- Committees)

This section describes the specific functions entrusted to the committee by the act such as recommendation for Seed Testing fee, advice on the suitability of seed testing laboratory, recommendation for the procedure and standards for seed certification and testing. Also the rules provide details of traveling and daily allowances payable to the members of the committee.

III. Central Seed Laboratory (Rule 5 - Functions)

This section describes the specific functions entrusted to the Central Seed Laboratory such as coordinating with State Seed Laboratories for uniformity in test results, collecting data on quality of seeds available in the market and any other function assigned to it by the Central Government.

IV. Seed Certification Agency (Rule 6. Functions of the Certification Agency)

This section deals with the specific functions entrusted to the Certification Agency such as outlining the procedure for submission of applications, growing, harvesting and processing and storage of seeds indented for certification, maintaining a list of recognized nucleus seed breeders, inspections of seed production fields, seed processing plant and seed stores, grant of certificates.

V. Marking or Labeling (Rules 7 to 12: Responsibility for Marking or Labeling, Contents of the mark or label, Manner of marking or labelling the container under clause (C) of section 7 and clause (B) of section 17, Mark or Label not to contain false or misleading statement, Mark or label not to contain reference to the Act or Rules contradictory to required Particulars, and Denial of Responsibility for mark or label content prohibited)

Rules for marking or labeling of seed lots indented for certification have been provided in this section. The label should contain name of the person or agency that produced the seed and shall be responsible for the accuracy of information given in the unopened original container. The label should contain the name, the address of the person offering the sale of the seed, name of the variety, germination and purity level of the seed, net weight of the seed, date of seed testing

and a statement if the seed is treated. Any transparent cover used solely for the purpose of packing during transport or delivery need not be marked or labeled.

VI. Requirements for Certification (Rule 13 to 14: Requirements to be complied with by a person carrying on the Business referred to in Section 7 and Classes and sources of certified seed)

Three classes of certified seed have been specified in this section, viz. Foundation (progeny of breeder seed), Registered (progeny of foundation seed) and Certified (progeny of registered / foundation seed) and each class shall meet the specific standards. Certification agency has the discretion of producing certified seed from certified seed provided that it does not exceed three generation and the genetic purity is not significantly altered.

VII. Certification of seeds (Rules 15 to 17: Application for the Grant of a Certificate, Fees and Certificate)

The detailed procedure of seed certification starting from applying for certification till the grant of certificate has been provided in this section. Application has been outlined by the certification agency containing the name and details of the applicant, the name of the seed to be certified, class and source of the seed, germination and purity and mark or label. A fee of Rs. 25 is levied for certification.

Once certified, the certification tag containing information such as name and address of the certification agency, name of variety, lot number, name and address of the producer, date of issue of its certificate and its validity, an appropriate sign, to designate certified seed. The color of the tag shall be white for foundation, purple for registered and blue for certified seed. The holder of certificate shall allow any seed inspector to enter and inspect the seeds kept for sale, registers or other documents.

The Seeds (Amendment) Rules, 1981 [10th June, 1981]

After rule 17 of the Seeds Rules, 1968, the following rule shall be inserted, namely:-

17-A. The Certification agency shall, before granting the certificate, ensure that the seed conforms to the standards laid down in the Manual known as "Indian Minimum Seed Certification Standards" published by the Central Seed Committee, as amended from time to time.

The amendment says certification agency shall ensure that the seed standards confirm to the minimum seed certification standards laid down in the manual known as Indian Minimum Seed Certification Standards published by the Central Seed Committee which is commonly called as Blue Book.

VIII. Appeal (Rule 18 to 19): The form and manner in which and the fee on payment of which the appeal may be referred and Procedure to be followed by the Appellate Authority)

Provision for appeal has been provided by submitting a memorandum accompanied by a treasury receipt for Rs. 100. The appellate authority shall exercise all the powers which a court has, while deciding appeal under the code of civil procedure, 1908.

- **Rule 19: Procedure to be followed by the Appellate Authority.** – In deciding appeals under the Act the appellate authority shall exercise all the powers which a Court has and shall follow the same procedure which a Court follows in deciding appeals from the decree or order of an original Court under the Code of Civil Procedure, 1908 (5 of 1908)

The Seeds (Amendment) Rules, 1973 (30th June 1973)

- ✓ In rule 19 of the Seeds Rule, 1968 the words, 'shall exercise all the powers which a Court has and' shall be omitted.
- ✓ **IX. Seed Analyst and Seed Inspectors (Rule 20 – 23: Qualifications of Seed Analyst, Duties of a Seed Analyst, Qualifications of Seed Inspectors and Duties of a Seed Inspector)**
- ✓ The specific qualifications and duties of seed analyst and seed inspectors have been provided in this section. Seed analyst should possess a Master Degree in Agriculture/ Agronomy/ Botany/ Horticulture from a recognized University with at least one year experience in Seed Technology or possess a Bachelors degree in Agriculture/Botany from a recognized university with a minimum of three years experience in Seed Technology for this purpose. Seed analyst shall analyze the seed samples according to the provisions of the Act. Seed Inspector shall be a graduate in agriculture with at least one year experience in Seed Technology.

Rule 21: Duties of a Seed Analyst. – On receipt of a sample for analysis the Seed Analyst shall first ascertain that the mark and the seal or fastening as provided in clause (b) of sub-section (1) of section 15 are intact and shall note the condition of the seals thereon.

(2) The Seed Analyst shall analyze the samples according to the provisions of the Act and these rules.

(3) The Seed Analyst shall deliver the copy of the report of the result of the analysis to the persons specified in sub-section (1) of section 16.

(4) The Seed Analyst shall from time to time forward to the State Government the reports giving the result of analytical work done by him.

The Seeds (Amendment) Rules, 1973 (30th June 1973)

- In rule 21 of the said rules for sub-rules (2) and (3) the following sub-rules shall be substituted, namely:
- "(2) The Seed Analyst shall analyze the samples in accordance with the procedures laid down in the Seed Testing Manual published by the Indian Council of Agricultural Research as amended from time to time."
- "(3) The Seed Analyst shall deliver in Form VII, a copy of the report of the result of analysis to the persons specified in sub-section (1) of Section 16, as soon as may be but not later than 30 days from the date of receipt of samples sent by the Seed Inspector under sub-section (2) of the Section 15".
- **Rule 23; clause h (Duties of a Seed Inspector) -**
- (h) perform such other duties as may be entrusted to him by the competent authority.
- **The Seeds (Amendment) Rules, 1973 (30th June 1973)**
- In rule 23 of the said rules, in clause (h) for the words competent authority "the words" State Government shall be substituted.

The Seeds (Amendment) Rules, 1974 (29th April 1975)

After rule 23 of the said rules, the following rule shall be inserted namely:-

"23-A. Action to be taken by the Seed Inspector if a complaint is lodged with him:-

(1) If farmer has lodged a complaint in writing that the failure of the crop is due to the defective quality of seeds of any notified kind or variety supplied to him, the Seed Inspector shall take in his possession the marks or labels, the seed containers and a sample of unused seeds to the extent possible from the complaint for establishing the source of supply of seeds and shall investigate the causes of the failure of his crop by sending samples of the lot to the Seed Analyst for detailed analysis at the State Seed Testing Laboratory. He shall thereupon submit the report of his findings as soon as possible to the competent authority.

(2) In case, the Seed Inspector comes to the conclusion that the failure of the crop is due to the quality of seeds supplied to the farmer being less than the minimum standards notified by the Central Government, launch proceedings against the supplier for contravention of the provisions of the Act or these Rules."

Part X. Sealing, Fastening, Dispatch and Analysis of Samples

(Rules 24 to 37: Manner of taking Samples, Containers to be labeled and addressed, Manner of Packing Fastening and Sealing the Samples, Form of Order, Form of Receipt for Records, how to be sent samples to the Seed Analyst, Memorandum and Impression of seal to be sent separately, Addition of Preservatives to Samples, Nature and Quantity of the Preservative to be noted on the Label, Analysis of the Sample, Form of Notice, Form of Report, Fees and Retaining of the Sample)

The details of sampling, labeling, manner of packing and sealing the samples as well as its dispatch to the seed analyst has been provided.

- Samples of any seed shall be taken in a clean dry, moisture and leakage proof container and shall be carefully sealed.
- The label on any sample of seed sent for analysis shall bear:
 - a. serial number;
 - b. name of the sender with official designation, if any;
 - c. name of the person from whom the sample has been taken.
 - d. Date and place of taking the sample;
 - e. Kind or variety of the seed for analysis;
 - f. Nature and quantity of preservative, if any, added to the sample.
- The container of sample for analysis shall be sent to the Seed Analyst by registered post or by hand in a sealed packet enclosed together with a memorandum in Form V in an outer cover addressed to the Seed Analyst.
It should be ensured that the sample reach the destination without any kind of damage/alterations/leakage.

- Whenever any **preservative** is added to a sample, the nature and quantity of the preservative added shall be clearly noted on the label to be affixed to the container.
- **Analysis of the sample** - On receipt of the packet, it shall be opened either by the Seed Analyst or by an officer authorized in writing in that behalf by the Seed Analyst, who shall record the condition of the seal on the packet. Analysis of the sample shall be carried out at the State Seed Laboratory in accordance with the procedure laid down by the Central Government.
- **Form of notice:** In Form VI, the notice be given under clause (a) of sub section (1) of section 15 to the person from whom the Seed Inspector intends to take sample.
- **Form of report :** In Form VII, the result of the analysis be delivered.
- **Fees:** Rs. 10/- per sample of the seed analyzed.
- **Retaining of the sample:** The sample of any seed shall, under clause (c) of Sub-section (2) of section 15, be retained under a cool, dry environment to eliminate the loss of viability and in insect proof or rat proof containers (good quality of uniform shape & size). The containers shall be dusted with suitable insecticides and the storage room fumigated to avoid infestation of samples by insects.
- **Part XI. Miscellaneous (Rules 38 to 39: Records and Form of Memorandum)**
- The need to maintain stock record of seeds and record of the sale of seed have been provided in this section.
- **Records:** A person carrying on the business referred to in section 7 shall maintain the following records, namely:
 - a. stock record of seed;
 - b. record of the sale of seeds;
- **Form of Memorandum:** - The memorandum to be prepared under sub-section (4) of section 14 shall be in Form VIII.

Seeds (Control) Order, 1983 [30th December, 1983]

In exercise of the powers conferred by section 3 of the Essential Commodities Act, 1955, the Central Government hereby makes the **Seeds (Control) Order**.

Dealer to obtain license:- No person shall carry on the business of selling, exporting or importing seeds at any place except under and in accordance with the terms and conditions of license granted to him under this order.

Application for license:- Every person desiring to obtain a license for selling, exporting or importing seeds shall make an application in duplicate in Form 'A' together with a fee of rupees fifty for license to licensing authority.

Grant and refusal of license:-

(1) The licensing authority may, after making such enquiry as it thinks fit, grant a license in Form 'B' to any person who applies for it under clause 4:

A license shall not be issued to a person-

(a) whose earlier license granted under this Order is under suspension, during the period of such suspension;

(b) whose earlier license granted under this Order has been cancelled, within a period of one year from the date of such cancellation.

(c) who has been convicted under the Essential Commodities Act, 1955 or any order issued thereunder within three years preceding the date of application.

(2) When the licensing authority refuses to grant license to a person who applies for it under clause 4, he shall record his reasons for doing so.

Period of validity of license:- Valid for three years from the date of its issue.

Renewal of license:- An application for renewal in duplicate, in Form C is made before the expiry of the license along with a fee of Rs.20/-

If any application for renewal is not made before the expiry of the license, but is made within one month from the date of expiry of the license, the license may be renewed on payment of additional fee of rupees twenty five, in addition to the fee for renewal of license.

- ✓ The seed dealer has to essentially display the stock position (opening and closing) on daily basis along with a list indicating prices or rates of different seeds.
- ✓ A cash or credit memorandum has to be given by the dealer to purchaser of seeds, compulsorily.

Appointment of licensing authority - The State Government is empowered with appointing a licensing authority, inspectors and mode of action for supply regulation.

Appointment of Inspectors - The State Government may appoint inspectors and define the area within which each such Inspector shall exercise his jurisdiction.

Inspection and punishment

- An Inspector may ask any dealer to give any information with respect to purchase, storage and sale of seeds; enter upon and search any premises where any seed is stored; draw samples of seeds meant for sale, export and seeds imported for confirmation of Quality Standards, seize or detain any seed in respect of which he has reason to believe that a contravention of this Order has been committed or is being committed and seize any books of accounts or document relating to any seed.
- The Inspector shall give a receipt, in respect of books of accounts or documents seized and return the seized books of accounts or documents after the purpose is solved.
- The provision of section 100 of the Code of Criminal Procedure, 1973 relating to search and seizure shall apply to searches and seizures.
- The Inspector shall report the fact of seizure to a Magistrate where-upon the provisions of sections 457 and 458 of the Code of Criminal Procedure, 1973 shall apply.
- Every person, if so required by an Inspector, shall be bound to offer all necessary facilities to him for the purpose of enabling him to exercise his power under this clause.

Time limit for analysis - Under this order the time period for completion of seed analysis in case of any doubt about quality is 60 days compared to 30 days under Seed Rules.

Suspension/Cancellation of license:- The licensing authority may, after giving the holder of the license an opportunity of being heard, suspend or cancel the license on the following grounds, namely:-

- (a) that the license had been obtained by misrepresentation as to a material, or
- (b) that any of the provisions of this Order or any condition of license has been contravened.

Appeal - Any person aggrieved by an order, may within sixty days (along with Rs. 20/-), appeal to authority as the State Government may specify, and the decision of such authority shall be final.

Amendment of license - Upon a written request along with Rs. 10/-, the licensing authority may amend the license of the dealer.

Maintenance of records and submission of returns, etc - Every dealer shall maintain books, accounts and records and submit monthly return (by 5th of every month) relating to his business as may be directed by the State Government.

New Policy on Seed Development, 1988

The policy was formulated to provide Indian farmers with access to the best available seeds and planting materials of domestic as well as imported.

- ❖ The policy permits the import of selected seeds under Open General License (OGL), to make available high quality seeds to farmers to maximize yield, increase productivity thereby farm income.
 - The policy allows import under OGL of items such as seeds of oilseed crops, pulses, coarse grains, vegetables, flowers, ornamental plants, tubers, bulbs, cuttings and saplings of flowers.
- ❖ While the import of horticultural crops including flowers need recommendation from Directors of Horticulture, import of crop seeds require permission from ICAR.
 - ICAR will direct MLT in various agro-climatic conditions at least for one season.
- ❖ Evaluation of important traits such as yield, pest resistance etc. needs to be done within 3 months of harvest after which importer shall apply to the DAC for permit.
 - Within a month, DAC will process it and thereafter controller of Imports and Exports will issue a license.

The policy was immediately followed by an order by Government of India (Plants, Fruits and Seeds Order) for the purpose to regulate the import of agricultural items into India.

Plants, Fruits and Seeds Order

(Regulation of Import into India order) 1989

- ❑ Post entry quarantine facilities shall be established which shall be permitted to be released by Designated Inspection Authority.
- ❑ Import of any form of seed for consumption or sowing should carry a permit issued by the competent authority, and the import should be only through specified customs stations.
- ❑ The consignment shall be inspected by the Plant Protection Advisor.
- Amendments have been made for the above order during 1998, 2000 and 2001.
- With the liberalized trade in agriculture, as consequence to WTO agreements, Government thought of providing new legislative provisions under the new order.

Plant Quarantine (Regulation of import into India) Order, 2003

- The Order has now replaced the Plants, Fruits and Seeds order, 1989.
- The order has widened the scope of plant quarantine activities and has made pest risk analysis compulsory for imports
- The order includes provision for regulating the import of soil, moss, germplasm and GMO's for research, insects, microbial cultures and bio-control agents, timber and wooden logs
- The order prohibits import of commodities contaminated with weeds, alien species, and packaging material of plant origin unless the material has been treated.
- Agricultural imports are thus classified as: prohibited plant species, restricted species where import permitted only by authorized institutions and declarations and plant material imported for consumption or industrial processing permitted with phytosanitary certificate (to prevent spread of noxious pests).
- Pest risk analysis during post entry quarantine is compulsory.
- Import of germplasm has to be permitted by NBPGR and any other biological materials such as soil, microbes, moss etc. has to be permitted by Plant Protection Advisor.
- Notified entry points for import have been increased compared to PFS Order, 1989 (26 quarantine and fumigation stations located at 10 airports, 9 seaports and 7 land frontiers)
- Strengthening Plant Quarantine facilities, opening new quarantine stations, establishing advanced molecular diagnostic facilities for rapid pathogen detection, setting up of National Pest Risk Analysis unit are other important features of the Order.

Protection of Plant Varieties and Farmers' Rights Act, 2001

- Global realization on the role of plant genetic resources in development of superior crop varieties and use of many traditionally grown plants in development of medicines and various industrial applications raised concerns for Conservation of Biological Diversity (CBD) which came into force in the year 1993.
- Government of India felt the need to provide protection to plant varieties which have tremendous commercial value after India became signatory to the Trade Related Aspects of Intellectual Property Rights Agreement (TRIPS) in the year 1994.
- The TRIPS agreement required the member countries to provide for protection of plant varieties either by a patent or by an effective *sui generis system* or by any combination thereof. The *sui generis* system for protection of plant varieties was developed by India integrating the rights of breeders, farmers, and village communities. **The Protection of Plant Varieties and Farmers Right Act was thus formulated in the year 2001.**
- The PPV&FR Act covers all categories of plants except microorganisms.
- Crops important for India in the world trade, species of Indian origin, crops where India could benefit from introduction of new germplasm are the priorities.
- The act is unique in the world with inclusion of rights of farmers, breeders, and researchers.
- A variety can be registered for protection if it satisfies the criteria of Novelty, Distinctness, Uniformity and Stability (NDUS).
- Farmers can save, re-sow, exchange, share and sell farm produce of any protected variety except its commercial marketing with brand name.

National Seed Policy, 2002

National Seed Policy was formulated in 2002 to raise India's share in the global seed trade by facilitating advanced scientific aspects such as biotechnology to farmers and in March 2002, first transgenic Bt cotton was approved for commercial cultivation in India.

- The policy encourages private sector participation in research and development of new plant varieties.
- The rights empowered to various bodies for regulating the quality of seeds produced, distributed and for providing variety protection as per the Seeds Act, 1966 and PPV & FR Act, 2001 have been retained in the policy.
- Promotion of seed village scheme to increase the production and make available the seeds in time as well as upgrading the quality of farmers' saved seeds.
- Establishment of a National Seed Board in place of Central Seed Committee and Central Seed Certification Board to undertake seed certification and advising Government on all matters related to seed planning and development. NSB will serve as the apex body in the seed sector.
- Setting up of National Seed Research and Training Centre (NSRTC, 2005) to impart training in seed technology.
- The Central Seed Testing Laboratory will be established at the National Seed Research and Training Center to perform referral and other functions as required under the Seeds Act.
- Development of a National Seed Grid to provide information on availability of different varieties of seeds with production details. Both public and private sector will be encouraged to join the grid for a clear assessment of demand and supply of seeds.
- All genetically engineered crops/varieties will be tested for environment and bio-safety before their commercial release, as per the regulations and guidelines of the Environment Protection Act (EPA), 1986.
- All seeds imported into the country will be required to be accompanied by a certificate from the Competent Authority of the exporting country regarding their transgenic character or otherwise.
- All importers will make available a small sample of the imported seed to the Gene Bank maintained by NBPGR.
- Incentives will be provided to the domestic seed industry to enable it to produce seeds of high yielding varieties and hybrid seeds at a faster pace to meet the challenges of domestic requirements.
- The Department of Agriculture & Cooperation (DAC) will supervise the overall implementation and monitoring of the National Seeds Policy.

Few of Policy's other recommendations have been addressed in PPV &FR, Act, 2001 also. Major ones are maintenance of a National Register on seeds of varieties, establishing a national gene fund, disclosure of the variety's expected performance and provision for farmer to claim compensation in case of crop failure.

Further, aims of National Seed Policy such as development of infrastructure, ensuring supply of good quality seeds and facilitating the International seed trade are sought to be addressed through the proposed Seeds Bill, 2004.

Varietal Release & Notification System in India

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Introduction

India is a fast-growing economy and agrarian country. Almost 65 percent of the Indian population depends on agriculture and its allied sectors to obtain employment and sustain livelihood. The seed is considered as a basic and key input in agriculture. High-quality seed production was the major concern in the Indian subcontinent till the 1960s. In order to meet the food and nutritional demand of population and to *become* self-reliant in food grain production, Indian Government established All India Coordinated Crop Research Projects (AICCRPs) to produce a large number of varieties with assured seed quality in all major crops.

The production of high-quality seeds was one of the pillars to change the position of Indian agriculture into the new world order. The ultimate intention was to introduce the newly evolved high yielding cultivars to the resource-poor farmers for broad- spectrum cultivation in the area of their adoption.

Under such circumstances the Government of India acknowledged seed an essential commodity under the Essential Commodities Act, 1955. On October 1964, Varietal Release System (VRS) came into existence with the formation of the Central Variety Release Committee (CVRC) at the national level, and State Variety Release Committees (SVRCs) at each state level. A Central Seed Committee (CSC) a statutory body was established under the Ministry of Agriculture, Cooperation and Farmers Welfare provided in the Seeds Act, 1966.

The functions of the CVRC were taken over by the CSC in 1969 to ensure the quality of seeds on sale and notification of the varieties. To perform the function at central level to release/notification, provisional notification and de-notification of cultivars, CSC constituted a Central Sub- Committee on Crop Standards, Notification & Release of Varieties for both Agricultural and Horticultural Crops, while to perform similar functions at state level, State Seed Sub-Committee (SSSC) was constituted.

Development of Plant Genetic Material

Entries (pure lines/open pollinated varieties/composites/synthetics/hybrids etc.) are developed by the concerned plant breeders/agencies through breeding programs for the benefit of humankind. Different conventional (Introduction, selection, hybridization mutation & polyploidy followed by selection etc.) and advanced (tissue culture-based techniques like somaclonal variation, anther and pollen culture, marker assisted breeding, transgenic or genome editing techniques) breeding methods are being used by the different agencies to generate elite material for high yield potential, nutritional quality and other associated traits. Developed elite materials are being tested by the concerned plant breeder/s at their research station for three to four years in replications for stability and selected superior cultivars enter into the All India coordinated crop improvement projects (AICCIPs) trials for further testing in multi-environments across the country.

All India coordinated crop improvement projects system of varietal testing:

First AICCIP was started in way back of 1957 by ICAR on maize crop for systemic testing of entries and for release of high yielding new maize varieties. In general, the three-tier system (IVT-AVTI-AVTII) of multi-location evaluation is used for three years except perennial fodder crops (requires four years-one for crop establishment and three for evaluation) in India. Multi locational trials are conducted by the Project Coordinator (PC)/ Project Director (PD) of AICCIPs with the help of concerned principle investigators. All AICCIP trials are well organized, systemic and conducted through a uniform testing procedure across the centers as per crop standard. It is a powerful system to screen large number of entries and recommend well-tested, superior, and adapted new cultivars to the end users.

Essential Parameters of a entry for Testing under AICCIP

1. Station trial or preliminary yield trial-Concerned plant breeder must perform station or regional trial and proposed entry must have undergone censorious evaluation process or screening (insect pests and diseases). Crop based quality parameters and tolerance to key abiotic stresses are also to be screened as per the requirement. Pre-coordinated trial data on yield, trait stability and other related agronomic traits must be available to the PC/PD in support of the relevance of entry.
2. The entry must have a high degree of genotypic stability, phenotypic uniformity, germination percentage and physical purity (as per the minimum seed certification standards).
3. The entry must have few distinct diagnostic traits which make it different to all remaining varieties. These distinct traits help to identification of variety during legal infringement (DUS testing).
4. All the information related to the development of entry *i.e.* parentage or pedigree should be available to the PC/PD by the concerned plant breeder/ agency. If the performance of entries are same in the coordinated trials, then preference will be given to the variety which has been developed by the using of diverse parents in breeding program.
5. Private companies can enter their material into the coordinated trial system as similar to other agencies but have to pay the prescribed fee for their entries as per guideline of the Government of India.

Prevailing Testing System(AICCP)

The AICCIP centers for various crops are located at ICAR institutes or State Agricultural Universities (SAUs) or other volunteer centers recommended by AICCIP workshop based on covered crop area, adaptability, and agro-climatic condition etc. Following steps are involved .

Initial varietal trial (IVT)

The time duration of the initial varietal trial (IVT) is one year. All the entries, which were superior to their respective station trials, would be introduced into the IVT. These entries would be used for multi-location trials along with checks. In general, three checks (national, zonal and local checks) are being used for efficient evaluation of entries across the centers. These checks cannot be replaced after the IVT. Maintenance of genetic purity, germination and physical purity of new material are the prime objectives of the concern plant breeder/agency. The IVT trials are conducted in such a manner that minimum difference of yield (5–10%) and other ancillary traits can be measured. The cultural practice(seed rate, date of sowing, row to row and plant to plant spacing; weed, fertilizer and water management etc) shall be strictly followed by the IVT centers as per guideline of PC/ PD.

The plot size of IVT is smaller than advanced trials. An IVT includes the maximum number of locations across the country to evaluate varietal adaptation and performance. A team of scientists (plant breeder, agronomist, pathologist, entomologists etc.) will monitor all the trials as per the recommendation of the PC. Each member of monitoring team submits their report to the PC based on their observation during trial monitoring. Entries which are superior over the best check in terms of yield and other related traits will be promoted into the advance varietal trial-I. The superiority is primarily decided based on yield potential and other related important traits such as quality traits.

Advance varietal trial-I (AVT-I)

Based on superiority (5–10%) over the best performing check, superior entries will enter into the AVT-I from IVT. The number of tested entries in the AVT-I will be less than IVT. The plot size is large in AVT-I as compared to IVT, therefore data generated on yield and other ancillary traits will be more realistic, accurate and minimal chances of error. The number of testing locations should be more as compare to IVT in a given zone. During AVT-I, additional data on disease and or insect pest tolerance under artificial epiphytotic condition must be generated by the experts. Based on the performance of entry over the best performing check-in the respective zone, the superior entries would enter into the AVT-II.

Advance varietal trial-II (AVT-II)

All the requirements shall be fulfilled as similar to AVT-I. However, few additional data will be generated at AVT-II stage *i.e.* response of entries to different dates of sowing, seed rate, spacing between plant to plant and row to row (population density), behavior in different level of fertilizer and irrigation by sponsored agronomists; response of diseases and pests by the plant pathologists, crop quality parameters by the biochemists. The seed technology center will develop descriptors which help in the seed certification process. All the processed and analyzed data on yield and other related traits, across the locations/centers (cooperating and volunteer) shall be submitted to the PC. On the basis of these data, annual reports are being made in each crop. All the data of superior entries are comprehensively discussed in the annual workshop/national group meetings by the PC/project director. After completion of the AVT-II, the concerned breeders are informed to submit varietal proposal based on the performance of their entries during three years of evaluation.

Procedure for Identification and Release

Based on three years performance, best performing test entries shall be identified in the annual group meet at the pre-defined institute/ university. The Zonal Coordinators and Principal Investigators attend the national group meet to provide wider aspects of information on the varieties. After the approval from Deputy Director General (Crop Science) of Indian Council of Agricultural Research (ICAR), a "Varietal Identification committee (VIC)" constituted in advance of national group meet. All the committee members (Table-1) shall be informed well in advance by the PC or PD. The VIC provides detailed information on recommended entries to the Central Sub-Committee on Crop Standards, Notification, and Release. This committee has sole right to release and notify the best-performing entry into national wise or zonal wise based on the recommendations of the VIC.

Table-1 Varietal Identification Committee (VIC)

| S.N. | Representative | Organizational position |
|-------------|---|--------------------------------|
| 1 | DDG (Crop Science)/ his or her nominee | Chairman |
| 2 | Project Coordinator/Project Director of AICCIP | Member Secretary |
| 3 | Director of Research of institute/SAUs of that region where the meeting is held | Member |
| 4 | Agricultural Commissioner (Department of Agriculture) | Member |
| 5 | One nominee of Seed organization (NSC, SSC) | Member |
| 6 | One representative of private seed agencies | Member |
| 7 | One representative of crop-based industries | Member |
| 8 | Project coordinator (seed technology) | Member |
| 9 | Two eminent scientists of that institute | Member |

Major Criteria for identification of the variety

1. The candidate variety must have a minimum of three years of yield and other ancillary trait data from multi-location coordinated trials.
2. At least two-year data on disease and pest reaction at a hot spot or artificial epiphytotic condition.
3. The candidate variety must have at least one-year data on agronomic performance like seed rate, dates of sowing, planting density, irrigation, and fertilization. In forage crops, three year rigorous evaluation must be done for annual crops (seed yield data for third year only) and four year for perennial crops (one year for crop establishment and other three years for evaluation).
4. The concerned breeder must have at least a minimum requirement of nucleus seed so that breeder seed can be generated easily.
5. The concerned plant breeder should have pure seed for planting of 5 ha area. If he or she did not match the requirement, then identification can only be postponed for one year.

Central sub-committee on crop standards, notification and release

Central Sub-Committee on Crop Standards, Notification, and Release of Varieties appointed by Central Seed Committee under Section 3 of the seed act, 1966 during 1994. The committee comprised one chairman and 17 members (Table-2). Central Sub-Committee releases varieties as per the benefit of the stake-holders and need of regional, zonal or national importance, and the State Seed Sub-Committee releases varieties beneficial for particular state.

Notification of variety is compulsory on regulating the seed quality under the provision of Seed Act, 1966. Notification usually authorizes certified seed production throughout the country, by private or public seed multiplication organizations. Once the Central Sub-Committee accepts the proposal, the varieties will be released for the concerned agro-climatic zone/s (may cover one or more number of states or nation- ally). Simultaneously, it must be notified for seed certification purpose in the country. During the release, the concerned breeder must have a minimum amount of seed which can be sown at least ten-hectare area. Later on, seed multiplication is the responsibility of various seed agencies (NSC, SSC, private seed companies and progressive farmers, etc.).

Table-2 Central Sub Committee

| S.N. | Representative | Organizaonal |
|------|---|------------------|
| 1 | Deputy Director General (Crop Sciences), ICAR | Chairman |
| 2 | Deputy Commissioner (QC) DAC & FW, GOI | Member Secretary |
| 3 | Directors of State Seed Certification Agencies, or their representatives | Member |
| 4 | Project Directors of Departments of Agriculture of all states, or their representatives | Member |
| 5 | Project Coordinators/Directors of AICCIPs | Member |
| 6 | Agricultural Commissioner, GOI | Member |
| 7 | Representatives of the seed industry, NSC, State Seed Corporations, Member private seed companies | Member |
| 8 | Representatives of ICAR, ICAR institutes, NGOs | Member |
| 9 | Progressive farmers | Member |

Difference between released & notified varieties

| | Released variety | Notified variety |
|---|--|---|
| 1 | It is not a statutory function under the Seed Act, 1966 | Statutory function and variety will be registered under Section 5 of seed act 1966. |
| 2 | It cannot be used for seed certification | Only notified varieties to come under seed certification |
| 3 | No guarantee on seed quality for farmers | Only notified varieties to come under seed certification |
| 4 | Seed law enforcement agencies (seed inspector etc.) cannot draw and test seed samples | They have the right to draw and test seed samples |
| 5 | These are not assets of Govt. of India | They have the right to draw and test seed samples |
| 6 | Its main purpose is to make available the information of cultivar to the public and its area of adoption | The main purpose is seed quality regulation |
| 7 | Difficult to trace out the genesis | The notification of the varieties will help to trace out its genesis |

Central seed committee (CSC)

It is a legal body constituted by the Department of Agriculture, Cooperation and Farmers' Welfare (DAC&FW), Ministry of Agriculture and Farmers' Welfare (MoA&FW), Government of India to advise central and state government on matters related to the implementation of seed act, 1966 and other related functions

Central seed committee (CSC)

| S.N. | Representative | Organizational |
|------|--|------------------|
| 1 | Secretary, DAC&FW, MoA& FW, GOI | Chairman |
| 2 | Additional Secretary (In charge Seeds), MoA& FW, GOI | Member |
| 3 | Agricultural Commissioner, MoA& FW, GOI | Member |
| 4 | Deputy Director General (Crop Sciences), ICAR | Member |
| 5 | Joint Secretary (In charge Seeds), MoA& FW, GOI | Member |
| 6 | Progressive farmers/ seed growers (4) nominated by the Member Central Government | |
| 7 | One representative from each State Govt. | Member |
| 8 | Director of National Seeds Project, MoA& FW, GOI | Member Secretary |

Major Empowerment of Central Seed Committee

- The CSC has authority to release varieties (pure lines/hybrids/composites/synthetics) developed by central research institutes (ICAR/non-ICAR), AICCIPs, private or corporate sector, and other organization as per the scientific data authenticity for zonal basis (which may include more than one state) or at national level.
- The CSC has authority to approve proposals received from the State Variety Release Committees/State Seed Sub-Committees for varieties developed by the State Research Institutes but is considered suitable for areas outside the state (based on their performance).

State Seed Sub-Committee

The State Seed Sub-Committees are constituted by Central Seed Committee and are authorized to set up a State Seed Laboratory, State Seed Certification Agency (SSCA) and an Appeals Authority, and to appoint seed inspectors and seed analysts

Empowerment of State Seed Sub-Committee

There are some rights which have been provided by the Central Seed Committee for proper functioning of seed chain in respective state in India. These empowerments are-

- The State Seed Sub Committee will advise the state government on all matters related to the execution of the Seeds Act, 1966.
- Planning for different crop varieties to be grown in different regions of the state, and to review the assessment of seed requirements.

- Considering the release of new varieties for the state and recommend their notification to the Central Seed Committee.

Need of notification

Since only notified varieties will be under the purview of Seed Law Enforcement, hence it is necessary to bring the seed of a particular crop variety under notification system. The seed inspector can only draw a sample from notified variety for analysis and ensure the seed quality. A released variety cannot come under seed chain without notification by the Gazette of India. The notification is made by the Central Government on the recommendation of the Central Seed Committee. Thus, notification is prerequisite for production of certified seed which ensures high quality of seeds to the farmers. The breeder seed can only be produced after the notification of variety and notified varieties enter into seed chain

Denotification of varieties

Released varieties can be denotified if they are not performing well in the area of their adoption or have been in cultivation for more than 15 years or are not much in demand. Denotification can be done based on the recommendation of central seed committee by the government of India.

Conclusion

There are several ways and means to increase the crop production and productivity, however using genetically pure and high-quality seed is first and prime objective in agriculture. Therefore the variety which will be used by farmers must have undergone several evaluations in order to ensure its stable yield potential, tolerance to biotic and abiotic stresses and these criteria are being fulfilled by a legal varietal release system. The main objective of the varietal release system in India is to introduce newly developed, high yielding varieties to the farmers for broad-spectrum cultivation in the area of their adoption and only those varieties will be notified which are superior to existing one.

Duties and Responsibilities of Seed Inspectors

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Introduction

Quality seed is the backbone to all the success in agriculture. Best technology reaches farmers through quality seeds. Seed quality includes germination, vigour, genetic purity, physical purity, optimum moisture content and free from pest and diseases. Seed Act 1966, Seed Rules 1968, and Seed Control Order 1983 etc., by Indian Government are ensuring the availability of quality seeds in Indian market. When the seed is in market, the quality of the seed is being monitored and controlled by seed inspectors. Under the provision given in Section 13 of Seed Act 1966 or Clause 12 of Seed Control Order 1983, the State Government may by notification in the Official Gazette appoint Seed Inspectors and may in such notification define the local area within which each such Inspector shall exercise his jurisdiction.

Qualifications of Inspector

1. Seed Inspector must have a huge level of integrity, initiative and above all pleasing manners. He should be tactful, discrete, fair, friendly and firm when firmness is needed in dealing with people. He must have no financial interest in the seed industry. He must be totally dedicated to the seed quality control in seed market and healthy growth and development of the industry.

2. The Inspector must act an educator and disseminate information and cause seeds men to recognize the benefits of complying with the Act. He should have right attitude towards his work and the manner in which he carries out his duties for successful enforcement of the Act. The seed industry cannot carry out the provisions of the Act unless they know what is expected of them.

3. The Inspector must be a well-trained person and knowledgeable in the following aspects of his duties.

- Clear-cut understanding about the provisions in the Seed Act, Seed Rules and Seed Control order etc., and all notifications relevant to his region.
- Knowledge of the kinds and varieties notified for his region
- Thorough with the seed standards and the minimum limits prescribed for different crops in Indian Minimum Seed Certification Standards.
- Ability to identify agricultural and horticultural seeds, objectionable and harmful weed seeds and other common weed seeds, and varieties of agricultural and horticultural seeds that can be identified readily.
- Thorough with the principles and procedures of seed sampling, division and submission of samples and knowledge of seed testing laboratory procedures and reports
- Have enough knowledge about all forms and details related to sampling, despatch of samples, stopping and revoke of seed sales order, seizure and related legal action.
- Have sufficient knowledge about seed production, certification, processing, storage and marketing.
- Undergo periodic training programmes and refresher courses

- New Inspectors should undertake on-the-job training and should work with more experienced Inspectors for a period to gain sufficient field experience.

Powers of Inspector

- Seed Inspector may draw representative samples from the seed lots of any person selling, offering to sell, keeping for sale, bartering, conveying, delivering or preparing to deliver such seed of any notified kind or variety. He may also draw samples after the delivery of such seed to a purchaser or consignee, if the container from which sample is to be drawn is intact.
- The representative sample must be sent for analysis, to the Analyst for the region within which the sample has been drawn.
- He may enter any place in which he has reason to believe that an offence under the Act has been or being committed and search at all reasonable times, with such assistance, if any, as he considers necessary. He may issue a stop sale order and ordering the possessor of such seed not to dispose of the concerned seed lot for a specific period not exceeding 30 days, if the offence is such that it can be removed or corrected. This provide time to the possessor of seed to correct the defect(s) and intimate such action to the Inspector. If the Inspector satisfied about the removal of the defect(s) shall revoke the stop sale order. If the defect(s) cannot be removed or corrected, the inspector may issue a seizure order in Form-IV of the Rules, and seize the seed lots.

FORM IV

To,

The records detailed below have this day been seized by me under the provisions of clause (4) of sub-section (1) of Section 14 of the Seeds Act, 1966 (No. 54 of 1966) from the premises of

situated at _____
Place _____

Date _____

Seed Inspector

Details of records seized

Date _____

Seed Inspector

- He has power to break open the door of any premises where any seed of any notified kind or variety may be kept for sale if the owner or any person in occupation of the

premises, in spite of being present, refuses to open the door even upon request made by the Inspector.

- Any container may be broken by Inspector which contains any seed of any notified kind or variety.
- Any record, document, register or any other material object found in any place may be examined by Seed Inspector. He may issue a seizure order in Form-IV of the Rules and seize the records, if he has reason to believe that the records etc., may furnish evidence of the commission of an offence punishable under the Act.
- He may search or seize seed stock(s) and/or record(s) under the Criminal Procedure Code, 1898. The relevant provisions of the Criminal Procedure Code 1898 (5 of 1898) regarding search of house suspected to contain stolen property, forged documents, etc.

Duties of Inspector

- Seed Inspector shall give notice in writing in Form-VI of the Rules, to the person from whose seed lots he intends to take samples, whenever he intends to take sample of any seed of any notified kind or variety for analysis. When he draws sample(s), minimum two persons to be present as witnesses and sign in Form-VIII of the Rules. He shall also remove five original labels from each lot and replace them by labels duly authenticated by the Department of Agriculture. Alternatively, if five spare labels identical to those on the seed containers under sampling are available with the person from whose seed lot sample is drawn, he may obtain these spare labels from the person.

FORM VI

To _____

I hereby give you the notice of my intention of taking a sample of seed from your stocks for the purposes of tests or analysis.

Date _____

Seed Inspector

Form VIII

To _____

I have this day taken from the premises of _____ situated at _____ samples of seeds specified below to have the same tested/analysed by Seed Analyst.

Date _____

Seed Inspector

Details of samples taken

Whether cost of sample demanded?

Cost of sample _____ Rs. _____ paid.

Date _____

Seed Inspector
Area

Signature of the party from whose premises samples taken and payment made.

- The representative sample drawn by Seed Inspector shall be randomly divided in to three equal and identical parts and:
 - a. One sample will be delivered to the person from whose seed lots the sample has been drawn;
 - b. Second sample will be sent along with Form-V of the Rules for analysis to the Analyst for the area within which the sample has been drawn; and
 - c. The third sample will be retained for production in case any legal proceedings are taken or for analysis by the Central Seed Laboratory if the accused vendor or the complainant makes an application to the court for sending the sample retained by the Inspector to the Central Seed Laboratory for its report.

The principles and procedure for sampling, mixing, dividing, preparation and despatch of samples are enumerated in green book.

FORM V

Memorandum to Seed Analyst.

Serial No. of Memorandum.

From: _____

To

The Seed Analyst

The sample described below is sent herewith for test and analysis under clause (b) of sub-section (1) of section 14 and/or clauses (b) and (c) of sub-section (2) of Section 15 of the Seeds Act, 1966.

1. Serial No. of the sample.
2. Date and place of collection.
3. Nature of the articles submitted for analysis/test.
2. A copy of this memo and specimen impression of the seal used to seal the packet of samples is being sent separately by post/hand.*

Date _____

Seed Inspector

*Strike out whichever is not applicable

Area _____

- Sometime the person from whose seed lot the samples have been drawn refuses to accept one of the samples. It has to be intimated to the Analyst and the samples so refused by the person has to be send to the Seed Analyst. After doing proper mixing and dividing the sample will be divided into two equal and identical parts by Analyst and after sealing or fastening, one of the samples has to be delivered to the Inspector's control. That will be retained by Inspector for production in case legal proceedings are taken.
- Based on the necessary, the seed samples will be procured and send for analysis by the Inspector which he has reason to suspect and kept for sale in the seed market.

- He shall satisfy himself that the conditions laid down by the certification agency are being observed in regard to issuance and revalidation of certificate.
- The cost of the seed sample has to be paid by the Inspector, on demand to the person from whose seed lot the sample is collected.
- He shall, as soon as possible, inform and take orders from magistrate for the custody of the seized stock, records, registers, documents or material object provided it furnishes evidence for commitment of offence.
- He shall be prompt in ascertaining whether or not the seed contravenes the provisions of the Act and the Rules and if it is ascertained that the seed does not contravene the provisions, revoke the order passed under Section-14 (1)(c) and take such action as may be necessary for the return of the stock of the seed and/or record(s) seized.
- He shall inspect as frequently as may be necessary all places used for storage or sale of any seed of notified kind or variety.
- He shall investigate any complaint, which may be made to him in writing in respect of any contravention of the provisions of the Act and/or Rules.
- He shall maintain a record of all inspections made, and action taken by him in the performance of his duties, including the taking of samples and the seizure of stocks; and submit copies of such record to the Director of Agriculture or to such authority as may be directed in this regard.
- He shall, when so authorized by the State Government, detain imported containers, which contravene the provisions of the Act.
- In the case of persistent defaults, or obvious infringement of the provisions of the Act and the Rules, he should promptly institute prosecution.

Mobility of and seed storage arrangements with Inspector

- Two important needs for Inspectors are mobility and storage space for seed samples. Mobility is vital for the success of the seed law enforcement programme. It is essential that Inspectors are provided with suitable facilities for quick movement.
- The storage of seed samples retained by the Inspector is his responsibility. However, recognizing his limitations in the location where he is working, it is recommended that the laboratory may arrange for suitable storage of all the Inspector's samples. The officer to whom the inspector is subordinate should ensure that the Inspector's samples are stored in a proper manner in a suitable location. Storage space should be such that the viability of the seed is maintained for a reasonable period of time, at least one year.

Introduction to Seed Rules-An Overview

Dr. Sunil S. Mahajan and Dr. V. Santhy,
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Seed is the basic input and vital determinant for a successful agricultural production and productivity in different agro-climatic regions. The seed is therefore, termed as career of technologies and a medium to spread them across wider distances. Continuous availability of newer varieties with desirable qualities forms the basis of agricultural development. Therefore, it is highly essential to maintain its purity and quality through various stages of seed production i.e. Breeder, foundation, registered and certified seed. Seed quality attains higher importance in view of emerging biotic and abiotic stresses, issues related to quality, phytosanitary measures and competition in domestic and international markets and emerging food needs. Different legislations are framed by the Government of India to protect the quality of seeds and planting materials and also provide adequate safeguards for quality assurance in the seed multiplication chain to maintain the purity of variety as it flows from the breeders to the farmers.

The importance of quality seed of any crop is well recognised in the domestic market as well as in the world. The seed business involves monetary benefits to the producers and traded in the world market through import and export. The total Indian seed market which valued around 500 million dollar a decade ago, now is INR 18,000 crore and is constantly growing. Looking at the country's well developed seed industry and expertise in the sector, it has all the potential to become a global hub for seed export. Currently, the seed export by India is less than ₹1,000 crore per annum and the annual global seed trade is \$14 billion (INR 10,460 crore). Presently, it is estimated that more than 80% turnover in seed business comes from private seed companies showing the monopoly of private firms. Therefore, India has a potential to capture a 10 per cent share which is \$1.4 billion or INR 747 crore by 2028 (Seed Connect, 2020). The private seed industry plays leading role in high value and low volume crops, whereas the public sector seed production dominated in high volume and low value crops

In order to ensure continuous availability of high-quality seeds to farmers who are the primary stake holders, Government enacted legislations/laws in 1966 termed as Seed Act, 1966. The development and distribution of crop varieties was dominated by public sector only during that period. Voluntary certification, compulsory truthful labeling, seed inspections and seed testing were the three important aspects of the act. The act became operational in 1968 with Seeds Rules. There were continuous orders/amendments regarding seeds in the following years such as amendments to this Seeds Rules during 1972, 1973 and 1981 and issuing Seeds (Control) Order in 1983. The provisions such as compulsory seed licensing and price control were included in the order. With National Seed Policy, 1988, seed industry was liberalized enabling large scale imports of technological seeds, entry of foreign firms etc. and competition in the country increased. Private firms with motive to recoup their R&D expenditures shifted their research focus to hybrids from straight varieties especially in cotton, maize and other cross-pollinated crops. Farmers were put in a position to purchase seed every year and could not save or reuse these hybrid seeds.

Parameters of a Quality Seed

The seed quality encompasses following seed parameters:

1. **Physical purity:** A seed is physically pure if it is free from damages (insect or physical), free from other crop/ weed seeds and inert matter.
2. **Genetic purity:** A seed is genetically pure if it is of true to type and same as the variety name mentioned in the label. Plants grown from these seeds should express all the important traits documented for the variety
3. **Germination percentage:** A seed with high germination shows that it is highly viable and the lot can produce a successful plant stand
4. **Seed moisture:** A seed shall retain its viability for a given period of time only if it is dry and hence should only be having a moisture content less than 8-10%
5. **Seed health:** A seed with no fungal/bacterial growth or insect attack in it and does not carry seed borne pathogens is considered a healthy seed

The seeds supplied for a variety is required to meet fixed standards for above parameters to be termed as a quality seed. The clauses covered under Seeds Act ensure that only such quality seeds are available in the country for commercial cultivation.

Seed legislations

Until 1966, there was no Central Legislation on Seeds. The Seeds Act was enacted in 1966 to ensure that farmers get good quality seeds. Seed legislation provides notification of varieties/kinds of crops, certification, labelling of seeds, seed testing; and the Seeds (Control) Order, provides licensing of dealers, display of stock etc.

Seeds Act, 1966

The objective of the Seed Act 1966 was to regulate the quality of seed sold for agricultural purpose and provides the basic regulatory structure to ensure seed quality control through compulsory labelling and voluntary certification. The Seeds rule were notified in September 1968 and Act was implemented in India in October, 1969 except Sikkim and J&K. The Act specifies the function of various regulatory bodies associated with the industry as well as chalks certain rules for notification of new varieties, specifications of minimum limits of germination and purity, regulation of sale of seeds, certification, labelling, etc.

Under compulsory labelling, any one selling the seed of a notified kind or variety, in the region for which it has been notified, should ensure that it should confirm to the minimum percentage of germination purity; seed container is labelled in the prescribed manner for easy identification and validation and the label truly represents the true quality of seed in the container.

Seed legislation could broadly be divided into two groups

1. **Sanctioning legislation:** Sanctioning legislation authorizes formation of Advisory bodies, Seed Certification Agencies, Seed Testing laboratories, Foundation and Certified Seed Programmes, Recognition of Seed certification Agencies of Foreign countries Appellate authorities etc.

2. **Regulatory legislation:** Regulatory Legislation controls the quality of seeds sold in the market including suitable agencies for regulating the seed quality. On quality control basis, the Seeds Act could conveniently be divided into the following:

Major Highlights of Seeds Act, 1966

The act includes 25 clauses and the major highlights are:

- The law applies to seeds/vegetative propagative material of all food crops, oil crops, and fodder crops
- Central Seed Committee has been constituted with powers to fix the minimum limits of germination and purity of a crop seed before its commercial marketing. The committee shall also recommend a variety for its gazette notification, shall cancel a certificate if obtained by a misappropriate manner, shall punish for offences committed by companies or anybody who do not follow the seed rules.
- A Central Seed Testing Laboratory as well as State Seed Testing Laboratory have been established under this act which exclusively undertake testing seeds of any notified variety
- Compulsory truthful labelling and voluntary certification is provided for regulating quality of seeds for sale.
- A seed inspector is appointed with powers to verify the quality of seeds sold in the market any time and take necessary action and there is a provision for a seed analyst to perform testing of seeds in a seed testing laboratory
- Farmers are free to exchange seeds without any brand name.

Seeds Rules, 1968

- ✓ The Seed Rules outlines the various procedures to implement the Seeds Act and contain total of 11 sections
- ✓ The specific functions of the Central Seed Committee have been specified which include fixing minimum seed standards, seed testing fees, guidelines for establishing a seed testing laboratory, laying down procedures for seed certification and testing.
- ✓ Specifies functions of a Central Seed Testing Laboratory which include coordination with state seed testing laboratories, monitoring uniformity in test results etc.
- ✓ Outlines functions of Certification agencies which mainly include laying procedures for submission of applications, growing, harvesting, processing and storage of seeds indented for certification, field inspections of seed producing farms, monitoring of seed processing plants, checking of seed storage godowns and granting certificates.
- ✓ Mentions about the three classes of quality seeds viz. Breeder seed, Foundation seed (Progeny of breeder seed), and Certified seed (progeny of foundation seed). There are specific standards which have to be met by seeds of each class. Under this rule, certified seeds can be produced from certified seeds if required provided three generations are not exceeded and genetic purity is maintained at required level.
- ✓ The contents to be provided while labelling certified seed lots is also mentioned in the rules. The label should contain name and address of the producer, variety name, levels of seed germination and purity of the lot, net seed weight, seed testing date, date of issue of certificate and its validity, an appropriate sign to designate certified seed. The colour of the tag shall be yellow for breeder seed, white for foundation, and blue for

certified seed. The holder of certificate shall allow any seed inspector to enter and inspect the seeds kept for sale, registers or other documents.

- ✓ A provision for appeal and an appellate authority has also been provided in the rules.
- ✓ The detailed procedure for drawing representative samples from a seed lot, the packing and sealing of seed samples drawn from a lot and its dispatch to the seed analyst have been mentioned.

There were four amendments to the Seeds Act/Rules during 1972, 1973, 1974 and 1981.

1. The Seeds (amendment) Rules, 1972

The major aspect of this amendment was inclusion of Jute seeds in the act and formation of a Central Seed Certification Board to advise Government on all matters relating to the seed certification.

2. The Seeds (amendment) Rules, 1973

Mentions a specific time period (maximum 30 days after receipt of the sample) within which the seed analyst should report the result of seed test performed per the procedures given in the Seed Testing Manual published by ICAR.

3. The Seeds (amendment) Rules, 1974

Seed Inspector conferred with more powers. During a crop failure, the seed inspector can take necessary actions if found that the failure is due to low quality seed supplied by the supplier.

4. The Seeds (amendment) Rules, 1981

Refers to the book on Indian Minimum seed Certification Standards published by Central seed Committee for certification purpose (commonly called blue book) which needs to be updated as per needs.

Seeds (Control) Order 1983

Under the order, seeds were included as an essential commodity. Anyone who wants to engage in selling, exporting or importing of seeds should get a license which has a validity of 3 years and need to be renewed if required. The daily stock position of seeds under sale along with their price has to be displayed by the dealer. The dealer has to compulsorily provide Credit memorandum to the purchaser of seeds.

A policy decision on breaking of public sector hold and entry of private sector into the Indian seed Market was recommended by National Commission on Agriculture in 1971 and subsequently, a National Seed Policy was formulated in 1988. The National Seed Project undertook various measures and had set up huge processing plants in order to provide processing of certified seeds of self-pollinated food crops to farmers.

New Policy on Seed Development, 1988

With a major emphasis was to make high quality seeds available to farmers, the policy permitted import of quality seeds of improved genotypes under Open General License (OGL) through ICAR. ICAR after conducting multi-location trials for one season and if found satisfactory shall permit a license to the importer. There are provisions for compulsory licensing of the seed control of sale prices, movement/exchange of seeds etc. The policy brought about

liberalization of seed industry resulting in entries of private and foreign firms into the Indian seed market.

Agriculture scenario witnessed far reaching developments through Biotechnology and gene revolution in India and abroad providing genetically modified varieties in major crops. Govt. Of India approved commercial cultivation of Bt cotton in 2002. With a view to utilize the available technologies safe guarding farmers' interest and biodiversity conservation, a seed policy was formulated in 2002.

Plants, Fruits and Seeds Order (Regulation of Import into India order) 1989

The order was made to regulation of Import of Plants, Fruits and Seeds Order only through specified customs stations into India based on post entry quarantine. Facilities for post entry quarantine shall be established which shall be permitted to be released by Designated Inspection Authority. Import of any form of seed for consumption or sowing should carry a permit issued by the competent authority, and the import should be inspected by the Plant Protection Advisor. With the liberalized trade in agriculture, further amendments have currently been made for the above order during 1998, 2000 and 2001. In year 2003, **Plant Quarantine (Regulation of import into India) Order** has been issued which has now replaced the Plants, Fruits and Seeds order, 1989

National Seed Policy, 2002

The policy aimed to provide benefits of modern agricultural technologies to farmers. National Seed Research and Training Laboratory was established and seed banks were set up to ensure supply of quality seeds during calamities. Central Seed Committee was replaced by a National Seed Board to serve as the superior body in the seed sector. For certification Central Seed Certification Board was set up under this. To make available information on seed availability a National seed Grid Development was set up including both public and private sector for a clear assessment of seed requirement.

The National Seeds Policy 2002: Major thrust areas –

- i) Varietal Development.
- ii) Seed Production.
- iii) Seed Replacement Rate Enhancement.
- iv) Primary responsibility for production of breeder seed to be that of the ICAR/State Agriculture Universities.
- v) An effective seed production programme.
- vi) Popularisation of new varieties.
- vii) Availability of newly developed varieties to farmers with minimum time gap.
- viii) Provision of incentives to domestic seed industry to enable it to produce seeds of high yielding varieties and hybrid seeds at a faster pace to meet the challenges of domestic requirements.

Trade Related Intellectual Property System (TRIPS) agreement in 1994, and India being a signatory to it provided the need for protection of plant varieties by an effective Variety protection system. A *sui generis* system or a system of its own was framed by Govt of India which incorporates the rights of breeders, farmers, and village communities in one system. The act is unique in the world and was introduced in 2001.

Protection of Plant Varieties and Farmers' Rights Act, 2001

The GOI enacted legislation in August 2001 named, "Plant Variety Protection and Farmers Rights Act, 2001" to address concerns about the lack of effective intellectual property rights in the seed industry. Enactment of legislation for effective protection of plant varieties (PVP) either by way of patenting or a sui generis system stipulated under the Article 27.3(b) of the TRIPS Agreement. PPV &FR Act 2001 fulfilled a mandatory requirement for India under the TRIPS

The major highlights of the act are as follows:

- Registration/Protection is provided only to the notified varieties after it meets the requirement of Distinctness, Uniformity and Stability
- DUS test to be conducted for each crop based on the developed National DUS test
- PPV&FR Authority was established including a chairman and 15 members
- For all varieties, except for farmers' varieties, complete passport and pedigree data has to be provided while applying for registration
- Six years is the period of protection which can be renewed with total period of protection shall not exceed 15 years
- An annual fee based on royalty gained has to be paid by the Breeder and he is provided with all rights to produce, sell, market, distribute, import or export.
- There are no restrictions for Researchers in using the protected variety for developing newer varieties
- Farmers can also avail protection for their varieties and are recognized for their work on conservation. They can save, use, reuse, exchange, share and sell without commercial marketing with a brand name.
- Provision of Benefit sharing is also provided in the act
- There is provision for compensation to the community if a breeder in spite of using a variety belonging to a particular community does not disclose the source
- Essentially Derived Varieties can also be registered as new varieties
- Constitution of a National Gene Fund under the act to provide rewards for farmers who conserve traditional/ indigenous varieties.
- Provision of an appellate authority to attend cases of appeal is also there.

The Indian PPV&FR Act is thus a balanced form of regulation providing rights to breeders, farmers, and researchers. Rules were framed to implement the act and are called as Protection of Plant Varieties Rules 2003. The detailed procedures on how a variety can be applied for protection, use of national gene fund, ways of compensation, protocols of DUS testing and other requirements for implementation of PPV&FR Act are given in the rules.

With a view to improve the Seed Act, 1966 and replace it, a new seed bill was proposed in the year 2004. However, due to several objections by various related departments, the seed bill is yet to be implemented.

Seed Bill, 2004: The Seed Bill is proposed to replace the Seed Act, 1966

The Seed Bill, 2004 include salient features such as Compulsory registration of seeds under sale based on trial for 3 seasons at various locations, voluntary seed certification, self certification, powers for Central Government to declare any seed testing lab as central seed

testing lab or referral lab, registration of newer transgenic events after clearance from GEAC and compulsory testing of GEAC cleared events.

There are controversies regarding rights of farmers, regulation in seed sale price including trait/loyalty fee, the issue of registration without parentage etc. Several amendments were notified in 2006, and later in 2010 and still is waiting to be implemented. The provisions of the seed Act, 1966 are only followed presently.

With the 2002 National Seed policy private firms entered and concentrated on hybrid seed research so that seeds shall be replaced every year and expenditures of their R &D could be recouped. Cotton, maize and other cross-pollinated crops started to be dominated by private. The value of Indian seed market took a leap from 500 million dollar a decade ago to 3.6 billion dollars presently. Cotton being a high value crop and often cross-pollinated crop and with the approval of Bt cotton for commercial cultivation of high value, private R & D investment enhanced significantly. More than 1000 Bt hybrids were developed by several companies utilizing the Bt technology of Monsanto.

Bt Cotton

There are six Bt events in transgenic cotton released in India till now which are available for cultivation. These include, Mon 531(Cry 1Ac) from Monsanto GFM (Cry1Ac) from Nath seeds, Event1 (Cry1Ac) from JK seeds, Event 9124 (Cry1c) from Meta helix all of which are BG I cotton, Mon 15985 (Cry1Ac+2Ab2) from Monsanto which is the BGII cotton.

The approved genetic events were used by private firms to develop their own Bt hybrids which did not have to undergo bio-safety trials and the Bt hybrids reached to more than 1500 in the seed market with the problem of supply of spurious seeds. These include seeds which are not true to type and do not carry Bt trait, F2 seeds of Bt hybrids, seeds with event other than that given in the seed packet etc. The need to introduce a systematic monitoring of Bt seeds were felt.

Seed Regulation of Transgenic

- Environment and Protection Act, 1986 and EPA rules, 1989 are the regulating authority for transgenics. The highlights of this act include:
- Establishment of DBT in 1986 for utilizing biotechnology in agriculture research
- Monitoring of r-DNA research work at organization level by an Institute Bio-safety Committee
- For effective evaluation and assessment of GM crops RCGM (Review Committee on Genetic Manipulation) was established in 1989
- To provide approval of a transgenic variety for commercial cultivation a Genetic Engineering and Appraisal Committee was established under Ministry of Environment and Forests, G.O.I. Obtaining Biosafety test results such as Pollen gene flow test, safety to cattle and poultry was made compulsory.

Under Seeds Rules, 1968, Central Government has declared CICR laboratory as the Referral laboratory for Bt cotton seeds in the year 2003. The detection kits developed by CICR have been recognized by the Government as a standard test for Bt detection. As per the rule, all

seed testing laboratories are to perform Bt purity testing along with genetic purity testing and the standards are as follows

Submitted sample size: 25g

Working sample size: 10 seeds

If 9 seeds out of 10 is positive, the seed packet is considered Bt positive

Table: The seed standards for Bt cotton sold in the market

| S. No. | Parameter | Certified seed (self) |
|--------|--|---|
| 1 | Pure seed | 98% |
| 2 | Inert matter | 2% |
| 3 | Germination | 75% |
| 4 | Genetic purity (Bt purity (Minimum) | 90% (9 seeds out of 10 seeds tested should be positive) |
| 5 | Name of the Variety/hybrid | |
| 6 | Date of testing | |
| 7 | Lot number | |
| 8 | Net weight of seeds | |
| 9 | Seller's name and address | |
| 10 | Name of transgene | |
| 11 | Level of Bt toxin expression | |
| | Cry 1Ac | 4 microgram dry weight tissue (leaf/square/boll) |
| | Cry 2Ab | 280 microgram dry weight of tissue (leaf/square/boll) |

Recent Notification in the Release of Bt Cotton Hybrids

In 2017, ICAR, New Delhi was authorized by G.O.I. to take up the responsibility of evaluation and approval after multilocation monitoring of Bt cotton hybrids (carrying approved events/genes and bio-safety cleared) replacing the Event Based Approval Mechanism of GEAC. Only newer events/genes shall be approved by GEAC.

Bt Cotton Varieties from Public Sector (ICAR-CICR)

Utilizing the deregulated Mon 531 event from Monsanto ICAR-CICR has developed and released 4 Bt cotton varieties (not hybrids unlike which were available till now) and are now available for commercial cultivation.

Regulation of Cotton Seed Price

With an aim to control the rising and non-uniform Bt cotton seed price in different states Government of India, brought out The Cotton seeds Price (Control) Order, 2015 under section 3 of the Essential Commodities Act, 1955.

The Cotton Seeds Price (Control) Order, 2015

The major highlights of the Order are as follows:

The Central Government shall regulate sale of cotton seeds at notified Maximum Sale Price (MSP), prescribe guidelines for licensing and give the format for the GM technology licensing agreements. A committee shall be constituted under this Order to fix the MSP and

regulate the License Fee including royalty or trait value, if any, form the components of the MSP. No person can sell seed above MSP fixed by the Central Government. Any contravention of this order is punishable under section 7 of the Essential Commodities Act.

The regulations on seed are basically to take care of the seed quality during its production, processing and marketing so that ultimately the farmers are benefitted. It is very clear that private is highly interested on cotton crop which has numbers of traits for which transgenic are going to be available in future. Having a proper seed law enforcement is very essential to take care of the quality of these technological cotton seeds so that poor farmers who are the primary stake holders are not exploited.

Regulations on Refugia Seed Supply

Any technology when introduced into the system need management measures so that technology is stable and lasts long. Use of refugia is one among those where small amounts of non Bt seeds are supplied along with Bt seeds to delay the development of resistance of insects. The refugia seeds were to be sown for a 20% of total cultivated area or 5 perimeter rows. Accordingly, 120 g non Bt seeds were (any line with matching phenotype) were to be supplied as separate package along with 450g Bt cotton seeds. But due to lack of monitoring as well as inhibition from farmers in sowing refugia seeds resulted in development of resistance.

Ministry of Agriculture, Co-operation and Farmers Welfare, GOI brought out a notification during the year 2016 that the refugia seeds of 25g shall be blended along with Bt cotton seeds with seed standards of 5% Bt purity for refugia and 95% Bt purity for Bt seeds. Refugia seeds have to be isogenic non Bt version of the original Bt hybrid. It is a globally approved method and practiced in Bt maize stacked with herbicide tolerance. Above notification is gazetted and enforceable.

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Seed Law Enforcement with Reference to Bt Cotton

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Introduction

Concern over possible environmental and health implications of modern biotechnology has stimulated regulatory mechanisms for food safety and environmental risk assessment. Given the challenges and difficulties inherent in building these regulatory systems and the needed operating capacities, the International Service for National Agricultural Research (ISNAR) convened an international expert consultation in July 2001 titled "A Framework for Biosafety Implementation: A Tool for Building Capacity." The purpose of this meeting was to develop a conceptual framework to address biosafety regulatory implementation and capacity-building needs of developing countries. FAO and International Service for National Agricultural Research (ISNAR) list four elements for developing the regulatory framework for biotechnology: (i) legislative framework, (ii) criteria for the assessment of a product, (iii) transparency and public involvement; and (iv) approaches to risk assessment and risk management. Development of recombinant DNA technology was a research breakthrough in agriculture and biotech varieties dominated the global cultivated area in crops such as cotton, maize, soybean and mustard. Novel transgenic crops were created to combat biotic and abiotic stresses and to improve yield in these crops. Cotton transgenic lines were developed all over the world mainly for herbicide tolerance and insect (boll worm) tolerance.

In India, the involvement of public sector in the seed industry began at the advent of the "green revolution" with the establishment of the National Seed Corporation (NSC) in 1963. The Indian seed industry was initially dominated by public sector seed companies. But owing to the easing of government regulations and the implementation of a new seed policy in 1988, the private sector has started to play a pivotal role in the production and distribution of seeds. The spread of private seed sectors significantly enhanced with the approval of Bt Cotton which is a kind of GM/transgenic cotton in 2002. Bt cotton is widely cultivated in India and it accounts for about 96 per cent of the total cotton area cultivated and produced in the country (ISAAA, 2017). Cotton being a commercial crop grown by resource-poor farmers across dry-lands in India, it is alleged that Bt cotton is a key driver for increasing farmers' suicides (Thomas and De Tavernier, 2017). However, these allegations were questioned by Gruère and Sengupta (2011), who reported that there is no 'resurgence' of farmers' suicides due to the adoption of Bt cotton. Other than the social and ethical controversies faced by Bt cotton, there was a series of litigations on regulatory procedures, the competition law, monopolisation of the seed sector and litigation on intellectual property (Chawla, 2018). Murugkar *et al.* (2007) in their study have discussed that government interventions by imposing a price ceiling (Cotton Price Control Order) had led to an anti-competitive effect in Bt cotton industry. Apart from these, the industry has also been under regulation through different government policies (Essential Commodities Act, 1955; Cotton Seeds Price Control Order, 2015) and several other such regulations to protect farmers' interest have been discussed below.

Bt Cotton Industry in India

Cotton is the first crop to have transgenic genotype cultivated commercially in India. Bt cotton contains a gene from a soil borne bacteria, *Bacillus thuringiensis* which confers tolerance against American boll worms which feed on leaf, squares and bolls of cotton. The gene has been

incorporated into cotton plant using genetic engineering technology with the help of *Agrobacterium tumefaciens*. There are several such genes producing toxic proteins that can kill the boll worms and these are called Cry genes. The commercially released GM cotton in India contains single gene or combination of Cry toxin encoding genes such as Cry 1Ac, Cry1Ab, Cry1A, Cry1F, Cry2Ab2, Cry1Ab-Ac, Cry 1EC and vip 3A identified by different organizations including private and CSIR-NBRI. GM event/Bt event refer to the specific location in the genome where genes have been incorporated. Therefore, with the same gene, there can be different events based on the location and its expression.

The timeline of events in Bt cotton industry in India can be divided into three phases – phase 1 (1990-2002), phase 2 (2002-07), and phase 3 (2008-2019). Phase 1 is the initial regulation phase, where the regulatory authorities assessed the technology. In phase 2, the technology got widely adopted in the country with lesser regulatory interventions, and in phase 3, there was a series of litigations and emergence of strong re-regulations.

Monsanto Holdings Private Ltd. (MHPL) (henceforth Monsanto) requested the authority (Department of Biotechnology – DBT) in India to conduct field trials in 1990. The request was rejected by DBT in 1993. In 1995, DBT allowed Maharashtra Hybrid Seeds Company Ltd. (henceforth Mahyco) to conduct field trials and approved import of 100 grams of cotton seeds containing Cry1Ac gene. Later in 1996, the Central Government also approved the import of Bt cotton variety (US Cocker 312). During the period 1996-1998, field trials were carried out in nine states with permission. In 1998, Monsanto and Mahyco started a 50:50 joint venture (JV), named Mahyco-Monsanto Biotech Pvt. Ltd. (MMBL). At the same time, DBT amended the law empowering Review Committee on Genetic Manipulation (RGCM) and granted multi-location small trials to MMBL.

Bt Cotton Events Released in India

In 2002, GEAC conditionally approved the release of four Monsanto hybrids (Bollgard I, MECH 12, MECH 162, MECH 184) for commercialisation for a period of three years in South India. Later in 2004, GEAC approved four more hybrids and furthermore 16 hybrids using event MON 531 and MON 15985. Mahyco developed a second event by sourcing MON 15985 (Bollgard II) from Monsanto. There were two patents of Bollgard II – (1) Patent No. 214436 (Methods for transforming plants to express *Bacillus thuringiensis* delta endotoxins) and (2) Patent No. 232681 which provide IPR protection to Bt II technology. The patent 214436 was granted in 2008 effective from 1999. Similarly, other firms/organisations also developed events for the cotton crop. The events were approved by GEAC and various companies have released their hybrids as given in the following table.

Though more than 10 events are patented, only five events of cotton are approved by GEAC – MON 531 (Maharashtra Hybrid Seeds Company), GFM Cry 1A Event (Nath Seeds), JK Event 1 (J.K. Agri Genetics Pvt. Ltd.), MON 15985 (Maharashtra Hybrid Seeds Company), and Event MLS 9124 (Metahelix Life Sciences Pvt. Ltd.) (GEAC, 2019). All of which are BG I cotton whereas, Mon 15985 (Cry1Ac+2Ab2) from Monsanto which is the BGII cotton.

Table 1: Bt Cotton Events in India

| Sr. No. | Events | Developer | Year of Approval |
|---------|-----------------------------------|-----------------------------------|------------------|
| 1 | MON 531* | Mahyco/Monsanto | 2002 |
| 2 | MON 15985 | Mahyco/Monsanto | 2006 |
| 3 | Event I | JK Agri Genetics Ltd. | 2006 |
| 4 | GFM Event | Nath Seeds | 2006 |
| 5 | Cry1Ac Event | CICR (ICAR) & UAS Dharward | 2008 |
| 6 | Event MLS 9124 | Metahelix Life Sciences Pvt. Ltd. | 2009 |
| 7 | EVENT 10 | JK Agri Genetics Ltd. | 2013 |
| 8 | CRY1F EVENT 281 24 236 | Dow AgroSciences LLC | 2014 |
| 9 | Event 3006 210 23 | Dow AgroSciences LLC | 2014 |
| 10 | Event PDAB4468.19.10.3 | Dow AgroSciences LLC | 2015 |
| 11 | Cotton Transgenic Event MON 88701 | Monsanto Technology LLC | 2015 |
| 12 | Elite Event EE-GH7 | Bayer Crop Science NV/LP | 2019 |

Note: *Mon 531 was not patented in India.

Genes identified for traits other than insect tolerance

Herbicide Tolerance (HT) in India

Cotton transgenics with herbicide tolerance are popular across the globe and the genes such as cp4 epsps and 2mepsps coding for glyphosate tolerant form of 5-enolpyruvulshikimate-3-phosphate synthase (EPSPS) enzyme, *pat* and *bar* genes coding for phosphinothricin N-acetyltransferase (PAT) enzyme, *bxn* produces nitrilase enzyme, *S4-HrA* herbicide tolerant acetolactate synthase (ALS), *dmodicamba* mono-oxygenase enzyme and *aad-12* aryloxyalkanoate di-oxygenase 12 (AAD-12) protein have been deployed.

Currently Herbicide Tolerant transgenic cotton hybrids are being cultivated illegally in Gujarat, Maharashtra, Telangana and Andhra Pradesh States since these are not approved by G.O.I. These are called BGIII hybrids by farmers and in addition to Bt genes they carry CP4-EPSPS gene for glyphosate tolerance (Events MON 88913 /MON 1445). ICAR-CICR, Nagpur has been designated as the referral lab for Ht cotton also.

It is very clear that cotton is a crop having keen interest for private to invest heavily. There are number of traits for which transgenic are going to be available in future. Proper seed law enforcement for such newly developed technological cotton seeds is very essential to take care of the sale price, environmental and human safety, illegal marketing, non-compliance to labelling etc. so that poor farmers who are the primary stake holders are not exploited.

The events that took place in spreading the HT and GMO crops in India is given below:

- Representation by social activists to GEAC for taking up the matter of illegal HT cotton, along with physical seed samples and video documentation from retailers in Gujarat, in its 98th meeting.
- The issue raised in 2011 again, in GEAC's 109th meeting
- The complaint was lodged formally in 2013, from a fact-finding report from Andhra Pradesh

- Supreme Court's Technical Expert Committee Report: The TEC has examined the issues in relation to HT, particularly with regard to sustainability and the likely socioeconomic impact on major sections of rural society. On both these counts, based on the reasons presented in the section on Herbicide Tolerance, the conclusion of the TEC is that HT crops would most likely exert a highly adverse impact on sustainable agriculture, rural livelihoods, and environment. The TEC finds them completely unsuitable in the Indian context and RECOMMENDS THAT FIELD TRIALS AND RELEASE OF HT CROPS NOT BE ALLOWED IN INDIA. (Page 71, Report of the majority 5 Independent Biosafety Experts of TEC, July 2013, along with the Corrigendum).
- Again, representation in 2016 to GEAC on suspected crops like, HT Cotton, HT Soybean, HT Mustard, Bt Brinjal and GM papaya.
- The Committee has been given to understand that GM mustard being a herbicide tolerant GMO, there is clear evidence on the adverse impacts of such GMOs from elsewhere in the world. Therefore, The Committee strongly believes that unless the bio-safety and socio-economic desirability, taking into consideration long run effects, is evaluated by a participatory, independent and transparent process and a retrieval and accountability regime is put in place, no GM crop should be introduced in the country. HT Crops: What Executive, Legislative & Judicial Committees. (Said Report No.301: "GENETICALLY MODIFIED CROPS AND ITS IMPACT ON ENVIRONMENT" DEPARTMENT-RELATED PARLIAMENTARY STANDING COMMITTEE ON SCIENCE & TECHNOLOGY, ENVIRONMENT & FORESTS, submitted in August, 2017).

Whitefly Tolerance

CSIR-NBRI has identified Tma-12 gene for whitefly tolerance

Drought Tolerance

Drought tolerance governing genes mainly involved in cellular level tolerance such as AtNHX1 gene, AVP1 gene, AtEDT1/HDG11 gene ScALDH21 gene, TsVP1 gene and SNAC1 genes have been successfully validated in cotton at green house as well as field conditions

Fibre Yield and Quality

A number of genes such as CpEXPA3, GhSusA1, GhADF1, PHYA1, WLIM1A etc. have been identified which by over-expressing or down regulating can improve fibre yield and quality in cotton.

Low Seed Gossypol

RNA interference technology is available to inhibit the expression of the *δ cadinene synthase* gene in a seed specific manner, thereby disrupting a key step in the biosynthesis of gossypol in cotton.

Seed Regulation of Transgenic

As the HT cotton is not approved by the GEAC for commercial cultivation in India, its sale, cultivation and seed production are also punishable offence under Seed Act 1966, Seed Rule 1968, Seed (Control) Order 1983 with regard to EPA 1986 and Environment Protection Rules, 1989.

The FIR has been based on the Environment Protection Act (EPA), the Essential Commodities Act (ECA) and the Seeds Act. The sections under which action can be taken against the accused include Maharashtra Cotton Seeds rules 2009 (12-G), section 7, 8, 9 and 10 of the EPA 1037 (E, 5 December 1989) Act.

Rules for the manufacture, use, import, export and storage of hazardous microorganisms genetically engineered organisms or cells (EP Act, 1986)

The Ministry of Environment & Forests had enacted Environment and Protection Act in 1986 to provide for the protection and improvement of environment and the related matters.

Under this act, the rules and procedures for the manufacture, import, use, research and release of GMOs as well as products made by the use of such organisms were notified by MoEF through their Notification No. 621 in Official Gazette of Govt. of India on December 5, 1989. These rules and regulations cover the areas of research as well as large scale applications of GMOs and products made there from throughout India. The rules also cover the application of hazardous microorganisms which may not be genetically modified. Hazardous microorganisms include those which are pathogenic to human beings, animals as well as plants. The rules cover activities involving manufacture, use, import, export, storage and research. The target substances covered are, besides the hazardous natural microorganisms, all genetically engineered organisms including microorganisms, plants and animals.

Approval and Prohibition, etc.

No person shall import, export, transport, manufacture, process, use or sell any hazardous microorganisms of genetically engineered organisms/substances or cells except with the approval of the Genetic Engineering Approval Committee.

Production

Production in which genetically engineered organisms or cells or micro- organisms are generated or used shall not be commenced except with the consent of Genetic Engineering Approval Committee with respect of discharge of genetically engineered organisms or cells into the environment. This shall also apply to production taking place in connection with development, testing and experiments where such production, etc., is not subject to rule 7.

Deliberate or unintentional release

Deliberate or unintentional release of genetically engineered organisms/hazardous microorganisms or cells, including deliberate release for the purpose of experiment shall not be allowed. The measures of transgenic regulation fall under the Environment and Protection Act, 1986 and EPA rules, 1989. The major aspects covered in this are:

- Establishment of DBT in 1986 exclusively to apply biotechnology in agriculture
- Establishment of Institute Bio-safety Committee at the organization level to monitor the r-DNA research work
- Establishment of RCGM (Review Committee on Genetic Manipulation) in 1989 for effective monitoring and evaluation and assessment of GM crops
- Establishment of Genetic Engineering and Appraisal Committee which will recommend the Government for approval of a transgenic variety for commercial cultivation. This shall be taken up only after getting the results of biosafety tests such as Pollen gene flow test, safety to cattle and poultry.

Thus, any new hybrid or variety developed with a new event will have to be registered and require approval from Genetic Engineering Appraisal Committee (GEAC) that works under the Ministry of Environment and Forests, G.O.I.

EPA Rules 1989 and regulations are implemented by:

1. Ministry of environment and Forests
2. Department of Biotechnology
3. State Governments

Six Competent Authorities and their composition have been notified under these Rules which are as follows:

1. Recombinant DNA Advisory Committee (RDAC)
2. Institutional Biosafety Committee (IBSC)
3. Review Committee on Genetic Manipulation (RCGM)
4. Genetic Engineering Approval Committee (GEAC)
5. State Biosafety Coordination Committee (SBCC)
6. District Level Committees (DLC)

While the RDAC is of advisory in function, the IBSC, RCGM and GEAC are of regulatory function. SBCC and DLC are for monitoring purposes. The composition of each committee is defined in the Rules, 1989. In addition to the above, a monitoring cum Evaluating Committee (MEC) has been set up by the RCGM to monitor the field performance of GM crops.

Bt Seed Testing

The ICAR-CICR laboratory very soon developed Bt detection kits for identification of spurious Bt seed packets. The methods are (1) Bt Express, (2) Bt Detect and (3) Bt Quant. The Bt express is a simple dip stick method which could be used by anyone including farmers and can identify a plant is Bt or not just by crushing the leaf in a solution in an Eppendorf supplied with the kit and dipping a filter paper. If two coloured bands appear, it indicates Bt positive and only one upper coloured band appear, it indicates Bt negative. The Bt quant is an ELISA method which quantifies the Bt protein (Cry 1Ac) in a seed. Bt detect is the immuno-chromatographic detection of Cry 2 Ab2 gene.

Under Seeds Rules, 1968, Central Government has declared CICR laboratory as the Referral laboratory for Bt cotton seeds in the year 2003. The detection kits developed by CICR have been recognized by the Government as a standard test for Bt detection. As per the rule, all seed testing laboratories are to perform Bt purity testing along with genetic purity testing and the standards are as follows

Submitted sample size: 25g

Working sample size: 10 seeds

If 9 seeds out of 10 is positive, the seed packet is considered Bt positive

Table: The seed standards for Bt cotton sold in the market

| S. No. | Parameter | Certified seed (self) |
|--------|--|---|
| 1 | Pure seed | 98% |
| 2 | Inert matter | 2% |
| 3 | Germination | 75% |
| 4 | Genetic purity (Bt purity (Minimum) | 90% (9 seeds out of 10 seeds tested should be positive) |
| 5 | Name of the Variety/hybrid | |
| 6 | Date of testing | |
| 7 | Lot number | |
| 8 | Net weight of seeds | |

| | | |
|----|------------------------------|---|
| 9 | Seller's name and address | |
| 10 | Name of transgene | |
| 11 | Level of Bt toxin expression | |
| | Cry 1Ac | 4 microgram dry weight tissue (leaf/square/boll) |
| | Cry 2Ab | 280 microgram dry weight of tissue (leaf/square/boll) |

A recent gazette notification (dated 16th June, 2017) under section 6 of the seeds Act, 1966 states minimum expression level of Bt protein (cry protein) in Bt seeds containing
Cry1Ac: 4 microgram dry weight tissue (leaf/square/boll)
Cry 2 Ab: 280 microgram dry weight of tissue (leaf/square/boll)

Maharashtra Cotton seeds (Regulation of Supply, Distribution, Sale and Fixation of Sale Price) Act, 2009

The label on each cotton seed packet shall display minimum limits of physical purity, germination, genetic purity, standards of Bt protein, seed health etc. and expected performance of seed in given conditions as approved by GEAC

Release of Bt cotton hybrids through ICAR

In 2017, G.O.I. has authorized ICAR, New Delhi to take the entire responsibility of evaluation, approval and entire management and monitoring of Bt cotton hybrids (carrying approved events/genes and bio-safety cleared) in place of Event Based Approval Mechanism of GEAC. GEAC takes responsibility only for approval of newer events/genes if anyone wants to release.

Bt cotton varieties from public sector (ICAR-CICR)

The Mon 531 event from Monsanto presently is deregulated and is no more under patent which could be utilized by any research organization/private firm to develop their own Bt cotton. Accordingly, ICAR-CICR has developed and released 8 Bt cotton varieties (not hybrids unlike which were available till now) and are now available for commercial cultivation.

PPV& FR Act, 2001 and transgenics

The PPVFR Act was enacted to provide for the establishment of an effective system for protection of plant varieties, the rights of farmers and plant breeders, and to encourage the development and cultivation of new varieties of plants.

There is provision for right to seed and for farmers to save, use, exchange or sell seed in the same manner as they were entitled to before the Act but not the seeds of protected plant varieties in branded packages. With Bt cotton hybrids, farmers are not given a choice and has to compulsorily purchase every year since the technology is in the form of a hybrid and not straight variety.

Right to Register Varieties - the right to obtain intellectual property rights for a plant variety which is distinct in terms of genetic uniqueness, uniformity and stability. This is applicable for Bt cotton hybrids also which can be registered with PPV&FRA. The BG II hybrids developed from original BG I hybrids or BGI hybrids developed from original non Bt hybrids are considered as Essentially Derived varieties and can be registered with PPV&FRA

The authority has passed a new resolution to dispense with the requirement of no-objection certificates (NOC) from the trait developer for breeding new Bt cotton varieties with genetically modified (GM) traits which is a very positive development.

National Seed Policy, 2002

In the Seed Policy, 2002, there is a separate section (No. 6) on transgenic plant varieties. It has been stated that all genetically engineered crops/varieties will be tested for environment and biosafety before their commercial release as per the regulations on guidelines of the EPA, 1986. Seeds of transgenic plant varieties for research purposes will be imported only through the National Bureau of Plant Genetic Resources (NBPGR) as per the EPA, 1986. Transgenic crops/varieties will be tested to determine their agronomic value for at least two seasons under the All India Coordinated Project Trials of ICAR, in coordination with the tests for environment and bio-safety clearance as per the EPA before any variety is commercially released in the market. After the transgenic plant variety is commercially released, its seed will be registered and marketed in the country as per the provisions of the Seeds Act. After commercial release of a transgenic plant variety, its performance in the field will be monitored for at least 3 to 5 years by the Ministry of Agriculture and State Departments of Agriculture. It has also been mentioned that transgenic varieties can be protected under the PVP legislation in the same manner as non-transgenic varieties after their release for commercial cultivation.

The Cotton seeds Price (Control) Order, 2015

In 2006, the Andhra Pradesh Government intervened to file a case against Bt cotton seeds pricing to the Monopolies and Restrictive Trade Practices Commission (MRTPC) (CCI, 2015). Andhra Pradesh Government negotiated with the private companies to bring down the seed prices to Rs. 750 and fixed the trait value to Rs. 150. Concomitantly, various states such as Gujarat and Maharashtra enacted state legislations to control the cotton price. Later, Andhra Pradesh government fixed price of Bt cotton seeds under the A.P. Cotton Seeds Act, 2007. Subsequently, there were several price interventions by state governments and subsequent litigations against them. In 2015, the Department of Agriculture, Government of India issued the Cotton Seeds Price (Control) Order, 2015, under Section 3 of the Essential Commodities Act (1955) to regulate Bt cotton seed prices. The order came into effect from March 2016 and fixed the prices at Rs. 635 and Rs. 800 for BG-I and BG-II, slashing the royalty fee to an extent of 74 per cent.

Salient features and important provisions of the Cotton seeds Price (Control) Order are as follows:

- ✓ **Clause 3:** Controller shall have the power to regulate the sale price of cotton seeds notified by the Central Government.
- ✓ **Clause 4:** Controller shall advise the Central Government on regulation of sale of cotton seeds at notified Maximum Sale Price (MSP), prescribe licensing guidelines and format for the GM technology licensing agreements and any other matter referred to him by Central Government for advice.
- ✓ **Clause 5:** Central Government on the recommendations of the Committee, constituted under this Order, shall fix the MSP and shall also fix and regulate the Seed Value, License Fee including royalty or trait value, if any, that constitute components of the MSP. (Seed Value, License Fee, Royalty have been elaborately defined in the Order so as to eliminate any ambiguity under clause 2.) MSP fixation along with fixation of its components shall be binding on all stakeholders. No licensor, licensee or dealer shall distribute and sell seed above MSP fixed by the Central Government. Further all license agreements shall be in the format prescribed by notification.

- ✓ **Clause 6:** Any person aggrieved by any notification or order may apply to the Central Government or the specified authority for a review within a period of 30 days from the date of such notification or order.
- ✓ **Clause 7:** Contraventions of any of the provisions of this Order or any direction made there under is punishable under section 7 of the Essential Commodities Act.

Conclusion

Genetic engineering is a globally recognized as a rapidly emerging and far-reaching technology. It is also being described as the "*Technology of Hope*" for its promising of food, health and environmental sustainability. The recent and continuing advances in life sciences clearly unfold a scenario energized and driven by the latest tools of biotechnology. A large number of agri-biotech and industrial biotech products have enormously helped mankind in many ways. Biotechnology is hence predicted to play a vital role in the development of the agriculture sector. This technology can be used not only to develop new crops/varieties, which are tolerant to disease, pests and abiotic stresses, but also to improve productivity and nutritional quality of food.

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Seed Sampling: Principles & Procedures

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In a laboratory, only a small portion (quantity) of a seed lot can be examined. Therefore, it is important that this small portion is representative of the seed. Hence, drawing of representative sample correctly is fundamental in order to obtain uniform, accurate and reproducible results. The reliability of the interface made about the quality of the seed lot depends primarily on two components: the accuracy with which the sample represents the lot and the accuracy and precision of the laboratory test. It is observed in many cases that the variations in test results are due to the variation in the sampling. Hence, seed sampling is one of the basic components responsible for the accurate seed testing results. Therefore, utmost care is required for drawing the sample. No matter how accurately the laboratory tests are done, the results can only show the quality of the sample submitted for analysis; consequently the sample should accurately represent the composition of the seed lot.

In his foreword to the ISTA Handbook on Seed Sampling (1986), late Dr Arne Wold, Former Chairman of Bulking and Sampling Committee of ISTA wrote "Sampling of seeds is an important part of seed quality control. Correct sampling is a pre-requisite for the reliable estimation of the quality of a seed lot. Accurate description and detailed information of the sampling procedures are therefore necessary. Uniformity in sampling seed lots as well as drawing working samples is as important as uniformity in test methods in order to obtain accurate and reproducible results, Incorrect sampling may lead to misleading test results, discarding seed lots of high quality or to the approval of seed lots of low quality, which may reduce crop yield or even result in complete failure".

Seed sampling refers to the selection of a small portion of seed from a larger amount. It is aimed at obtaining a sample of a size suitable for tests, in which the probability of a constituent being present is determined only by its level of occurrence in the seed lot. While selecting samples, equal amounts should be drawn from different parts of the seed lot – from the top, middle and bottom of the lot. In general, seed lots are either in bags, in bulk or in stream. The amount or size of a seed lot determines how much sampling is required. This is called the sampling intensity. Seed Testing Laboratory personnel are not necessarily engaged in the sampling of seeds. But, nevertheless they should be well acquainted with the principles of seed sampling and should also be able to guide properly the persons engaged in this job.

Objectives

1. Sampling is done to get a uniform and representative sample from a seed lot, to minimize the errors during seed testing. The size of the submitted sample required for testing is small as compared to the size of the lot. Therefore, care must be taken to ensure that the submitted sample represents the lot of the seed to be tested.

2. Hence it is essential that the samples be prepared in accordance to ISTA rules to ensure that the small sized sample should represent truly and in the same proportion all constituents of seed lot.

Definitions

Seed lot

A seed lot is a specified quantity of seed that is physically and uniquely identifiable.

Primary sample

A primary sample is a portion taken from the seed lot during one single sampling action.

Composite sample

The composite sample is formed by combining and mixing all the primary samples taken from the seed lot.

Sub-sample

A sub-sample is a portion of a sample obtained by reducing a sample.

Submitted sample

A submitted sample is a sample that is to be submitted to the testing laboratory and may comprise either the whole of the composite sample or a sub-sample thereof. The submitted sample may be divided into sub-samples packed in different material meeting conditions for specific tests (e.g. moisture or health).

Duplicate sample

A duplicate sample is another sample obtained for submission from the same composite sample and marked "Duplicate sample".

Working sample

The working sample is the whole of the submitted sample or a sub-sample thereof, on which one of the quality tests described in these ISTA Rules is made and must be at least the weight prescribed by the ISTA Rules for the particular test.

Sealed

Sealed means that a container in which seed is held and closed in such a way, that it cannot be opened to gain access to the seed and closed again, without either destroying the seal or leaving evidence of tampering. This definition refers to the sealing of seed lots, as well as of seed samples.

Self-sealing containers

The 'valve-pack' bag is a specific type of self-sealing container. It is filled through a sleeve-shaped valve which is automatically closed by the completion of filling the bag.

Marked/labeled

A container of a seed lot can be considered as marked or labeled when there is a unique identification mark on the container, which defines the seed lot to which the container belongs. All containers of a seed lot must be marked with the same unique seed lot designation (numbers, characters or combination of both). Making of samples and sub-samples must ensure

that there is always an unambiguous link between the seed lot and the samples and sub-samples.

General principles of seed sampling:

A composite sample is obtained from the seed lot by taking primary samples from different positions in the whole seed lot and combining them. From this composite sample, sub-samples are obtained by sample reduction procedures at one or more stages forming the submitted sample and finally the working samples for testing. Sampling and sample reduction must be performed using appropriate techniques and equipment that is clean and in good condition.

1. Sampling should be carried out only by persons trained and experienced in seed sampling and employed by the official organizations.
2. The seed lot shall be so arranged that each individual container or part of the lot is conveniently accessible. Upon request by the sampler, the owner shall provide full information regarding the bulking and mixing of the lot. When there is definite evidence of heterogeneity, sampling should be reduced. In case of doubt, heterogeneity can be tested.
3. The size of the seed lot should also not exceed maximum seed lot size limits as prescribed in the rules, subject to a tolerance of 5%.
4. When sampling is being done by hand, great care should be taken to keep the fingers tightly closed around the seeds so that none may escape. Seed sampler may request that bags be emptied or partially emptied to facilitate sampling. The bags may then be refilled. This may be necessary, since it is impossible to obtain sample deeper than 400 mm that is, from the lower layers in bags and bins.
5. Other things being equal, a large sample is more representative of a lot than is a small sample. Moreover, if there is a choice as to whether to reduce a sample before sending it to the laboratory, the larger quantity should be submitted.
6. The sampler should determine that all seed bags sampled are identified as belonging to a single lot, either by a label or stencil mark on the bag.
7. The sampler must sample the minimum requisite number of bags from the seed lot. The sampling intensity must not be less than that prescribed below:

Table 1: Sampling intensity

| Weight of individual container in the seed lot | Weight of lot (kg or number of container) | Number of primary samples |
|--|---|--|
| >100 kg | Up to 500 kg | at least 5 |
| | 501 - 3000 kg | 1 for each 300 kg , but not less than 5 |
| | 3,001 -20,000 kg | 1 for each 500 kg , but not less than 10 |
| | 20,001 kg and more | 1 for each 700 kg , but not less than 40 |

| | | |
|---|-----------------------|-----------------------|
| Note: | | |
| <ul style="list-style-type: none"> Applicable for containers of more than 100 kg, or from streams of seed entering containers When sampling a seed lot of upto 15 containers, regardless of their size, the same number of primary samples shall be taken from each container | | |
| 15 - 100 kg Inclusive | 1 - 4 containers | 3 from each container |
| | 5 - 8 containers | 2 from each container |
| | 9 - 15 containers | 1 from each container |
| | 16 - 30 containers | 15 from the seed lot |
| | 31 - 59 containers | 20 from the seed lot |
| | 60 or more containers | 30 from the seed lot |
| Note: | | |
| <ul style="list-style-type: none"> For seed pellets, seed granules, seed mats and tapes, small packets and reels, containers of less than 30,000 seed units must be combined to sample units that not exceeding 20,00,000 seeds. The sampling units shall be regarded as containers. For containers holding less than 15 kg of seed, containers must be combined into sampling units not exceeding 100 kg (20 Containers of 5 kg, 33 containers of 3 kg or 100 containers of 1 kg). The sampling units shall be regarded as containers. | | |

When sampling a seed lot of upto 15 containers, regardless of their size, the same number of primary samples shall be taken from each container.

8. Care must be exercised in reducing composite samples. Careless splitting of the sample cannot be expected to produce two similar portions.
9. Any seed known to have been treated with a poisonous fungicide should be identified so that the person who subsequently may handle the sample will be informed of the potential hazard.
10. While taking samples from machine sewed cotton bags, a few stitches at one of the top corners can be loosened broken and then this break can be closed with hand stapling device after the contents of the bag have been sampled or a self adhesive label shall be affixed to ensure proper sealing and to avoid a tampering.
11. The weight of the sample drawn should not be less than the weight of the submitted sample as prescribed in the ISTA rules.
12. Under seed law enforcement programme, only trained and experienced officials are authorized to undertake sampling and he has to give notice to such intention to the person from whom he intends to take sample. Three representative samples should be taken in the prescribed manner, which should be marked & sealed.
 - One sample to be delivered to the person from whom it has been taken
 - Second to be sent for analysis to the Seed Analyst of the area.
 - Third to be retained for any legal proceedings.
 - At least two persons should be present and obtain the signature of both the witnesses on form VIII of the Seed Rules.
 - Sampler must verify the information provided on the label as per the requirements of the Seed Act.

Following information should be checked on label

- i. Kind
 - ii. Variety
 - iii. Lot Number
 - iv. Date of Test
 - v. Seller's name & address
13. In case of certified lots, sampler should check the following information on seed certification tag:
- Name & Address of certification agency
 - Kind & Variety
 - Lot No.
 - Name & Address of certified seed producer
 - Date of issue of the certificate & its validity
 - Class & Designation of seed
 - Period during which the seed shall be used for sowing
14. The seed lot should be so arranged that each individual or part of the lot is conveniently accessible.

Procedures for sampling a seed lot

Preparation of a seed lot and conditions for sampling

At the time of sampling, the seed lot shall be as uniform as practicable. If there is documentary or other evidence of heterogeneity, or the seed lot is found to be obviously heterogeneous, sampling must be refused/ stopped. In cases of doubt, heterogeneity can be determined. Seed may be sampled in containers or while entering the containers. The containers must be fit for purpose, e.g. must not damage the seed, and must be clean to avoid cross contamination. The containers must be labeled or marked before or just after sampling is completed. The seed lot should be so arranged that each individual or part of the lot is conveniently accessible.

Obtaining primary samples

- The primary samples are drawn with the aid of suitable seed triers / or by hand in case of chaffy / non-free flowing seeds
- When defining the number and/or the size of primary samples, the seed sampler needs to ensure (besides meeting the minimum sampling intensity) that the minimum amount of seed required for the requested test(s) is sent to the testing laboratory and enough seed remains available for obtaining duplicate samples, if requested.
- Primary samples of approximately equal size shall be taken from a seed lot, irrespective of where in the lot or container the primary sample is taken.
- When the seed lot is in bags/ containers, the containers to be sampled shall be selected at random or according to a systematic plan throughout the seed lot. Primary samples shall be drawn from the top, middle and bottom of containers, but not necessarily from more than one position in any container, unless so specified.
- Closed paper bags may also be sampled in this manner. However, the holes in the paper bags should be closed with self-adhesive tape, duly signed by the sampler

- When the seed is in bulk or in large containers, the primary samples shall be drawn from random positions and depths with the aid of bin sampler.
- In case of chaffy seeds that have not been rendered free flowing, the primary samples are drawn by hand.
- When seed is to be packed in smaller moisture-proof containers, (e.g. tins, or plastic bags), it should be sampled, if possible, either before or during the filling of the containers. When this has not been done, a sufficient number of containers shall be opened or pierced for abstraction of primary samples. The sampled containers shall then be closed or the containers transferred to new containers.
- Seeds are also sampled as it enters the containers, i.e. at the time processed seeds are being put into the containers, this can be done with the help of an automatic device or manually. An uniform quantity of seeds may be taken from the seed stream at specified intervals.
- Sampling seed lots of seed tapes and seed mats should be done by taking packets or pieces of tape or mat.
- The instruments being used must neither damage the seed nor select according to seed size, shape, density, chaffiness or any other quality trait. All sampling apparatus must be clean before use to prevent cross contaminations. Triers must be long enough so that the opening at the tip reaches at least half of the diameter of the container. When the container is not accessible from opposite sides, the trier must be long enough to reach the opposite side.

Sampling seed lots may be done by one of the methods listed below.

- a. **Automatic sampling from a seed stream:** Seed may be sampled by automatic sampling devices, provided that the instrument uniformly samples the cross section of the seed stream and the material entering the instrument does not bounce out again. It may be operated either under manual or automatic control. However, the intervals between taking primary samples should be constant.
- b. **Manual sampling from a seed stream:** Seed streams may also be sampled by using manual instruments when fulfilling the requirements listed under a sampling stick.
- c. **Sampling stick:** Sampling stick (e.g. stick trier, sleeve type trier, spiral trier) consists of two parts, one of which fits loosely inside the other, but tightly enough so that seed or impurities do not slip between them. The outer part has a solid pointed end. Both parts have slots in their walls so that the cavity of the inner part can be opened and closed by moving the two parts against each other by either a twisting or a push-pull motion. The sampling stick may be used horizontally, diagonally or vertically. The spiral trier has slots in a spiral arrangement for their subsequent opening from the tip to handle and may only be used of a size smaller than *Triticum aestivum*. The sampling stick is inserted in the closed position into the container, gently pushing it so that the point reaches the required position. Further, the sampling stick is opened and slightly agitated to allow it to fill completely, followed by closing gently, withdrawing and emptying the primary sample into a container. Care should be exercised in closing the sampling stick so that seeds are not damaged.
- d. **Nobbe trier:** The Nobbe trier (dynamic spear) is a pointed tube with an opening near the pointed end, seed passes through the tube and is collected in a container. The minimum internal diameter of the Nobbe trier should be wide enough to allow the smooth and free flow of seed and contaminants through the trier. It is inserted at

- an angle of about 30° to the horizontal plane with the opening facing down and pushed until it reaches the required position and revolve it through 180°. Later, it is withdrawn with decreasing speed from the container, gently agitating the trier to help maintain an even flow of seed, and collect the seed sample coming in a suitable container.
- e. **Cargo sampler:** The cargo sampler (bulk sampler) consists of a special type of chamber that is fixed to a shaft. The lower part of the chamber is cone-shaped with a pointed end. To reach a greater depth, the shaft may be lengthened by screwing on successive extensions. There is a closing system in the chamber that may be a collar on the outside of the instrument, a wing connected to a door or a valve with a spring. Some cargo samplers can be closed before they are drawn back from the sampling position; others cannot be closed, so that the filled chamber is open during withdrawal.
- For all species, the minimum inside diameter can be about 35 mm and the depth 75 mm. It is inserted in the closed position into the container and gently pushed vertically into the seed so that the point reaches the required *position*, pull the cargo sampler back about 10 cm or turn it (depending on the closing system), agitate it slightly to allow it to fill completely, gently close if possible and withdraw it and empty the primary sample into a container. Care should be exercised in closing the cargo sampler, so that the seeds are not damaged.
- f. **Sampling by hand:** This method can be used for all species and may be the most suitable method for seed that may be damaged by the use of triers, seeds with wings, seeds with low moisture content, seed tapes and seed mats. For hand sampling seed in containers, all positions inside the containers must be accessible. Containers with layers which are not accessible from the regular opening may have to be cut open, sampled and repackaged. Containers may also be partially or completely emptied during the sampling process to gain access to all positions in the containers. For sampling by hand, clean the hand and roll the sleeve up if necessary, insert the open hand into the container to the required position, close and withdraw the hand, taking great care that the fingers remain tightly closed about the seeds so none may escape, and empty the hand into a receiving pan.

Obtaining the composite sample

The primary samples are compared with each other during sampling. If they appear to be uniform, they are combined to form the composite sample. If not, the sampling procedure must be stopped. When primary samples are collected directly into one container, the content of this container may be regarded as the composite sample only if it appears uniform. If not, it must not be used for obtaining a submitted sample.

Obtaining the submitted sample:

The submitted sample of requisite weight or more may be obtained from the composite sample, either by repeated halving or by abstracting and subsequently combining small portions to an appropriate size. Obtaining subsamples such as seed moisture testing must be carried out in such a way that changes in moisture content are minimal. The composite sample can be submitted to the seed testing laboratory if it is of appropriate size for the tests to be conducted, or if it is difficult to mix and reduce the composite sample properly under warehouse conditions.

Obtaining the submitted sample for determination of moisture content:

Obtaining submitted samples of the required size for moisture testing must be carried out in such a way that changes in moisture content are minimal. Samples must be taken in the following way from the composite sample: first, mix the composite sample by either stirring it or by passing it through a mechanical divider and combining preferably once but not more than three times. Then, take a minimum of three subsamples from different positions and combine them to create the submitted sample for moisture testing.

Obtaining duplicate samples:

Duplicate samples, which were requested no later than at the time of sampling, must be prepared in the same way as the submitted sample.

Dispatch of the submitted sample

- The submitted sample should be sealed and marked with the same identification as the seed lot, in such a way that it establishes connection between the seed lot and the sample. The label should contain all the necessary details; such as variety, class of seed, quantity in the lot, to whom it belongs, name of the producer, seed treatment, date of harvesting and threshing, if known, sampled by, date of sampling and kind of tests required.
- For an ISTA International Seed Lot Certificate, the sample must be sealed. The additional information required as well as the name of any chemical treatment applied must be provided.
- After marking, samples should be packed so as to prevent damage during transit. For germination tests, it should be packed preferably in the cloth bags. Submitted samples for germination tests, viability tests and health tests may only be packed in moisture proof containers if suitable storage conditions can be assured.
- For determination of seed moisture content, it should be packed separately in moisture proof containers from which as much air as possible has been excluded.
- Submitted samples shall be dispatched by the sampler to the seed testing laboratory without delay.

Procedure for obtaining the working sample

Minimum size of working sample

Minimum sizes of working samples are prescribed in the ISTA rules for each test. The working sample weights for purity analyses are calculated to contain at least 2500 seeds. These weights are recommended for normal use in purity test. The sample weights, for counts of other species are 10 times the weights recommended for purity analysis in column 4, subject to a maximum of 1000g.

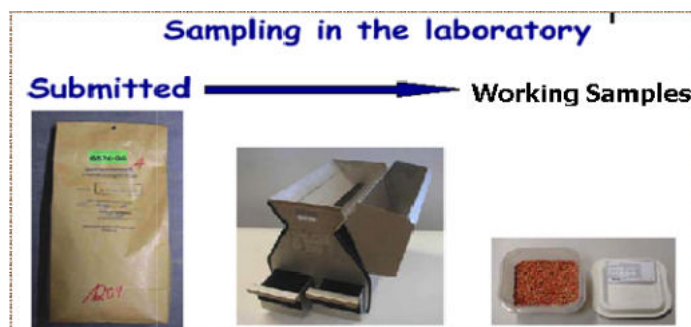
Working sample for all coated seeds except those defined as treated seeds must contain at least the number of seeds, pellets, granules as prescribed in the ISTA rules. If smaller sample is used, the actual number of pellets, seeds or granules in the sample must be reported.

Sample reduction methods

- If the seed sample needs to be reduced to a size equal to or greater than the size prescribed, the seed sample shall first be thoroughly mixed. The submitted/working sample shall then be obtained either by repeated halving or by abstracting and subsequently combining small random portions. One, two or more of these methods may be used in one sample reduction procedure. While using one of the dividers described for seed pellets the distance of fall must not exceed 250 mm.
- Only the spoon methods and the hand halving method may be used in the laboratory to obtain working samples for seed health testing where other samples or equipment may be contaminated by spores or other propagation material.
- For seed tapes and mats, take pieces of tape or mat at random to provide sufficient seeds for the test.
- After obtaining a working sample or half-working sample, the remainder shall be re-mixed before a second working sample or half-working sample is obtained.
- Sub-samples for moisture content determination may be taken in the following way; before taking the sub-sample, mix the sample by either stirring the sample in its container with a spoon or place the opening of the original container against the opening of a similar container and pour the seed back and forth between the two containers. Take a minimum of 3 sub samples with spoon from different positions and combine them to form a sub-sample of the required size. The seed may not be exposed to the air during sample reduction for more than 30 seconds.

Methods for obtaining working samples

- The seed samples received in the Seed Testing Laboratory (Submitted sample) are required to be reduced to obtain working samples for carrying out various tests.

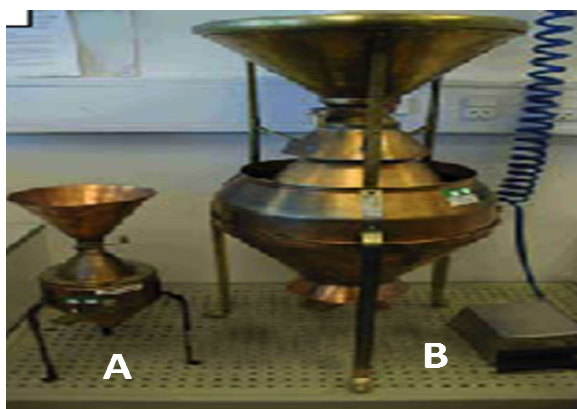


Mechanical divider method

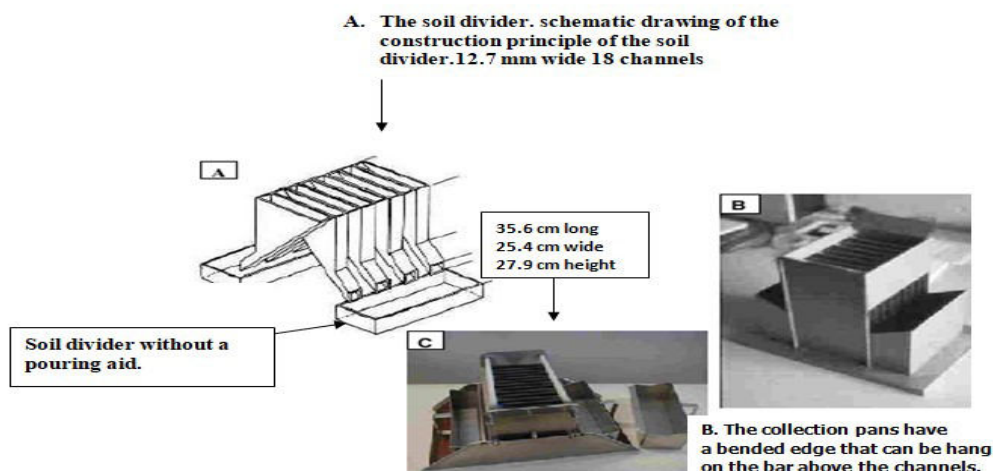
This method is suitable for all kinds of seeds except some very chaffy seeds. The apparatus divides a sample passed through it into two or more through it into two or more approximately equal parts. The submitted sample can be mixed by passing it through the divider, recombining the parts and passing the whole sample through a second time, and similarly, a third time if necessary. The sample is reduced by passing the seed through repeatedly and removing parts on each occasion. This process of reduction is continued until a working sample of approximately, but not less than, the required size is obtained.

a. Conical divider.

The conical divider (Boerner type) consists of a hopper, cone, and series of baffles directing the seed into two spouts. The baffles form alternate channels and spaces of equal width. They are arranged in a circle and are directed inward and downward, the channels leading to one spout and the spaces to an opposite spout. A valve or gate at the base of the hopper retains the seed. When the valve is opened the seed falls by gravity over the cone where it is evenly distributed to the channels and spaces, then passes through the spouts into the seed pans. Dividers with more than 18 channels have been found to be suitable. Channels must be wide enough to allow the smooth free flow of seed and contaminants. Channels and spaces must be wide enough to allow the smooth free flow of seed and contaminants. The more channels and spaces, the better the accuracy. Typical conical dividers have about 15 channels and spaces.

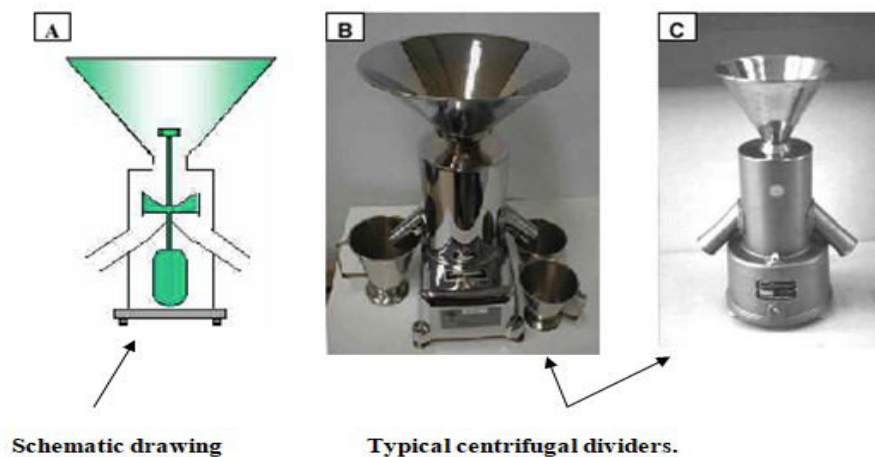


- i. **Small divider:** 40.64 cm high and 15.24 cm in diameter, designed for small free-flowing seeds there are 22 channels and 22 spaces, each 7.9 mm wide.
 - ii. **Large divider:** 81.28 cm high and 36.83 cm in diameter, designed for large seeds and grains, there are 19 channels and 19 spaces, each 25.4 mm wide.
- b. Soil divider (Riffle divider):** It is simpler divider, built on the same principle as the conical divider. However, the channels are here arranged in a straight row instead of a circle as in the conical divider. It consists of a hopper with 18 attached channels or ducts alternately leading to opposite sides, a frame to hold the hopper, two receiving pans and a pouring pan. The channels must be wide enough to allow the smooth free flow of seed and contaminants. The more channels, the better the accuracy. A minimum of 10 channels is required. While using the divider, the seed is placed evenly into a pouring pan and then poured in the hopper at approximately equal rates along the entire length. The seed passes through the channels and is collected in two receiving pans.



c. Centrifugal divider:

The centrifugal divider (Gamete type) makes use of centrifugal force to mix and scatter the seeds over the dividing surface. The seed flows downward through a hopper onto a shallow rubber cup or spinner. Upon rotation of the spinner by an electric motor, the seeds are thrown out by centrifugal force and fall downward. The circle or area where the seeds fall is equally divided into two parts by a stationary baffle so that approximately half the seeds fall in one spout and half in the other spout. The centrifugal divider tends to give variable results, unless the spinner is operated after having poured the seed centrally into the hopper.



d. Rotary divider:

The rotary divider comprises a rotating crown base unit usually with 6 to 32 attached subsample containers, a vibration chute and a hopper. The seed is poured into the hopper and the rotary divider is switched on so that the crown/ base unit with the containers rotates with approx. 100 rpm and the vibration chute starts to feed the seed into the inlet cylinder of the rotating crown. The longer duration of the dividing

operation, the better the accuracy. The feeding rate and therefore the duration of the dividing operation can be adjusted by the distance between the funnel of the hopper and the chute and the vibration intensity of the chute.

There are two principles:

- (i) The inlet cylinder feeds the seed centrally onto a distributor within the rotating crown distributing the seed to all containers simultaneously.
- (ii) The inlet cylinder feeds the seed de-centrally into the inlets of the containers rotating underneath the inlet cylinder so that the seed stream is subdivided into a lot of subsamples.

For this type of divider, mixing and dividing takes place in one operation.

e. Variable sample divider:

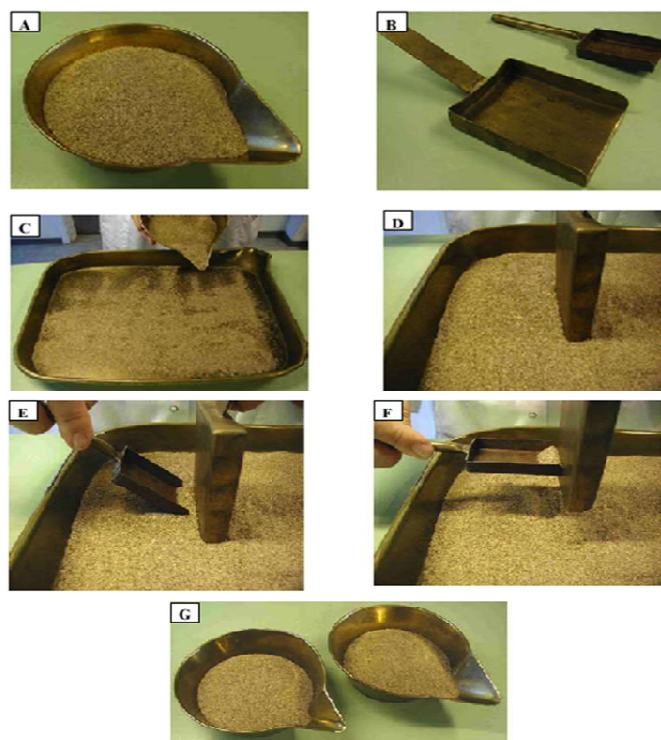
The variable sample divider consists of a pouring hopper and a rotating tube underneath that rotates with about 40 rpm. The tube distributes the seed stream from the pouring hopper onto the inner surface of a further hopper, which is well fitted into a third hopper all being concentric. In the second and the third hopper, there are slots that can be twisted against each other, resulting in wider or narrower slots. The effect is that a smaller percentage will pass through the slots. Either the smaller sample outside the hoppers or the bigger sample inside the hoppers can be used as the required sample. The position of the two hoppers in relation to each other can be adjusted accurately, resulting in pre-determined subsamples sizes.

f. Modified halving method:

The apparatus comprises a tray into which fits a grid of equal-sized cubical cells, open at the top and every alternate one having no bottom. After preliminary mixing, the seed is poured evenly over the grid. When the grid is lifted, approximately half the sample remains on the tray. The submitted sample is successively halved in this way until a working sample, of approximately but not less than the required size, is obtained.

g. Spoon method:

- The spoon method is recommended for single small-seeded species and for sample reduction for moisture determination or seed health testing sample reduction for seed health testing.
- For other tests, it is restricted to species with seeds smaller than *Triticum aestivum*; to the genera *Arachis*, *Glycine* and *Phaseolus*, and to tree genera *Abies*, *Cedrus* and *Pseudotsuga*. For all other species, it can only be used to obtain working samples in the laboratory for seed health tests.
- A tray, a spatula and a spoon with a straight edge are required. After preliminary mixing, pour the seed evenly over the tray; do not shake the tray thereafter.
- With the spoon in one hand, the spatula in the other, and using both, remove small portions of seed from not less than five random places. Sufficient portions of seed are taken to constitute a subsample of the required size.

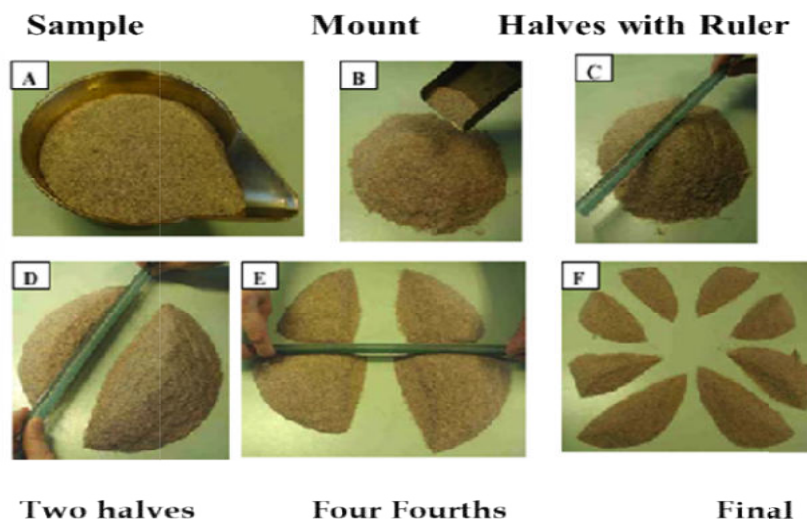


- A. Sample to be reduced.
- B. Two spoons
- C. A spoon is pushed vertically into the seed layer (as a substitute).
- D. Distributing the seed over the pan.
- E. With the second spoon the seed in front of the vertical spoon is collected.
- F. Both spoons are removed from the seed and the seed sample is transferred to a collection pan.
- G. Two sub-samples as the result.

h. The hand halving method:

This method is the most satisfactory method for chaffy and genera of tree and shrub seed. However, this method is restricted to:

- the following genera of chaffy seeds, *Agrimonia*, *Andropogon*, *Anthoxanthum*, *Arrhenatherum*, *Astrebla*, *beckmannioa*, *Bouteloua*, *Brachiaria*, *Briza*, *Cenchrus*, *Chloris*, *Dicghanthium* *Chloris*, *Digitaria*, *Echinochloa*, *Ehrharta*, *Elymus*, *Eragrostis*, *Gomphrena*, *Gossypium* (linted seed only), *Melinis*, *Oryza*, *Pennisetum* (non glaucum), *Psathyrostachys*, *Scabiosa*, *Sorghastrum*, *Stylosanthes* (non guianensis), *Trisetum*, *Urochloa*;
- to the following genera of easily damaged fragile seeds: *Arachis*, *Glycine* and *Phaseolus*;
- and to the following genera and species of tree and shrub seeds: *Acer*, *Aesculus*, *Ailanthus*, *Castanea*, *Cedrela*, *Corylus*, *Fagus*, *Fraxinus*, *Juglans*, *Liriodendron*, *Pinus cembra*, *Pinus pinea*, *Platanus*, *Populus*, *Quercus*, *Salix*, *Tectona*, *Ulmus*.
- This method can also be used with the species, where all other dividing methods are extremely difficult or impossible to use. The steps involved are given below:
- The seed is poured evenly onto a smooth clean surface.
- Thoroughly mix the seed into a mound with a flat-edged spatula
- The mound is divided into half and each half is halved again, giving four portions. Each of the four portions is halved again giving eight portions which should be arranged in two rows of four.
- Combine and retain alternate portions: e.g. combine the first and third portions in the first row with the second and fourth in the second row. Remove the remaining four portions.
- Steps two, three and four are repeated using the retained portions from step four until the weight of sample required is obtained.



Random Cups Method



- Schematic drawing of the tray, the cups and how to distribute the seed over the tray.
- A tray with cups and distributing a sample over the tray.
- The tray with the total sample distributed over the tray.
- The cups removed from the tray and emptied into a glass vessel.
- Cups of different size in one set.

To avoid variability in the results, the divider is operated

- Leveled by means of the adjustable feet.
- Divider & four containers are checked for cleanliness.
- A container is placed under each spout.
- The whole sample is fed into the hopper; when filling the hopper, seed must always be poured centrally.
- The spinner is operated and the seed passes into the containers.

- vi. Full containers are replaced by empty containers. The contents of the two full containers are fed into the hopper together, the seed being allowed to blend as it flows in. The spinner is operated.
- vii. The procedure described in (vi) above is repeated at least once more.

Storage of submitted samples before testing: Every effort must be made to start testing a submitted sample on the day of receipt. Storage of orthodox seeds, when necessary, should be in a cool, well-ventilated room. Non-orthodox (i.e. recalcitrant or intermediated seeds should be tested as soon as possible after obtaining the submitted sample from the composite sample without any storage. Handling of the submitted sample and, if necessary, storage should be done under species specific optimum conditions.

Storage of samples after testing: The primary aim of storage of samples after testing is to be able to repeat the original tests carried out on the submitted sample. Therefore, storage conditions should be such that changes in the seed quality traits tested are minimal. For example, in the case of the purity test or other seed count, the sample should be stored in such a way that the physical identity is kept. In the case of germination, viability or health test of orthodox seeds the sample should be stored under cool and dry conditions. For such tests in recalcitrant and intermediate seeds of tropical and sub-tropical species, long term storage is not possible. For such seed of temperate species storability depends on the fungal status and to some extent whether the seed is dormant or not. All factors pertaining to storage need to be determined on a species basis. Protection against insects and rodents may be necessary. When a re-test in a different testing laboratory is required, a portion shall be drawn from the stored sample and submitted to the designated testing laboratory. The remainder shall be retained in the store.

Table 2: Sample weights of important field and vegetable crops

| (1) Crop | Minimum weight for | | |
|---|---------------------------------|---|---|
| | (2) Submitted sample (gm) | (3) Working sample for purity analysis(gm) | (4) Working sample for count of other species seeds (gm) |
| FIELD CROPS | | | |
| Cereal crops and Millets | | | |
| Paddy | 400 | 40 | 400 |
| Barley, Wheat | 1000 | 120 | 1000 |
| Maize | 1000 | 900 | 1000 |
| Sorghum | 900 | 90 | 900 |
| Pearl millet (Bajra) | 150 | 15 | 150 |
| Common millet (Proso millet, Hog millet) | | | |
| Italian millet | 90 | 9 | 90 |
| Oats | 1000 | 100 | 1000 |
| Pulse crops | | | |
| Chickpea (Gram) | 1000 | 1000 | 1000 |

| | | | |
|--|------|------|------|
| Pigeon pea (Red gram, Arhar) | 500 | 200 | 200 |
| Green gram (Mung bean) | 1000 | 120 | 1000 |
| Black gram | 1000 | 700 | 1000 |
| Lima bean | 1000 | 1000 | 1000 |
| French bean | 1000 | 700 | 1000 |
| Lablab bean, Field bean | 1000 | 500 | 1000 |
| Cowpea | 1000 | 400 | 1000 |
| Garden pea | 1000 | 900 | 1000 |
| Lentil | 600 | 60 | 600 |
| Oilseed crops | | | |
| Groundnut | 1000 | 1000 | 1000 |
| Rapeseed and mustard | 160 | 16 | 160 |
| Soybean | 1000 | 500 | 1000 |
| Safflower | 900 | 90 | 900 |
| Sunflower (varieties) | 1000 | 250 | 1000 |
| Sunflower (hybrids) | 250 | 125 | 250 |
| Castor | 1000 | 100 | 1000 |
| Sesame | 70 | 7 | 70 |
| Niger | 150 | 5 | 150 |
| Fibre crops | | | |
| Cotton varieties (linted) | 1000 | 350 | 1000 |
| Cotton hybrids (linted) | 250 | 25 | 250 |
| Cotton varieties/ hybrid(delinted) | 350 | 35 | 350 |
| Jute | 100 | 10 | 100 |
| Sunn hemp | 700 | 100 | 700 |
| Forage crops | | | |
| Egyptian clover (berseem) | 60 | 6 | 60 |
| Sweet clover, | | | |
| Alfalfa (Lucerne) | 50 | 5 | 50 |
| Giant-star grass | 25 | 1 | 10 |
| Guinea grass | 25 | 2 | 20 |
| Thunberg kudzu vine | 350 | 35 | 350 |
| Sudan grass | 250 | 25 | 250 |
| Teosinte | 1000 | 900 | 1000 |
| VEGETABLE CROPS | | | |
| Bulb crops | | | |
| Onion | 80 | 8 | 80 |
| Leek | 70 | 7 | 70 |
| Cruciferous vegetables (Cole crops) | | | |

| | | | |
|--|------|------|------|
| Brussels sprouts, Cabbage, Cauliflower, Broccoli, Karamsag, Knol-kohl, Kohlrabi, Sprouting broccoli | 100 | 10 | 100 |
| Chinese cabbage, | 40 | 4 | 40 |
| Cucurbitaceous vegetables | | | |
| Ash gourd, Bottle gourd, Pointed gourd, Winter squash, Summer squash | 700 | 70 | 700 |
| Bitter gourd | 1000 | 450 | 1000 |
| Ridge gourd | 1000 | 400 | 1000 |
| Round gourd (Indian squash), Snake gourd, Sponge gourd, Water melon | 1000 | 250 | 1000 |
| Cucumber, Long-melon, Musk melon, Snap melon | 150 | 70 | 150 |
| Pumpkin | 350 | 180 | 350 |
| Green/ Leafy vegetables | | | |
| Amaranthus | 70 | 7 | 70 |
| Asparagus bean (vegetable cowpea) | 1000 | 100 | 1000 |
| Beet | 500 | 50 | 500 |
| Celery | 25 | 1 | 10 |
| Coriander | 400 | 40 | 400 |
| Fenugreek (Methi) | 40 | 4 | 40 |
| Lettuce | 30 | 3 | 30 |
| Parsley | 40 | 4 | 40 |
| Parsnip | 100 | 10 | 100 |
| Spinach | 250 | 25 | 250 |
| Leguminous vegetables | | | |
| Broad bean, Lima bean | 1000 | 1000 | 1000 |
| Cluster bean, Dolichos Bean, Field bean, Goa bean, Jack bean, sword bean Velvet bean | 500 | 50 | 500 |
| French bean | 1000 | 700 | 1000 |
| Garden pea | 1000 | 900 | 1000 |
| Root crops | | | |
| Beet | 500 | 50 | 500 |
| Carrot | 30 | 3 | 30 |
| Radish | 300 | 30 | 300 |

| | | | |
|---|-----|-----|-----|
| Turnip | 70 | 7 | 70 |
| Fruit crops | | | |
| Tomato (varieties) | 70 | 7 | 70 |
| Tomato (hybrids) | 7 | 7 | 7 |
| Brinjal, Chillies (Hot Pepper), Sweet pepper | 150 | 15 | 150 |
| Okra (Bhindi) | 500 | 100 | 500 |

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Seed quality control regulatory mechanism in India

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Seed is an essential input for crop production. Access of farmers to quality seed of superior varieties is key in increasing agricultural productivity and production. Use of quality seeds alone could increase productivity by 15-20 % indicate the critical role of seed in agriculture. Therefore it is imperative to increase the production and distribution of quality seeds. Measures of seed legislation with respect to quantity and quality were initiated in the country by establishment of National Seed Corporation during 1963 under Ministry of Agriculture. The seed sector in India during the period was dominated by the Public sector. The NSC was the Central Body to produce seeds of superior dwarf varieties in rice, wheat and, superior hybrids in maize, pearl millet and sorghum. This was followed by various seed legislations enacted by Government of India.

Since most of the farming community is illiterate or semi- literate, it is the responsibility of the Government to frame rules that govern the production and distribution of quality seeds to the farming community. Though seed act had been implemented in European countries at the fag end of eighteenth century, India did have an act to designate seed quality parameters. This void was fulfilled during 1966, when the Seed Act was formed and followed by Seed Rules in 1968. Both were adopted during 1969. Amendments were made subsequently for the Seeds Act during the years 1972, 1973, 1974 & 1981. With newer varieties coming into the agricultural scenario, the seeds control order was formed insisting on compulsory licensing of the dealer. This was made even more stringent by bringing the seeds under the Essential Commodity Act, 1955. To help Multinational Corporation in utilizing the manpower and knowledge base of our country, the Plants, Varieties and Fruits Order was passed during 1989 and amended subsequently during 1998, 2000 and 2001. Finally the order was revised by another order, Plant Quarantine (Regulation of import into India) Order in 2003. Signing of WTO in 1995 paved the way for private research and development of varieties. In order to regulate such varieties, the protection of Plant Varieties and Farmers' Right Act was passed in 2001. Later many legislations were enacted to ensure the quality of seeds viz. National Seed Policy, 2002 and Seeds Bill, 2004 and draft seed bill 2019.

Seeds Act 1966

The object of Seed Act is for regulating the quality of certain notified kind / varieties of seeds for sale and for matters connected therewith. The seed act passed by the Indian Parliament in 1966 was designed to create a 'Climate' in which the seeds man could operate effectively and to make good quality seed available to cultivators. Seeds rule under the act were notified in September 1968 and the act was implemented in its entirety in October 1969. This act extent to the whole of India and it has 25 sections.

Seed legislation could broadly be divided into two groups

1. Applicability: Applicable only to 'Notified' Variety of seeds

2. Sanctioning legislation: Sanctioning legislation authorities' formation of advisory bodies, Seed Certification Agencies, Seed Testing laboratories, Foundation and Certified Seed Programmes, Recognition of Seed Certification Agencies of Foreign countries, Appellate authorities.

Statutory Bodies under the seed Act 1966: Central seed committee, central seed certification board, central seed testing laboratory, state seed testing laboratory, appellate authority, committee for recognition of seed certification agencies of foreign countries.

3. Regulatory legislation: Regulatory Legislation controls the quality of seeds sold in the market including suitable agencies for regulating the seed quality.

A total of twenty five sections have been mentioned in the seed act covering the various aspects to regulate the quality of seeds sold in the market.

Seed Rules, 1968

The rules have been framed to implement various legislations given under Seed Act, 1966 and contain 11 sections pertaining to various aspects central seed committee, central seed laboratory, seed certification agency, marketing or labeling, requirements for certification, certification of seeds, appeal, seed analyst and seed inspectors, sealing, dispatch and analysis of samples.

Seeds (Control) Order, 1983

The inclusion of seeds as an essential commodity item under the Essential Commodity Act, 1955 brought the Seeds (Control) Order.

- A person carrying on the business of selling, exporting and importing of seeds needs to obtain a license
- The Essential Commodity Act, 1955 gives powers to state governments to regulate various aspects of trading in essential commodities under the supervision of Central Government.
- The license provided to a seed dealer remains valid only for 3 years from the date of its issue which can be later renewed
- The seed dealer has to essentially display the stock position (opening and closing) on daily basis along with a list indicating prices or rates of different seeds
- A cash or credit memorandum has to be given by the dealer to purchaser of seeds, compulsorily
- The State Government is empowered with appointing a licensing authority, inspectors and mode of action for supply regulation.
- Under this order the time period for completion of seed analysis in case of any doubt about quality is 60 days compared to 30 days under Seed Rules
- Cancellation of license if obtained through misrepresentation and provision for appeal and an appellate has also been provided
- Provision for amendment of license and need for maintenance of records and submission of monthly returns by the dealer.

New Policy on Seed Development, 1988

The Government of India evolved a New seed policy implemented from October 1, 1988. The policy laid special emphasis on

- Import of high quality of seeds
- A time bound programme to modernize plant quarantine facilities
- Effective implementation of procedures for quarantine / post entry quarantine
- Incentives to encourage the domestic industry

- Import of quality seeds.

The policy permits the import of selected seeds under Open General License (OGL), to make available to farmers high quality seeds to maximize yield, increase productivity thereby farm income. The policy allow import under OGL of items such as seeds of oilseed crops, pulses, coarse grains, vegetables, flowers, ornamental plants, tubers, bulbs, cuttings and saplings of flowers. While the import of horticultural crops including flowers need recommendation from Directors of Horticulture, import of crop seeds require permission from ICAR. ICAR will direct multi -location trials in various agro-climatic conditions at least for one season. Evaluation of important traits such as yield, pest resistance etc. needs to be done within 3 months of harvest after which importer shall apply to the DAC for permit. Within a month, DAC will process it and thereafter controller of Imports and Exports will issue a license. Private seed producing firms should compulsorily register with NSC before importing the seeds.

Plants, Fruits and Seeds Order (Regulation of Import into India order) 1989

The order was made suppressing the Plants, Fruits and Seeds Order (Regulation of Import into India) 1984 and provides regulations during import based on post entry quarantine checks.

- Post entry quarantine facilities shall be established which shall be permitted to be released by
- Designated Inspection Authority.
- Import of any form of seed for consumption or sowing should carry a permit issued by the competent authority, and the import should be only through specified customs stations.
- The consignment shall be inspected by the Plant Protection Advisor.

Plant Quarantine (Regulation of import into India) Order, 2003

With the liberalized trade in agriculture, as consequence to WTO agreements, Government thought of providing new legislative provisions under the new order, Plant Quarantine (Regulation of import into India) Order, 2003. The order has now replaced the Plants, Fruits and Seeds order, 1989.

- The order has widened the scope of plant quarantine activities and has made pest risk analysis compulsory for imports
- The order includes provision for regulating the import of soil, moss, germplasm and GMO's for research, insects, microbial cultures and bio-control agents, timber and wooden logs
- The order prohibits import of commodities contaminated with weeds, alien species, and packaging material of plant origin unless the material has been treated
- Agricultural imports are thus classified as: prohibited plant species, restricted species where import permitted only by authorized institutions and declarations and plant material imported for consumption or industrial processing permitted with phytosanitary certificate
- Phytosanitary certificate according to Plant Quarantine requirements has to be provided so as to prevent spread of noxious pests
- Pest risk analysis during post entry quarantine is compulsory.
- Import of germplasm has to be permitted by NBPGR and any other biological materials such as soil, microbes, moss etc. has to be permitted by Plant Protection Advisor
- A list of 590 quarantine pests and 61 weed species have been declared under the Order
- Notified entry points for import have been increased compared to PFS Order, 1989

- Strengthening Plant Quarantine facilities, opening new quarantine stations, establishing advanced molecular diagnostic facilities for rapid pathogen detection, setting up of National Pest Risk Analysis unit are other important features of the Order.

Protection of Plant Varieties and Farmers Right Act, 2001

Government of India felt the need to provide protection to plant varieties which have tremendous commercial value after India became signatory to the Trade Related Aspects of Intellectual Property Rights Agreement (TRIPS) in the year 1994. The TRIPS agreement required the member countries to provide for protection of plant varieties either by a patent or by an effective *sui generis* system or by any combination thereof. The *sui generis* system for protection of plant varieties was developed by India integrating the rights of breeders, farmers, and village communities. The Protection of Plant Varieties and Farmers Right Act was thus formulated in the year 2001.

The act covers all categories of plants except microorganisms

- The variety being claimed for protection needs to be notified.
- The food crops including major cereals, pulses, oilseeds, vegetables and fruit crops are selected on first priority.
- Crops important for India in the world trade, species of Indian origin, crops where India could benefit from introduction of new germplasm are other priorities.
- The act is unique in the world with inclusion of rights of farmers, breeders, researchers and equity concerns.
- The Central Government shall establish a PPV & FR Authority with a Chairman and 15 members to implement the various functions of the Act.
- A variety can be registered for protection if it satisfies the criteria of Novelty, Distinctness, Uniformity and Stability (NDUS).
- Period of protection is six years in case of crops and may be renewed on condition that the total period of validity does not exceed 15 years.
- Registration certificate issued to a breeder confer him/her exclusive right to produce, sell, market, distribute, import or export the variety.
- Researchers are not prevented for conducting research using the registered variety or using the same for creating newer varieties provided an authorization is given by the breeder indicating the necessity of use of protected variety. The breeder of essentially derived varieties so developed using the protected varieties shall have the same rights as the breeder of other new varieties.
- Farmers have been provided right to avail protection of varieties conserved or developed by them. Farmers can save, re-sow, exchange, share and sell farm produce of any protected variety except its commercial marketing with brand name. Farmers have the right for innocent infringement when, at the time of infringement he is not aware of the existence of breeder rights.
- A National Gene Fund has been constituted which will be utilized for payment as rewards to farmers who has preserved a variety and which has been used as donor of genes in development of a new variety by any breeder.

National Seed Policy 2002

Globalization and economic liberalization have opened up new opportunities as well as challenges. While unnecessary regulation needs to be dismantled, it must be ensured that gullible farmers are not exploited by unscrupulous elements. A regulatory system of a new genre is, therefore, needed, which will encompass quality assurance mechanisms coupled with facilitation of a vibrant and responsible seed industry.

This policy covers 10 thrust areas as follows viz. varietal development and plant varieties protection, seed production, quality assurance, seed distribution and marketing, infrastructure facilities, transgenic plant varieties, import of seeds and planting material, export of seeds, promotion of domestic seed, strengthening of monitoring system. These initiatives will encourage investment in research and development, thereby ensuring availability of high yielding varieties of seeds which will lead to higher production and improving the economic condition of the farmers in the country.

Draft Seed Bill 2019

The New Seed Bill (2019) was proposed to replace the Seed Act (1966) to regulate quality of the seeds produced and distributed to cater the advancement in technology and the growth of the seed industry.

Highlights of Draft Seed Bill 2019

- Compulsory registration of seed varieties based on VCU (value for cultivation and use), evaluation and licensing of seed producers and processors.
- There are also provisions for seed price control in the event of an emergency, monopolisation or profiteering
- The seeds are required to meet certain prescribed minimum standards especially more emphasis was given on seed health and crop performance.
- Provision has been made to register transgenic varieties as per the Environment Protection Act, 1986
- Farmers can use seeds of registered varieties and farmers are allowed to sow, exchange or sell their farm seeds and planting material without having to conform to the prescribed minimum limits of germination, physical purity and genetic purity. However, farmers cannot sell any seeds under a brand name.
- Farmers are exempted from obtaining registration for varieties developed by them.
- The Bill keeps seed certification voluntary and provision for accreditation of other agencies for the purpose of seed certification
- Bill proposes registration/licenses for seed companies, seed processing plants, seed producers, seed dealers and nurseries.

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Essential Commodities Act (ECA) 1955 in relation to seed

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The Essential Commodities Act (ECA) was enacted in 1955 and has since been used by the Government to regulate the production, supply, and distribution of a whole host of commodities that it declares 'essential' to make them available to consumers at fair prices. The Essential Commodities Act is an act of the Parliament of India that was established to ensure the delivery of certain commodities or products, the supply of which, if obstructed due to hoarding or black marketing, would affect the normal life of the people. This includes foodstuff, drugs, fuel (petroleum products) etc.

This act has since been used by the government to regulate the production, supply, and distribution of a whole host of commodities that it declares 'essential' to make them available to consumers at fair prices. Additionally, the government can also fix the minimum support price (MSP) of any packaged product that it declares an "essential commodity". The list of items under the Act includes drugs, fertilizers, pulses, and edible oils, as well as petroleum and petroleum products. The centre can include new commodities as and when the need arises, and takes them off the list once the situation improves.

If the centre finds that a certain commodity is in short supply and its price is spiking, it can notify stock-holding limits on it for a specified period. The States act on this notification to specify limits and take steps to ensure that these are adhered to. Anybody trading or dealing in the commodity, be it wholesalers, retailers, or even importers are prevented from stockpiling it beyond a certain quantity. A State can, however, choose not to impose any restrictions. But once it does, traders have to immediately sell into the market any stocks held beyond the mandated quantity. This improves supplies and brings down prices. As not all shopkeepers and traders comply, State agencies conduct raids to get everyone to toe the line and the errant are punished. The excess stocks are auctioned or sold through fair price shops.

In this act seed was not included as essential commodity. In exercise of the powers conferred sub-clause (xi) of clause (a) section 2 of the essential commodities Act, 1955 (10 of 1955), the central government declared the seeds of food crops and seeds of fruit and vegetables, seeds of cattle fodder and jute seeds used for sowing or planting (including seedlings and tuber, bulbs, rhizomes, roots, cuttings and all types of graft and other vegetatively propagated material of food crops or cattle fodder) as essential commodities through enactment of seed control order, 1983 on 30th December, 1983. The key features of this order are detailed below.

- A person carrying on the business of selling, exporting and importing of seeds needs to obtain a license
- The Essential Commodity Act, 1955 gives powers to State governments to regulate various aspects of trading in essential commodities under the supervision of Central Government.

- The act again passed with amendments in the year 1980 clearly states that detaining of persons whose activities are unethical in the supply of essential commodities. This help in prevention of black marketing of the supplies
- The license provided to a seed dealer remains valid only for 3 years from the date of its issue which can be later renewed
- The seed dealer has to essentially display the stock position (opening and closing) on daily basis along with a list indicating prices or rates of different seeds
- A cash or credit memorandum has to be given by the dealer to purchaser of seeds, compulsorily
- The State Government is empowered with appointing a licensing authority, inspectors and mode of action for supply regulation.
- Under this order the time period for completion of seed analysis in case of any doubt about quality is 60 days compared to 30 days under Seed Rules
- Cancellation of license if obtained through misrepresentation
- Provision for appeal and an appellate has also been provided
- Provision for amendment of license and need for maintenance of records and submission of monthly returns by the dealer.

Prosecution protocols & follow up actions by the Seed Inspector

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Inspection Procedure:

1. Prior to taking seed samples, the Inspector should verify the information on the label to ensure that the seed is labeled as required under the Act in regard to the following.

Checking information:

- a. Kind
- b. Variety
- c. Lot number
- d. Date of test
- e. Pure seed
- f. Inert matter
- g. Other crop seed
- h. Weed seed
- i. Germination
- j. Net content
- k. Seller's name and address
- l. If treated, then, either of the following two statements should appear on the label:
 - i. Do not use for food, feed or oil purposes
 - ii. Poison

If the content of the container is 250 grams or less, items [e] to [i] may be replaced by the following statement:

"The seed in this container conforms to the minimum limits of germination and purity prescribed under the Act".

The inspector should check if the information on label in regard to germination and pure seed is in conformity with the minimum limits prescribed.

2. In the case of certified seed lot(s), the Inspector should check the information on the certification tag in regard to the following:

- a. Name and address of the Certification Agency;
- b. Kind and variety of the seed;
- c. Lot number or other mark of the seed;
- d. Name & address of the certified seed producer;
- e. Date of issue of the certificate and its validity;
- f. The sign to designate certified seed;
- g. The word denoting the class designation of the seed;
- h. The period during which the seed shall be used for sowing;
- i. Condition that the use of seed after the expiry of the validity period by any person is entirely at his risk and that the holder of the certificate shall not be responsible to the buyer for any damage to the seed; and
- j. Condition that no one should purchase the seed if the seal or the certification tag has been tampered with.

The Inspector should also check if the colour of the certification tag(s) is as prescribed in the Rules and whether the tags on seed containers appear genuine and intact.

In the case of certified seed lot(s) the Inspector should also determine whether the contents of the label are in conformity with the seed standards prescribed in the Minimum Seed Certification Standards. He should also check whether revalidation has been done, in case the validity period indicated on the tag has expired. In case of doubt, relevant records should be examined.

Steps to be followed:

- 3.a. Give notice in writing in Form-VI of the Rules; prepare in duplicate and give original copy to the person from whose seed lot sample is to be drawn and obtain acknowledgement on the office copy;
- b. As far as possible call not less than two witnesses;
- c. Examine the information on the label and determine whether it violets the provisions of the Act and the Rules. In case violation is found take appropriate action as indicated in para-4 below.
- d. Draw, mix, divide and prepare samples for dispatch;
- e. If cost of seed is demanded confirm that the cost is at the rate at which that seed is normally sold to the public. Then pay the seed cost and fill in the remainder of the form-VIII of the Rules.
- f. Prepare form-V of the Rules in quinplicate and send original copy to the Analyst along with sample, second copy to the Analyst by post / hand along with a specimen impression of the seal used for sealing the sample, give the third copy to the person from whose seed lot sample is drawn, retain the fourth copy along with file sample and the fifth copy as office copy.
- g. Record detailed information in Form-V of the Rules and detach five labels from each lot and replace them by replacement labels duly authenticated by the Department of Agriculture. Alternatively if five spare labels identical to those on the seed containers under sampling are available with the person from whose seed lots sample is drawn obtain them from the person and affix one to each of the five copies of Form-V.
- h. Prepare Form-VIII in duplicate, obtain the signatures of the witnesses, hand over the original copy to the seller and retain the second as office copy.

Violations:

4. a. Rectifiable violations:

- i. The first consideration is to establish that the seed is labeled in accordance with the Act and the Rules. The Inspector should be alert to possible labeling violations that are detectable prior to taking samples;
- ii. The Inspector can determine the deficiencies in label information, by comparing the results reported by the laboratory with those appearing on the label. When making such comparison apply, if necessary, the prescribed tolerance levels(Appendix-IV). If the deficiency is such that it can be removed or rectified, the Inspector may issue a stop sale order until the correction is carried out.
- iii. For certified seed, if the seed is being sold after the expiry of the validity period recorded on the certification tag, the Inspector may issue a stop sale order and direct the seller to get the seed revalidated by the certification agency. If validation by the certification agency reveals that the seed is not conforming to the minimum seed certification standards prescribed for the crop concerned the seller may be advised that the certification tags should be removed and relabeling done provided the seed is conforming at least to the minimum limits of germination and purity prescribed for mere labeling.

b. Procedure for stopping sale:

- i. Examine any record, register, document or any other material object;

ii. If the offence is such that the defect may be removed by the possessor of the seed, order in writing in Form-III of the Rules the possessor of the seed not to dispose of any part of the seed lot for a period not exceeding thirty days; prepare in triplicate, give original copy to the person whose seed lot is under inspection, send the second copy to the Director of Agriculture or to such authority as may be directed in this regard and obtain acknowledgement on the Inspector's office copy.

iii. During the period to which the stop sale order relates, the possessor of the seed may correct the defect(s) and intimate such action to the Inspector who on being satisfied about the removal of the defect(s) shall revoke the stop sale order as in Annexure-I to be prepared and distributed in the same manner as the stop sale order.

iv. Recommend prosecution if labeler is a persistent violator; issue Form-IV in quadruplicate, original copy to the seller, second copy to the magistrate, third copy to the Director of Agriculture or to such authority as may be directed in this regard and fourth as office copy; seize seed and records, inform a magistrate and take his orders for the custody there of and initiate further action.

c. Non-rectifiable violations:

The Inspector can determine this type of violation by comparing the results of the laboratory test with those appearing on the label. When making such a comparison apply if necessary the prescribed tolerance levels (Appendix -IV).

d. Procedure:

i. Recommended prosecution. Order in writing in Form-IV of the Rules. Seize the seed lot and records, inform a magistrate and take his orders as to the custody here of and initiate further action.

ii. If, after seizure of the stock, records etc. it is ascertained that the seed does not contravene any of the provisions of the Act, revoke the seizure order by issue of Annexure-II to be prepared and distributed in the same manner as the seizure order.

Inspector's records:

1. Maintain a record of all inspections made and action taken in the performance of duties including taking of samples and seizure of stocks. Submit copies of such records to the Director of Agriculture or to such authority as may be directed in this regard.

Safety:

2. Seed inspection is not without hazards and the following precautions should be observed:

- a. Be cautious when attempting to climb high piles of seed bags.
- b. Be cautious when working around bags piled in such a manner that they might fall.
- c. Be careful in moving piles of bags; preferably, ask the seeds man to move them.
- d. Be cautious when working in places where lighting is inadequate.
- e. Exercise care in handling treated seed.
- f. Do not enter warehouses, which are under fumigation

Procedure:

i. Recommended prosecution. Order in writing in Form-IV of the Rules. Seize the seed lot and records, inform a magistrate and take his orders as to the custody here of and initiate further action.

ii. If, after seizure of the stock, records etc. it is ascertained that the seed does not contravene any of the provisions of the Act, revoke the seizure order by issue of Annexure-II to be prepared and distributed in the same manner as the seizure order.

Storing Seed Samples:

Storing Inspector's seed sample:

The Act specifies that the Inspector shall retain one of the three samples prepared by him. The Inspector is responsible to see that seed samples drawn and to be retained by him are properly stored. The condition of the sample should be similar to its condition at the time of sampling, testing or sale. The sample should be kept in this condition for at least one year. In disputed cases it must be kept for a longer period of time. Rule 37 states that:

"The sample of any seed shall, under clause (c) of sub-section (2) of Section 15, be retained under a cool, dry environment to eliminate the loss of viability and in insect proof or rat proof containers. The containers shall be dusted with suitable insecticides and the storage room fumigated to avoid infestation of samples by insects. The samples shall be packed in good quality containers of uniform shape and size before storage".

Obviously, the laboratory would be storing samples sent to it. To provide the kind of storage facility needed and to ensure that the Inspector's sample is truly maintained in satisfactory condition, it is recommended that a portion in the laboratory's storage room be designated for holding the Inspector's samples. Considering the limitations with the Inspector for providing the proper storage conditions, this is the only logical place to hold the Inspector's samples. Necessary safeguards should be provided to ensure that no one tampers with the Inspector's sample stored in this location. To achieve proper storage of samples two methods are suggested below. The first is the most desirable method and the second would meet the objective. These are not the only methods to use but are the ones that should meet the requirements of the Act.

First method

1. Provide a special room with rodent-proofed, insulated and moisture-proofed walls, floor and ceiling. The insulation could be foam plastic such as Styrofoam or thermo Cole, expanded mica, glass wool or even rice hull. The moisture proofing could be 800 gauge polyethylene, laminated aluminum foil 1/8" coating of bitumen or less desirable, moisture-proof sealants. If water-absorbing insulation is used, the moisture proof material must be outside the insulation. There should be no windows in the room and the door should be gasketed like a refrigerator door. Since in most of India the temperature exceeds 800 F and RH exceeds 70% for three to five months in the year, refrigeration and dehumidification of the room are necessary. It is suggested that the room be dehumidified to 25% RH and the temperature maintained in the 60-70o F range. The 25% RH will help to control insects in addition to maintaining a low moisture content in seed.
2. Within the seed storage room, build wooden or metal racks to easily hold the samples. Provide metal boxes with gasketed lids. Lids can protect against rodents. Lids should not be placed on the boxes immediately after entering storage to allow time for the seed to dry to equilibrium with the RH of the room. Alternatively, drill holes in lids and bottoms of boxes to provide for air movement. The samples should be in bags which would allow a free exchange of moisture vapor so the samples dry down to equilibrium with the RH of the room.
3. The general containers such as metal boxes and those in which sample is placed should be of uniform shape and size. Number file samples systematically with the laboratory test number, the Inspector's serial number or the seeds man's lot number. The number used would depend on who is storing the sample.
4. Dust the containers with an insecticide such as DDT and fumigate the entire room periodically if any insect infestation is noticed. Aluminum phosphate tablets could be conveniently used for this purpose.

Second method:

1. Provide a special room with insulation, rodent proofing and ventilation to cool and/or dry the room when weather conditions permit.
2. Within the storage room build wooden or metal racks to easily hold the samples. Provide metal boxes with gasketed lids for holding samples. These would be moisture-proof and insect-proof. To dry seed samples and maintain them dry in each box include the required quantity of dry silica gel in a separate bag in each metal box. The silica gel acts as a desiccant, dries and maintains all samples within the box at a low moisture level. This process eliminates the room dehumidifier. An air-conditioner can increase the life span of seed in storage but is not vital if all other things are proper.
3. The general containers such as metal boxes and those in which sample is placed should be of uniform shape and size. Number file samples systematically with the laboratory test number, the Inspector's serial number or the seed man's lot number. The number used would depend on who is storing the sample.
4. Dust the containers with an insecticide such as DDT and fumigate the entire room periodically if any insect infestation is noticed. Aluminum phosphide tablets could be conveniently used for this purpose.

Storing seller's seed sample:

The Act and the Rules are definite about the need for a seeds man to maintain samples of seed as part of the records. Rule 13(3) states that:

"Every person selling, keeping for sale, offering to sell, bartering or otherwise supplying any seed of notified kind of variety under Section 7, shall keep over a period of three years a complete record of each lot of seed sold except that any seed sample may be discarded one year after the entire lot represented by such sample has been disposed of. The sample of seed kept as part of the complete record shall be as large as the size notified in the official Gazette. This sample, if required to be tested, shall be tested only for determining the purity".

The Inspector should provide adequate guidance to seeds men to help assure that they also develop the capacity to store samples for three years when necessary. Samples provided to them by the Inspector and samples of all seed lots sold must be stored properly.

This is for their protection and evidence against questions rose about the seed they have sold. This also applies to government-operated seed farms selling seed. One significant point is the statement at the end of Rule 13 (3) indicating that if the seed is to be tested, the testing shall be only for determining purity. This statement, undoubtedly, will be changed at some time in the future.

The concern of the drafters of the Rules centered on the ability of seeds men to keep their samples viable for three years. It was assumed that they could keep insects out of samples, but it might be difficult for them to so maintain samples that they would continue to germinate up to one year after the seed lot was sold. Obviously, determination of germination must be a part of the seed law enforcement programme and this statement would, of necessity, need to be changed as soon as it appears that seeds men can actually keep their samples for the required period of time in good, viable condition.

OECD Seed Certification & its importance in context to India

B.S. Gupta

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&

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Outline

- Introduction
- International (OECD) Seed Certification
- OECD Seed Schemes
- India: Participation
- Indian Vs OECD seed certification
- Status of Implementation
- Certification Charges
- Progress

Introduction

- The Organization for Economic Co-operation and Development (OECD) is an intergovernmental organization founded in 1961
- Act as a multilateral forum to discuss, develop and reform economic and social policies
- Promote sustainable economic growth and employment, a rising standard of living and trade liberalization

Contd...

- **Inter-governmental Organization**
 - 34 Member countries
 - Works with > 80 partner, developing and transition economies
 - Works with > 30 international organisations (IOs)
- **Multilateral Forum ...**
 - Addresses economic, social, environmental, trade and agricultural challenges
 - Economic analyses ...

International (OECD) Seed Certification

- The OECD Schemes for the Varietal Certification referred as International (OECD) Seed Schemes
- Provides International framework for certification of seeds moving in International seed market
- Voluntary & Self financing programmes
- 61 participating countries

OECD Seed Schemes: Objectives

- To encourage the use of "quality-guaranteed" seed in participating countries
- To authorize the use of globally recognised labels and certificates for international seed trade
- To facilitate the import and export of seed
- To enhance co-operation and understanding between
 - Importing and exporting countries
 - Public and private sector and other international organizations

OECD Seed Schemes

There are eight broad groups of crops

- Cereals
- Maize
- Sorghum
- Grasses and legumes
- Crucifers and Other Oil or Fibre Species
- Vegetables
- Fodder Beet and Sugar Beet
- Subterranean Clover and Similar Species



OECD Seed Schemes: Benefits

- Facilitate the International seed trade
- Provides a framework to develop seed production plans
- Internationally harmonized rules for seed certification
- Develops collaboration between the public and private sectors
- Regular exchange of information with other national certification agencies
- Improves competencies in domestic seed quality regulation system

India: Participation

- India: become member of OECD seed schemes in October 2008
- National Designated Authority (NDA): Joint Secretary (Seeds), Ministry of Agriculture, Government of India
- Participating in **six seed schemes**
- NDA is responsible for implementation of the schemes



Implementation

- National Designated Authority is apex body for implementation of the schemes
- Registration of varieties eligible for certification in the national list of OECD
- Certification for **varietal identity and purity**
- **Control plot tests**
- **Nine State Seed Certification Agencies** identified as **Designated Authorities** for implementation of the schemes

| Name of DA | Area of Operation |
|-------------------|--|
| TSSOCA, Hyderabad | Telangana, Chattisgarh |
| RSSOCA, Jaipur | Rajasthan, Haryana, Punjab & MP |
| BSSCA, Patna | Bihar, Jharkhand, West Bengal, All North Eastern States including Sikkim and Andaman & Nicobar |
| MSSCA, Akola | Maharashtra, Gujarat, Daman & Diu, Dadra & Nagar Haveli & Goa |
| USSCA, Dehradun | Uttarakhand, HP, Delhi, Jammu & Kashmir |
| APSSCA | Andhra Pradesh and Orissa |
| UPSSCA | Uttar Pradesh |
| KSSCA | Karnataka |
| TSSCA | Tamil Nadu, Puducherry, Lakshadweep and Kerala |

OECD List of Varieties

- It is an official list of varieties of NDA as eligible for certification
- A variety proposed to be added in the OECD List of Varieties for certification must:
 - ✓ Be distinct
 - ✓ Have an acceptable "value" in at least one participating country.
 - ✓ Be maintained
 - ✓ Be included on the National Official Catalogue of the country of registration of the variety
 - ✓ 245 varieties of 24 crops listed under OECD.

OECD varietal list: Criteria for inclusion

- Released and notified under the Seeds Act, 1966
- Filed for registration to PPV & FR Authority
- Tested under multi-location trials for two years in public system
- Export potential and Tested under multi-location trials including in-house trials for two years
- Tested outside the country for two years along with data

Instruments of the schemes

- OECD Seed Schemes Rules and Regulations 2020
- OECD List of Varieties
- Guidelines for Control plots tests & Field Inspection of Seed Crops
- Handbook of OECD Varietal Certification In India



OECD Labels

| Indian seed category | OECD Seed category | Color code |
|----------------------|---|-----------------------------------|
| Breeder seed | Pre-basic | White with diagonal violet stripe |
| Foundation seed | Basic | White |
| Certified seed | Certified 1st Generation | Blue |
| Certified seed – II | Certified 2nd Generation and successive generations | Red |
| Labelled seed | Not Finally Certified Seed | Grey |

| Indian seed certification | OECD Seed Certification |
|--|--|
| 1. Classes of seed | |
| Nucleus Seed: • Through maintenance breeding by the maintainers / breeders varietal characters checked. • Controlled and maintained by the maintainers/breeder. • Carries breeder's certificate. • Used for breeder seed multiplication. | Breeders Maintenance Material: • Checked against DUS Centers for the definite characters. • Carries Suppliers Labels. • Controlled and maintained by the maintainer/breeder. • Used for pre-basic seed multiplication. |
| Breeder Seed: (Golden Yellow Tag) □ Controlled by monitoring team of i. crop breeder, ii. Representative of Director of Seed Certification/ Assistant Director of Seed Certification, iii. Representative of NSC, iv. Farmers / producers representative □ Grow Out Test is employed for certain crops. □ Produced through Breeder Seed Production Center (BSP) based on the indent. □ Used for foundation class seed multiplication. | Pre-Basic Seed: (White Label with diagonal Violet Stripe) • Controlled by official certification authority (DA) + Maintainer. • Undertake pre-controlled test – • Can not be commercialized and not for sale. • Produced officially by the recognized Institute/organization. |

| Indian seed certification | OECD Seed Certification |
|---|---|
| Foundation Seed: (White Colour Tag) • Controlled by official seed certification agency directly and no role of maintainer. • need based GOT test • Produced through registered seed producers / growers. • Can be used for foundation stage I (F1) to foundation stage II (F2) multiplication on specific cases for the open pollinated varieties with specific approval from the Director of Seed Certification. • Can be used for certified stage of multiplication. • Initial validity period of 9 months from the date of test and subsequently six months for revalidation. | Basic Seed: (White Label) • Controlled by official certification authority (DA) + Maintainer. • Undertake pre-control tests – • Can not be commercialized and not for sale. • Produced officially by the recognized Institute/organization. • No such validity period |

| Indian seed certification | OECD Seed Certification |
|--|--|
| Certified Seed: (Azure Blue Tag) | Certified Seed (C1) - (Blue Label) (C2) - (Red Label) |
| • Controlled by official seed certification agency directly and no role of maintainer. • need based GOT test • Produced through registered seed producers / growers. • Can be used for certified stage I (F1) to certified stage II (F2) multiplication on specific cases for the open pollinated varieties with specific approval from the Director of Seed Certification. • Can be used for certified stage II and commercial multiplication. • Initial validity period of 9 months from the date of test | • DA's and Controlling Authorities— under take quality control including post control test + provision of Patent Royalty to the Maintainers / Breeder's. • Used for the commercial multiplication/sale. • No such validity period is existing. |

| Indian seed certification | OECD Seed Certification |
|---|--|
| Labeled Seed: (Opal green colour) | Not Finally Certified Seed : (Grey Label) |
| ➤ Produced by the producer himself and no role of certification agencies. ➤ Label with all seed standards details and signed by the producer himself. ➤ Producer himself responsible for varietal purity and seed standards. No such class of seed exist | Seed Which is to be exported from the country of production after field approval, but before final certification as basic or certified seed, shall be identified in fastened containers by the special label. |
| | Standard Seed: (Dark Yellow Label) ➤ mainly exists in vegetable seed scheme. ➤ declared by the supplier as being true to the variety and of satisfactory varietal purity. ➤ It must conform to the appropriate conditions in the Scheme. |

| Indian seed certification | OECD Seed Certification |
|--|---|
| Eligibility of Varieties and Parental Constituents | |
| Varieties notified under Section (5) of the Seed Act, 1966 eligible for certification | <ul style="list-style-type: none"> Registered in National catalogue of Varieties. Country shall have national list of varieties under the OECD Schemes. (DUS) (VCU at least in country) |
| Field inspection & sampling | |
| <ul style="list-style-type: none"> Done by seed certification officials and supervised by supervising authority. There is no system of authorization of private inspectors / seed sampler in Indian system | <ul style="list-style-type: none"> Done by the officials of DAs Can also be done by authorized inspectors/ samplers and supervised by official supervisors. (5% check sampling done by official seed samplers.) |

| (Specific Crop standards) IMSCS | OECD |
|---|--|
| Previous Cropping | |
| Free from volunteer crop Eg. Groundnut- 2 years Sunflower- 1 year | Minimum time interval between seed crop and any other crop of same species Crucifer spp- 5 years Other spp- 2 years Hybrid seed may not be grown of the same field in successive years. |
| Isolation Distance | |
| No modification of Isolation distance is permitted (except maize) | Distances can be modified where there is sufficient protection from undesirable pollen or where the possibility of cross-fertilization is eliminated. |
| Seed standards | |
| Maximum permitted objectionable weed plants: 1. Foundation Seed : 0.010% 2. Certified Seed : 0.020% Insect damage For both F.S. and C.S.- Maize and Legumes- 1% Other crops- 0.5 % | Specific permissible limit for designated diseases and weed seeds not indicated in OECD standards. No maximum permissible limits are indicated in case of insect damage. |

| | |
|---|--|
| Pre and Post Control Tests | |
| As per IMSCS, SCAs shall conduct GOT wherever it is a pre-requisite No provision of Pre and Post Control Tests | Pre control test is compulsory for Pre-basic and Basic seed, A part of every sample of Basic Seed and 5 to 10% of the Certified seed shall be checked in a post-control test conducted immediately or in the following season |
| Issue of Certificates | |
| For Breeder seed by the concerned Scientist in charge of Production. | The Designated Authority may issue certificates for each lot of Pre-Basic, Basic and Certified seed approved under the Scheme. |
| For Foundation and Certified class issued by the officers of SSCA. | |
| Blending of Lots | |
| No provision for blending | lots of certified seed of the same generation of one variety may be blended before or after export in accordance with the regulations of the Country. Provision for Re-packing and Re-labeling in another Country. |

Status of Implementation

| Status of implementation | |
|--------------------------|--|
| September 2007 | Submission of application to the Secretary General, OECD Secretariate |
| April 2008 | OECD Evaluation Mission to India |
| June to July 2008 | Indian delegation participated in the Annual Meeting of the OECD held in Chicago, USA. |
| October 2008 | OECD Seed Schemes was accepted by the OECD council. |
| November 2008 | Notification of the Joint Secretary (Seeds), Government of India Ministry of Agriculture as NDA for the OECD Seed Scheme |

| Status of implementation | |
|--------------------------|--|
| January, 2009 | Tamil Nadu, Karnataka, Andhra Pradesh, Maharashtra, Rajasthan, Uttarakhand and Uttar Pradesh were nominated as Designated Authorities |
| March, 2009 | Haryana, Bihar and Assam were subsequently identified as Designated Authorities. |
| June, 2009 | Indian Delegation participated in the Technical Working Group and Annual Meeting of OECD at Paris |
| February, 2010 | Training on OECD Seed Schemes for the members of DAs was organized by the Govt. of India at New Delhi by inviting Foreign Expert MR. David White, Seed consultant, OECD Coordinating Centre, United Kingdom(UK) |
| June, 2010 | OECD Seed Scheme training in Canada under the leadership of Joint Secretary(Seeds), GOVT. of India, DAC, New Delhi |
| July, 2010 | OECD Seed Schemes Workshop organized by the Govt. of India at NSRTC, Varanasi. |

Status of Implementation

| | |
|------------------------|---|
| September, 2012 | Workshop on OECD Seed Schemes held at Hyderabad by inviting members of DA. |
| January, 2013 | Hands on Training programme on OECD Varietal Certification and seed testing at Bengaluru. |
| April, 2015 | Publication of book " OECD Varietal Certification in INDIA" By Ministry of Agriculture and Farmers Welfare Govt. of India, New Delhi" |
| October, 2015 | Training of OECD Seed Schemes for the members of DA'S was organized by the GOVT. Of India at NSRTC, Varanasi |
| July, 2016 | Telangana State Seed & Organic Certification Authority organized the National level workshop |

Status of implementation

| | |
|--------------------------------------|---|
| July, 2016 | Telangana State Seed & Organic Certification Authority organized the National level workshop |
| November & December, 2016 | Telangana State Seed & Organic Certification Authority in collaboration with Govt. of India organized the second International level workshop |
| January, 2017 | National Task Force on OECD Seed Schemes was constituted to accelerate implementation of OECD seed schemes |
| November, 2017 | Theoretical Workshop on OECD Varietal Certification at Hyderabad by inviting Foreign Experts |
| April, 2018 | Practical Workshop OECD Varietal Certification at Hyderabad by inviting Foreign Experts. |
| September, 2018 | Workshop on Introduction of International (OECD) Seed Certification at Dehradun (Uttarakhand) |
| January, 2020 | Training programme on OECD Varietal Certification in India organized by KSSOCA at Bengaluru. |

Indian list of OECD varieties

| | Crops | Number of varieties | | |
|--|--------------|---------------------|-----------|------------|
| | | Public | Private | Total |
| In the world 200 species 49,899 varieties | Pulses | 17 | - | 17 |
| | Oilseeds | 9 | 2 | 11 |
| In India 20 species 237 varieties Further listed 10 species 73 varieties | Cotton | 2 | 5 | 7 |
| | Pearl millet | 3 | 5 | 8 |
| | Barley | 4 | - | 4 |
| | Rice | 15 | 21 | 36 |
| | Wheat | 5 | 1 | 6 |
| | Sorghum | 4 | 3 | 7 |
| | Maize | 1 | 12 | 13 |
| | Total | 160 | 78 | 237 |

OECD Certification Charges

| S. No | Operational details | Grasses, legumes, cereals, maize and sorghum (Rs.) | Crucifer and other oil or fiber species seed (Rs.) | Vegetables seed (Rs.) |
|-------|--|--|--|-----------------------|
| 1 | Registration charges for growers/sowing report | 125 | 125 | 125 |
| 2 | Field inspection charges/acre | | | |
| | Varieties | 500 | 500 | 500-4000 |
| | Hybrids | 750 | 750 | |
| 3 | Processing charges (per qtl.) | 40 | 40 | ----- |
| | Ginning and processing (cotton) | ----- | 75 | ----- |
| | kapas/qtl Post harvest supervision charges for 8 hrs | ----- | ----- | 1000 |

OECD Certification Charges

| S.No | Operational Details | Grasses, legumes, cereals, maize and sorghum (Rs.) | Crucifer and other oil or fiber species seed (Rs.) | Vegetables seed (Rs.) |
|------|--|--|--|-----------------------|
| 4 | Seed testing charges (per sample or actual) | 400 | 400 | 400 |
| 5 | Pre-control & post control test charges (per sample) | 1000 | 1000 | 1000 |
| 6 | Tag charges (per tag) | 10 | 10 | 10 |
| 7 | Varietal purity (DNA test) test charges (per sample or actual) | 2000 | 2000 | 2000 |

Note:

1. Registration & Annual renewal charges of Seed Production Organisation is Rs.2000/- and 1000/- respectively.
2. Registration & Annual renewal charges of Seed Processing Plant is Rs.3000/- and 1000/- respectively.

The progress on International (OECD) Seed Certification

- The TSSOCA has initiated the registration of area under the schemes from Kharif, 2016
- During the year **2016-17** an quantity of **17159.00** quintals of seed was certified under OECD seed schemes
- During **2017-18** a quantity of about **7000** quintals of seed was certified
- For **2018-19**, a quantity of about **7000** quintals of seed was certified
- For **2019-20**, a quantity of about **1000** quintals of seed was certified

Progress of OECD Seed Production and Certification from 2013 to 2020 (RSSOCA)

| S. No. | Season | Crop | Variety | Class | Qty. Certified (Qn) | Remarks |
|--------|--------------|-------------------|-----------------|---------|---|--|
| 1. | Kharif 2013 | Mung | BMG-248 | Pro-ban | Nil | Crop failure due to VMOT (Yellow Mosaic virus) |
| 2. | Rabi 2013-14 | Wheat | Raj-3745 | Pro-ban | 18.88 | KVK Alwar |
| 3. | Rabi 2014-15 | Wheat | Raj-3745 | Pro-ban | 18.88 | KVK Alwar |
| 4. | 2015-16 | Mung | BM 2-3 | Pro-ban | 1.88 | KVK Alwar |
| 5. | Rabi 2016-17 | Rape Seed (Hyola) | PAC-401 | C/S | 417.30 Qn Raw Seed Skipped in TSSOCA for Further Certification activities | 1. UPL Rewari Production Agency; 2. Exported to KUSA |
| 6. | Rabi 2017-18 | Rape Seed (Hyola) | PAC-401 | C/S | About 140 Qn Raw Seed Skipped in TSSOCA for Further Certification activities | 1. UPL Rewari (Production Agency); |
| 7. | Rabi 2017-18 | Hybrid Mustard | CORAL (PAC-407) | C/S | About 150 Qn Raw Seed Skipped in TSSOCA for Further Certification activities | 1. UPL Rewari (Production Agency); |
| 8. | Post 2018-19 | Wheat | RAJ-3745 | Pro-ban | 1 acre area about 12 quintals | RAI, Gurgaon, Jaipur |
| 9. | Rabi 2019-20 | Hyola | PAC-405 | C/S | 230 quintals | UPL Rewari |
| 10. | Rabi 2020-21 | Hyola | PAC-401 | C/S | 230 acres proposed | UPL Rewari |

Thank you!

Field Inspection in Seed Certification-An Overview

B.S. Gupta

Ex-Seed Certification Officer,

Rajasthan State Seed & Organic Production Certification Agency, Jaipur

Details of Establishment & Names of Rajasthan State Seed Certification Agency

- 1977-78 Rajasthan State Seed Certification Agency (RSSCA) IMSCS
- 2005-06 ROCA
- 2007 RSSOPCA (RSSCA + ROCA)
- 2018 RSSOCA

Category of Quality Seed

- 1. Certified Seed where certification is compulsory
- 2. Labeled seed where certification is not compulsory but labeling is compulsory
- Types of Seed
 1. Nucleus seed
 2. Breeder seed (Yellow label)
 3. Foundation seed (White Tag)
 4. Certified seed (Blue Tag)

Details of Seeds Act, 1966

- Seeds Act 1966 _ Section 5 - Notification of Varieties
- Seeds Act 1966 _ Section 6 - Labeling of Seed
- Seeds Act 1966 _ Section 7 - Regulation of Sale of Seeds of Notified Kinds or Varieties
- Seeds Act 1966 _ Section 8 - Establishment of Seed Certification Agency
- Seeds Act 1966 _ Section 9 - Grant of Certificate by Certification Agency
- Seeds Act 1966 _ Section 10 - Revocation of Certificate
- Seeds Act 1966 _ Section 11 - Appeal

GENERAL SEED CERTIFICATION STANDARDS

The General Seed Certification Standards are applicable to all crops which are eligible for certification, and with field and seed standards for the individual crops, shall constitute the Minimum Seed Certification Standards. The word 'Seed' or 'seeds' as used in these standards shall include all propagating materials

I. Purpose of Seed Certification

The purpose of seed certification is to maintain and make available to the public, through certification, high quality seeds and propagating materials of notified kind and varieties so grown and distributed as to ensure genetic identity and genetic purity. Seed certification is also designed to achieve prescribed standards

II. ~~Certification Agency~~ Certification shall be conducted by the Certification Agency notified under Section 8 of the Seeds Act, 1966.

III. Certified Seed Producer Certified seed producer means a person/organization who grows or distributes certified seed in accordance with the procedures and standards of the certification.

IV. Eligibility Requirements for Certification of Crop Varieties Seed of only those varieties which are notified under Section 5 of the Seeds Act, 1966 shall be eligible for certification.

Classes and Sources of Seed

A. Breeder Seed Breeder seed is seed or vegetative propagating material directly controlled by the originating or sponsoring plant breeder of the breeding programme or institution and/or seed whose production is personally supervised by a qualified plant breeder and which provides the source for the initial and recurring increase of Foundation seed.

Breeder seed shall be genetically so pure as to guarantee that in the subsequent generation i.e. certified Foundation seed class shall conform to the prescribed standards of genetic purity. The other quality factors of Breeder seed such as physical purity, inert matter, germination etc. 13

shall be indicated on the label on actual basis. The Breeder seed shall be packed and supplied by the breeders in the form and manner indicated in **Appendix-I**.

B. Certified Seed Certified seed shall be the seed certified by Certification Agency notified under Section 8 of the Seeds Act, 1966 or seed certified by any Certification Agency established in any foreign country provided the Certification Agency has been reorganized by the Central Government through notification in the Official Gazette. Certified seed shall consist of two classes, namely, Foundation and Certified seed and each class shall conform to the following description: 1. Certified Foundation seed shall be the progeny of Breeder seed, or be produced from Foundation seed which can be clearly traced to Breeder seed. Thus, Foundation seed can even be produced from Foundation seed. During the production of certified Foundation seed, the following guidelines shall be observed:

B. Certified Seed Certified seed shall be the seed certified by Certification Agency notified under Section 8 of the Seeds Act, 1966 or seed certified by any Certification Agency established in any foreign country provided the Certification Agency has been reorganized by the Central Government through notification in the Official Gazette. Certified seed shall consist of two classes, namely, Foundation and Certified seed and each class shall conform to the following description: 1. Certified Foundation seed shall be the progeny of Breeder seed, or be produced from Foundation seed which can be clearly traced to Breeder seed. Thus, Foundation seed can even be produced from Foundation seed. During the production of certified Foundation seed, the following guidelines shall be observed:

- vegetatively propagated crops;
- apomictically reproduced crops;
- self-pollinated crops;
- often cross-pollinated and cross-pollinated crops, these being gene – pools should not lose their genetic identity and purity if measures to safeguard the same are adequately taken;
- composite and synthetics;
- parental line increase of hybrids.

2. Production of Foundation seed stage-I and II shall be supervised and approved by the Certification Agency and be so handled as to maintain specific genetic identity and genetic purity and shall be required to conform to certification standards specified for the crop/variety being certified.

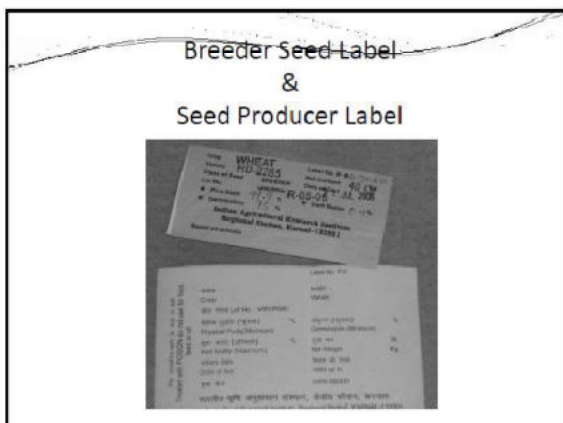
3. (a) Certified seed shall be the progeny of Foundation seed and its production shall be so handled as to maintain specific genetic identity and purity according to standards prescribed for the crop being certified; (b) Certified seed may be the progeny of Certified seed provided this reproduction does not exceed three generations beyond Foundation seed stage-I and - it is determined by the Certification Agency that genetic identity and genetic purity will not be significantly altered; - and when the Certification Agency is satisfied that there is genuine shortage of Foundation seed despite all the reasonable efforts made by the seed producer. (c) Certification tag shall be of blue colour (shade ISI No. 104 AZURE BLUE) for Certified seed class. (d) Certified seed produced from Certified seed shall not be eligible for further seed increase under certification. Certification tags for such production which is not eligible for further seed increase under certification shall be super scribed with, "not eligible for further seed increase under certification". V

VI. Phases of Seed Certification Certification shall be completed in six broad phases listed as under:

- receipt and scrutiny of application
- verification of seed source, class and other requirements of the seed used for raising the seed crop;
- field inspections to verify conformity to the prescribed field standards;
- supervision at post-harvest stages including processing and packing;
- seed sampling and analysis, including genetic purity test and/or seed health test, if any, in order to verify conformity to the prescribed standards; and
- grant of certificate and certification tags, tagging and sealing.

F/S & C/S Tags





WHY INSPECTIONS ARE NECESSARY

The primary objective in conducting field inspections is to confirm that seed produced from a crop grown for seed purpose is of the designated variety, and that it has not been contaminated genetically and or physically beyond certain specified limits. Genetic contamination of a seed crop is prevented by permitting pollination by pollen from a specific desirable source recognized as the pollinator, and conversely, by preventing pollination by pollen from an undesirable or unrecognized source, through controlled pollination, physical or mechanical contamination in the field is avoided by preventing admixture during sowing and harvesting. Field inspections ensure that steps necessary to overcome genetic and physical contamination have been taken in time to make them effective.

The objective of field inspection is fulfilled by verifying that the seed crop is:

- Raised from seed whose source is approved.
- Grown on a field area which satisfies the prescribed land requirements as to previous crop (s), to prevent contamination by volunteer plants and disease spread by pathogens.
- Provided with the prescribed isolation and or with the prescribed number of border rows in hybrid seed production.
- Planted in the prescribed ratios of female (seed) and male (pollinator) parents in the case of hybrid seed production.
- Properly rogued to remove contaminating factors such as pollen shedders in bajra and sorghum, shedding tassels in maize, crosses, off types, diseased plants/ears, objectionable weeds, and inseparable other crop plants so as to conform to the standards prescribed for these factors.

- True to the varietal characteristics descriptive of that variety. Harvested properly to avoid mechanical admixture.
- Grown in compliance with other special requirements for the crop concerned.

The field observations made for these are compared with a set of prescribed norms called the Minimum Seed Certification Standards which are specific for each crop. The Minimum Seed Certification Standards specify the requirements for seed crops as to previous crops, isolation, varietal purity, other crop plants, objectionable weeds and freedom from certain designated diseases. They also specify the requirements for seed lots for physical qualities including pure seed, inert matter, other crop seed, weed seed, and objectionable weed seed, and for germination and entitled the "Indian Minimum Seed Certification Standards", published in September, 2013.

WHO SHOULD INSPECT WHAT

The authority of an agency to inspect a seed crop depends basically on whether the inspection is for certification under the Seeds Act 1966 or is only to assure production of high-quality uncertified seed. If the inspection is for official certification, only the officially notified agency for the concerned region under the Act, has the authority to perform the inspection. If the inspection is only to ensure high quality in uncertified seed, any qualified agency such as the seed producing or contracting agency may make the inspection.

If the inspection is for certification under the Act, the seed crop should be of the variety eligible for such certification. If the inspection is only to ensure high quality in uncertified seed any crop recognised by the qualified agency as for seed production can be inspected.

FIELD INSPECTION

GENERAL GUIDE LINES

Procedure for field inspections differ among crops and among growth stages of the same crop. The following broad principles on inspection methods are common to most crops and stages of growth.

- The number of inspections indicated in MSCS are the minimum and should be conducted at proper stage.
- The inspecting officer should ensure that he is guided by the producer to the correct seed field.
- Inspection of cross-pollinated crops at and after commencement of flowering should be made without prior intimation to the producer.
- The producer or his representative should be requested to accompany to the field during the entire inspection and they be shown all the factors observed in the field and which will be recorded in the inspection report.

5. When seed fields of the same class/variety of the same producer are separated by less than 50 meters they can be considered as one field unit for inspection provided they are of same growth stage and level of conformity to standards. If they are separated by more than 50 meters, a separate inspection report shall be made for each unit.
6. It is compulsory to observe it and its border areas before entering the fields, especially in tall crops like Bajra, Sorghum, Mustard etc. and crops requiring sizeable isolation distances around the outer boundary of the seed fields.
7. If one third or more of a self pollinated/cross pollinated crop is so lodged that taking counts is difficult, the seed crop may be recommended for rejection.
8. Walk through the entire seed field while taking field counts (it should not be localized to a portion or a few portions of a field) it should be randomly distributed all over the field.

9. If the plant population in a field is so thin that the entire population is less than the number of counts required entire population may be counted.
10. Counting may be started from any pointed of the seed field but spotting a defect and trying to include/avoid it in the counts, is not desirable.
11. Factors counted during inspection need not normally be pulled out, but be shown to the seed grower/farmer to rogue out such plants.
12. If plants/heads of the designated factors which were pulled out by the producer are lying on the ground within out skirts of the seed field, the producer should be directed to collect and remove them from the field.
13. If the seed field is found to be liable for rejection either in part or in full on account of inadequate isolation, the prescribed number of field counts for the entire are still to be taken for that inspection.

14. A seed crop liable to be partially rejected due to inadequate isolation, further inspection of the entire field (including the affected portion) should be continued according to the prescribed number and procedure and separate counts for the affected area should be mentioned in the inspection report.
15. If on the basis of first set of field counts, the seed crop does not conform to the prescribed standards for any factor, a second set of counts should be taken for the concerned factor, provided the percentage of the first set of counts for that factor is more than maximum permissible limit but not more than twice the maximum permissible limit.
16. For seed crops involving two parental lines, even if two sets of counts in one parental line show that the field does not conform to the prescribed standards it is necessary to take counts in the other parental line.

17. If on the basis of two set of counts the seed crop does not conform to the prescribed standards, further inspections need not be made unless the seed crop is eligible for re-inspection (after removal of contaminating factors). If the seed crop is not eligible for such re-inspection then LIABLE FOR REJECTION and final inspection should be recorded in the inspection report.
18. If the factor present beyond the maximum permissible limit as verified by two sets of counts could not have already caused contamination of the seed crop or when contamination has already taken place; if removal of contaminating factors and contaminated materials could make the seed crop conform to the prescribed standards, their removal from the field may be recommended to permitted. Re-inspection to conform removal and conformity to standards must then be made when re-inspection is permitted and it should be shown in the inspection report.
19. Observations made during field inspection shall be directly recorded on inspection report on the spot and the signature of the cultivator or his representative on the field should be obtained on all copies of inspection report and, if he refuses to sign then it should be indicated in the inspection report as "Refused to Sign".

| MINIMUM NUMBER OF FIELD INSPECTION AND STAGES OF INSPECTION REQUIRED FOR CERTIFICATION | | | |
|--|--|-----------------------|--|
| Sr.No | Crop | Number of Inspections | Stages of Inspection |
| 1 | 2 | 3 | 4 |
| 1. | Ragi, Paddy, Wheat, Cowpea, Greengram, Blackgram, Redgram, Groundnut, Soyabean, Frenchbean, Amaranthus | 2 | Flowering to harvest |
| 2. | Maize (a) Inbred line, single crosses and hybrids (a) Composites, Synthetics and open pollinated varieties | 4 2 | First before Flowering and three during silking stage First pre-Flowering and second during Flowering |
| 3. | Hybrid Sorghum, Hybrid Bajra, Hybrid Sunflower and their parents | 4 | First before Flowering, second and third during Flowering & fourth during pre-harvesting. |

| Sr.No. | Crop | Number of Inspections | Stages of Inspection |
|--------|---|-----------------------|--|
| 1 | 2 | 3 | 4 |
| 4. | Open pollinated varieties of Sorghum, Bajra, Sunflower, Safflower, Sesamum and jute | 3 | First pre-Flowering, second during Flowering & third during pre-harvesting. |
| 5. | Cotton (a) Hybrids (a) Varieties | 4 2 | First before Flowering, Second and third during Flowering (Emasculation and crossing) fourth during picking of bolls. Flowering to harvest |
| 6. | Castor (a) Hybrids (a) varieties | 4 2 | 1 st before Flowering 2 nd and 3 rd during Flowering 4 th at pre-harvest Flowering to harvest |

| Sr.No. | Crop | Number of Inspections | Stages of Inspection |
|--------|--|-----------------------|---|
| 7. | Dhaincha | 2 | 1 st before Flowering 2 nd at flowering and pod stage |
| 8. | All cucurbits and fruit vegetables (other than hybrids) viz. Brinjal, Bhindi, Tomoto, Chillies, Capsicum | 3 | 1 st pre-Flowering, 2 nd during Flowering and fruiting, 3 rd during mature fruit stage |
| 9. | Potato | 3 | 1 st 45 days after sowing, 2 nd just before haulm cutting, 3 rd after haulm cutting |
| 10. | Radish, Carrot and Turnip | 3 | 1 st 20-30 days after sowing, 2 nd when lifted & replanted, 3 rd flowering |
| 11. | Cumin, Coriander and Fennel | 3 | 1 st before Flowering 2 nd 50% Flowering 3 rd Maturity |

WHEN TO INSPECT

The field inspection offered for seed certification are conducted at following stages :

- (1) Vegetative or pre-flowering stage.
- (2) Flowering stage.
- (3) Post flowering and pre-harvest stage.
- (4) Harvest stage.

FIELD COUNTS

1. The number of counts taken and the method of taking counts vary from crop to crop for all crops; five counts are taken for any area upto 5 Acre and an additional count is taken for every additional 5 Acre as given below :

| Area of the field/crops | No. of Counts to be taken |
|-------------------------|---------------------------|
| Up to 5 acres | 5 |
| Above 5 to 10 acres | 6 |
| Above 10 to 15 acres | 7 |
| Above 15 to 20 acres | 8 |
| Above 20 to 25 acres | 9 |
| Above 25 to 30 acres | 10 |

In any inspection if the first set of counts shows that the said crop does not conform to the prescribed standards for any factor, a second set of counts shall be taken for the factor. However, when the first set of counts shows a factor to be more than twice the maximum permitted, it is not necessary to take a second set of counts. Two sets of counts are called double counts.

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2. Taking double sets of counts for a factor is :
 - a) Necessary if in the first set of counts occurrence of the factor is more than the maximum permitted, but not more than twice the maximum permitted.
 - b) Necessary if in the first set of counts occurrence of factor is equal two twice the maximum permissible level.
 - c) Not necessary if in the first set of counts occurrence of the factor is less than or equal to the maximum permitted.
 - d) Not necessary if in the first set of counts occurrence of the factor is more than twice the maximum permitted.

| Number of plants to be counted per count : | | | |
|--|---|--------------------------------|---------------------------------|
| S.No. | Crop | No. of plants/ heads per count | Remarks |
| 1. | Bhindi, Brinjal, Bulb crops Capsicum, Castor, Chilli, Colecrops, Cotton, Cucurbits, Maize, Groundnut, Potato, Redgram, Root crops, Teosinte, Tomato | 100 plants | wide spaced and non tillering |
| 2. | Beans, Cowpea, Gram, Leaf crops, Moong, Mustard, Peas, Sesamum, Sunhemp, Sunflower, Blackgram, Green Gram, Lentil, Niger | 500 plants | Medium spaced and mon tillering |
| 3. | Berseem, Jute, Lucerne, Mesta, Soyabean | 1000 plants | Medium spaced and line sown |
| 4. | Bajra, Barley, Oats, Paddy, Sorghum, Wheat, Ragi millets | 1000 heads | Tillering crops |

3. All plants or heads falling in each count must be examined for each designated factor as per MSCS.
4. If the seed field is planted with two different parents, the prescribed number of counts must be taken separately for each parent.
5. Percentage for deciding acceptance or rejection is calculated only to the number of decimals in which the standard is expressed.

WHAT TO INSPECT

Basically sources of genetic and physical contamination must be observed and extent of their occurrence estimated.

Sources of contamination can broadly be classified as follows :

A. OFF TYPES

Off types are the plants of the same species as that of the seed crop variety but morphologically of different characters eg. pigmentation, plant type, stem/ leaf shape and texture, size/colour of flower or fruit etc.

Similarly plants of other varieties of same crop are also included in off types. To designate a plant as off type it is necessary to trace it to any variety.

B. INSEPARABLE OTHER CROP PLANTS

Such type of plants whose seeds are similar in size, colour etc. and are difficult to separate from the seeds of seed crop by mechanical means are inseparable other crop plants. Such plants are counted if the growth stage of these plants is such that the maturity time resembles to the seed crop and may cause mechanical admixture at the time of harvesting/threshing.

| Crop | Designated Inseparable other crops |
|--------|------------------------------------|
| Barely | Oats, Wheat and Gram |
| Oats | Barely, Wheat and Gram |
| Wheat | Barely, Oats and Gram |

C. OBJECTIONABLE WEED PLANTS

The plants of weed species harmful in the following ways :

- Size/ shape of seeds are similar to crop seed which are difficult to remove by mechanical means.
- Growth habits has detrimental or competing effects on crop plants.
- Mode of spread, perpetuation, perennation or growth habit make eradication difficult.
- Plant parts are poisonous/injurious serves as alternate host for pests and diseases. Such plants are counted if the growth habit is similar to the seed crop thus causing admixture at the time of harvesting/threshing.

Crop

Paddy
Rape, Mustard
Cacurbits
Okra (Bhindi)
Lettuce
Berseem
Lucerne
Methi

Designated objectionable Weeds

Wild rice or red rice (Oryza sativa var)
Satanash (Argemone mexicana)
Wild Cucurbits Spp.
Wild Abelmoschus spp.
Wild Lettuce (Lactuca scariola)
Chicory or Kasni (Cichorium intybus)
Dodder (Cuscuta spp)
Senji (Mehilotus spp)

D. DISEASES

Seed may carry seed borne, soil or air borne diseases. Economical and effective measures of some seed borne diseases are available. However, counts of each designated diseases should be mentioned in the inspection report.

E. ISOLATION

A proper designated isolation distance is compulsorily be maintained in the seed fields. All precautions should be taken so that produce of rejected area of the seed field on account of isolation is not mixed with that of the certified seed field. Threshing certificate if required may be given.

MINIMUM ISOLATION REQUIREMENTS FOR FIELD CROPS

| Sl. No. | Crop | Minimum distance (In Meters) Foundation | Isolation Certified | To be isolated by the distance in column 3 or 4 from fields of |
|---------|---|---|---------------------|---|
| 1 | 2 | 3 | 4 | 5 |
| 1. | Paddy, Wheat, Ragi, Barley, Groundnut, Soyabean | 3 | 3 | Other varieties; the same variety not conforming to varietal purity requirements for certification. |
| | | 150 | 150 | For loose smut susceptible wheat from affected plants |

| Sl.No | Crop | Minimum distance Foundation | Isolation (meters) Certified | To be isolated by the distance in column 3 or 4 from fields of |
|-------|---|-----------------------------|------------------------------|---|
| 2. | Maize | 400 | - | Any maize with same kernel colour and texture, same inbred/single cross not conforming to varietal purity requirements for certification. |
| | (a) Inbred Line & Single crosses | 600 | - | Any maize with different kernel colour and texture. |
| | (b) Hybrids | - | 200 | Any maize kernel colour and texture colour same as that of seed parent. |
| | - | - | 300 | Maize of the same cross not conforming for certification. |
| | (c) Composite s Synthetics and open pollinated varieties. | 400 | 200 | Any Maize with kernel colour or texture different from that of the seed parent. |
| | | | | Other varieties, the same variety not Conforming to varietal purity requirements for certification. |

| SL No | Crop | Minimum distance Foundation | Isolation (meters) Certified | To be isolated by the distance in column 3 or 4 from fields of |
|-------|-------------------------------|-----------------------------|------------------------------|--|
| 3. | Sorghum (a) Hybrids | 300 | 200 | Other varieties of grain or dual purpose Sorghum, the same variety not conforming to varietal purity requirements for certification. Johnson grass (Sorghum halepense) and forage sorghum with high tillering and grassy panicle. Sorghum hybrids with same male parent and conforming to varietal purity requirement for certification. Other varieties of grain or dual purpose & same variety not conforming to varietal purity requirement for certification. Forage sorghum with high tillering and grassy panicle, johnson grass (Sorghum halepense) |
| | | 400 | 400 | |
| | | - | 5 | |
| | (b) Open pollinated Varieties | 200 | 100 | |
| | | 400 | 400 | |

| SL No. | Crop | Minimum distance Foundation | Isolation (meters) Certified | To be isolated by the distance in column 3 or 4 from fields of |
|--------|---|-----------------------------|------------------------------|--|
| 4. | Bajra (a) Hybrids | 1000 | 200 | Other varieties, the same variety not conforming to varietal purity requirement for certification. Other varieties, the same variety not conforming to varietal purity requirement for certification. |
| | (b) Open pollinated varieties | 400 | 200 | |
| 5. | Cowpea, Green gram, Black gram, Bengal gram, Peas and beans | 10 | 5 | Other varieties and fields of same variety not conforming to the purity requirement for certification. |
| 6. | Red gram | 250 | 100 | Other varieties and fields of same variety not conforming to the purity requirement for certification. |

| SL No. | Crop | Minimum distance Foundation | Isolation (meters) Certified | To be isolated by the distance in column 3 or 4 from fields of |
|--------|------------------------------------|-----------------------------|------------------------------|--|
| 7. | Sunflower (a) Hybrids | 600 | 400 | Fields of other varieties and fields of the same variety not conforming to the varietal purity requirement for certification and wild sunflower. |
| | (b) Varieties | 400 | 200 | |
| 8. | Safflower and Niger | 400 | 200 | Fields of other varieties of the same kind or the same variety not conforming to the varietal purity requirement for certification. |
| 9. | Castor | 600 | 300 | Other varieties of the same kind or not Varieties and hybrids conforming to the varietal purity requirement for certification |
| | Seed production by modified method | 1000 | 300 | Other varieties of the same kind or not conforming to the varietal purity requirement for certification. |

| SL No. | Crop | Minimum distance Foundation | Isolation (meters) Certified | To be isolated by the distance in column 3 or 4 from fields of |
|--------|---|-----------------------------|------------------------------|--|
| 10. | Sesamum | 100 | 50 | Other varieties of the same kind or same variety not conforming to the varietal purity requirements for certification. |
| 11. | Cotton (a) Parents of hybrids and varieties (b) Hybrids | 50 - | 30 5 | Other varieties of the same species, fields of the same variety not conforming to the varietal purity requirements for certification, fields of other species. Between the block of the parental lines of the same hybrids. |
| 12. | Jute | 50 5 | 30 5 | Other varieties of the same variety not conforming to varietal purity for certification. Fields of other species. |

| SL No. | Crop | Minimum distance Foundation | Isolation (meters) Certified | To be isolated by the distance in column 3 or 4 from fields of |
|--------|---|-----------------------------|------------------------------|--|
| 13. | Tomato Varieties | 50 | 25 | Other varieties of the same species not conforming to varietal purity for certification. Other varieties of the same species not conforming to varietal purity for certification. |
| | Hybrids | 200 | 100 | |
| 14. | Bhindi | 500 | 250 | Fields of other varieties, the same variety not conforming to varietal purity requirements for certification and wild Abelmoschus spp. |
| 15. | Capsicum and chilli | 500 | 250 | Other varieties, the same variety not conforming to varietal purity requirements for certification, chilli from capsicum and vice versa |
| 16. | Brinjal (a) varieties (b) Hybrids | 300 200 | 150 200 | Other varieties, the same variety not conforming to varietal purity requirements for certification. |

| SL No. | Crop | Minimum distance Foundation | Isolation (meters) Certified | To be isolated by the distance in column 3 or 4 from fields of |
|--------|--|-----------------------------|------------------------------|---|
| 17. | Potato | 5 | 5 | Other varieties, the same variety not conforming to varietal purity requirements for certification. |
| 18. | Cluster bean | 10 | 5 | Other varieties, the same variety not conforming to varietal purity requirements for certification. |
| 19. | Gourds (cucurbits) (a) Hybrids (b) Varieties | 1500 1000 | 1000 500 | Fields of varieties including commercial hybrid of the same variety. Variety and the variety/hybrid not conforming to varietal purity requirements for certification. |
| 20. | Amaranthus | 400 | 200 | variety and the variety/hybrid not conforming to varietal purity requirements for certification. |

| Sl. No. | Crop | Minimum distance Foundation | Isolation (meters) Certified | To be isolated by the distance in column 3 or 4 from fields of |
|---------|---|-----------------------------|------------------------------|---|
| 21. | Mustard (a) Self Compatible (b) Self Incompatible (c) Fields of Rocket salad and any of the other spp. of Genus Brassica | 200 100 100 | 50 50 50 | Other varieties of Brassica, the same spp. & fields of the same variety not conforming to varietal purity requirement "do" "do" |
| 22. | Fenugreek | 50 | 25 | Other Variety and the same |
| 23. | Cumin | 800 | 400 | variety not conforming to |
| 24. | Coriander | 200 | 100 | varietal purity requirement |
| 25. | Fennel Ajwain | 200 | 100 | for certification |
| 26. | Dhaincha | 10 | 05 | " " |

REINSPECTION

For crops not conforming to the standards for certification at any inspection, the field may be reinspected by the Agency on producers or seed grower/farmers request on depositing reinspection fee, when he has removed the source of contamination in the seed field and has maintained the isolation distance and or the contaminated plants in the seed field. The Agency may conduct one or more reinspection over and above normal set of inspections to ensure conformity of the seed crop to the standards as per MSCS.

REPORTING RESULTS

The results of the field inspection must be reported in the prescribed inspection report of the Agency & is to be signed by the seed grower/farmer also. A copy is to be given to him on spot.

Sometimes, even after following all regulations and observing normal field counts, an officer may some times observe defects which do not come in field counts. Under such conditions he may follow the suggested procedure :

1. When patches or rows off types, shadders, shedding tassels objectionable weeds, inseparable other crop plants heads or plants affected by diseases are noticed but not come under field counts, separate observations such as size of the patch, number of rows etc. should be made, reported and be shown on a map. The officer should exercise discretion and attempt to save the crop from rejection by advising the grower to remove the defective patch before contamination occurs.
2. If the male/female parents in seed production involving two parents have been irregularly planted, it should be recommended as "LIABLE FOR REJECTION".
3. If the seed crop is grown as mixed, inter or companion crop other than prescribed norms, it should be recommended as liable for rejection.
4. If the seed crop has failed partially or completely or is damaged by cattle, flood, drought etc. or the producer does not want to offer it for certification, the inspection report should still be prepared.

HARVESTING

Seed crop meeting the field standards after final field certification shall be properly harvested, threshed, dried and transported to the registered seed processing plant as per crop calendar for processing and certification. during the above operations seed producer/growers should take all necessary precautions to safeguard the seed quality.

- (i) The Crop should be harvested at proper stage.
- (ii) It should be properly dried, threshed so that no admixture takes place at threshing floor.
- (iii) All thresher or bags should be clean, bags are not old and torned.
- (iv) All stones, stalks, mud balls etc. should be removed for better processing.
- (v) Bags should not be over filled & not more than 100 Kg. capacity.
- (vi) Care to be taken for Soyabean harvesting, threshing & packing.

Thanks!!!

Introduction of Indian Minimum Seed Certification Standard

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The failure of many conservation plantings can often be related back to our lack of understanding seed certification, reading seed analysis tags, and purchasing the best quality seeds available. Certification is the process by which a state seed certifying agency gives official recognition to seeds produced of a cultivar or named variety under a limited generation system which ensures genetic purity, identity, and a given minimum level of quality.

"Seed certification is a legally sanctioned system designed to secure, maintain & make available certain prescribed standards of genetic identity physical purity, quality and seed health of notified kinds and varieties including vegetative propagating materials of crop plant varieties."

The most common levels of certification that would normally be available for consumer purchase would be "Certified Seed". Breeder seed is usually reserved for future development and seed increase by the owner or developer of the seed line, and foundation seed would normally be used by a commercial seed company to establish new production fields. Certified seed, if available should be your first choice for any seeding project. If a class of certified seed is not available, you should try to obtain non-certified seed that meets certification standards for purity, germination, weed seed, and noxious weed seed.

Classes of Seeds

Four main classes of seeds are defined by the Association of Official Seed Certification Agency.

Nucleus Seed:

- It is the initial amount of pure seed of an improved variety or notified variety or parental lines of a hybrid produced under the supervision of the evolver of that variety / Institute/ State Agriculture University.
- It is generally 100 % pure and does not contain other physical impurities.
- It is produced strictly under isolation to avoid both genetic and physical impurities.
- Vigour of the original variety or parental line should be retained in the nucleus seed.

Breeder Seed:

It is the progeny of nucleus seed multiplied in large area under the supervision of plant breeder/ Institute/State Agriculture University and monitored by a committee consisting of the representatives of state seed certification agency, national/ State seed corporations, ICAR nominee and the concerned breeder. It is 100 % physical and genetically pure seed.

Foundation Seed:

It is the progeny of breeder seed produced on the farms of State Agriculture Universities/ Other government farms and State Seed Corporations. It is 99.5 % genetically pure seed.

Certified Seed:

It is the progeny of foundation seed produced by registered seed growers under the supervision of seed certification agencies to maintain the seed quality as per minimum seed certification standards. It is 99% genetically pure seed.

Truthfully labelled Seed:

It is the category of seed produced by private seed companies and is sold under truthful labels. Companies should maintain field and seed standards suggested for quality seed production as per seed act. Labeling is compulsory but certification is voluntary.

| Seed Class | Colour | Size |
|--------------------------|---------------|----------------|
| Breeder Seed | Golden Yellow | 12 cm x 6 cm |
| Foundation Seed | White | 15 cm x 7.5 cm |
| Certified Seed | Blue | 15 cm x 7.5 cm |
| Truthfully labelled Seed | Opal Green | 15 cm x 10 cm |

Objectives:

The main objectives for which the Agency is established are-

- Act as the Seed Certification Agency under section 8 of the Indian Seeds Act. 1966
- Discharge the functions entrusted to the Seed Certification Agency under section 9 and 10 of the Seeds Act 1966; (Grant or revocation of certificate)
- Recognize varieties eligible for seed certification and annually publish lists indicating the names of such varieties
- Maintain a list of sources of breeder and foundation seeds by the Central Seed Certification Board
- Outline the procedure for submission of application for growing, harvesting, processing, labelling and tagging of seeds intended for certification
- Verify upon receipt of an application for certification that the variety is eligible for certification, and the applications submitted are in accordance with the procedure prescribed for it and the seed used for planting is from the duly approved source
- Undertake inspection of seed fields, seed processing plants and seed lots in accordance with the procedures outlined by the Central Seed Certification Board
- Regulate the processing of seeds at seed processing units
- Arrange for analysis of seed samples drawn from the seed lots produced as per procedure to verify their conformity to the prescribed standards
- Grant certificates, as per the prescribed procedure for Seed Certification
- Carry out educational programme along with the State Department of Agriculture to promote the production and use of certified seed

Eligibility of varieties for Certification

Seed of only those varieties which are notified under Section 5 of the Seeds Act. 1966 are eligible for certification.

Unit of Certification

For the purpose of field inspection, the entire area planted under seed production shall constitute one unit provided –

1. It shall under one variety.
2. It does not exceed ten hectares.
3. It is not divided into fields separated by more than fifty meters between them.
4. It is planted with or is meant to produce seed belonging to the same class and stage.
5. The crop over the entire area is more or less of the same stage of growth so that observations made are representative of the entire crop.
6. The total area planted, by the large corresponds to the quantity of seed reported to have been used, and the Certification Agency's permission had been obtained by economizing the seed rate.
7. Raised strictly as a single crop.
8. The crop should not lodge more than one third of the plant population, thereby hindering proper certification of fields.

Seed Certification Procedures

The Seed Certification Agency is the legally authorized body to manage the production, multiplication and monitoring of the seed quality as per the Seed Act 1966, seed certification is voluntary. Seeds which are certified by the Seed Certification Agency are called "certified seeds", which passes through both the field and seed standards as specified by the certification body. Seed standards are specified and uniform throughout the country, whereas the seed certification procedures and fee vary from one State to another State. The details mentioned in the following pages pertain to the State of Bihar. It may slightly vary in other States.

Aim of the Seed Certification Agency:

Producing high quality seeds of the crop varieties that the notified by the Central and State Governments and make them available to the farmers is the prime aim of the Seed Certification Agency.

Steps Involved in Seed Certification

1. Application for seed production
2. Registration of sowing report
3. Field inspection
4. Seed processing
5. Seed sample and seed analysis
6. Tagging and sealing

Application of seed production

Any person who wants to take up certified seed production should submit a sowing report in triplicate to the Director, State Seed Certification Agency, to register the crop and season with a registration fee of Rs. 30/- (Rupees Thirty only) and prescribed certification charges. The fee is

for a single crop variety for an area up to 25 acres and for a single season. Along with this fee for seed certification the label of the seed source should be submitted.

Separate sowing reports are required for different crop varieties, different classes and different stages. Separate sowing reports are required to be registered for the same crop variety if the seed production fields are separated by more than 50 meters, sowing or planting dates differ by more than 7 days and if the seed farm area exceeds 25 acres. The sowing report should reach the Director, State Seed Certification Agency within 35 days from the date of sowing or 15 days before flowering whichever is earlier. In the case of transplanted crop the sowing report should be sent 15 days before flowering.

Registration of sowing report

After receiving the application of the sowing report, the Director, State Seed Certification Agency scrutinizes and registers the seed farm and duly assigns a Seed certification number for each sowing report.

Field inspection

Procedure for field inspections differ among crops and among growth stages of the same crop. The following broad principles on inspection methods are common to most crops and stages of growth:

1. The field inspection work which requires technically-trained personnel, shall be performed by the persons who have been so authorized by the Certification Agency;
2. Field inspection meant to verify those factors which can cause irreversible damage to the genetic purity or seed health shall be conducted without prior notice to the seed producer;
3. Soon after the completion of the field inspection, a copy of the report shall be handed over to the seed producer or his representative.

The objective of the field inspection is to check for the factors that may affect the genetic purity and physical health of the seeds. Field inspection will be conducted by the Seed Certification Inspector (SCI) to whom the specific seed farm has been allocated. The specific date of inspection and details of the seed farm will be intimated by the Seed Certification Officer through a copy of the sowing report sent to him. Number of field inspections will differ from crop to crop depending upon the growth stages of the crop. Generally field inspections would be carried out during the following growth stages of the crop.

- Pre-flowering stage
- Flowering stage
- Post flowering and Pre-harvest stage
- Harvest time

For each crop at least two field inspections should be conducted. Apart from the assigned field inspection, the Seed Certification Inspector can visit the seed farm at any time during the crop growth stage. Two field inspections in a same seed farm are not allowed in a same day. Re-inspection should be done to confirm that the shortcomings found during the first inspection have been solved. The following things are normally checked during field inspection.

| S.N. | Crops | No of Inspections | Stages of Inspection |
|------|--|-------------------|---|
| 1 | Ragi, Paddy, Wheat, Cowpea Green-gram, Blackgram, Redgram, Groundnut Soyabeans, Frenchbeans, Clusteban, Dolichosbean, Amaranthus | 2 | Flowering to harvest |
| 2 | Maize a) Inbred line, single crosses and hybrids b) Composites, synthetics and open pollinated varieties | 4 2 | 1 st before flowering and three during silking stage 1 st pre-flowering and 2 nd during flowering |
| 3 | Hybrid Sorghum, Hybrid Bajra, Hybrid Sunflower and their parents | 4 | 1 st before flowering, 2 nd and 3 rd during flowering & 4 th during pre-harvesting |
| 4 | Open pollinated varieties of Sorghum, Bajra, Sunflower, Sesamum and Jute | 3 | 1 st pre-flowering, 2 nd during Flowering & 3 rd during pre-harvesting. |
| 5 | Cotton a) Hybrids b) Varieties | 4 2 | 1 st before flowering, 2 nd and 3 rd during flowering (Emasculation and crossing) 4 th during pickings of bolls. Flowering to harvest |
| 6 | Castor | | |
| | a) Hybrids | 4 | 1 st before flowering 2 nd and 3 rd during flowering 4 th at pre-harvest |
| | b) Varieties | 2 | Flowering to harvest |
| 7 | Dhaincha | 2 | 1 st before flowering 2 nd at Flowering and pod stage |
| 8 | All cucurbits and fruit vegetables (other than hybrids) viz, Brinjal, Bhindi, Tomato, Chillies, Capsicum | 3 | 1 st pre-flowering, 2 nd during flowering and fruiting, 3 rd during mature fruit stage |

| | | | |
|----|-----------------------------|---|---|
| 9 | Potato | 3 | 1 st 45 days after sowing, 2 nd just before haulm cutting, 3 rd after haulm cutting. |
| 10 | Radish, Carrot and Turnip | 3 | 1 st 20-30 days after sowing, 2 nd when lifted & replanted, 3 rd flowering |
| 11 | Cumin, Coriander and Fennel | 3 | 1 st before Flowering, 2 nd 50% Flowering, 3 rd Maturity |

Rejection of the seed field

- The seed production field, which do not conform to the required standards for any of the following factors will be rejected.
- When the size of the seed farm exceeds the registered size.
- When there is no cultivation of the crop in the registered seed farm.
- Drying of the seed farm due to water scarcity.
- Inability to carry out the minimum number of field inspections.
- Lodging of the crop in one third of the seed farm.
- Seed crop affected by flood or very poor crop management Difference found in the seed farm when compared with the sowing report.
- Not allowing the Seed Certification Officer to take the count.

Field Counts

The number of counts taken and the method of taking counts vary from crop to crop for all crops; five counts are taken for any area upto 5 acre and an additional count is taken for every additional 5 Acre as given below:

| Area of the field crops | No. of counts to be taken |
|---------------------------|---------------------------|
| Upto 5 acres (ha.) | 5 |
| 5 to 10 acres | 6 |
| 10 to 15 acres | 7 |
| 15 to 20 acres | 8 |
| 20 to 25 acres | 9 |
| 25 to 30 acres | 10 |

What to Inspect

Basically, sources of genetic and physical contamination must be observed, and extent of their occurrence estimated. Sources of contamination can broadly be classified as follows:

Off Types:

Off types are the plants of the same species as that of the seed crop variety but morphologically of different characters eg. Pigmentation, plant type, stem/leaf shape and texture, size/colour of flower or fruit etc. Similarly plants of other varieties of same crop are also included in off types. To designate a plant as off type it is necessary to trace it to any variety.

Inseparable other crop plants

Such type of plants whose seeds are similar in size, colour etc. and are difficult to separate from the seeds of seed crop by mechanical means are inseparable other crop plants. Such plants are counted if the growth stage of these plants is such that the maturity time resembles to the seed crop and may cause mechanical admixture at the time of harvesting/threshing.

| Crop | Designated Inseparable other crops |
|--------|------------------------------------|
| Barely | Oats, Wheat and Gram |
| Oats | Barely, Wheat and Gram |
| Wheat | Barley, Oats and Gram |

Isolation

A proper designated isolation distance is compulsorily be maintained in the seed fields. All precautions should be taken so that produce of rejected area of the seed field on account of isolation is not mixed with that of the certified seed field. Threshing certificate if required may be given.

Re-inspection

For crops not conforming to the standards for certification at any inspection, the field may be re-inspected by the Agency on producers or seed grower/farmers request on depositing re-inspection fee, when he has removed the source of contamination in the seed field and has maintained the isolation distance and or the contaminated plants in the seed field.

The Agency may conduct one or more re-inspection over and above normal set of inspection to ensure conformity of the seed crop to the standards as per MSCS.

Reporting Results

The Results of the field inspection must be reported in the prescribed inspection report of the Agency & is to be signed by the seed grower/farmer also. A copy is to be given to him on spot. Sometimes, even after following all regulations and observing normal field counts, an officer may sometimes observe defects which do not come in field counts. Under such conditions he may follow the suggested procedure:

- When patches or rows off types, shedders, shedding tassels objectionable weeds, inseparable other crop plants/heads or plants affected by diseases are noticed but do not come under field counts, separate observations such as size of the patch, number of rows etc. should be made, reported and be shown on a map.

Harvesting, Threshing and Transportation

Seed crop meeting field standards for certification shall be harvested, threshed and transported to the seed processing plant in accordance with the guidelines issued by the Certification Agency. During these operations, seed producer will take all precautions to safeguard the seed from admixture and other causes of seed deterioration.

Seed Processing and Packing Schedule

The Certification Agency shall prepare and communicate seed processing and packing schedule to all certified seed producers soon after the certification of seed crops at field stage. The seed

producers shall adhere to the schedule specified by the Certification Agency. However, re-scheduling may be accepted by the Certification Agency on the request of seed producer on genuine grounds.

Seed Lot

A seed lot is a physically identifiable quantity of seed which is homogeneous. A seed lot would represent any quantity of agricultural seeds upto a maximum of 20,000 kilogrammes for seeds of the size of rice or larger (except maize seed, seed potato, sweet potato, yams, taro and chow-chow for which the maximum size of the lot may be 40,000 kilogrammes) and 10,000 kilogrammes for seeds smaller than rice subject to a tolerance limit of 5.0%. The quantities in excess of the above maximum limits shall be sub-divided and separate lot identification shall be given.

Construction of Seed Lot Number

Each seed lot shall be assigned a specific number in order to facilitate maintaining its identity, tracing back to its origin, handling in stores, transit etc., accounting and inventory maintenance and referring/communicating about a certain quantity of seed.

Assigning lot numbers is done as below – MAY15/ 88-12-01-01 Apr.-15-04/19-09/R2/2-31

| | | |
|-------|---|---|
| MAY15 | - | represents seed harvested in May -15. |
| 12 | - | State Code |
| 01 | - | Processing plant Code |
| 01 | - | Seed Produce Code which will trace to the particular unit of certification. |

Seed Processing

Seed processing means cleaning, drying, treating, grading and other operations which will improve the quality of seeds. Seed from fields which conformed to the standards of certification at field stage shall, as soon as possible after the harvest will be brought at processing plant for processing. The screen aperture specified size shall be used for cleaning and grading of seeds so that typical contaminants such as weed seeds, small seeds, damaged seeds, broken and shriveled seeds, straw, chaff, leaves, twigs, stones, soil particles etc. are removed.

Seed Treatment

When a variety, seed of which is under certification is susceptible to a seed borne disease organism or when seed under certification is carrying a seed borne pathogen and a seed treatment is available which may control the disease or pathogen when properly applied, the Certification Agency may require such seed to undergo such treatment before Certification. The information about the treatment shall be displayed on seed containers.

Samples and Sampling of Seeds

Soon after completion of the seed processing or after seed treatment as the case may be, the Certification Agency shall draw a representative composite sample. The quantity of seed

samples so drawn shall be sufficient to provide three samples of the size of submitted sample. The composite sample will be divided into three equal parts, and one shall be sent for analysis to a notified Seed Testing Laboratory, the second part to the seed producer and retain the third part as a guard sample.

Seed Analysis Report

The Seed Testing Laboratory shall analysis the seed samples in accordance with the prescribed procedure and deliver the Seed Analysis Report to the Certification Agency as soon as may be, but not later than 30 days from the date of receipt of the samples unless the seed is subjected to such tests which require more than 30 days for completion of the test.

Seed Standards of Genetic Purity

All certified seed lots shall conform to the following Minimum Standards for genetic purity unless otherwise prescribed:

| Class | Standards for Minimum Genetic Purity (%) |
|--|---|
| Foundation | 99.00 |
| Certified: | |
| 1. Varieties, composites, synthetics & multi-lines | 98.00 |
| 2. Hybrids | 95.00 |
| 3. Hybrids of cotton, TPS, muskmelon, brinjal & tomato | 90.00 |
| 4. Hybrid castor | 85.00 |

Grow-out Test

The Certification Agency shall conduct grow-out test to determine genetic purity of a seed lot whenever it is a pre-requisite for grant of the certificate and also on the seed lots where a doubt has arisen about the genetic purity. The grow-out test can be complemented by certain related laboratory tests.

Recleaning, Resampling and Retesting

When a seed lot does not meet the prescribed seed standards, the Certification Agency on the request of seed producer may permit recleaning, resampling and retesting. The recleaning, resampling and retesting shall be permitted only once.

Seed Standards for Insect Damage

A seed lot under certification shall not have apparent or visible evidence of damage by insects for both Foundation and Certified seed classes in excess of 1.0% for the seeds of maize and legumes and 0.50% for the seeds other than maize and legumes unless otherwise prescribed.

Seed Moisture Content

Seed standards in respect of seed moisture shall be met at the time of packing of seed. For cereals in ordinary storage conditions for 12-18 months, seed drying up to 10% moisture content appears quite satisfactory.

Seed Sampling and Analysis

Seed sample should be sent to the seed testing laboratory for analysis through the Seed Certification Inspector. The fee of Rs. 40/- (Rupees forty only) for seed analysis should be paid during the sampling. To analyses the genetic purity of the seed sample, the producer should pay a fee of Rs. 300/- (Rupees three hundred only) to the Director, State Seed Certification Agency. Seeds lots which meet the prescribed seed standards like purity, free of inert matter, moisture percentage and germination capacity alone will be allotted the certification label. White colour label for foundation seeds and blue colour label for certified seeds should be bought from the Director of Seed Certification by paying Rs. 4 and Rs. 3 respectively.

Packing, Tagging, Sealing and Issuance of the Certificate

On receipt of Seed Analysis Report and the results of the grow-out test wherever prescribed, and if seed lot has met prescribed standards, the Certification Agency shall ensure packing, tagging and sealing and issuance of certificate expeditiously. An authorized official of the Certification Agency shall endorse the signature on the reverse of each certification tag and shall affix rubber stamp indicating the official's name and designation. Containers to be used for packing of the certified seeds shall be durable and free from defects.

Advance tagging may be permitted at the discretion of the Certification Agency with proper safeguards.

Validity period

The certified tagged seed is valid only for a limited period of time, say nine months from the date of seed sample testing for all seed crops. If the particular seed lot is not sold out within this period, revalidation of additional six months can be made only if the seed lot meets out necessary seed standards.

Certification of Seeds as Organic

A prerequisite for farmers following organic cultivation method is that they should use organically certified seeds in their farms. However, certified organic seeds are not commonly available in the market. To overcome this situation, certified organic farm could take up the production of quality certified organic seeds in consultation with the Department of Seed Certification and an Organic Certifying Agency. Farmers should follow all the organic certification standards according to the National Programme for Organic Production (NPOP) in addition to the seed certification standards for the production of certified organic seeds. For the production of such seeds, farmers have to register their land with any of the accredited organic certification bodies in India and also the seed crop with the Department or Board of Seed Certification in the respective State.

Service Charges for Various Operations of Seed Certification

| | | |
|-----------|--|--|
| 1 | Application fee | Free |
| 2 | Registration Charges | 30/- (Thirty Rs. per Application Form) |
| 3 | Inspection fee | |
| | Self-pollinated crops | 250/- (Two hundred fifty Rs. per ha.) |
| | Cross pollinated crops | 300/- (Three hundred Rs. per ha.) |
| | For sugarcane crops | 250/- (Two hundred fifty Rs. per ha.) |
| 4 | Tag Charges | |
| | Certified tag | 3.00 (Three Rs. per tag) |
| | Foundation tag | 4.00 (Four Rs. per tag) |
| 5 | Late Fine | 50.00 (fifty Rs. per application form) |
| 6 | Registration fee of processing plant (for two years) | 3000.00 (Three thousand Rs. per plant) |
| | Renual of processing plant (for two years) | 2000.00 (Two thousand Rs. per plant) |
| 7 | Institutional Registration Fee (for three year) | 5000.00 (Five thousand Rs. per institution) |
| | Renual of Institutional Registration (for three yr.) | 2000.00 (Two thousand Rs. only) |
| 8 | Re-Inspection Fee | |
| | Self-pollinated crops | 125.00 (One hundred twenty five Rs. per ha.) |
| | Cross-pollinated crops | 150.00 (One hundred fifty Rs. per ha.) |
| 9 | Seed Testing charges | |
| | Certified seed sample charges | 40.00 (Forty rupees Rs. per sample) |
| 10 | Grow Out Test Charges | |
| | Self-pollinated crop | 200.00 (Two hundred Rs. per sample) |
| | Cross pollinated crop | 250.00 (Two thousand and fifty Rs. per Sample) |
| 11 | Processing Charges | |
| | Self-pollinated | 3.00 (Three Rs. per qtl.) |
| | Cross pollinated | 5.00 (Five Rs. per qtl.) |
| 12 | Spot Tagging | 4.00 (Four Rs./tag only) |
| 13 | Seed transfer Charges | 3.50 (Three Rs. fifty paise/qtl. only) |
| 14 | Re Validation Charge | |
| | Self-pollinated crop | 10.00 (Ten Rs. / qtl. only) |
| | Cross pollinated crop | 15.00 (Fifteen Rs./qtl. only) |
| 15 | Seed Retesting Charge | 35.00 (Thirty five Rs./sample) |
| | Export Certificate | 1000.00 (One thousand Rs. per certificate) |

Note: Minimum Inspection fee for vegetable seed 0.25 ha. and other varieties 0.50 ha. will paid.

Certificate

On completion of certification work SSCA shall issue a certificate under section 9(3) of the Seeds Act for each lot in triplicate indicating all the required information's, the original copy to be

issued to the producer, second copy to the Agency Head Office and third copy to be retained as office copy.

Downgrading of Seed Class

If a seed field or a seed lot is not found meeting prescribed standards for the class for which it has been registered but conforms to the prescribed standards to the immediate lower class, the Certification Agency may accept such seed fields/seed lots for certification to the immediate lower class provided request has been made to this effect by seed producer/production agency. However, downgrading of the seed class shall not be applicable in case of hybrids and their parents.

Revocation of the Certificate

- As per the provisions under section 10 of the Seeds Act, 1966, the certificate issued by the Agency shall be revoked on following grounds:
- The certificate granted under section 9(3) of the Act has been obtained by the misrepresentation as to an essential fact or the holder of the certificate has, without reasonable cause, failed to comply with the conditions subject to which the certificate has been granted or has contravened any of the provisions of the Act or the rules may thereunder, then, without prejudice to any other penalty to which the holder of the certificate may be liable under the Act after giving an opportunity to the holder of the certificate to show cause, the certificate could be revoked.

Refusal for Certification

The Certification Agency shall have the authority to refuse certification of any seed production field or any lot that does not conform to the minimum standards prescribed for that particular crop either for field or for seed or for both. Such refusal will be subject to any application made to the Appellate Authority constituted under Section 11(1) of the Seeds Act, 1966.

All such appeals be made within 30 days from the date of which the decision of the Agency is communicated along with –

- A copy of decision of Certification Agency against which appeal has been referred with the grounds of objection to such decision.
- A bank draft for Rs. 100/- towards the appeal fees.

Seed Processing, Seed Testing & Packaging in Certification System

B.S. Gupta

Former Senior Seed Certification Officer

What is Seed Processing

- Seed processing is mainly a cleaning process of removing the undesirable material i.e. inert matter, weed seed, other crop seed, damaged seed, light & chaffy material from the raw seed by mechanical means to obtain the good quality seed.
- Seed cleaning is done on the basis of differences in physical properties of good & undesirable seed i.e.
 1. Seed size (Length, width and thickness)
 2. Weight/density
 3. Shape
 4. Surface texture
 5. Colour

Steps of Seed Processing

1. Receipt/intake of raw seed from the seed growers
2. Physical verification of raw seed
3. Approval of seed processing plant
4. Drying (if necessary)
5. Pre-cleaning – preparing seeds for basic cleaning
6. Basic seed cleaning/ grading
7. Fine cleaning/grading
8. Sampling & submission of sample to STL
9. Seed treatment
10. Tagging & bagging
11. Issue of Certificate –II under Section-9 of the seed Act 1966
12. Storage- stacking of finally packed seed.

Receipt/intake of raw seed from the seed growers

- The seed production Agency accept the raw seed from the seed growers at the seed processing plant as per the estimated yield given by the certification agency at the time of final field inspection.
- Each and every bag of raw seed should have been marked the specific identification code of the seed grower including the name of crop, variety, class & stage of seed.
- The production agency check the moisture and physical quality of raw seed with reference to admixture of other crop seed, insect damage, inert matter and after weighing issue receipt to seed grower for the quantity received.
- No raw seed intake will be entertained by the certification Agency after the cutoff date as per the crop calendar

Physical verification of raw seed

- Seed production Agencies submit the complete information of raw seed procured by them to the certification Agency just after the cutoff date of intake.
- Certification Agency after receipt of intake list of raw seed conduct the physical verification in order to check the information submitted by seed production Agencies.
- Only physically verified stocks are entertained for further seed processing and certification.

Approval of seed processing plant

- The Production Agency after physical verification of raw seed request for the registration/renewal of their seed processing plant.
- The certification agency conduct the inspection of seed processing plant and evaluation is done with reference to essential parameters specified for the registration/ renewal of evaluation. (format)

Essential requirements for the registration/ renewal of seed processing plant.

- (A) **Building** – The plant should be installed in a suitable building in a spacious processing shed having sufficient light facility, exhaust and ceiling fans, sufficient working space to provide storage of raw seed around the machine and to keep the graded seed, space for packing and movement of working personals.
- (B) **Storage** – Sufficient and separate godowns for storage of each category of seed i.e. raw seed, graded seed, packed seed, under size seed, packing material & chemicals.
- (C) **Machine & other equipments** – The processing machinery should have a set of standard equipment i.e. pre-cleaner, seed grader, indented cylinder, gravity separator, seed treator, moisture meter, bag closer, vacuum cleaner, weighing machine. All the machines should be so arranged that seeds flow continuously from beginning to end.

During the inspection of seed processing plants marks is to be allotted for specified essential requirements. Out of total 100 marks minimum 60 marks is required for the registration/renewal.

Essential Guidelines in Seed Processing

- Every machine and their parts should be cleaned thoroughly before starting the grading and at the time of changing the crop/variety to avoid mechanical mixing.
- The total processing area should be cleaned with special reference to seed as well as impurity.
- Only one crop/variety /seed grower code should be handled in the processing area at one time.
- The prescribed size of grading screen should be selected as per the crop and variety to be processed.
- The air velocity of air screen machine should be adjusted in accordance with the quality of raw seed.
- Observe the moisture of the raw seed before starting the grading.
- Cleaning of machines of screens at regular interval is to be done to get the good quality of seed.

Drying Importance

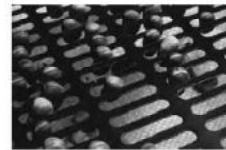
- Safe mechanical handling
- Low moisture content increases self life
- Reduces chances of insect infestation and mould growth
- Reduces loss of seed quality

Selection of screens Screen Action



- Screens separate seed by width and thickness.
- Screens are usually made of iron sheet and are perforated with round or oblong holes.

Screen Action



- Seed can be separated by thickness by using oblong or slotted screens. Since the seeds roll over the screens, the smallest dimension — the thickness — determines whether it will fall through the sieves.

Selection of Screen

Size: Scalping> Seed Components Pass,
Grading< Optimum thickness/dia. of good seeds

| Shape of seed | Upper screen | Lower screen |
|---------------|----------------|---------------|
| Round | Round holes | Slotted holes |
| Oblong | *Slotted holes | Slotted holes |

Processing operation Phase-I : Pre-cleaning

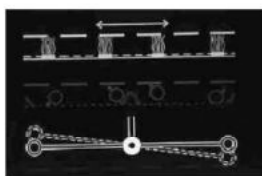
- It is done by the pre-cleaner machine meant to prepare the raw seed for basic grading by removal of larger inert material from the raw seed and separate dust & light chaffy materials with a controlled air suction.
- Machine is having two screens upper and lower screen. The upper screen separate larger size inert material while lower screen separate the under size materials from the raw seed & pass on the good seed to the grading machine through elevators to increase the capacity of grading machine.

Processing Phase-II : Basic grading

- It is done by the seed grader machine which is designed for essential process of grading on the basis of differences in the seed size and weight.
- The process of grading is operated in three ways.
 1. **Air suction** – The grading machine have two air systems (suction fans) designed as upper and lower air suction.
 - (a) **The upper air** removes dust and light chaffy materials from the raw seed before they reach the upper screen. It is controlled by an air adjustable system.
 - (b) **The lower air suction** removes the light seed and trashes from the lower screen. It is also controlled by an air adjustable system.

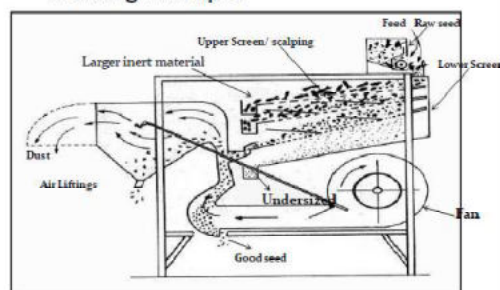
2. **Scalping** – The upper screen of grader further removes the larger inert material. The good seeds are dropped on lower screen through the perforation of upper screen. This screen is also called as scalper screen.
3. **Grading** – Lower screen of the grader, receives seed from the upper screen which flows over the openings while under size material and smaller seed, weed seed, damage seed dropped through the lower screen. The seed must flow on the screen in a single layer otherwise under size and lighter seeds material may pass with good seed to next stage & deteriorate the quality the cleaning of lower screen should be done at regular interval to avoid the clogging.

Cleaning of Screen



- During the cleaning process the screens have to be kept clean. Brushes, balls or knockers are used to remove the seed that gets stuck in the perforations of the screens.

Air-Screen Cleaner/Grader Working Principle



Processing Phase-III : fine grading/up grading

- Fine grading is done mostly by using indented cylinder and gravity separators.
- Indented cylinder is specifically used for the removal of weed seed and cut seed having thickness equal to the seed size not separated by the lower screen.
- The cylinder operates on a principle of centrifugal force in which the speed of the cylinder holds good seed in the indent while weed seed and cut seed smaller then the seed length fall separately.

Indented cylinder separator



- It consists of indents which lift particles that fit into the indents. Particles which do not fit drop out of the cell and fall downwards.

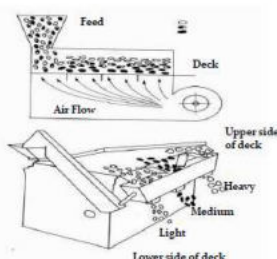
Specific gravity separation



- Even after the seed is cleaned in the air-screen cleaner and the indented cylinder, it may be necessary to obtain higher-quality seed. In such cases, the seed can often be passed over the specific gravity separator.

Gravity separator

- Even after the seed is cleaned in the air-screen cleaner and indented cylinder to obtain fine quality of seed, the seed can be passed over the specific gravity separator.
- It operates on a flotation principle. Separation of good seed and undesirable inert material takes place on the basis of density by flotation.
- Gravity separator is having a deck with perforations and air blowing unit (fans) below the deck. The shaking deck pushes the heavy seeds upward with deck and air stream float lighter seed towards lower side of the deck.
- Slope & Oscillation controls movement of the gravity separator.



Formation of seed lot

- After grading certification Agency allot the lot no. to each identification code of farmer.
 - In the IMSCS a procedure for formation of lot no. is defined to induce traceability of certified seed as detailed here :
 1. First part: Called the harvesting month & year code- for ex., NOV. 15 it explain the crop is harvested in the month of NOV. 2015
 2. Second part: Called the production location code and indicate State or Union Territory where the concerned seed field was located for this purpose each State is allotted a permanent numerical code by CSCB. For Rajasthan State the numerical code is 20.
 3. Third part: This is called processing plant code and shall indicate the seed processing plant where the relevant lot was processed. The certification Agency allot the registration no. to the seed processing plant on request of seed production Agency. For ex. Durgapura , Jaipur allotted plant no.
 4. Fourth part: The seed produce code it will indicate ultimate serial no. of an individual lot based on the raw seed of particular seed grower i.e. 01.
- All the four parts in the lot no. shall be written in series with a dash (-) between First, Second, Third & fourth parts to distinctly indicate the code no. of each part. An example is shown below:
- Lot no.: NOV 15-20-01-01
NOV 15- Seed harvested in NOV 2015
20- Seed crop raised in Rajasthan
01- Seed processed in a processing plant on Durgapura , Jaipur
01- Seed produced code trace to the particular farmer

Seed lot size

- Seed lot – Is a physically identifiable quantity of seed which is homogeneous.
- The seed equal to the size of wheat the maximum size of seed lot will be 200 Qtls. subjected to the tolerance limit of 5 %
- The seed less than the size of wheat the quantity maximum size of seed lot will be 100 Qtls. subjected to the tolerance limit of 5 %
- The seed more than the size of maize the maximum size of seed lot will be 400 Qtls. subjected to the tolerance limit of 5 %

SAMPLING

- Procedure of sampling- Ensure that the entire quantity of seed to be sampled belongs to one lot.
- Determine the number of containers in the lot and the number of containers to be sampled for the lot.
- Up to 5 containers – Minimum 5 primary samples, from each container.
- 6 to 30 containers- Minimum 5 primary samples, one from every 3 containers whichever is greater.
- More than 30 – Minimum 10 primary samples, one from every 5 containers whichever is greater.

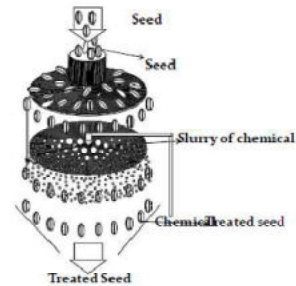
Sampling & submission of sample to STL

- The soon after completion of the seed processing certification Agency shall draw a representative composite sample as per procedure specified in Seed Testing Manual.
- The quantity of seed samples so drawn shall be sufficient to provide three samples of the size of submitted sample. The composite sample will be divided into three equal parts and one shall be sent for analysis to a notified Seed Testing Laboratory, the second part to the seed producer and retain the third part as a guard sample.
- Primary sample- Several individual samples are drawn from the different containers each such sample is called a primary sample.
- Composite sample – All the primary samples drawn from one lot are combined to form a bulk and is called composite sample.
- Submitted sample- A portion of seed derived from the composite sample to be submitted for analysis to Seed Testing Laboratory is called submitted sample. (minimum size of submitted sample is specified in ISTA rules). After proper sealing the sample is to be sent to STL.

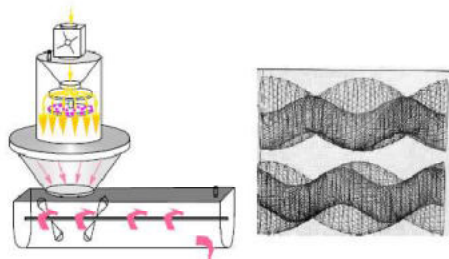
Seed treatment

- The application of chemicals i.e. fungicides, insecticides or a combination of both, to seed so as to disinfect them from seed or soil borne pathogens and storage insects & pests.
- Method of seed treatment-
 1. Dusting- The chemicals and seed are thoroughly mixed by mechanical mixer normally at the rate of 200 to 300 gm. Chemical/qtls.
 2. Slurry- In this method the fungicide is applied to the seed in a soup like water suspension which is mixed with the seed in a special slurry treater. All foundation class seeds shall invariably be subjected to such treatment. To prepare a slurry 200 gm. of chemical mix with the 600 ml. of water for each qtls. of seed

Seed Treater



Seed Treater



Tagging & bagging

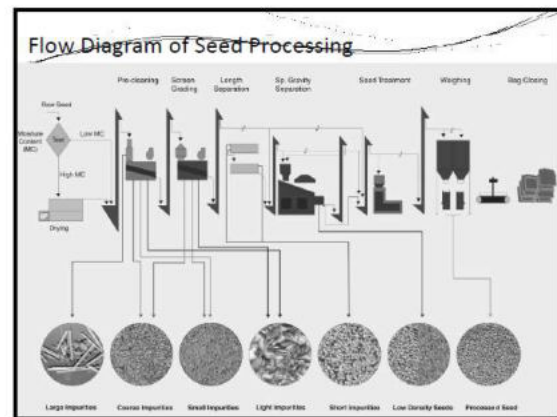
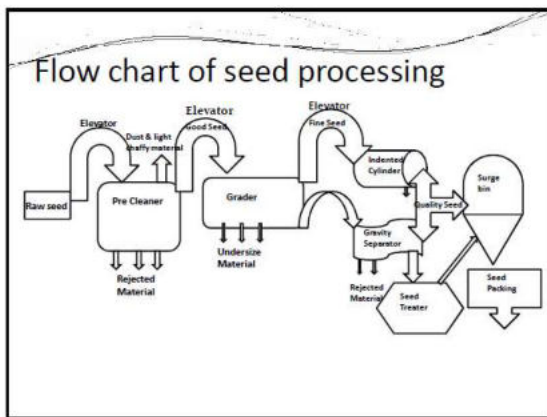
- On the receipt of seed analysis report and the results of the Grow-Out Test if seed lot has met prescribed standards, the certification Agency shall ensure packing, tagging and sealing of standard seed lots in a prescribed size of packing by using an approved packing material (format of bag, tag & label). The certification Agency keep the complete packing record including the serial no. of tags issued by them.
- Advance packing- On request of seed production Agency may permit advance packing/ tagging of graded seed with certain conditions subjected to the submission of such undertaking by the production Agency that seed shall not be moved without receipt of satisfactory results from STL and In case seed lot found substandard the tag shall be returned back to the certification Agency.
- The validity of STL results is nine months from the date of test for the fresh seed lot and six month for carry over stock.

Seed Packaging



Issue of Certificate II under Section-9 of the seed Act 1966

- On completion of all certification work the certification Agency shall issue a certificate II under Section-9 of the seed Act 1966 for each seed lot indicating all the required information's, regarding the seed standards, validity and serial no. of tags issued to that particular lot with the detail of seed producer.
- Now the seed shall be marketed by seed production Agency.



- Storage- stacking of finally packed seed.

- After packing of seed, it may be stored in a suitable godowns having proper ventilation, high plinth, free from leaks and insect pests.
- Seed should be stored on wooden/iron pallets
- The stacks height should not exceed more than fifteen bags in case of cereals and pulses and 8 to 10 in case of Soybean seed.
- The proper distance should be maintained between stacks of different crop, varieties.
- Each stack should have stack card with details of seed stored.
- Fumigation and chemical spray chart should also be displayed.
- Store godown should be clean and free from any undesirable inert material.
- Fumigation of stacks should be done in regular intervals as and when required.

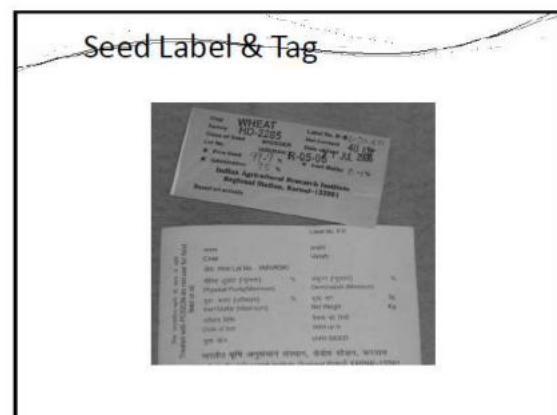
FORMAT OF BAG

Certification Void without tag & Seal
Class of Seed Stage (Not to be used for food, feed or oil purpose)

| | |
|---|--|
| Crop : | |
| Variety : | |
| Lot Number : | |
| Moisture (Max. When packed) : | |
| Net Weight (When packed) : | |
| M.R.F. : | |
| Certified by : | |
| Rajasthan State Seed & Organic Production certification Agency, Jaipur. | |
| Produced and marketed by : | |
| (Address of the registered seed Producer) | |
| Delete whichever is not applicable : | |
| 1 | Treated with poison. |
| 2 | Treat the seed with the chemical kept in the bag as per direction before sowing. |

SPECIFICATION FOR THE LABEL

1. TO BE PRINTED BY PRODUCTION AGENCY)
- a. The length and breadth of the label shall be 15 X 10cm or proportionately small label may be used.
- b. The content of the mark or label shall contain the following information namely:
- a. Label No.
- b. Kind
c. Variety
d. Lot Number
e. Date, Month and Year of test
f. Valid up to
g. Germination (Minimum)
h. Physical Purity (Minimum)
i. Genetic Purity (In case of variety) (Minimum)
j. Net Weight
k. Moisture, When packed, (Max)
l. Name of the chemical used for seed treatment, If seed is treated
m. Name and address of the person who offers for sale, sells or otherwise supplies the seed
n.
o. If seed has been treated, the following statement shall also be printed on the label
- "DO NOT USE FOR FOOD, FEED AND OIL PURPOSES"**
- a. The caution for mercurial's and similarly toxic substance shall be POISON in type size, Prominently displayed on the label in RED.
- a. The colour Should resemble with opal green (IS No. 275).





Introduction to Seed Act 1966

Nakul Gupta, Shivam Kumar Rai, Rajesh Kumar and P.M Singh
ICAR-Indian Institute of Vegetable Research, Varanasi 221305, U.P.

Introduction

The Act was approved by the President on December 29 and was published on December 30, 1966, in issue No. 66 of Part II, Section 1 of the Extraordinary Gazette of India. To give farmers access to high-quality seeds and to provide a legislative framework for seed certification, the Seeds Act of 1966 was created. This act resulted in the creation and notification of seed rules in 1968 and the beginning of systematic seed certification in India in 1969. This law authorised the creation of a Central Seed Committee to counsel the states on issues pertaining to seeds. Additionally, seed certification agencies, seed certification boards, and state seed testing laboratories were to be established.

Object and Reasons

It is thought that regulating the quality of specific seeds, such as seeds of food crops, cotton, jute, etc., to be sold for agricultural use, would boost agricultural production in the nation (including horticulture)

Method to Achieve This Object:

- Establishing a central seed committee with members from the federal and state governments, the National Seeds Corporation, and other stakeholders to advise the governments on all issues relating to the law under consideration.
- Establishing minimum requirements for germination, physical purity, varietal purity, and maximum requirements for moisture, ODV, and other quality elements.
- The central government and state governments will create seed testing laboratories to examine seeds for quality attributes.
- Each state should establish a service for seed certification and inspection, and dealers in seeds should have licences and certifications.
- Limiting the export, import, and interstate movement of non-descriptive seed and requiring seed containers to bear labels describing the quality of seeds offered for sale.
- The Act's drafting contains provisions designed to prevent excessive hardship, such as allowing the sale of seed by:
 - a. Plant Breeder
 - b. Certain classes of producers
 - c. Any other person for purpose other than for the purpose of sowing or planting.

25 sections make up the Seeds Act of 1966's basic structure, which can be largely divided into the following three categories:

- General Sections.
- Sanctioning legislation.
- Regulating legislation.

The Seeds Act, 1966

Enacted by Parliament for the whole of India to regulate seeds.

(1) Short title, extent and commencement

- This Act may be called the Seeds Act, 1966.

- It extends to the whole of India.
- It will go into effect on the day that the Central Government designates by publishing a notice in the Official Gazette. Different dates may be set for various provisions of this Act, as well as for various States or regions thereof.

(2) Definitions

1. "Agriculture" includes horticulture;
2. "Central Seed Laboratory" means the Central Seed Laboratory established or declared as such under sub-section (1) of section 4;
3. "Certification agency" means the certification agency established
4. "Committee" means the Central Seed Committee constituted under sub-section (1) of Section 3;
5. "Container" means a box, bottle, casket, tin, barrel, case, receptacle, sack, bag, wrapper or other thing in which any article or thing is placed or packed;
6. "Export" means taking out of India to a place outside India;
7. "Import" means bringing into India from a place outside India;
8. "Kind" means one or more related species or sub-species of crop plants each individually or collectively known by one common name such as cabbage, maize, paddy and wheat;
9. "Notified kind or variety", in relation to any seed, means any kind or variety thereof notified under Section 5;
10. "Prescribed" means prescribed by rules made under this act;
11. "Seed" means any of the following classes of seeds used for sowing or planting-
 - Seeds of food crops including edible oil seeds and seeds of fruits and vegetables;
 - Cotton seeds;
 - Seeds of cattle fodder; and includes seedlings, and tubers, bulbs, rhizomes, roots, cuttings, all types of grafts and other vegetative propagated material, of food crops or cattle fodder;
12. "Seed Analyst" means a Seed Analyst appointed under section 12;
13. "Seed Inspector" means a Seed Inspector appointed under section 13;
14. "State Government", in relation to a Union territory, means the administrator thereof;
15. "State Seed Laboratory", in relation to any State, means the State Seed Laboratory established or declared as such under sub-section (2) of section 4 for that State; and
16. "Variety" means a sub-division of a kind identifiable by growth, yield, plant, fruit, seed, or other characteristic.

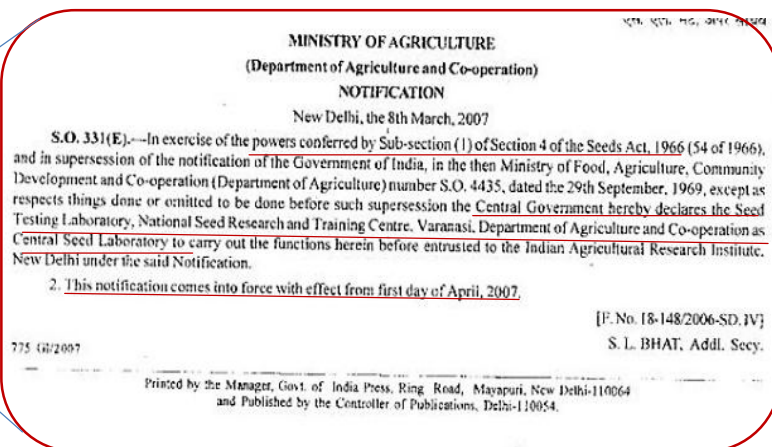
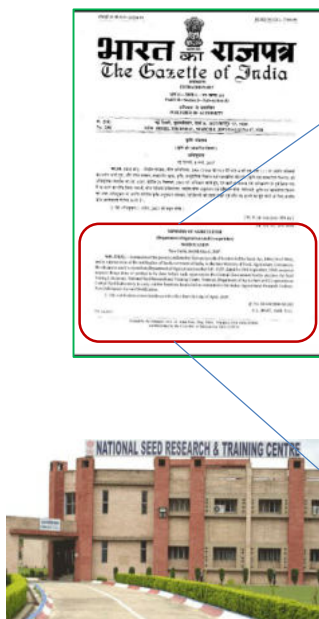
(3) Central Seed Committee

To advise the Central Government and the State Governments on matters arising out of the administration of this Act and to carry out the other functions assigned to it by or under this Act.

One chairman, eight members—two of whom are seed growers—and a member who will be proposed by the governments of each state make up the committee. The Central Government has nominated everyone. The members of the Committee are authorised to hold office for two years and are eligible for re-nomination unless their positions become vacant earlier due to resignation, death, or other circumstances. The Committee may establish its own operating procedures with the consent of the Central Government. For the committee to operate effectively, it could form a subcommittee. If necessary, the central government will select a secretary to serve as the office's secretary.

(4) Central Seed Laboratory and State Seed Laboratory

- The Central Government may, by notification in the Official Gazette, establish a Central Seed Laboratory or declare any seed laboratory as the Central Seed Laboratory to carry out the functions entrusted to the Central Seed Laboratory by or under this Act.
- The State Government may, by notification in the Official Gazette, establish one or more State Seed Laboratories or declare any seed laboratory as a State Seed Laboratory where analysis of seeds of any notified kind or variety shall be carried out by Seed Analysts under this Act in the prescribed manner.



(5) Power to notify kinds or varieties of seeds

If the Central Government, after consultation with the Committee, is of opinion that it is necessary or expedient to regulate the quality of seed of any kind or variety to be sold for purposes of agriculture, it may, by notification in the Official Gazette, declare such kind or variety to be a notified kind or variety for the purposes of this Act and different kinds or varieties may be notified for different States or for different areas thereof.

Seed Division : Gazette Notifications

Select Year of Notification

| Year | 2017 | 2016 | 2015 | 2014 | 2013 | 2012 |
|------|------|------|------|------|------|------|
| 2017 | 2017 | 2016 | 2015 | 2014 | 2013 | 2012 |
| 2011 | 2010 | 2009 | 2008 | 2007 | 2006 | 2005 |
| 2004 | 2003 | 2002 | 2001 | 2000 | 1999 | 1998 |
| 1997 | 1996 | 1995 | 1994 | 1993 | 1992 | 1991 |
| 1990 | 1989 | 1988 | 1987 | 1986 | 1985 | 1984 |
| 1983 | 1982 | 1981 | 1980 | 1979 | 1978 | 1977 |
| 1976 | 1975 | 1974 | 1973 | 1972 | 1971 | 1970 |

Year - 2017

| S. No. | G.O. No. | Statutory Order (S.O.) Number | Date of the Order | Remarks |
|--------|----------|-------------------------------|-------------------|---|
| 1 | ≥ | S.O. 182 (E) | 19/01/2017 | Seed Variety Notification |
| 2 | ≥ | S.O. 802 (E) | 10/03/2017 | Seed Variety Notification |
| 3 | ≥ | S.O. 1007 (E) | 30/03/2017 | Seed Variety Notification |
| 4 | ≥ | S.O. 1007 (E) | 30/03/2017 | Notification of crop varieties under section 5 of the Seeds |

भाग II-खण्ड 3(i)

भारत का राजपत्र : अध्यादेश

MINISTRY OF AGRICULTURE AND FARMERS WELFARE
(Department of Agriculture, Co-operation and Farmers Welfare)
NOTIFICATION
New Delhi, the 30th March, 2017

S.O. 1007(E).—In exercise of the powers conferred by section 5 of the Seeds Act, 1966 (54 of 1966), the Central Government after consultation with the Central Seed Committee, is of the opinion that it is necessary and expedient to regulate the quality of the seeds of the varieties specified in column (3) of the Table below of the kinds specified in the corresponding entries in column (2) of the said Table, hereby declares that the said varieties of the seeds shall be notified varieties to be sold for the purposes of agriculture for the States mentioned in column (4) of the said Table and shall be the notified varieties for the whole of India for the purposes of the said Act, with effect from the date of publication of this notification in the Official Gazette, namely:-

TABLE

| Crop | Variety | State |
|----------|----------------------------|--|
| 1. Rice | HRI-183 (Arize Swift Gold) | Haryana, Uttarakhand, Uttar Pradesh and Gujarat. |
| 2. Rice | HRI-180 (Arize Tej Gold) | Punjab, Haryana and Uttarakhand. |
| 3. Rice | PA6129 (Arize 6129) | Madhya Pradesh. |
| 4. Rice | BS129G (Arize 6129 Gold) | Chhattisgarh. |
| 5. Rice | 28P09 | Odisha, West Bengal and Uttar Pradesh, Assam, Chhattisgarh, Maharashtra, Gujarat, Tamil Nadu and Andhra Pradesh. |
| 6. Rice | CO 51 | Haryana, Uttarakhand, Odisha, Bihar, West Bengal, Uttar Pradesh, Madhya Pradesh, Maharashtra, Gujarat, Andhra Pradesh, Kerala, Karnataka and Tamil Nadu. |
| 7. Rice | VL Duan 158 (VL 8657) | Himachal Pradesh and Uttarakhand. |
| 8. Rice | Jalkunwari (TTB 207-4) | Assam. |
| 9. Rice | Jalashree (TTB 202-3) | Assam. |
| 10. Rice | Kamakhya (TTB 103-i-1) | Assam. |
| 11. Rice | Gitesh (TTB 253-i-2) | Assam. |

<http://www.seednet.gov.in/SeedGO/Index.htm>

(6) Power to specify minimum limits of germination and purity, etc

The Central Government may, after consultation with the Committee and by notification in the Official Gazette, specify –

- The minimum limits of germination and purity with respect to any seed of any notified kind or variety;
- The mark or label to indicate that such seed conforms to the minimum limits of germination and purity specified under clause (a) and the particulars which such mark or label may contain.

(7) Regulation or sale of seeds of notified kinds or varieties

Keeping for sale, offering to sell, bartering or otherwise supplying any seed of any notified kind or variety

- is distinguishable in terms of kind or variety
- conforms to the minimum limits of germination and purity specified under clause (a) of section 6
- the container of such seed bears in the prescribed manner, the mark or label containing the correct particulars thereof, specified under clause (b) of section 6

(8) Certification agency

- The State Government or the Central Government in consultation with the State Government may, by notification in the Official Gazette, establish a certification agency for the State to carry out the functions entrusted to the certification agency by or under this Act.
- The Central Seed Certification Board - to advise the Central Government and the State Governments on all matters relating to certification, and to co-ordinate the functioning of the agencies established under section 8.

(9) Grant of certificate by certification agency

- Any person selling, keeping for sale, offering to sell, bartering or otherwise supplying any seed of any notified kind or variety may, if he desires to have such seed certified by the certification agency, apply to the certification agency for the grant of a certificate for the purpose.
- Every application under sub-section (1) shall be made in such form, shall contain such particulars and shall be accompanied by such fees as may be prescribed.
- On receipt of any such application for the grant of a certificate, the certification agency may, after such enquiry as it thinks fit and after satisfying itself that the seed to which the application relates conforms to the 1[prescribed standards], grant a certificate in such form and on such conditions as may be prescribed:
- Provided that such standards shall not be lower than the minimum limits of germination and purity specified for that seed under clause (a) of section 6.

(10) Revocation of certificate

If the certification agency is satisfied, either on a reference made to it in this behalf or otherwise, that –

- The certificate granted by it under section 9 has been obtained by misrepresentation as to an essential fact; or
- The holder of the certificate has, without reasonable cause, failed to comply with the conditions subject to which the certificate has been granted or has contravened any of the provisions of this Act or the rules made thereunder, then, without prejudice to any other penalty to which the holder of the certificate may be liable under this Act, the certification

agency may, after giving the holder of the certificate an opportunity of showing cause, revoke the certificate.

(11) Appeal

- Any person aggrieved by a decision of a certification agency under section 9 or section 10, may within thirty days from the date on which the decision is communicated to him and on payment of such fees as may be prescribed, prefer an appeal to such authority as may be specified by the State Government in this behalf
- On receipt of an appeal under sub-section (1), the appellate authority shall, after giving the appellate an opportunity of being heard, dispose of the appeal as expeditiously as possible.
- Every order of the appellate authority under this section shall be final.

(12) Seed Analysts

The State Government may, by notification in the Official Gazette, appoint such persons as it thinks fit, having the prescribed qualifications, to be Seed Analysts and define the areas within which they shall exercise jurisdiction.

(13) Seed Inspectors

- The State Government may, by notification in the Official Gazette, appoint such persons as it thinks fit, having the prescribed qualifications, to be Seed Inspectors and define the areas within which they shall exercise jurisdiction.
- Every Seed Inspector shall be deemed to be a public servant within the meaning of section 21 of the Indian Penal Code (45 of 1860) and shall be officially subordinate to such authority as the State Government may specify in this behalf.

(14) Powers of Seed Inspector

- The Seed Inspector may –
 - take samples of any seed in any notified kind or variety from –
 - any person selling such seed; or
 - any person who is in the course of conveying, delivering or preparing to deliver such seed to a purchaser or a consignee; or
 - a purchaser or a consignee after delivery of such seed to him;
 - send such sample for analysis to the Seed Analyst for the area within which such sample has been taken;
 - enter and search at all reasonable times, with such assistance, if any, as he considers necessary, any place in which he has reason to believe that an offence under this Act has been or is being committed and order in writing the person in possession of any seed in respect of which the offence has been or is being committed, not to dispose of any stock of such seed for a specific period not exceeding thirty days or, unless the alleged offence is such that the defect may be removed by the possessor of the seed, seize the stock of such seed;
 - Examine any record, register, document or any other material object found in any place mentioned in clause (c) and seize the same if he has reason to believe that it may furnish evidence of the commission of an offence punishable under this Act;

- Exercise such other powers as may be necessary for carrying out the purposes of this Act or any rule made thereunder.
- Where any sample of any seed of any notified kind or variety is taken under clause (a) of sub-section (1), its cost, calculated at the rate at which such seed is usually sold to the public, shall be paid on demand to the person from whom it is taken
- The power conferred by this section includes power to break-open any container in which any seed of any notified kind or variety may be contained or to break-open the door of any premises where any such seed may be kept for sale: Provided that the power to break-open the door shall be exercised only after the owner or any other person in occupation of the premises, if he is present therein, refuses to open the door on being called upon to do so.
- Where the Seed Inspector takes any action under clause (a) of sub-section (1), he shall, as far as possible, call not less than two persons to be present at the time when such action is taken and take their signatures on a memorandum to be prepared in the prescribed form and manner.
- The provisions of the Code of Criminal Procedure, 1898 (5 of 1898), shall, so far as may be, apply to any search or seizure under this section as they apply to any search or seizure made under the authority of a warrant issued under section 98 of the said Code

(15) Procedure to be followed by Seed Inspectors

1. Whenever a Seed Inspector intends to take sample of any seed of any notified kind or variety or analysis, he shall –
 - Give notice in writing, then and there, of such intention to the person from whom he intends to take sample;
 - Except in special cases provided by rules made under this Act, take three representative samples in the prescribed manner and mark and seal or fasten up each sample in such manner as its nature permits.
2. When samples of any seed of any notified kind or variety are taken under sub-section (1), the Seed Inspector shall –
 - deliver one sample to the person from whom it has been taken;
 - Rend in the prescribed manner another sample for analysis to the Seed Analyst for the area within which such sample has been taken; and
 - Retain the remaining sample in the prescribed manner for production in case any legal proceedings are taken or for analysis by the Central Seed Laboratory under sub-section (2) of section 16, as the case may be.
3. If the person from whom the samples have been taken refuses to accept one of the samples, the Seed Inspector shall send intimation to the Seed Analyst of such refusal and thereupon the Seed Analyst receiving the sample for analysis shall divide it into two parts and shall seal or fasten up one of those parts and shall cause it, either upon receipt of the sample or when he delivers his report, to be delivered to the Seed Inspector who shall retain it for production in case legal proceedings are taken.
4. Where a Seed Inspector takes any action under clause (c) of sub-section (1) of section 14, –
 - He shall use all despatch in ascertaining whether or not the seed contravenes any of the provisions of section 7 and if it is ascertained that the seed does not so contravene, forthwith revoke the order passed under the said clause or, as the case may be, take such action as may be necessary for the return of the stock of the seed seized;
 - If he seizes the stock of the seed, he shall, as soon as may be, inform a magistrate and take his orders as to the custody thereof;

- Without prejudice to the institution of any prosecution, if the alleged offence is such that the defect may be removed by the possessor of the seed, he shall, on being satisfied that the defect has been so removed, forthwith revoke the order passed under the said clause.
- 5. Where a Seed Inspector seizes any record, register, document or any other material object under clause (d) of sub-section (1) of section 14, he shall, as soon as may be, inform a magistrate and take his orders as to the custody thereof.

(16) Report of Seed Analyst

1. The Seed Analyst shall, as soon as may be after the receipt of the sample under sub-section (2) of section 15, analyse the sample at the State Seed Laboratory and deliver, in such form as may be prescribed, one copy of the report of the result of the analysis to the Seed Inspector and another copy thereof to the person from whom the sample has been taken.
2. After the institution of a prosecution under this Act, the accused vendor or the complainant may, on payment of the prescribed fee, make an application to the court for sending any of the samples mentioned in clause (a) or clause (c) of sub-section (2) of section 15 to the Central Seed Laboratory for its report and on receipt of the application, the court shall first ascertain that the mark and the seal or fastening as provided in clause (b) of sub-section (1) of section 15 are intact and may then despatch the sample under its own seal to the Central Seed Laboratory which shall thereupon send its report to the court in the prescribed form within one month from the date of receipt of the sample, specifying the result of the analysis.
3. The report sent by the Central Seed Laboratory under sub-section (2) shall supersede the report given by the Seed Analyst under sub-section (1)
4. Where the report sent by the Central Seed Laboratory under sub-section (2) is produced in any proceedings under section 19, it shall not be necessary in such proceedings to produce any sample or part thereof taken for analysis.

(17) Restriction on export and import of seeds of notified kinds or varieties

No person shall, for the purpose of showing or planting by any person (including himself), export or import or cause to be exported or imported any seed of any notified kind or variety, unless—

- It conforms to the minimum limits of germination and purity specified for that seed under clause (a) of section 6;
- Its container bears, in the prescribed manner, the mark or label with the correct particulars thereof specified for that seed under clause (b) of section 6.

(18) Recognition of seed certification agencies of foreign countries

The Central Government may, on the recommendation of the Committee and by notification in the Official Gazette, recognise any seed certification agency established in any foreign country, for the purposes of this Act.

(19) Penalty

If any person— (a) contravenes any provision of this Act or any rule made thereunder; or (b) prevents a Seed Inspector from taking sample under this Act; or (c) prevents a Seed Inspector from exercising any other power conferred on him by or under this Act, he shall, on conviction, be punishable— (i) for the first offence with fine which may extend to five hundred rupees, and (ii) in the event of such person having been previously convicted of an offence under this section, with imprisonment for a term which may extend to six months, or with fine which may extend to one thousand rupees, or with both.

(20) Forfeiture of property

When any person has been convicted under this Act for the contravention of any of the provisions of this Act or the rules made thereunder, the seed in respect of which the contravention has been committed may be forfeited to the Government

(21) Offences by companies

1. Where an offence under this Act has been committed by a company, every person who at the time the offence was committed was in charge of, and was responsible to, the company for the conduct of the business of the company, as well as the company, shall be deemed to be guilty of the offence and shall be liable to be proceeded against and punished accordingly: Provided that nothing contained in this sub-section shall render any such person liable to any punishment under this Act if he proves that the offence was committed without his knowledge and that he exercised all due diligence to prevent the commission of such offence
2. Notwithstanding anything contained in sub-section (1), where an offence under this Act has been committed by a company and it is proved that the offence has been committed with the consent or connivance of, or is attributable to any neglect on the part of, any director, manager, secretary or other officer of the company, such director, manager, secretary or other officer shall also be deemed to be guilty of that offence and shall be liable to be proceeded against and punished accordingly.

Explanation—For the purposes of this section,— (a) “company” means anybody corporate and includes a firm or other association of individuals; and (b) “director”, in relation to a firm, means a partner in the firm.

(22) Protection of action taken in good faith

Not suit, prosecution or other legal proceeding shall lie against the Government or any officer of the Government for anything which is in good faith done or intended to be done under this Act.

(23) Power to give directions

The Central Government may give such directions to any State Government as may appear to the Central Government to be necessary for carrying into execution in the State any of the provisions of this Act or of any rule made thereunder.

(24) Exemption

Nothing in this Act shall apply to any seed of any notified kind or variety grown by a person and sold or delivered by him on his own premises direct to another person for being used by that person for the purpose of sowing or planting.

(25) Power to make rules

1. The Central Government may, by notification in the Official Gazette, make rules to carry out the purposes of this Act.
2. In particular and without prejudice to the generality of the foregoing power.

Lacunae in Seed Act 1966

- The farmers' traditional seed system is left outside the Act.
- Seed marketing is linked neither to plant breeders' rights nor to any established ownership on variety.
- Not prescribe the declaration of pedigree, particularly in the case of TLVs, secrecy on pedigree is used to create a commercial monopoly on seeds.

- In the seed chain involving producers, processors and stockists/traders, license for the transaction is required only for the stockist/trader
- The enforcement of the law is weak and the prescribed penalty is soft.
- Excludes horticultural nurseries

Seeds Bill 2011 and Seeds Act 1966 -A Comparison (CUTS, 2015)

The Seeds Act of 1966 and the significant amendments proposed should be taken into account while analysing the Seeds Bill of 2004 and how it came to be in its current form. Several adjustments are suggested. A few significant ones are export and import restrictions, farmer compensation, transgenic varieties, registration, and penalties. These appear to be consistent with shifting domestic and global dynamics, where the private sector's position has significantly changed. The broad suggested amendments are summarised below and show how the Seeds Act of 1966 compares to the Bill's proposed revisions. The Bill is aware of the shifting dynamics of seeds both domestically and internationally. It suggests a thorough makeover, starting with a broader definition of agriculture, followed by farmer compensation and penalties for seed providers and producers of inferior quality.

| Particular | Seeds Bill 2011 | Seeds Act 1966 |
|-------------------------|--|--|
| Definitions | <p>Agriculture includes horticulture, forestry, and cultivation of medicinal and aromatic plants</p> <p>Definitions of Seed and Variety have been changed to make them more specific and technical</p> <p>Defines the terms Dealer, Essentially Derived Variety, Extant Variety, Farmer, Horticulture Nursery, Misbranded, Spurious Seed, and Transgenic Variety</p> | <p>Agriculture includes horticulture</p> <p>Does not define these terms</p> |
| Registration | All seeds for sale must be registered | Only the varieties notified by the Government need to be registered |
| Seed Committee | Constitutes Central and State Seed Committees. A Registration Sub-committee would register seeds of all varieties | Constitutes CSC. The Central Government, after consulting with the CSC, may notify a seed in order to regulate the quality of seed |
| Transgenic Varieties | Includes special provisions for registration of transgenic varieties of seeds | No provision for transgenic varieties of seeds |
| Compensation to Farmers | Provides for compensation to the farmers through specially constituted Compensation Committee | No specific provision for compensation mentioned in the Act |
| Export and Import | All seed imports are regulated by the Plant Quarantine (Regulation of Import into India) Order, 2003 or any corresponding order of the | A person is restricted from exporting or importing notified variety of seeds unless it conforms to minimum limits of |

| | | |
|-----------|--|---|
| | Destructive Insects and Pests Act, 1914; shall conform to the minimum limits of germination etc. Exports can be restricted if they adversely affect the food security of the country | germination etc |
| Penalties | Any person who contravenes any provisions of the Act or imports, sells or stocks seeds deemed to be misbranded or not registered, can be punishable by a fine of Rs. 5,000 to Rs. 30,000. The penalty for giving false information might lead to prison term up to six months and/or a fine up to Rs.100,000 | Any person, who contravenes any provisions of the Act, prevents a Seed Inspector from taking samples etc. shall be punished for the first offence with a fine, which may extend to Rs.500. If the offence is repeated he may be imprisoned for a maximum term of six-months and/or fined up to Rs.1,000 |

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Seeds Control Order, 1983

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The Essential Commodities Act (ECA) 1955 is an act of the parliament of India that was established to ensure the delivery of certain commodities or products, the supply of which, if obstructed due to hoarding or black marketing, would affect the normal life of the people. The ECA was enacted in 1955 and has since been used by the Government to regulate the production, supply, and distribution of a whole host of commodities that it declares 'essential' to make them available to consumers at fair prices. In this act seed was not included as essential commodity. In exercise of the powers conferred sub-clause (xi) of clause (a) section 2 of the essential commodities Act, 1955 (10 of 1955), the central Government declared the seeds of food crops and seeds of fruit and vegetables, seeds of cattle fodder and jute seeds used for sowing or planting (including seedlings and tuber, bulbs, rhizomes, roots, cuttings and all types of graft and other vegetatively propagated material of food crops or cattle fodder) as essential commodities through enactment of seed control order, 1983 on 30th December, 1983

It empowered the State Governments/Union Territories to either compulsorily license all the seed dealers within their jurisdiction or exempt such class of seed dealers, deemed fit to it through official gazette Notification. No person can sell, export or import seeds unless he possesses the license to do so or exempted from doing so through official gazette notification.

The licensed dealers are required to display opening and closing of different seeds held by them and the price list, on daily basis. They are also required to issue cash/credit sale memo, maintain records and faithfully abide the directives of Controller of Seeds to Govt. of India, if any, regarding distribution of seeds.

Statutory bodies

1. Controller of seeds. The Central Government is required to appoint a person as Controller of Seeds to exercise all or any functions of the Controller under Seeds (Control) Order, 1983.

2. Licensing authority. The State Governments/Union Territories are required to appoint 'Licensing Authority' (Registering Authority) for licencing seed dealer. They may appoint such number of persons as deemed necessary to be 'Licencing Authority' and specify their respective areas of jurisdiction.

3. Inspectors (enforcement authority). The State Govt./Union Territories are required to appoint number of persons as deemed necessary to be inspectors (Seeds dealers (control) inspectors) and specify their respective areas of jurisdiction for enforcement of seeds (control) order, 1983.

Powers of Inspectors (Seed dealers (control) inspectors)

For securing the compliance of seeds (control) inspector may exercise following powers.

- a. He may require any seed dealer to give the information regarding purchase, storage and sale of seeds
- b. He may upon information search any premises where any seed is stored or exhibited for sale.
- c. He may draw samples of seeds meant for sale, export or seeds imported and send these samples to Laboratories notified under the provisions of State Seed Testing Seeds Act, 1966 to verify whether the samples conform to standard or quality claimed. The State Seed Testing Laboratories shall furnish the required information to the concerned Inspector within 60 days from the date of receipt of the sample in the laboratory.
- d. He may seize or detain any seed in respect of which he has reason to believe that a contravention of this order has been committed or is being committed. The provision, of section 100 of the code of criminal procedure, 1973 (2 of 1974) relating to search and seizure shall, so far as may be, apply to such searches and seizures. Whenever, inspector seizes any stock he is required to forthwith report the fact of such seizure to a Magistrate whereupon the provisions of sections 457 and 458 of the Code of Criminal Procedure, 1973 (2 of 1974) shall, so far as may be apply to the custody and disposal of such seed.

4. Appellate authority. The State Governments, Union territories are required to specify the 'Appellate Authority' to deal with the matters related to the enforcement of Seeds (Control) Order, 1983.

Grant of license

- i. The requirement for the grant of license: The applicant must not have been convicted under the Essential Commodities Act, 1955 or any order issued there under within the last three years date of application. Also his previous license, if any, must not be under suspension/or cancelled within the last one year preceding the date of application.
- ii. Terms and conditions for the grant of license. The grant of license is subject to following terms and conditions.
 - That the license shall be displayed in the shop at a place where it can be readily seen by the customers and all other concerned.
 - That the holder of the license shall comply with the provisions of the Seeds (Control) Order, 1983 and the notification issued there under and for the time being in force.
 - The license is valid for a period of three years unless suspended/or cancelled before the expiry of the validity period. It is, however, renewable on application.
 - That the holder of the license shall report any change of premises to the Licensing Authority.
 - That the holder of the license shall extend every facility to the Licensing Authority or any of its officers for the inspection of seed stocks in his shop/depot or godown or any other place/places used by him for the purposes of storage, sale or export of seeds.

iii. Procedure for obtaining license. Those, interested in obtaining license as Seed Dealer may do so by submitting his/their application in the prescribed form to the Licensing Authority together with a fee of rupees fifty only.

The Licensing Authority after examining the application and upon being satisfied that the applicant fulfils the requirements for grant of License grants the license. The Licensing Authority if satisfied that the applicant does not fulfill the requirements for the grant of license may refuse to issue the license by recording his reasons to do so.

iv. Periods of validity of license. Every license unless suspended or cancelled prior to the expiry of validity period shall be valid for three years from the date of its issue. The licensing authority shall amend, renew the license on receipt of the application for renewal along with the prescribed application fee.

v. Suspension/cancellation of seed dealers license. The Licensing Authority, after giving the holder of seed dealers license an opportunity of being heard may suspend/and/or cancel the license on the following two grounds:

1. that the license was obtained by misrepresentation as to a material particular or
2. that any of the provisions of Seeds (Control) order, 1983 has been contravened.

vi. Appeal against the Licensing Authority. The persons aggrieved by an order of Licensing Authority refusing to grant, amend or renew the license for sale, export or import of seeds; and suspending or cancelling any license may appeal to the appellate authority specified by the state government within 60 days from the date of such order. The application of appeal should be accompanied with an appeal fee of rupees fifty only. The decision of the appellate authority shall be final.

References

1. The seeds (control) order 1983, Government of India, Ministry of Agriculture, Department of Agriculture & Cooperation, New Delhi.

Post Harvest Handling of Seeds

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Seed is one of the most important inputs for sustainable agriculture. Quality of seed affects both yield and credibility in the market. Unlike in grain, extreme care and vigilance is required in seed to avoid mechanical mixing of crop varieties during post harvest stages such as threshing, winnowing, drying, Pre-cleaning, grading, packaging, storage and marketing. Many a time carelessness as well as ignorance at any stage cause colossal loss in seed quality and market value. Hence in-depth knowledge of post harvest care and improvement in physical purity of seed is most important.

The objective of seed processing is to achieve clean, pure seeds of high physiological quality (germinability) which can be stored and easily handled during succeeding processes, such as pretreatment, transport and sowing. Processing includes a number of handling procedures, where applicability differs e.g. according to seed type, condition of the seeds after harvest and potential storage period. Seed cleaning typically consists of a series of processes during which impurities are gradually removed and the seed lot concurrently achieves a progressively higher purity (Fig-1). The type, order, and adjustment of the processes depend on seed type and type of impurities. During seed processing, contaminants are removed to a level that meets the industry wide minimum seed certification standards, failing which, they may be discarded or blended with a relatively better lot of the same variety. Contaminants are removed by procedures utilizing machines which exploit the differences in physical characteristics of the desirable seed and other components in the mixture. These physical properties include but are not limited to length, width, thickness, shape, density, terminal velocity, drag coefficient, reflectivity, surface texture, electrical conductivity and resilience. Seed separators are designed to utilize the difference in a single physical property or a combination of physical properties of the seed.

Concept of Separation Processes:

Separation and purification of materials forms an important process in post harvest handling of agricultural products. Naturally occurring processes are inherently mixing processes and have led to the reverse procedure of separation processes which are becoming the most challenging categories of engineering problems. Mechanical separations are applicable to heterogeneous mixtures. Broadly, a separation processes a mixture of substances in two or more products which differ from one another in composition. The separation is caused by the addition of a separating agent which may be in the form of energy. Need for separation accounts for the most of the production cost of a pure substance. Often separation itself can be the key function of the entire process e.g. grain cleaning. To a large extent man's ability to ease food shortage depends upon his technical knowledge and capacity to extract and separate essential food materials from the new or inexpensive sources. From the above considerations, it is apparent that much careful thought and effort must go into understanding and improvement of various separation processes.

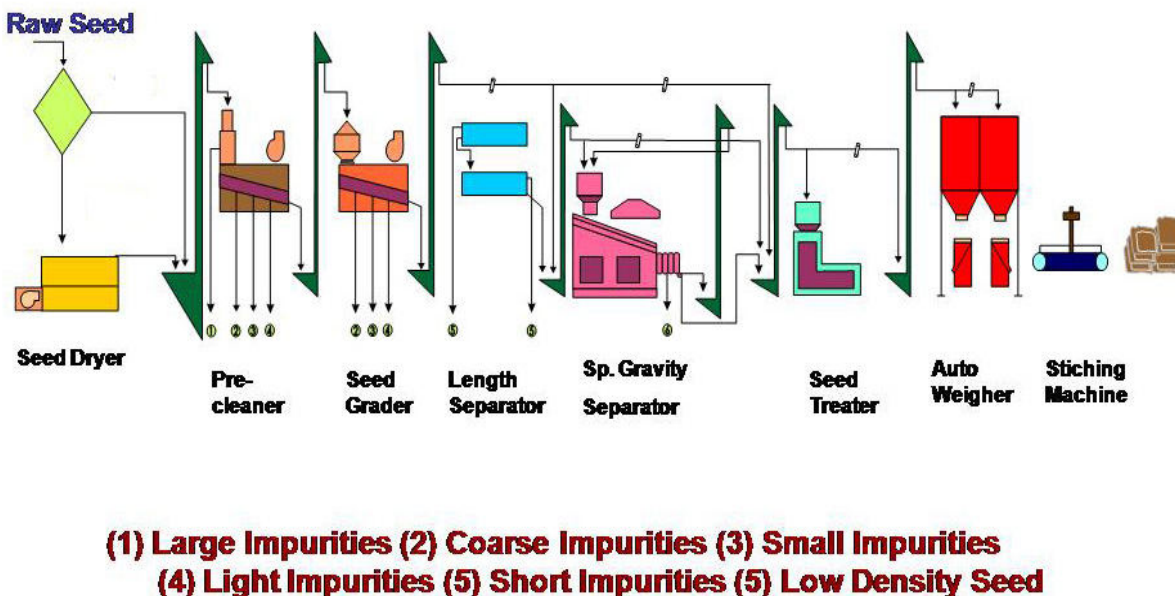


Fig-1: Flow diagram of modern seed processing

Methods of Seed Separation:

Improvement in seed separation technology from simple hand picking and domestic hand screen to present day methods runs parallel to the story of civilization. A modern seed processing involves moving the field produce through a series of machines which perform specific operations and pass on the product to the next machine after discharging the reject. A well designed seed processing plant is laid out to permit by passing any machine without interrupting the product flow. Many types of seed cleaning machines are used to remove contaminants from the harvested-threshed seed.

Air-Screen Cleaner:

The air-screen cleaner is the most widely used machine. It is an essential unit operation in seed processing plant. The simplest mechanical method of separating particulate solids, the class to which most agricultural seeds and food grains belong, is by passing them over screens which are stationary or reciprocating and are set at a slight downward slope, so that small particles will pass through and larger materials will fall over them. In combination with air-fans or blowers, the screen machine provides adequate conditioning for some seed crops. Such machines work by taking advantage of dimensional and aerodynamic differences. Agricultural screens are constructed of perforated metal or woven wire mesh. Hole shapes in perforated screens are usually round, triangular, oblong or rectangular. Openings in wire screens are square or rectangular, their size being represented by mesh numbers. Round hole screens are identified by a number denoting diameter of the perforation. In India, these numbers indicate the diameter in millimeters. Rectangular or oblong holes in perforated screens are identified by two numbers describing the width and length of the slot. Selection of the screen depends on the seeds being handled. Screen opening sizes used for different crops have been prepared and are available in literature. Screens with various sizes and shapes of holes drop some particles and retain others depending mainly on the width and thickness of particles and, to a lesser extent on their length. Pneumatic separators or air columns exploiting aerodynamic differences are used to remove dust, chaff or other light contaminants. The air system in air-screen machine operates in this manner. As a finishing machine it can remove light, immature, shriveled or damaged

seeds from already cleaned good seed lots. Air screen combinations are extensively used in grain combining and threshing.

The air screen machine in general employs three cleaning elements: aspiration, scalping and grading. The light seeds and chaffy materials are removed from the seed through aspiration. In scalping operation, the good seeds are dropped through top screen opening and the larger materials (trash, clods etc.) are carried over the screen into the rejection spout. In grading operation, the good seed ride over screen openings, while smaller particles (under size, cut shriveled, broken seeds) drop through.

Feed hoppers of air screen cleaner cum grader are of three types: Roll feed hopper consists of a container to receive the seed, hopper flights and auger to spread the seed across the width of the hopper and a revolving fluted roll in the bottom of the hopper that feeds and even steady flow of seed to the top screen and distributes the seed across the full screen width. In roll feed brush hopper a rotating shaft pulls trash of seeds down to the revolving fluted roll and a tough fibre brush to prevent clogging. In the metering hopper a shaft with specially bent rod is used to spread the seed. Other special purpose variants are designed to handle special seeds.

Principles of operation:

In a typical two screen seed cleaner cum grader, as the seed is delivered by the feed hopper the air blast removes light weight seed and chaff, scalping screen remove material larger than the crop seed; grading screen dropout material smaller than the crop seed. In a four screen machine, the 4 screen do the following operations: (a) 1st screen- scalping, (b) 2nd screen- grading, (c) 3rd screen- close scalping, (d) 4th fine grading. At the seed drop off the gravity screens they fall through the lower air separation to remove residual light seed and trash.

Length Separator:

Length separators are designed to lift and remove the short fraction from a varied length mixture by exploiting the difference in the largest dimension of the product and the reject. These are two types of length separators, the indented disc separators and indented cylinder separators. Both lift out short particles out of a seed mixture with a given pocket or indentation and a relatively cleaned product is pushed further. The indented disc separator consists of a series of indented discs, mounted together on a rotating horizontal shaft. Each disc is designed with an open centre and numerous undercut recesses on each face. The broken seeds and the material shorter than the crop seed are lifted by the indents and are delivered into a trough at the side of the machine. Discs of increasing pocket sizes are normally provided on the shaft so that the particles of increasing lengths are removed selectively. The long seed that does not match the pockets is pushed by the incoming seed through the open centre of the disc and is discharged at the outlet.

The indented cylinder separator consists of a rotating cylinder and an adjustable trough. The inner surface of the cylinder has closely spaced indents. The seed mass to be handled is fed at one end and lies at the bottom of the cylinder. As the cylinder rotates on its axis the short seeds are lifted from the mixture by indents. Thus at some point before reaching the top of the rotation, the seeds fall out from the indents, because of the tilting of the later. Actually, the seeds resting in the indents lose balance and are eventually received in the adjustable trough from where they are conveyed out by an auger. The long seed which is not lifted by the indents gradually move through the cylinder end and are discharged to a separate spout at the other end of the cylinder. The quality of separation depends on the position of the trough and the speed of the cylinder.

Specific Gravity Separator:

A specific gravity separator consists of two key components - air chest and the deck. Air chest houses fans and motor. The deck is mounted above the chest. The deck is a rectangular or triangular table covered with a porous cloth or wire mesh and inclined in two directions. The gravity separator classifies components of a mixture mainly according to density. Separation is caused in two steps. Seed mixture introduced at the back of the porous deck is stratified by the low pressure air coming through the deck. Low density particles tend to float and form a layer at the top and the high density particles sink to the bottom layer. Fractions of intermediate density, assume intermediate position. For proper identification of different density fractions, the seed lot must be well screened before hand so that all particles are of the same size. The seed should be dust free. An aspiration canopy is installed above the feed corner to further suck up any residual dust. The oscillating motion of the deck moves the high density particles laterally towards the uphill side at the deck. Simultaneously the floating low density material moves downhill by gravity. As the seed mixture layers travel from the feeding corner to the discharge end of the deck, a continuous gradation of particles takes place ranging from the low density ones at the lower side of the deck to the high density ones at the upper side. Adjustable splitters divide the output into number of density fractions needed. For deck covering a closely woven material for small seeds and a coarse weave for large seeds is used. Typical covering materials are small hole perforated metal and wire mesh. The coverings are supported by a deck frame, which serves as the top of the air chamber and helps to equalize the flow of air through the seed mass. Feed rate, air flow rate, deck angles and frequency of stroke are major adjustments. These adjustments are interrelated.

Seed Refining:

To further refine the seed, machines have been developed to take advantage from additional differences in physical properties. The electrostatic separator exploits the difference in the electrical characteristics of the seeds and contaminants. The quality of separation depends on the relative availability of the components in the seed mixture to conduct electricity or to hold electrical charge on surface. A spiral separator senses the ability of components to roll. This is very simple machine and operates completely by gravity. It has no moving parts and needs no prime mover. The endless draper belt separator utilizes surface texture differences to separate rough seeds from the smooth ones. A magnetic separator requires certain pre treatment of the feed mixture. Iron power or a magnetic fluid is added. Variation in seed coat characteristics is utilized. The iron is selectively adsorbed by rough, broken, cracked porous or sticky components making them more reactive than the smooth components. A colour separator acts on differences in reflective properties. The components of the mixture must be cingulated for individual sensing by the photoelectric cells. To scale up the throughput multi-channel machines are required.

New Emerging Technologies:

Modernization of agriculture causes demand for higher quality seeds and invites application of new technologies to seed conditioning. This needs removal of all contaminants even when the physical property difference is very slight. This emphasis has led to the investigation of measurement system for physical properties and development of systems for improved seed conditioning. With the advent of microprocessors and the rapidly expanding application of technology, seed conditioning is beginning to benefit as the use of computers is integrated into the new equipments. Machine vision system (MVS) is being used for seed conditioning. The feasibility of the application was shown for identifying seeds of different

colour, size and shape. The MVS can also be used to detect stress cracks in certain seeds. There appears a need to develop expert systems for modern seed processing and once a system is made available, the performance and the status of an average worker can be raised to the level of an expert.

Management of Seed Storage

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Seed storage management implies the maintenance of the harvested seed mass in good physical and physiological condition from the time of harvesting upto the time of their replanting. Seed ageing and loss of germination during storage can not be checked altogether. However, it could be reduced appreciably by proper pre storage treatment to the product and providing good storage conditions. Seeds should be stored dry and kept dry. Seeds should be handled more like eggs than like stones. The period of time that seed can be stored without decline in viability is a function of their storage environmental variables and initial seed quality. The simplest and the oldest method of storage is to store dry seed in bags near air temperatures. This is termed as ambient storage or normal temperature storage. Many species can be stored in this way for a year or longer. Conditioned storage is necessary for longer periods and for extra sensitive seeds. Seed longevity in storage rooms depends upon a number of factors. The factors other than kind and variety of seeds are:

Factors Affecting Seed Longevity in Storage

Initial Seed Quality: Seed lots figuring high in initial seed quality store longer than deteriorated lots. The important implication of this is that only high quality seed should be carried over. The medium quality seed may be retained for the next planting season. The low quality seeds should be normally not considered for storage. Low quality seeds decline rapidly in storage. Initial seed quality reflects pre harvest history of the seed lot and the amount of care during the harvesting, transport, threshing, conveying and processing. Well maintained and adjusted post harvest handling equipment are essential for retaining the highest seed quality.

Moisture content: Life of seed and its span largely revolves around its moisture content and it is essential to dry seeds to safe moisture content. Over the moisture range of about 8 to 12%, the rate of seed deterioration increases as the moisture content increases. At higher moisture contents, the losses could be rapid due to mold growth and/or due to heating. Most seeds are good thermal insulators and, therefore they do not permit heat energy to transmit through them easily. Thermal resistance of wheat seed is considered 6 to 10 times higher than concrete. Minor source of heat in the form of moist seed may cause serious rise in its temperature and develop hot spots. Also, within the normal range, the biological activity of seeds, insect and mold further increase as the temperature increases. However, it is important to note that very low moisture content (< 4%) may also damage seeds due to extreme desiccation or cause hard seededness in some species.

Relative humidity and temperature during storage: Relative humidity and the temperature in the air of the seed storage room are the major environmental factors influencing the storage life of the seeds. Low relative humidity makes the air thirsty of water and it picks up the unwanted moisture from the seed. Hence the seeds are kept dry in low humidity condition. Seeds achieve a rather specific and characteristics moisture content, termed as equilibrium moisture content, when subjected to a given combination of atmospheric relative humidity and the air temperature. This

results due to the hygroscopic nature of the seeds. Fortunately, the establishment of moisture equilibrium in seeds is a time dependent process and it does not occur instantaneously. Therefore, the diurnal fluctuations in the relative humidity have little effect on moisture content.

Temperature also plays an important role in life of seed. Within the normal range, insect and molds increase as the temperature increases. Decreasing temperatures, relative humidity and moisture, therefore, is an effective means of maintaining seed quality in storage. Low temperature, low humidity storage of dry, cleaned and healthy seeds is the key to effective seed storage management.

Temperature Control:

Temperature is one of the most important environmental factors which influence seed storability. The lower the temperature, the longer the seed maintain good quality. Temperature control may be achieved by ventilation, insulation and refrigeration. These methods are not mutually exclusive and are used in combination.

Ventilation: Ventilation can be used to lower seed temperature and seed moisture control when used judiciously. Ventilation is suitable for minor downward adjustment of temperature (and to a lesser extent the moisture). It can also help to prevent hot spots from developing; the formation of convection air current; and maintenance of uniform seed moisture content and temperature. Right time of ventilation is when the outside temperature and relative humidity are low. At that time the exhaust fan can be put on.

Insulation: The walls, ceiling and floor of a seed storage room must have satisfactory heat insulation and a moisture vapour seal. Floor insulation is frequently installed in a bed of hot asphalt, which provides a good vapour seal. The types of material used may be fibreglass, spray-on-foam, Styrofoam, saw dust, glass wool cork etc. The insulation materials must be kept dry for maximum efficiency. The moisture protection must be provided outside the insulation, if the material does not have a characteristic for dryness naturally built into it. Board type insulation is applied in 2 or more layers. The joints are lapped and/or staggered to minimize heat and moisture penetration at joints. Ceiling insulation can be of many kinds. Ceiling and wall finishes usually consist of one half inch or more cement plaster applied as two coats. Wood, metal, or concrete bumpers are installed on walls where trucks and tractors might accidentally hit them. Low temperature seed storage rooms must have no windows and their doors must be well insulated and well sealed. For large openings, the roller-mounted door (siding door) may be preferred over swinging doors. A relatively novel idea is to use a high velocity stream of cool air across the inner face of the door. Double door air locks and small anterooms also help reduce heat and moisture entering low temperature low humidity seed storage rooms. Adequate measures for checking the leakage of heat and moisture can be provided at the time of planning and building such seed stores. This job is better left to construction consultants and seed technologists should provide the functional requirements.

It is usually desirable to construct several low temperature rooms rather than a single large warehouse. In this ways annual operating costs can be lowered significantly. During the period when only small lots of seeds are stored, one or two rooms rather than the entire warehouse can be kept refrigerated. Most refrigerated seed storage facilities use forced air circulated through a cooling

coil and then through the room. For large areas, a duct system distributes the cold air uniformly throughout the room.

Classification of moisture and heat removal systems configuration

| System type | Components | Operation |
|-------------|--|---|
| I | Refrigeration compressor, motor and fans, evaporator and condenser coils | System is placed inside the conditioned space. Inside air is re-circulated through the unit until the set relative humidity is reached and the humidistat shut the unit off. It turns the unit on when the RH begins to rise due to product or system variables. Suitable where the sensible heat does not raise the temperatures above safe limits. |
| II | Desiccant, heater coils, conditioned air blower, and reactivation blower | Desiccant dehumidifier is located outside the conditioned space. Air in the conditioned space through a closed system, is re-circulated through, the unit until the set relative humidity is reached. A humidistat located inside the seed stores controls the running of the plant. |
| III | Conventional type split air conditioner | Evaporator section of the refrigeration unit is placed inside the conditioned space. Air is recirculated over the cold evaporator coil. Outside air is drawn over the condenser coils releasing the transferred heat to the atmosphere. A thermostat controls the unit. Electrical heater strips are sometimes used to add heat to the system for RH control. |
| IV | Desiccant dehumidifier with water after cooler | The water cooler reduces the air temperature as it leaves the desiccant dehumidifier. Effective for maintaining low humidities. |
| V | Refrigeration unit and the desiccant dehumidifier | Air in the conditioned space is cooled by pre-cooling coil before dehumidification. In the dehumidifier, latent heat of condensation is converted into sensible heat. Therefore, the after-cooling coil is provided. Pre-cooling and after-cooling is provided by refrigeration system. |
| VI | Refrigeration type dehumidifier and cooler | A self-contained refrigeration-type dehumidifier located inside the conditioned space removes the moisture from the air. The sensible heat load is handled by a refrigeration unit that transfers the heat to the outside atmosphere. |
| VII | Split air-refrigeration and desiccant dehumidifier | A dual system. The refrigeration system independently dehumidifies (within limits) and cools the air. The desiccant dehumidifier has much larger moisture extraction capacity. Offers a factor of safety in extreme conditions. |

Refrigeration: Refrigeration is the household term. It is a process by which the heat is made to flow from lower to higher temperature, i.e., against the natural heat transfer process. It is the only method to achieve and maintain low temperature on long term basis. The medium employed to absorb heat is the refrigeration agent or simply refrigerant. Mechanical refrigeration systems are based on the ability of liquid heat as they vaporize. The vaporizing temperature of the liquid can be regulated by controlling the pressure at which the liquid vaporizes. In closed systems, the vapour is condensed back into liquid and thus used over and over again to provide a continuous flow of liquid for vaporization. Of all the fluids currently used as refrigerant, the one nearest to ideal general purpose refrigerant is refrigerant-12 or R-12. It has a saturation temperature of -29.8°C . It can be stored as a liquid at ordinary temperature only under pressure in heavy steel cylinders. A typical mechanical refrigeration system contains the following parts: (1) An evaporator to provide heat transfer surface through which heat moves from the space being refrigerated into the vaporising refrigerant; (2) a suction line to convey the refrigerant vapour from the evaporator to the compressor; (3) a compressor to heat and compress the vapour; (4) a hot gas or discharge line to carry the high-temperature, high-pressure vapour from the compressor to a condenser; (5) a condenser to provide heat transfer surface through which heat passes from the hot gas to the condensing medium; (6) a receiving tank to hold the liquid refrigerant for future use; (7) a liquid line to carry the liquid refrigerant from the receiving tank to the refrigerant metering device; and (8) a refrigerant metering device to control the flow of liquid to the evaporator. The typical vapor-compression system is divided into a low and a high-pressure side. The refrigerant metering device, evaporator, and suction line constitute the low pressure side of the system; the compressor,

discharge line, condenser, receiving tank, and liquid line constitute the high pressure side of the system. A mechanical refrigeration system that will cool at a rate equivalent to melting one tonne of ice in 24 hours is said to have a capacity of one tonne refrigeration. The capacity of the compressor must be such that the vapor is drawn from the evaporator at the same rate at which it is produced.

Controlling Humidity:

Relative humidity is measured by taking dry bulb and wet bulb temperature reading and finding the relative humidity from psychometric charts. Lower the wet bulb depression (dry bulb temperature – wet bulb temperature) lower is the relative humidity and vice-versa. At 100% relative humidity the wet bulb temperature and dry bulb temperature equalize. Humidity control systems are of two types. These are the refrigeration type and the desiccant type. The refrigeration type dehumidifier draws warm, moist air over a metal coil with fins spaced far enough apart to permit partial frosting and still allow for sufficient air passage. To be effect at low temperatures, a refrigeration type dehumidification system must cool the air below the desired temperature and reheat to the desired temperature. Air handling units are available with built-in refrigeration coils, electric defrosters, and reheat coils. Dehumidifiers using liquid or solid desiccants in conjunction with refrigeration can frequently reduce the cost of maintaining very low relative humilities. The dehumidifier incorporates one or two beds of granulated silica gel or activated alumina, which can absorb much water vapour. Now a days the rotary bed dehumidifiers are in practice. The rotary bed dehumidifiers have one or more beds divided into two air streams. The bed rotates slowly, and while part of each bed is absorbing water vapour from the air stream, the remainder is being recharged.

INTRODUCTION TO ISTA RULES AND ACCREDITATION

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Though the importance of good seed was realized with the inception of agriculture; however, the concept of seed quality on scientific lines, gained importance during 1989, when Professor Friedrich Nobbe in Germany advocated that the seeds must be tested before sowing. **Nobbe's hypothesis was based on scientific investigations made by him on the vegetable and flower seed samples offered for marketing in European Countries.** This gave birth to the establishment of seed testing laboratories in European countries, USA and Canada during late eighties and early nineties. The establishment and development of seed testing laboratories in the developed world generated tremendous impact in the seed trade and the development of seed testing procedures. The International Seed Testing Association (ISTA) was established in 1924 during the 4th International Seed Testing Congress held in Cambridge, United Kingdom.

ISTA is independent and acts free from economic interest and political influence, it is unbiased, objective and fair. Furthermore, the hitherto unsurpassed expertise of ISTA is based on the non-profit cooperation of the international community of approximately 400 experienced, competent and energetic seed scientists and analysts. ISTA works in developing standard seed testing methods, facilitates the trade of quality seeds and makes a valuable contribution to food security. ISTA membership consists of member laboratories and sampling entities, personal members, associate members and industry members from more than 83 countries/distinct economies around the world, representing a truly a global network. The membership is a collaboration of seed scientists and seed analysts from universities, research centres and governmental, private and company seed testing laboratories around the world. ISTA values and promotes the diversity of membership, this being the basis for its independence from economic and political influence. The membership of ISTA counts **261 Member Laboratories, 334 Personal Members and 77 Associate Members** in 83 countries/distinct economies; 148 ISTA Member Laboratories are accredited by ISTA and entitled to issue **ISTA International Seed Analysis Certificates**. ISTA has stood for uniformity in seed testing for more than 80 years. ISTA is managed and directed by an Executive Committee, comprising of a President, Vice-President and 9 Members-at-large. All Executive Committee members are Designated Members of ISTA. The finances and administration of the association is managed by the ISTA Secretariat, based in Switzerland, and lead by the Secretary General with 8 staff members. There are 17 subject-focused Technical Committees, which are responsible for the development of new methodologies for seed testing; and constituted from amongst approximately 400 members and many of which are active in more than one committee. These Technical Committees are responsible for the development of new methodologies for seed testing and each committee is headed by a chair and vice chair. ISTA Technical Committees include Advanced Technologies, Bulking and Sampling, Editorial Board of Seed Science and Technology, Flower Seed Testing, Forest Tree and Shrub Seed, Germination, GMO, Moisture, Nomenclature, Proficiency Test, Purity, Rules, Seed Health, Seed

Science Advisory Group, Statistics, Seed Storage, Tetrazolium, Variety, Vigour. The methods of the ISTA Rules are being validated, internationally harmonized and voted on by the ISTA membership.

The objectives of the Association are:

- (a) The primary purpose of the Association is to develop, adopt and publish standard procedures for sampling and testing seeds, and to promote uniform application of these procedures for evaluation of seeds moving in international trade.
- (b) The secondary purposes of the Association are actively to promote research in all areas of seed science and technology, including sampling, testing, storing, processing, and distributing seeds, to encourage variety (cultivar) certification, to participate in conferences and training courses aimed at furthering these objectives, and to establish and maintain liaison with other organisations having common or related interests in seed.

The ISTA membership consists of Member Laboratories, Personal Members, Associate and Industry Members.

Member Laboratory: A **Member Laboratory** is a laboratory engaged in the testing of seed which supports the Association and its objectives and is admitted by the Association. The Member Laboratory can participate in the ISTA Proficiency Test Programme, and once accredited by ISTA, be authorised to issue ISTA International Seed Analysis Certificates. Once admitted as a member, the Member Laboratory is entitled to free online multi-user access to the 'International Rules for Seed Testing', and a free online multi-user subscription to 'Seed Science and Technology'. The Member Laboratory also receives, through its Personal Member, ISTA Handbooks and proceedings published after admission, and the ISTA newsletter 'Seed Testing International'. Additional copies of ISTA publications which pre-date the membership can also be purchased at the Member's reduced price. A Member Laboratory membership also includes that for one Personal Member, whose postal address has to be the same as that of the laboratory. A Member Laboratory usually nominates the Personal Member to be its representative in the affairs of the Association. The Personal Member may be designated by their Designated Authority as a Designated Member, and be authorised to execute the country/distinct economy's voting right on behalf of its Government at ISTA Ordinary Meetings. All staff members of the Member Laboratory receive priority for any ISTA event and can benefit from the reduced membership registration fees for ISTA Congresses, Ordinary Meetings, Symposia and Workshops.

- (c) **Personal Member:** A **Personal Member** is a person engaged in the science and practice of seed testing or in the technical control of such activities and who supports the Association and its objectives and is admitted by the Association. A Personal Member is entitled to free online single-user access to the 'International Rules for Seed Testing', and a free online single-user subscription to 'Seed Science and Technology'. A Personal Member also receives ISTA Handbooks and proceedings that are published after admission as Member, and the ISTA newsletter 'Seed Testing International'. Additional copies of ISTA publications which predate the membership can also be purchased at the Member's reduced price. A Personal Member receives priority at any ISTA event and can benefit from the reduced membership registration fees for ISTA Congresses, Ordinary Meetings, Symposia and Workshops. A Personal Member may be designated by their Designated Authority as a

Designated Member, and be authorised to execute the country/distinct economy's voting right on behalf of its Government at ISTA Ordinary Meetings.

Associate Member: An **Associate Member** is a person who is not a Personal Member, but who supports the Association and its objectives, and is admitted by the Association. An Associate Member receives 'Seed Testing International' and has priority for membership of an ISTA Technical Committee over individuals who are not ISTA Members. An Associate Member can purchase the ISTA Handbooks, proceedings, and single-user online access to the 'International Rules for Seed Testing' at the reduced membership price, and can benefit from the reduced membership registration fees for ISTA Congresses, Ordinary Meetings, Symposia and Workshops. An Associate Member cannot become a Designated Member and therefore cannot vote at ISTA Meetings or hold office in the Association.

Industry Member: An **Industry Member** is an organization which supports the Association and its objectives, and through paying an annual fee, provides sponsorship to the Association. An Industry Member is any entity which supports the Association and its objectives, pays an appropriate annual fee to the Association, and is admitted by the Association. The Industry Membership fee depends on the number of employees.

The benefits accrued from obtaining ISTA membership are:

- Provides the basis for ensuring the trade of quality seed by developing standard seed testing methods
- Provides a platform for research and cooperation between seed scientists worldwide
- Promotes research and provides the opportunity for publishing and distributing of the technological data
- Guarantees worldwide harmonised, uniform seed testing through the Accreditation, Proficiency Test and Auditing Programmes
- Provides services and professional development programmes for furthering the education and experience of seed analysts around the world
- Provides an unbiased voice in the seed industry

As an authority in seed science and technology, ISTA continues its role as the developer of seed testing methods. Its major achievements and services provided to date are briefly the following:

- ISTA International Rules for Seed Testing, guaranteeing worldwide annually updated, harmonized and uniform seed testing methods.
- ISTA Accreditation Programme, including Accreditation Standard, Proficiency Testing Programme and Auditing Programme guaranteeing worldwide harmonized and uniform seed testing.
- Issuance of the ISTA International Seed Lot Certificates by officially independent ISTA accredited and authorised laboratories.
- Promotion of research, training, publishing and information in all areas of seed science and technology and cooperation with related organisations such as ISF, OECD, UPOV and many others.

ISTA Rules:

ISTA was established with the primary aim of to develop, adopt and publish standard procedures for sampling and testing seeds, and to promote uniform application of these procedures for evaluation of seeds moving in international trade. ISTA is engaged in the development of standardized seed testing procedures, and produces internationally agreed rules for seed sampling and testing, whereby members work together to achieve their vision of 'Uniformity in seed quality evaluation worldwide'. The International Rules are ISTA primary tool to promote uniformity in the seed testing internationally which facilitates seed trading nationally and internationally, and also contributes to food security. The first set of International Rules of Seed Testing were framed and published by ISTA during 1931. The ISTA rules are henceforth being updated annually; which contain seed testing protocols of large number of plant species and forms the basic reference book for all kinds of seed testing activities and also for the international seed trade.

Therefore, the need for seed testing methods that are reliable and reproducible among its accredited member laboratories is a basic need for ISTA. This is achieved through the publication of the *International Rules for Seed Testing* (hereafter 'ISTA Rules'). The primary aim of the ISTA Rules is to provide testing methods for seeds designated for growing of crops or production of plants. In addition, most of the testing methods can also be applied for evaluation of the quality of seeds used as food or for technical purposes. ISTA's seed sampling and testing methods have been developed by its members since its formation in 1924. The methods have gone through appropriate validation studies to ensure that test procedures give reliable and reproducible results. Following agreement between ISTA's member countries, the validated methods have been included in the ISTA Rules. Seed quality testing therefore requires test methods and equipment that have been tested to ensure they are fit for the purpose i.e. validated. The ISTA method validation provides the mechanism for the inclusion of test methods in the ISTA Rules.

The ISTA Rules contain 19 chapters, 17 of which provide internationally accepted test methods for various attributes of seed quality. The details of ISTA certificates are presented in the Chapter 1. Chapter 2 (Sampling) provides the required methods for sampling of seed lots, because for ISTA, a direct connection between the seed lot from which these samples was drawn and the results of quality tests conducted on that seed lot must always be evident. The 'end product' for an ISTA accredited laboratory following quality tests on a seed lot is an ISTA Certificate. The information on how to use ISTA Certificates is presented in Chapter 1. Each of the 17 chapters on test methods includes sections on the Object (of the test), Definitions (of terms used in the chapter), General Principles (for the test), Apparatus (required for the test), Procedure (how to conduct the test), Calculation and Expression of Results (specific to each test), Reporting Results (how to report results correctly on an ISTA Certificate), and Tolerances (statistical tables for use in determining whether test results are acceptable or not). Further, guidance has been provided in the Apparatus section to refer to a particular manufacturer's piece of equipment.

The ISTA Rules are designed for the principal crop species in the world. The species are broadly classified as agricultural and vegetable, tree and shrub, and flower, spice, herb and medicinal. ISTA encourages proposals for the addition of new species to the ISTA Rules. ISTA certificates can only be issued by ISTA accredited laboratories. For seed quality tests to be reported on an ISTA certificate is mandatory that all the requirements of ISTA rules are strictly followed. ISTA

also recommends that the ISTA Rules be used by all the seed testing laboratories (including non-ISTA member laboratories) when testing seed for trade transactions which do not require use of ISTA certificate (e.g. within a country) and for the enforcement of national laws for the control of seed quality. ISTA operates an open system and the proposals to amend the ISTA Rules or to introduce new species are welcome from any source. The external proposal must be submitted to the ISTA Secretariat, following which it will be sent to the relevant Technical Committee or directly the ISTA Rules Committee for review. The ISTA Executive Committee with the either approve a proposal for consideration or request further work on the proposal. All approved Rules proposals are sent to the ISTA membership two months before the Ordinary Meeting. At the Ordinary Meeting, The ISTA voting delegates may vote to accept a proposal (to be implemented in the ISTA Rules), to withdraw a proposal (for further consideration) or to reject a proposal.

All seed quality test methods proposed for inclusion in the ISTA Rules must have gone through the ISTA Method Validation Programme. The test methods of the ISTA Rules need to be validated, internationally harmonized and voted on by the ISTA membership. This is required for both new test methods (i.e. not currently in the ISTA Rules) and modifications to the existing methods already included in the ISTA Rules, and require a four-step process:

- i. Method selection and development;
- ii. Validation through comparative testing;
- iii. Review of comparative test results and preparation of a Method Validation Report;
- iv. Approval of validation status by the relevant ISTA Technical Committee and preparation and of an ISTA Rules proposal for the method.

Proposal for new species:

For a proposal to introduce a new species the following information must be supplied by the applicant:

1. Names of species
2. Maximum lot size and sample size.
3. Pure seed Definition
4. Validated germination test methods
5. Validated germination test procedures
6. Validated moisture content determination methods
7. Thousand seed weight
8. Varietal identification
9. Seed health tests

Other proposals: Within a chapter of the ISTA Rules, a change to the existing text (e.g. introduction of a new definition) may be proposed. Providing the proposal does not directly involve a test method or new species, it should be sent directly to the ISTA Secretariat.

ISTA Accreditation:

Accreditation is defined as the procedure by which an authoritative body gives formal recognition that a body or person is competent to carry out specific task. It is a process through which a laboratory's technical competence is verified through assessment by an experienced audit team against established audit criteria. The aim of ISTA Accreditation is to verify if a seed testing laboratory is technically competent to carry out seed testing procedures in accordance

with the 'ISTA International Rules for Seed Testing'. Accredited laboratories must show that they run a quality management system fulfilling the requirements of the ISTA Accreditation Standard. An accredited laboratory must satisfy two additional conditions before it can be authorized to issue ISTA certificates:

1. The laboratory must not have any financial interest in the production, processing and/or distribution of seeds.
2. The laboratory must have taken part, usually for at least three years, in the ISTA referee testing programme with conclusive results.

The laboratories accredited by ISTA are authorized to issue [ISTA Seed Lot and Sample Certificates](#). By reporting seed test results on ISTA Seed Lot Certificates, the issuing laboratory assures that the sampling and testing has been carried out in accordance with the ISTA Rules. The ISTA Certificates provide an assurance that the test results are reproducible, true and represent the quality of the seed. The certificate shall be issued in accordance with the ISTA Rules currently in force only, and on forms obtained from the International Seed Testing Association. ISTA Certificates are accepted by many authorities and are mentioned into the Seed Act of several countries. These certificates are of two kinds:

A) Orange International Seed Lot Certificate: This is issued when both sampling from the lot and testing of the sample are carried out under the responsibility of an ISTA-accredited laboratory. The sample is drawn officially from the lot under the authority of a member station. The lot is sealed, labelled and tested for seed quality attributes by the same member station. The orange certificate shall have the following information:

- i. Name of the issuing station
- ii. Name of the sampling and sealing agency
- iii. Official mark and seal of the lot
- iv. Number of containers in the lot
- v. Date of sampling
- vi. Date of sample received by testing station
- vii. Date of issuance of certificate
- viii. Testing station's test number
- ix. Result of tests
- x. The following statement signed by the appropriate authority of the issuing station "I certify that sampling, sealing and testing have been carried out in accordance with the International Rules for Seed Testing of ISTA and that the tests have been made at the official Station authorised by the ISTA to issue international Seed Analysis Certificate".

B) Blue International Seed Sample Certificate: This is issued when the sampling from the lot is not under the responsibility of an ISTA-accredited laboratory. It refers to the sample submitted for testing and shall be printed on blue paper. Therefore, the results obtained by the ISTA-accredited laboratory apply only to the sample and not to the seed lot the sample was taken from. The information on blue certificate would be the same as given above except that of items (2) and (3) would be deleted and the statement given above in (10) shall be as follows: "I certify that testing has been carried out in accordance with the International Rules for seed Testing of the ISTA and that the tests have been made at an official station authorized by the ISTA to issue International Certificates".

The Certificates are available only for accredited member laboratories, and can be purchased from the ISTA Secretariat, contacting [audit\(at\)ista.ch](mailto:audit(at)ista.ch) address, with a minimum quantity to be

ordered is one box containing 100 certificates sheets. The price per sheet is in Swiss Francs CHF 3.25 and it is the same for Orange and for Blue certificates. About 200000 TA Orange International Seed Lot Certificates and Blue International Seed Sample Certificates are issued every year, facilitating seed trading internationally.

The definitions and Abbreviations with respect to ISTA Accreditation are given below:

Accreditation: A procedure by which an authoritative body gives formal recognition that a body or person is competent to carry out specific tasks.

Accreditation body: body that conducts and administers an accreditation system and grants accreditation.

Audit: systematic, independent and documented process for obtaining audit evidence and evaluating it objectively to determine the extent to which audit criteria are fulfilled.

Auditor/Assessor: person with competence to conduct an audit.

Authorisation: approval by the ISTA Executive Committee that an ISTA accredited laboratory may issue ISTA International Seed Analysis Certificates.

ISTA Laboratory Accreditation Standard: document provided by the ISTA Secretariat and approved by the Executive Committee where requirements of the quality management systems are laid down. Seed testing laboratories are assessed against this standard.

ISTA Rules: ISTA International Rules for Seed Testing, published by the Association

Laboratory Proficiency Test Programme: determination of laboratory testing performance by means of inter-laboratory comparisons.

On-site assessment: part of the audit conducted by an ISTA audit team to verify compliance of the current quality management system with the requirements of the ISTA Laboratory Accreditation Standard which takes place in the premises of the laboratory.

Quality Manual: document specifying the quality management system of an organisation.

Re-accreditation audit: audit conducted every three years after the first audit to verify maintenance of the quality management system.

Repeat audit: additional assessment conducted after a (re-)accreditation audit to verify the suitability of corrective actions taken to address audit findings. This might be necessary when major non-compliances occur and removal cannot be verified through submission of documents.

Scope of accreditation: The scope of accreditation gives details of activities for which the laboratory is accredited in terms of methods in the current version of the ISTA Rules and species mentioned there, including methods for which a laboratory can be accredited under the Performance Based Approach. It cannot comprise methods described only in ISTA Handbooks or Working Sheets. The scope of accreditation must be documented and communicated to the staff members.

The responsibilities/ obligations of an Accredited Laboratory

- Advise the ISTA Secretariat in advance of any significant changes to its ownership, affiliation, organisation, location, or any other matter relevant to its status as an ISTA accredited member laboratory. The ISTA Secretariat will then assess the effect of such

changes, on a case-by-case basis, and if accreditation may be maintained or whether maintenance is dependent on the result of an audit.

- Provide any additional documentation and/or survey information relating to its accreditation, as requested by the ISTA Secretariat.
- Continuously abide by the ISTA Laboratory Accreditation Standard once accreditation is granted.
- Immediately discontinue the use of ISTA Certificates and return any unused ISTA Certificates and the Certificate of Accreditation to the ISTA Secretariat in the event of withdrawal or termination of accreditation. Conditions for termination, suspension and withdrawal of accreditation are laid down in 'Procedures for Termination, Suspension and Withdrawal of ISTA Accreditation' obtainable from the ISTA Secretariat.

Scope of the ISTA Proficiency Test (PT) Programme: All ISTA member laboratories are eligible to participate in all PT rounds of the ISTA PT Programme. It is mandatory for ISTA accredited member laboratories (depending on their scope of accreditation) and voluntary for non-accredited laboratories who want to benchmark themselves with accredited laboratories and prepare themselves for accreditation in the future. The goal is not to identify the best seed testing laboratory in the world, but to identify those laboratories that do not meet the minimum standard of performance that is reasonably expected from an ISTA accredited laboratory and to determine if such laboratories are taking reasonable corrective action to bring their performance standard to at least the minimal level. Non-members of ISTA may participate in the ISTA PT Programme for a flat fee determined and published by the Association. Participation comprises shipment of samples, statistical analysis and reporting to the participating laboratory. Non-members who wish to participate should contact the ISTA Secretariat.

Schedule: Regular PT rounds are performed three times per year. Normally, a test round starts 1st of April, August and December each year with the shipment of the samples as indicated in the **Programme Plan**. Each round is made up of three samples for each test (or group of tests) that are analysed for e.g. purity, other seed determination (OSD), germination, moisture, and/or Tetrazolium as applicable. PTs for tests other than those mentioned are currently organised by the GMO and Seed Health Committee. The latest information about the upcoming **GMO Proficiency Test and Seed Health Proficiency Test** rounds are published on their committee websites. ISTA Members are automatically informed about upcoming GMO and Seed Health Proficiency Test rounds by email.

Register of Accredited Laboratories: A directory of accredited laboratories is published by ISTA, including the names of the laboratories and their scope of accreditation. Details of every new or re-accredited laboratory are published in Seed Testing International.

Keeping of Records: The documents concerning the accreditation process for individual laboratories are kept by the ISTA Accreditation Department.

Confidentiality: All information and documents regarding current accreditations and their results are kept confidential.

Re-assessment of Accredited Laboratories: Accreditation is valid for three years, starting from the date of the audit. A re-assessment should take place within three months of the third anniversary of accreditation.

Use of ISTA Logo and the Way of Referring to the Accreditation Granted: ISTA accredited laboratories may refer to their accreditation status on letters and reports. The use of the ISTA logo, which is a registered trade mark, by members for example for public relations' purposes is restricted following the regulations of the Association.

Benefits of ISTA Accreditation

Seed producers who want to have their seed tested have to be sure that the results produced are reliable and reflect the true quality of the seed to be sold. These results are influenced by many factors, such as competence of analysts, use of appropriate equipment, use of validated methods, accurate recording and reporting, etc. Accreditation is a process through which a laboratory's technical competence is verified through assessment by an experienced audit team against established audit criteria. The factors that influence the test results are subjected to assessment to verify if these criteria are met. The criteria are formulated in the ISTA Accreditation Standard, which is based on the internationally agreed generic accreditation standard for testing and calibration laboratories Standard. The risk to ship seeds with faulty results on the test report shall be minimized, especially when seed lots are shipped overseas. Hence, using an accredited laboratory for testing of seed helps to increase acceptance of seed lots and thus reduces costs. In some countries, import of seed is only permitted if an ISTA Certificate accompanies the seed lot. ISTA Accreditation programme is internationally recognised and the work is endorsed by international organisations such as **Food and Agriculture Organization (FAO)**, **International Union for the Protection of New Varieties of Plants (UPOV)** and **World Trade Organization (WTO)**. The seed scheme of the **Organisation for Economic Co-operation and Development (OECD)** refers to the ISTA Rules. The ISTA Rules are applied by all countries which adhere to the OECD seed certification scheme, including individual European Union (EU) countries and the EU as a whole. **International Seed Federation (ISF)** rules for trade refer to the ISTA Certificates for seed analysis as required trading documents.

Accreditation is beneficial to the seed seller, buyer and to the laboratory

For the seed seller:

- Issue ISTA Certificates and grow your business internationally.
- Reduce costs by using an ISTA-accredited laboratory to increase acceptance of seed lots.
- Build on Accreditation to promote your business successfully with your government, customers and stakeholders.

For the seed buyer:

- Expect certainty that the results on the test report correspond to the quality of the seed lot
- Abide by the law of several countries where import of seed is only permitted if the seed lot is accompanied by an ISTA Certificate.

For the laboratory:

- Evaluate your performance with the Proficiency Test programme,
- Receive formal recognition and assurance that you perform your work correctly

- Build the confidence to produce reliable results
- Seek performance and remain up to date with latest testing methods.
- Develop internal pride and staff motivation.

Accredited laboratories are reassessed in regular intervals to examine if they continuously abide by the ISTA accreditation requirements. The accredited laboratories are obliged to participate in relevant proficiency test rounds according to the testing capabilities. The failure in the proficiency test programme may lead to suspension of the accreditation. Seed producers themselves may accredit their laboratory to ensure that in-house seed testing is done correctly. Seed buyers are interested in buying seed of high quality, which is to be proofed through testing the seed lots' quality in a seed-testing laboratory. The test reports, e.g. ISTA Certificates issued by accredited laboratories provide the seed buyer with confidence that the results on the test report correspond to the quality of the seed lot. To realize the quality of the purchased seed is lower than expected is costly and sometimes even too late to do something about it.

ISTA Accreditation gives a formal recognition to seed testing laboratory; that it is technically competent to test seed using the ISTA methods and producing reliable results. Through the independent technical evaluation of a laboratory's performance, the laboratory receives assurance that its work is performed correctly and appropriately. During the on-site assessment, various aspects of the laboratory's work are looked at, improvement potential and non-conformities are identified. As accreditation is becoming more and more accepted by authorities, customers and stakeholder to be an efficient tool to evaluate a laboratory's testing performance, accreditation is in fact an important marketing tool.

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1. International Seed Testing Association (ISTA) (2022). International Rules for Seed Testing. Bassersdorf, CH. Switzerland.
2. <https://www.seedtest.org/en/home.html>
3. Agrawal P.K. (1993). International Seed Analysis Certificates. In: Handbook of Seed Testing, Dept. of Agriculture and Cooperation, Ministry of Agriculture, Govt. of India, New Delhi, pp: 340.
4. <https://seednet.gov.in/>

Annexure I

ISTA Accredited Member Laboratories in India - 8

1. **INML0500:** Namdhari Seeds Pvt. Ltd. Quality Control Laboratory
Sri Sai arcade, No:8, 12th cross, 1st phase, Ideal Homes Township
PO: Rajarajeshwari Nagar, Karnataka
Bangalore - 560 098 (India)
2. **INML0600:** Mahyco Private Limited Quality Assurance Laboratory
Jalna - Aurangabad Road, Dawalwadi, BadnapurTq
PO: P.O. Box 76., Maharashtra
Jalna - 431 203 (India)
3. **INML0700:** Indo-American Hybrid Seeds (India) Pvt Ltd Seed Laboratory
7th Km,Banashankari-Kengeri Link Road,
PO: Channasandra, Rajarajeshwarinagar Post, Karnataka
Bangalore - 560 098 (India)
4. **INML1200:** Nuziveedu Seeds Limited (NSLICON) Seed Testing Laboratory
Survey no: 183, Kompally
Quthbullapur Mandal, Andhra Pradesh
Secunderabad - 500014 (India)
5. **INML1400:** Kalash Seeds Pvt. Ltd.
Bejo Sheetal Corner, Mantha Road
Jalna, Maharashtra - 431203 (India)
6. **INML1600:** Seed Testing Laboratory
Department of Seed Certification
Lawley road, G.C.T., Tamilnadu
Coimbatore - 641013 (India)
7. **INML3900:** Telangana State Seed & Organic Certification Authority
5-10-193, 1st Floor, HACA Bhavan
Public Gardens
TS Hyderabad - 500 004 (India)
8. **INML4500:** East West Seeds India Pvt. Ltd.Quality Assurance Laboratory
Gut Number 66, Village Narayanpur, Waluj,
Tq. Gangapur, Maharashtra
Aurangabad - 431133 (India)

Non-Accredited ISTA Member Laboratories in India - 21

1. **NDL0100: ICAR-Indian Agricultural Research Institute**
Seed Testing Laboratory, Pusa Campus
New Delhi - 110 012 (India)

2. **INDL0300: National Seeds Corp. Ltd.**
Quality Control Laboratory
Beej Bhavan, Pusa Complex
New Delhi - 110 012 (India)
3. **INML4800: Telangana DNA Fingerprinting and Transgenic Crops**
Monitoring Laboratory
2nd floor SAMETI COMPLEX, Old Malakpet
Hyderabad, Andhra Pradesh - 500 036 (India)
4. **INML0800: Bayer Bio Science Pvt. Ltd.**
Seed Quality Assurance Laboratory
14-111, Tatapapannapally, TOOPRAN, Medak District
Telangana - 502 335 (India)
5. **INML1000: J. K. Agri Genetics Ltd.**
1-10-177, 4th Floor, Varun Towers
Begumpet, Hyderabad, Andhra Pradesh - 500 016 (India)
6. **INML1600: Seed Testing Laboratory**
Department of Seed Certification
Lawley Road, G.C.T., Coimbatore, Tamilnadu - 641 013 (India)
7. **INML1700: Syngenta India Pvt. Ltd**
Quality Control Laboratory
No. 660/661, Nutankal Village
Medchal Mandal, Ranga Reddy District
Telangana - 502 335 (India)
8. **INML1900: National Seed Research and Training Centre**
Central Seed Testing Laboratory
G.T.Road, Collectry Farm, P.O. Industrial Estate
Varanasi, Uttar Pradesh - 221106 (India)
9. **NML2300: Acsen Hyveg (P) Ltd**
HYVEG QA LAB., Village Nunhera, Near Toll Plaza
Sohna-Ballabhgarh Road, Sohna
Gurugram, Haryana- 122 103 (India)
10. **INML2500: Rasi Seeds (P) Ltd**
Seed Testing Laboratory
65/1 Cadalur Main Road, Thulukanur
Village, Ammampalayam (PO) Attur (TK)
Salem, Tamil Nadu - 636102 (India)
11. **INML3100: University of Agricultural Sciences**
AICRP on Seed Tech, Gandhi Krishi Vignana Kendra
Bangalore, Karnataka - 560001 (India)
12. **INML3500: ICAR - Indian Institute of Seed Science**
Vill: Kushmuar, PO: Kaithauli, Maunath Bhanjan
Uttar Pradesh - 275 103 (India)

13. INML3600: Kaveri Seed Company Limited

Seed Testing Laboratory
Survey No. Part 707, 712 to 719, Pamulaparthi (Village)
Wargal (Mandal), Medak (District)
Hyderabad, Andhra Pradesh - 502279 (India)

14. INML3800: Seed Testing Laboratory

Department of Agriculture, Old Pedgaon Road, Laxminagar
Parbhani, Maharashtra - 431401 (India)

15. INML4000: Quality Assurance Laboratory

Ajeet Seeds PVT.LTD. Aurangabad
GUT NO-233, Village-Chitegaon
TQ-Paithan, Dist-Aurangabad
Aurangabad, Maharashtra - 431105 (India)

16. INML4100: Maharashtra State Seeds Corporation Ltd

Seed Testing Laboratory
Murtizapur Road, Shivani
Akola, Maharashtra - 444104 (India)

17. INML4200: Andhra Pradesh State

Seed Certification Authority
Seed Testing Laboratory
LAMFARM GUNTUR
Guntur - 522034 (India)

18. INML4300: VNR Seeds Pvt. LTD Quality Assurance

Village - Deorjhal, Ahiwara Dhamda Road
Post - Medasara, Dist. Durg
Chattisgarh - 493006 (India)

19. INML4400: Seed Works International Pvt Ltd Quality Assurance Laboratory

Survey No. 217/B, Ayodhya X Road,
Kandlakoya Village, Medchal Mandal
Hyderabad, Andhra Pradesh- 501403 (India)

20. INML4600: Karnataka State Seed & Organic Certification Agency

State of the Art, Bellary Road, Hebbal
Bangalore, Karnataka - 560001 (India)

21. INML4700: Advanta Enterprises Private Limited Advanta Quality Center

Survey 315/316/324, Opp. Lane Janata
Real Estate Off, Kallakal Village
Medak Dist, Hyderabad, Andhra Pradesh- 502336 (India)

SEEDS ACT & RULES IN RELATION TO SEED TESTING

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Seed testing helps to assess the quality attributes of the seed lots which have to be offered for sale and minimize the risk of planting low quality seeds, thus assume importance for all those who produce, sell and use seeds. It helps to gain information regarding planting value of seed lots, which need to be performed to obtain accurate and reproducible results regarding the quality status of the seed samples submitted to the seed testing laboratories, thereby enabling the farmer community to get quality seeds. Seed testing is conducted to achieve the following objectives:

- **Planting purposes:** To determine the quality of seed lots, i. e. their suitability for planting
- To identify the seed quality problems and their probable causes
- To determine the need for seed drying and processing and specific procedures to be used
- **Labeling purposes:** To determine whether a seed lot meets established quality standards or labelling specifications or not?
- **Upgrading the seed quality:** To determine the need for drying and processing and specific procedures that should be used
- Fixation of seed prices: To establish quality and provide a basis for price and consumer discrimination among lots in the market.

Hence, seed testing is considered to be an integral part of seed programme in India for the purpose of certification and seed law enforcement.

The importance of seed testing was realized more than 100 years ago for assured planting values, when the adulteration of vegetable seeds was practiced by mixing stone dust in some parts of the world, particularly in Europe, when Professor Friedrich Nobbe (Germany) in 1969 advocated that the seeds must be tested before sowing. In India, it was decided in the late fifties to establish at least one seed testing laboratory in each State/Union territory. The Seeds Act was passed in 1966 and Seed Analyst and Laboratories have been assigned important role to ensure the quality of planting material for sale. In fact, seed testing laboratory is considered as the hub of seed quality control. At present, about 140 Seed Testing Laboratories are functioning in the country and testing more than 6 lakh seed samples annually, including 2 Central Seed Testing Laboratories at National Seed Research and Training Centre, Varanasi and Central Institute for Cotton Research, Nagpur (for GM cotton only).

Seed is considered to be a legal entity in India subsequent to the promulgation of Seeds Act in 1966. Further, Seed Rules were framed in 1968 to implement various legislations given under Seed Act, 1966 for regulating the quality of certain seeds for sale, and for matters connected therewith, and ensure the availability of good quality seeds to the farmers. The main provisions deal with setting up of the seed laboratory, seed sampling, seed analysis and report/results. Thus, all essential aspects of the seed testing have been taken care of in the Seeds Act and Seeds Rules.

The major provisions in the Seed Act related to seed testing include:

- Seeds Act and Seeds Rules provide for quality certification and minimum quality standards of notified kind/varieties.
- The varieties are notified under the Seeds Act subsequent to official release, so that quality of seeds can be regulated.
- Notification of the variety is made by Central Government on the recommendation of the Central Seed Committee.
- The main purpose of notification is to bring the seeds of particular crop under the purview of Seed Law Enforcement.
- Quality Control as envisaged in the Act is to be achieved through pre & post marketing control, voluntary certification and compulsory labelling of notified kind/varieties
- Minimum limit for germination, physical and genetic purity of varieties have been prescribed and notified for labelling the seeds of notified kind varieties under Section 6 of the Seeds Act.
- All seed of notified varieties sold to farmers must meet the minimum standards of germination and physical purity.
- The seed should be packed in a suitable container and a label has to be affixed on the container.
- Information about germination, physical purity, variety, date of test, name of the seed producer has to be mentioned on the label.
- The validity period of certification tag is nine months from the date of test, which can be further extended for six months, provided seed conforms to the prescribed standards in respect of physical purity, germination and insect damage on retesting.
- The seed samples of the notified varieties are being sent to the Seed Testing Laboratory of the state for analysis of germination and purity.
- In case of any legal disputes, the reference sample is sent to Central Seed Testing Laboratory, whose results will be final.
- There is a provision to set up Central Seed Laboratory and State Seed Laboratory to discharge functions enshrined under Section 4 (1) and 4(2) of the Seeds Act.
- Seed Analysts are appointed through notification with prescribed qualification.
- State Government under Section 13 of the Seeds Act may appoint such person as he thinks fit having prescribed qualification through notification as Seed Inspector and defined the areas within which they shall exercise jurisdiction for enforcing the Seed Law.
- Seed Inspectors appointed under relevant provision have adequate power under Section 14 of the Seeds Act to draw the samples of notified kind/varieties of seeds from the source to assess the quality of seed sold in the market.
- Seed Inspectors can seize the stock of the seed, issue stop sale order for 30 days in case the seed under reference contravenes the Act and Rules.

Seeds Testing Laboratory: Seed Testing is a part of Seed Certification Programme, Seed Law Enforcement, enforcement of Seeds (Control) Order, seed production and marketing.

There is a provision to Set up a Central Seed Laboratory and States Seed Laboratory to discharge various functions enshrined under the Seeds Ad. The Section 2(2) and Section 2(15) define these laboratories as under:

2(2): "Central Seed Laboratory means the Central Seed Laboratory established or declared as such under sub-section (1) of Section 4;

2(15): " State Seed Laboratory", in relation to any state, means the State Seed Laboratory established or declared as such under sub-section (2) of Section 4 for that State.

Section 4(1) and 4(2) of the Seeds Act specify that Central Government and State Governments could set up the Central Seed Laboratory and State Seed Laboratory respectively. The Section 4(1) and 4(2) read as under:

4(1): The Central Government may, by notification in the Official Gazette, establish a Central Seed Laboratory or declare any Seed Laboratory as the Central Seed Laboratory to carry out the functions entrusted to the Central Seed Laboratory by or under this Act.

4(2): The State Government may, by notification in the Official Gazette, establish one or more State Seed Laboratories or declare any Seed Laboratory as a State Seed Laboratory where analysis of seeds of any notified kind or variety shall be carried out by Seed Analysts under this Act in the prescribed manner.

Functions of the Seeds Laboratories

(a) Services to the certification agencies for certification and validation/revalidation of foundation and certified seeds – **Certification sample**

(b) Testing of service samples, **Service sample** is the sample submitted to STL by the farmers or purchaser of the seed to know the quality of seed. It may be any seed – breeder seed, foundation seed, certified seed, labeled seed or farm saved seed; and

(c) Testing of seed law enforcement sample. This is the seed sample submitted to notified seed testing laboratory by the Seed Inspector to assess the quality of seed sold in the market as per Seeds Act, 1966 and Seeds (Control) Order, 1983 – **official sample**

Central Seed Laboratory has been other important functions under the Seeds Act and Seeds Rules. The detail of the same is given as under:

Analysis of the sample received from accused vendor or complainant. As specified under Section 16(2), any accused vendor or complainant could request the Central Seed Laboratory through Court to Analyse the sample. The Section 16(2) reads as under:

16(2) : "After the institution of a prosecution under this Act, the accused vendor or the complainant may, on payment of the prescribed fee, make an application to the court for sending any of the samples mentioned in clause (a) or clause (c) of sub-section (2) of Section 15 to the Central Seed Laboratory for its report and on receipt of the application, the court shall first ascertain that the mark and the seal or fastening as provided in clause (b) of sub-section (1) of Section 15 are intact and may then despatch the sample under its own seal to the Central Seed Laboratory which shall thereupon send its report to the court in the prescribed form within one month from the date of receipt of the sample, specifying the result of the analysis."

Analysis of the service sample: The Central Seed Laboratory could also analyse the service sample of which results to be used as information for seeding, selling or labelling purposes (Rule 2(i) of Seeds Rules, 1968).

Apart from above, the Central Seed Laboratory has been assigned to perform the following functions as indicated in Rule 5 of the Seeds Rules, 1968. In addition to the function entrusted to the Central Seed Laboratory by the Act, the Laboratory shall carry out the following functions, namely:

(a) initiate testing programmes in collaboration with the State Seed Laboratories designed to promote uniformity in test results between all seed laboratories in India;

(h) collect data continually on the quality of seeds found in the market and make this data available to the Committee; and

(c) carry out such other functions as may be assigned to it by the Central Government from time to time.

Functions of the State Seed Laboratories

State Seed laboratories are meant to analyse the seed samples of any notified kind or variety in the prescribed manner. The State Seed Laboratory is expected to analyse the samples received from various sources for the following different purposes.

(i) Analysis of the samples received from Seed Certification Agencies set up under Section 8 of the Seeds Act.

(ii) Analysis of the service samples: Seed users and seed producers could get seed sample tested to obtain the result to be used as information for seeding, selling or labelling purpose.

(iii) Analysis of the samples received from Seed Inspector to determine the compliance of labelling requirements under Section 7 of the Seeds Act.

Seed Analyst

As per Section 2(12) "Seed Analyst" means a seed analyst appointed under Section 12, which reads as under:

"The State Government may, by notification in the Official Gazette, appoint such persons as it thinks fit, having the prescribed qualifications, to be Seed Analysts and define the areas within which they shall exercise jurisdiction."

The Seed Analyst should possess certain minimum qualifications as prescribed in Rule 20 of the Seeds Rules, 1968. The same are reproduced below: Qualifications of Seed Analyst: A person shall not be qualified for appointment as Seed Analyst unless he –

- i. possesses a Master's or equivalent degree in Agriculture or Agronomy or Botany or Horticulture of a University recognized for this purpose by the Government and has had not less than one year's experience in seed technology; or
- ii. possesses a Bachelor's degree in Agriculture or Botany of a University recognized for this purpose by the Government and has had not less than three years' experience in seed technology.

Duties of a Seed Analyst: The duties of a Seed Analyst have been specified in the Rule 21 of the Seeds Rules, 1968 and are reproduced below:

- i. On receipt of a sample for analysis the Seed Analyst shall first ascertain that the mark and the seal or fastening as provided in clause (b) of sub-section (1) of section 15 are intact and shall note the condition of the seals thereon.
- ii. The Seed Analyst shall analyse the samples in accordance with the provisions of the Seeds Act and Rules
- iii. The Seed Analyst shall deliver a copy of the report (in Form VII) of the result of analysis to the persons specified in sub-section (i) of Section 16, as soon as may be, but not later than 30 days from the date of receipt of samples sent by the Seed Inspector under sub-section (2) of the section 15.
- iv. The Seed Analyst shall from time to time forward to the State Government the reports giving the result of analytical work done by him.

Precautions to be followed by Seed Analyst at the time of receipt of samples for analysis: Rules 29, 30 and 31 of the Seeds Rules specify the precautions to be taken at the time of despatch of the samples to Seed Analyst. The Rules 29, 30 and 31 read as under:

- i. **Rule 29: Samples, how to be sent to the Seed Analyst-** The container of sample for analysis shall be sent to the Seed Analyst by registered post or by hand in a sealed packet enclosed together with a memorandum in Form V in an outer Cover addressed to the Seed Analyst.
- ii. **Rule 30: Memorandum and Impression of seal to be sent separately -** A copy of the memorandum and a specimen impression of the seal used to seal the packet shall be sent to the Seed Analyst separately by registered post or delivered to him or to any person authorised by him.
- iii. **Rule 31: Addition of preservatives to Samples -** Any person taking a sample of seed for the purpose of analysis under the Act may add a preservative as may be specified from time to time to the sample for the purpose of maintaining it in a condition suitable for analysis.

- iv. Accordingly, the Seed Analysts should ensure that seed sample is received in proper form.
- v. **Analysis of the Sample:** Rule 33 specifies the following:
- vi. "On receipt of the packet, it shall be opened either by The Seed Analyst or by an officer authorised in writing in that behalf by the Seed Analyst, who shall record the condition of the seal on the packet. Analysis of the sample shall be carried out at the State Seed Laboratory in accordance with the procedure laid down by the Central Government".
- vii. **Form of Report:** Rule 35 specify that the report of the results of the analysis under sub-section (1) or sub-section (2) of Section 16 shall be delivered or sent in Form VII. A specimen copy of the same is given as under:

FORM VII

(Certificate of test and/or analysis by the Seed Analyst)

Certified that the sample(s) bearing
number.....
received onMemorandum
No.
Dated.....
from.....
has/have been tested/analysed and that the
result/results of such test(s)/analysis is/are as
stated below:

2.The condition of the seals on the packet and the
outer covering on receipt was as follows:

Seed
Analyst
Central
Laboratory

Place.....
Date.....

If opinion is required on any other matter suitable
paragraph(s) may be added

Fees: The Rule 36 specifies the following

"The fees payable in respect of the report from the
Central Seed Laboratory under sub-section (2) of
section 16 shall be Rs. 10/- per sample of the seed
analyzed ".

Retaining of the Sample: Rule 37 specifies the following

"The sample of any seed shall, under clause (c) of sub-section (2) of section 15, be retained under a cool, dry environment to eliminate the loss of viability and insect proof or rat proof container. The containers shall be dusted with suitable insecticides and the storage room fumigated to avoid infestation of samples by insects. The sample shall be packed in goal quality containers of uniform shape and size before storage".

National Seed Research and Training Centre (NSRTC), Varanasi

The Government of India, Ministry of Agriculture & Farmers Welfare, Department of Agriculture, Cooperation & Farmers Welfare, Krishi Bhawan, New Delhi initiated the National Seed Research and Training Centre (NSRTC), Varanasi during October, 2005. The prime objective of establishment of NSRTC was to have a separate National Seed Quality Control Laboratory, which serves as a Central Seed Testing Laboratory (CSTL) w.e.f. 1st April, 2007 by Gazette Notification No. REGD.NO. D.L-33004/99 dated: 8th March, 2007. National Seed Research and Training Centre (NSRTC) is the apex centre to maintain the uniformity in seed testing results and HRD at national level. It monitors the all-State Seed Testing Laboratories and try to overcome their difficulties. It makes efforts to provide expertise/ guidance to seed entrepreneurs and other stakeholders involved in seed development programme and make them more potent. Through National Trainings, National Workshops and National Seed Congress, NSRTC is continuously disseminating the knowledge of new techniques of seed testing, role of quality seed etc. to the various seed development agencies and other stakeholders. Central Seed Testing Laboratory (CSTL) has been assigned to analyse the sample of complainants through Court. Seed testing in collaboration of state testing laboratories and testing of market samples are also important programmes of CSTL. Central Seed Testing Laboratory is a member laboratory of International Seed Testing Association (ISTA) and undergoing PT programme of ISTA for accreditation which will ensure Seed Industry in India globally competitive.

Objectives:

- Promote quality seed availability to meet the challenges of science-based Agriculture.
- Making of promising technologies reach the seed entrepreneurs and other stakeholders through innovative Trainings, Conferences & Symposia.
- Establishing uniformity in Seed production & Quality Control programmes at National level.
- Innovative curriculum planning and implementation to make Seed Science & Research more vibrant and responsible to match the vision and needs of present and future.
- Provide common platform to all agencies and organizations concerned with the seed science at National level.
- Transfer of modern technologies in Seed science through organizing various HRD activities.
- Co-ordination with other premier institutes of the country and globe.

- Contribute in systematic manner with integrated approach to ensure availability of high-quality seeds to user.
- Strengthening the "Seed Quality Testing Network" in the country
- Innovative curriculum planning and implementation to make Seed Science & Research more vibrant and responsible to match the vision and needs of present and future.

Activities

- **5% Re-testing programme of seed samples:** Under the 5% Re-testing programme, CSTL is testing 5% samples from notified state seed testing laboratories across the country free of cost.
- **Court referred seed samples:** Under this programme, CSTL is testing seed samples received from the Hon'ble court. The seed testing fee of Rs. 10/- sample is required and may be paid through Bharat Kosh Portal and the payment receipt should be sent to the Director, NSRTC through post.
- Participation in ISTA Proficiency Tests
- Conduct of Grow Out Test

Seeds (Control) Order, 1983: The Ministry of Civil Supplies through an order dated 24 February 1983 had declared the seed for sowing or planting of food crops, fruits, vegetables, cattle fodder and jute to be essential commodities in exercise of power conferred by Section 2(a)(viii) of Essential Commodities Act, 1955. It was followed by the issue of Seeds (Control) Order dated 30.12.1983 by the Ministry of Agriculture, Department of Agriculture and Co-operation in exercise of powers contained in Section 3 of Essential Commodities Act. The inclusion of seeds as an essential commodity under the Essential Commodity Act, 1955 and GoI declared all the crop seeds whether notified or not as an essential commodity under the Seeds (Control) Order 1983.

The order confers power to the Central Govt. to control, and regulate production, supply and distribution of essential commodities. Seeds (Control) Order, 1983 has been notified as per the Gazette Notification; G.S.R. 832 (E) dated 30.12.1983. The notification under reference holds good and remains operative. Joint Secretary (Seeds), Department of Agriculture & Cooperation, Ministry of Agriculture & Farmers Welfare, Govt. of India acts as the Controller of Seeds for the implementation of Seeds (Control) Order. Seeds (Control) Order, 1983 empowered the State Governments / Union Territories to either compulsorily license all the seed dealers within their jurisdiction or exempt such class of seed dealers deemed fit to it through official Gazette Notification. Whereas, the Seeds Act, 1966 (54 of 1966) provides for regulating the quality of certain seeds for sale, and for matter connected therewith; Seeds (Control) Order, 1983 regulates the trading activity in seeds. The important provisions of this order are:

- i. A person carrying on the business of selling, exporting and importing of seeds needs to obtain a license & notify the authority for grant of licence. No person can sell, export or import seeds unless he possesses the license to do so or exempted from doing so through official Gazette notification.

- ii. The Essential Commodity Act, 1955 gives powers to State governments to regulate various aspects of trading in essential commodities under the supervision of Central Government. The act again passed with amendments in the year 1980 clearly states that detaining of persons whose activities are unethical in the supply of essential commodities. It is one of the legal instruments being enforced to check the supply of inferior seeds of notified and unnotified seeds to the farmers.
- iii. All persons carrying on the business of selling, exporting and importing seeds will be required to have a licence to carry on the business in accordance with terms and conditions of licence granted to him.
- iv. The license provided to a seed dealer remains valid only for 3 years from the date of its issue, which can be later renewed.
- v. Based on such enquiry as it thinks fit the licensing authority may grant or refuse the license in provisions of the Order.
- vi. Licensing Authorities are empowered to cancel or suspend the licence under the relevant provision of the order.
- vii. It is mandatory for the licensed seed dealer to display stock position (opening and closing) of different seeds held by them and the price list on daily basis, maintenance of records, submission of returns to the Notified Authority, and faithfully abide the directives of Controller of Seeds to Govt. of India regarding distribution of seeds, if any.
- viii. A cash or credit sale memorandum need to be issued by the dealer to purchaser of seeds, compulsorily.
- ix. The State Government is empowered with appointing a licensing authority, inspectors and mode of action for supply regulation.
- x. Seed Inspectors notified under clause 12 of the Order are eligible to draw any samples of seeds meant for sale or export/import etc. and to ensure that the sample confirms to the standards of quality claimed by the Seed Dealer under clause 13 (c) of the order.
- xi. Seed Inspectors have powers for search and seize the seeds under relevant provisions of this order.
- xii. Under this order, the time period for completion of seed analysis in case of any doubt about quality is 60 days compared to 30 days under Seed Rules
- xiii. Provision for appeal and an appellate has also been provided.

References:

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- Santhy V. and VijayaKumari, P.R.. Legislations for Seed Quality Regulation. In: CICR Technical Bulletin No: 38, Central Institute for Cotton Research Nagpur (India).
- <https://seednet.gov.in/>



For further details log on to : www.nsrtec.nic.in

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