MINIMUM SEED STANDARDS OF BHUTAN 2019

Royal Government of Bhutan

Ministry of Agriculture and Forests

Thimphu: Bhutan

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Published by:
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ROYAL GOVERNMENT OF BHUTAN

MINIMUM SEED STANDARDS OF BHUTAN 2019

Ministry of Agriculture and Forests

Thimphu: Bhutan

June 2019

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SECTION 1: MINIMUM SEED STANDARDS FOR AGRICULTURE CROPS

1. GENERAL STANDARDS AND GUIDELINES FOR CERTIFICATION

The general standards are applicable to any kind and variety of plants notified by VRC/NSB for the purpose of certification by the authorized agency identified by Ministry of Agriculture and Forests.

1.1. Purpose of Seed Certification

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

1.2. Certification Agency

Certification shall be conducted by the Certification Agency identified by the National Seed Board, Ministry of Agriculture and Forests, Royal Government of Bhutan. The Bhutan Agriculture Food Regulatory Authority (BAFRA) is the appointed Certification Agency.

1.3. Certified Seed Producer

Certified seed producer means an organization or an individual who grows or distributes certified seed in accordance with the procedures and standards of the certifications.

1.4. Eligibility Requirements for Certification

Seed of only those kind and varieties, which are notified by NSB, MoAF shall be eligible for certification.

1.5. Classes and Sources of Seed

1.5.1. Breeder Seed

Breeder seed is seed or vegetative propagating material directly controlled by the originating or sponsoring plant breeder of the breeding program 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 the subsequent generation of seeds shall conform to the prescribed standards of genetic purity. The other quality factors of Breeder Seed such as physical purity, inert matter, germination etc. shall be indicated on the label on actual basis. The Breeder seed shall be supplied by the breeder/breeding institution to the seed producer as mutually agreed.

1.5.2. Certified Seed

Certified Seed shall be the seed certified by certification Agency as notified by NSB. Certified Seed shall consist of two classes, namely, Foundation and Certified seed and each class shall conform to the following description:

Foundation Seed shall be the progeny of Breeder seed, or be produced from Foundation seed, which can be clearly traced to Breeder seed. During the production of Foundation seed, the following guidelines shall be observed:

Foundation seed produced directly from Breeder seed shall be designated as Foundation seed stage-I, Foundation seed produced from Foundation seed stage–I shall be designated as Foundation seed stage II.

Foundation Seed Stage II will not be used for further increase of seed and shall be used only for production of certified Seeds. Minimum Seed Certification Standards shall be the same for both Foundation Seeds Stage I (registered) and Foundation Seeds Stage II (certified seeds) unless otherwise prescribed. Production of Foundation Seeds Stage I & II (registered & certified seeds) 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.

1.6. **Phases of Seed Certification**

Certification shall be completed in seven broad phases listed as under:

i. Registration of varieties for certification purpose.
ii. Receipt and scrutiny of application.
iii. Verification of seed source, class and other requirements of the seed used for raising the seed crop.
iv. Field inspections to verify conformity to the prescribed field standard.
v. Supervision at post-harvest stages including processing and packing.
vi. Seed sampling and analysis, including genetic purity test and/or seed health test, if any, in order to verify conformity to the prescribed standard; and
vii. Grant of Seed certificate and certification tags, tagging and sealing.

1.7. **Unit of Certification**

For the purpose of field inspections, the entire area planted under seed production by an organization/individual shall constitute one unit provided:

i. It is all under one variety;
ii. It does not exceed ten hectares;
iii. It is not divided into fields separated by more than fifty meters between them;
iv. It is planted with or is meant to produce seed belonging to the same class and stage in the generation chain;
v. 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;
vi. The total area planted, by and large, corresponds to the quantity of seed reported to have been used; and the Certification Agency's permission had been obtained to sow a larger area by economizing on seed rate;
vii. Raised strictly as a single crop and never as mixed;
viii. Not so heavily and uniformly lodged that more than one third of the plant population is trailing on the ground leaving no scope for it to stand up again thus making it impossible for the Certification Agency to inspect the seed crop at the appropriate growth stage in the prescribed manner;

ix. As far as possible, so maintained as to show adequate evidence of good crop husbandry thereby improving the reputation for certified seeds; and

x. Not grown as inter, companion or ratoon crop unless otherwise specified.

1.8. **Field Inspection**

The field inspection work, which requires technically trained personnel, shall be performed by the persons who have been so authorized by the Certification Agency. 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. Soon after the completion of the field inspection, a copy of the report shall be submitted to Certifying Agency, who in turn shall communicate the report to the producer or representative at the shortest possible time.

1.9. **Re-inspection**

Seed fields not conforming to prescribed standards for certification at any inspection, the Certification Agency shall, upon the request of seed producer and after removing the sources of contamination in the seed field and within the prescribed isolation distance and/or the contaminated plants in the seed field (if so directed by the Certification Agency) perform one or more re-inspections provided such removal can ensure conformity of the seed crop to the prescribed standards and provided further that no irreversible damage has been caused to the quality of seed by the contaminant(s). The Certification Agency may at its discretion, also perform one or more re-inspections over and above the minimum number of inspections prescribed, if considered necessary.

1.10. **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 standard practices as mentioned below:

i. Harvest the crop at the right maturity stage;
ii. Avoid mechanical injury of seed while threshing;
iii. Thresh different varieties separately to avoid admixture;
iv. During transportation, seed should be properly packed in a clean and appropriate container to avoid admixture;

During these operations, seed producer will take all precautions to safeguard the seed from admixture and other causes of seed deterioration.

1.11. **Bulking**

Bulking of unprocessed seed stocks to obtain larger homogeneous seed stocks may be permitted by the Certification Agency provided the stocks to be bulked meet the following requirements:

i. Belong to the same certified seed producer;
ii. Belong to the same crop, variety, class of seed and stage in the generation chain;
iii. Were produced in the same season and under similar agro-climatic conditions;

iv. Were subject to certification by the same certification agency;
v. Have more or less similar physical appearance and levels of moisture;
vi. Are adequately homogeneous in composition.

1.12. **Seed Processing and Packing Schedule**

The Certification Agency shall prepare and communicate seed processing and packing schedule to the seed producer 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.

1.13. **Seed Lot**

A seed lot is a physically identifiable quantity of seed, which is homogeneous.

1.14. **Lot Size**

A seed lot would represent any quantity of seeds up to a maximum of 20,000 kg of seeds of the size of rice or larger (except seed potato for which the maximum size of the lot may be 40,000 kg) and 10,000 kg for seed smaller than rice subject to a tolerance limit of 5%. The quantities in excess of the above maximum limits shall be sub-divided and separate lot identification shall be given.

1.15. **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 purposes.

1.16. **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. Cleaning and grading of seeds shall be done so that typical contaminants such as weed seeds, ergoty, diseased /insect damage, small seeds, damaged seeds, broken and shriveled seeds, straw, chaff, leaves, twigs, stones, soil particles etc. are removed.

1.17. **Seed Treatment**

When a variety, seed of which is under certification is susceptible to a seed borne disease 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.

1.18. **Sample 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 as per standard procedures. The quantity of seed samples so drawn shall be sufficient to provide three

samples. 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.

1.19. **Seed Analysis Report**

The Seed Testing Laboratory shall analyze 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 sample unless the seed is subject to such tests which require more than 30 days for completion of the test.

1.20. **Seed Standards of Genetic Purity**

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

Seed class	Minimum genetic purity %
Foundation	99
Certified	98

1.21. **Grow-out Test**

The Certification Agency shall conduct grow-out test to determine genetic purity of a seed wherever 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 shall be conducted as per standard procedures (following recommended cultural/agronomic practices and with a control for comparison).

1.22. **Re-cleaning, Re-sampling and Re-testing**

When a seed lot does not meet the prescribed seed standards, the Certification Agency on the request of seed producer may permit re-cleaning, re-sampling and re-testing. The re-cleaning, re-sampling and re-testing shall be permitted only once.

1.23. **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.

1.24. **Seed Moisture Content**

Seed standards in respect of seed moisture content shall be met at the time of packing of seed.

1.25. **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 a request has been made to this effect by the seed producer.

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

1.27. **Refusal for Certification**

The Certification Agency shall have the authority to refuse certification of any seed production field or any seed 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 appeal made to the Appellate Authority constituted under the Seed Act, 2000.

1.28. **Validity Period of the Certificate**

The validity period shall be nine months from the date of test at the time of initial certification. The validity period could be further extended for six months provided on re-testing seed conforms to the prescribed standards in respect of physical purity, germination and insect damage for all seeds except vegetative propagating material for which lot shall be re-examined for seed standards specified for respective crop. A seed lot will be eligible for extension of the validity period as long as it conforms to the prescribed standards.

1.29. **Revocation of Certificate**

If the Certification Agency is satisfied, either on reference made to it in this behalf or otherwise that: the certificate granted by it 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 the Act or the rules made there under, then, without prejudice to any other penalty to which the holder of the certificate may be liable under the Act, the Certification Agency may, after giving the holder of the certificate an opportunity of showing cause, revoke the certificate under the provisions of the Seed Act, 2000.

1.30. **Retention of Certification Records**

The Certification Agency shall preserve in order all the documents including the guard samples pertaining to certification of each seed lot for two years from the date of grant/extension of the certificate and four years in respect of rejected seed crops or lots from the date of communication of rejection unless and otherwise required for longer period.

1.31. **Certified planting material producer**

Means a person/organization who grows or distributes planting material in accordance with the procedure and standards of the certification.

1.32. **Certification shall be completed in four broad phases listed under**

i. The Producer should apply for the certification of the planting materials prior to the distribution of the materials. The Certification Agency in turn will scrutinize.
ii. The Certification Agency should verify the source, class and other requirements of the materials used for raising planting materials.
iii. The Certification Agency should inspect the materials in the field during full growth and prior to distribution to verify conformity of the materials to the prescribed standards.
iv. Grant of certificate and certification tags and tagging.

1.33. **Tags or Labels**

All certified seed and planting materials offered for sale shall have the official certification tag or label properly affixed to each bundle or container. Even if all standards have been met, planting materials will not be considered certified unless properly labeled.

The certification tag attached to each bundles or container serves as evidence of the genetic purity, identity and other quality standard of the planting materials contained therein. Every package should have a tagged label with the following information:

i. Common and Scientific Name of the variety
ii. Complete address of producer, packer / importer
iii. Class of seed: Breeder seed, foundation seed I or II, or Certified seed
iv. Physical purity, inert matter, germination, moisture content
v. Year of seed crop production
vi. Origin of seed
vii. Producer seed lot number
viii. Label serial number
ix. Color of the Tag:
    a. White for foundation seed
    b. Blue for certified seed

2. SPECIFIC SEED STANDARDS FOR CEREAL, LEGUMES AND OILSEED CROPS

2.1. **RICE** (*Oryza sativa*)

Land Requirements

Land intended to be used for rice seed production shall be free of volunteer plants of any variety.

Field Inspections

A minimum of two field inspections shall be made from pre-flowering to harvest stage of the crop.

Field Standards

Isolation distance and other plant contaminants shall be as specified in the table below:

Contaminants	Isolation distance	
	Foundation	Certified
Fields of other varieties	3 m	3 m
Fields of same variety not conforming to purity	3 m	3 m
Off-types*	0.05%	0.20%
Objectionable weeds**	0.01%	0.02%
Plants infected by seed borne diseases (Max. % of infected plants)	5%	10%

*Standards for off-types and objectionable weeds shall be met at the final inspection.
**Objectionable weeds include wild rice and *Echinocloa species*

Seed Standards

Parameters	Foundation	Certified
Germination (minimum)	85%	80%
Pure seed (minimum)	98%	97%
Inert matter (maximum)	2%	3%
Other crop seeds (max no.)	10/kg	20/kg
Other variety seeds (max no.)	10/kg	20/kg
Weed seeds (max no.)	10/kg	20/kg
Objectionable weed seeds* (max no.)	2/kg	5/kg
Seed moisture	12%	13%

* Wild Rice Seeds

2.2. **MAIZE** (*Zea mays*) (Open-pollinated varieties/composites/synthetics)

Land Requirements

Land to be used for seed production of maize composites, synthetics and OPs shall be free of volunteer plants.

Field Inspections

A minimum of two field inspections shall be made, one before flowering and the other during flowering. Ear inspection after maturity shall also be done by the Certification Agency.

Field Standards

Isolation distance and other plant contaminants shall be as specified in the table below:

Contaminants	Isolation distance	
	Foundation	Certified
Fields of other varieties	400 m	200 m
Fields of same variety not conforming to purity	400 m	200 m
Off-types shedding pollen during flowering of seed variety	1%	1%

Seed Standards

Parameters	Foundation	Certified
Germination (minimum)	90%	90%
Pure seed (minimum)	98%	98%
Inert matter (maximum)	2%	2%
Other crop seeds (max no.)	5 per kg	10 per kg
Other distinguishable variety seeds (max no.)	10/kg	20/kg
Weed seeds (max no.)	None	None
Seed moisture	12%	12%

Note: Seed ears after harvest shall not contain in excess of 1% of off-type ears including ears of off-colored kernels. Shelling of the seeds ears is to be done after obtaining approval from the Certification Agency.

2.3. **WHEAT** (*Triticum spp*.)

Land Requirements

Land intended to be used for seed production shall be free of volunteer plants of any variety or closely related species.

Field Inspections

A minimum of two field inspections shall be made between ear emergences and harvesting of the seed crop.

Field Standards

Isolation distance and other plant contaminants shall be as specified in the table below:

Contaminants	Isolation distance	
	Foundation	Certified
Fields of other varieties	3 m	3 m
Fields of same variety not conforming to purity	3 m	3 m
Fields of wheat, triticale or rye with loose smut infection	150 m	150 m
Off-types	0.05%	0.20%
Inseparable other crops*	0.01%	0.05%
Plants affected by seed-borne diseases	0.10%	0.50%

* include barley, oats, triticale

Seed Standards

Parameters	Foundation	Certified
Germination (minimum)	90%	85%
Pure seed (minimum)	98%	97%
Inert matter (maximum)	2%	3%
Other crop seeds (max no.)	10/kg	20/kg
Other variety seeds (max no.)	10/kg	20/kg
Weed seeds (max no.)	10/kg	20/kg
Objectionable weed seeds* (max no.)	2/kg	5/kg
Seed moisture	12%	12%

* Seeds of *Phalaris* minor

2.4. **QUINOA** (*Chenopodium quinoa*)

Land Requirements

Land intended to be used for seed production shall be free of volunteer plants.

Field Inspections

A minimum of two field inspections shall be made – first during flowering and the second at maturity/before harvesting.

Field Standards

Isolation distance and other plant contaminants shall be as specified in the table below:

Contaminants	Isolation distance	
	Foundation	Certified
Fields of other varieties	3 m	3 m
Fields of same variety not conforming to variety purity requirements for certification	3 m	3 m
Off-types*	0.05%	0.10%

* Off-types – maximum permitted at the final inspection.

Seed Standards

Parameters	Foundation	Certified
Germination (minimum)	85%	80%
Pure seed (minimum)	98%	97%
Inert matter (maximum)	2%	3%
Other crop seeds (max no.)	10/kg	20/kg
Weed seeds (max no.)	10/kg	20/kg
Seed moisture	12%	12%

2.5. **FINGER MILLET** (*Eleusine coracana*)

Land Requirements

Land intended to be used for seed production shall be free of volunteer plants.

Field Inspections

A minimum of two field inspections shall be made – first during flowering and the second at maturity/before harvesting.

Field Standards

Isolation distance and other plant contaminants shall be as specified in the table below:

Contaminants	Isolation distance	
	Foundation	Certified
Fields of other varieties	3 m	3 m
Fields of same variety not conforming to variety purity requirements for certification	3 m	3 m
Off-types*	0.05%	0.10%

* Off-types – maximum permitted at the final inspection.

Seed Standards

Parameters	Foundation	Certified
Germination (minimum)	85%	80%
Pure seed (minimum)	97%	98%
Inert matter (maximum)	2%	3%
Other crop seeds (max)	10/kg	20/kg
Weed seeds (max)	10/kg	20/kg
Seed moisture	12%	12%

2.6. **RAPESEED-MUSTARD** (*Brassica campestris* and *B. juncea*)

Land Requirements

Land to be used for seed production of rape seed and mustard shall be free of volunteer plants.

Field Inspections

A minimum of three field inspections shall be made, the first before flowering, the second from flowering to fruiting and the third at maturity and prior to harvesting.

Field Standards

Isolation distance and other plant contaminants shall be as specified in the table below:

Contaminants	Isolation distance	
	Foundation	Certified
Fields of other varieties of same species	150 m	100 m
Fields of same variety not conforming to purity	150 m	100 m
Fields of other Brassica spp.*	150 m	100 m
Off-types (max)	0.10%	0.50%
Objectionable weed plants**	0.05%	0.10%

* including *B. chinensis, B. rapa, B. napus, B. nigra.* ** *Argemone mexicana*

Seeds Standards

Parameters	Foundation	Certified
Germination (minimum)	90%	85%
Pure seed (minimum)	97%	97%
Inert matter (maximum)	2%	3%
Other crop seeds (max no.)	10/kg	20/kg
Other distinguishable variety seeds (max no.)	10/kg	20/kg
Total weed seeds (max no.)	10/kg	20/kg
Objectionable weed seeds (max no.)*	5/kg	10/kg
Seed moisture	8%	8%

* Seeds of *Argemone mexicana*

2.7. **SOYBEAN** (*Glycine max*)

Land Requirements

Land intended to be used for Soybean seed production shall be free of volunteer plants.

Field Inspections

A minimum of two field inspections shall be made –first during flowering and the second before harvesting after the leaves have shed.

Field Standards

Isolation distance and other plant contaminants shall be as specified in the table below:

Contaminants	Isolation distance	
	Foundation	Certified
Fields of other varieties	3 m	3 m
Fields of same variety not conforming to variety purity requirement for certification	3 m	3 m
Off-types*	0.10%	0.50%

*maximum permitted at the final inspection.

Seeds Standards

Parameters	Foundation	Certified
Germination (min.)	85%	80%
Pure seed (min.)	97%	98%
Inert matter (max.)	2%	3%
Other crop seeds (max. no.)	None	10/kg
Weed seeds (max. no.)	5/kg	10/kg
Seed moisture	12%	12%

2.8. **SUNFLOWER** (*Helianthus annuus* L)

Land Requirements

A seed crop of sunflower shall not be eligible for certification if planted on land on which the same kind of crop was grown in the previous year unless the crop(s) grown in the previous year was of the same variety and of an equivalent or high class of certified seed and was/were certified.

Field Inspections

A minimum of three inspections shall be made as follows:

i. The first inspection shall be made at the stage of 6-7 pairs of leaves in order to determine isolation, volunteer plants, designated disease and other relevant factors.
ii. The second inspection shall be made during flowering to check isolation, off-types and other relevant factors.
iii. The third inspection shall be made at maturity and prior to harvesting to verify disease, true nature of plant and head, characteristics of seeds and other relevant factors.

Field Standards

Isolation distance and other plant contaminants for sunflower seed fields shall be as specified in the table below:

Contaminants	Isolation distance	
	Foundation	Certified
Fields of other varieties	400m	200m
Fields of the same variety not conforming to varietal purity requirements for certification and wild *Helianthus spp*.	400m	200m
*Off-types at and after flowering	0.10%	0.20%
**Objectionable weed plants at and after flowering	None	None
Plants infected by downy mildew disease (*Plasmopara halstedii*) at each inspection	0.050%	0.50%
Plants infested with *Orobanche cumana* at final inspection	None	None

*Sterile plants of the same variety shall not be considered as Off-types

**Objectionable weed shall be: wild *Helianthus spp.*

Seed Standards

Parameters	Foundation	Certified
Germination (minimum)	95%	95%
Pure seed (minimum)	98%	97%
Inert matter (maximum)	2%	3%
Other crop seeds (max no.)	10/kg	20/kg
Weed seeds (max no.)	10/kg	20/kg
Seed moisture	9%	9%

2.9. **MUNGBEAN** (*Vigna radiata*)

Land Requirements

Land intended to be used for Mungbean seed production shall be free of volunteer plants.

Field Inspections

A minimum of two field inspections shall be made – first before flowering and the second at flowering/fruit stage

Field Standards

Isolation distance and other plant contaminants shall be as specified in the table below:

Contaminants	Isolation distance	
	Foundation	Certified
Fields of other varieties	10 m	5 m
Fields of same variety not conforming to variety purity requirements for certification	10 m	5 m
Off-types*	0.10%	0.20%

* Off-types – maximum permitted at the final inspection.

Seed Standards

Parameters	Foundation	Certified
Germination (minimum)	85%	80%
Pure seed (minimum)	97%	98%
Inert matter (maximum)	2%	3%
Other crop seeds (max No.)	5/kg	10/kg
Weed seeds (max no.)	5/kg	10/kg
Seed moisture	9%	9%

3. SPECIFIC SEED STANDARDS FOR VEGETABLE CROPS

General requirements

- The General seed certification standards are basic and together with the following specific standards constitute the standards for certification of vegetable seeds.
- Land to be used for seed production shall be free of volunteer plants.

3.1. **ASPARAGUS** (*Asparagus officinalis* L.)

Field standards

Seed fields shall be isolated from the contaminants as specified below:

Contaminants	Minimum Isolation Distance	
	Foundation	Certified
Fields of other varieties	500 m	300 m
Fields of the same variety not conforming to varietal purity	500m	300 m

Field Inspection

A minimum of three inspections shall be made, the first at crowning stage, the second during flowering and fruiting stage and the third at seed maturity and prior to harvesting.

Specific Requirement

Factor	Maximum permitted	
	Foundation	Certified
*Off-types	0.10 %	0.20 %

* Maximum permitted at and after flowering

Seed Standards

Factor	Standard for each class	
	Foundation	Certified
Pure seed (minimum)	96%	96%
Inert matter (maximum)	4%	4%
Other crop seeds (maximum)	5 Nos./kg	10 Nos./kg
Weed seeds (maximum)	5 Nos./kg	10 Nos./kg
Germination (minimum)	70%	70%
Moisture (maximum)	8%	8%

Asparagus Seedling Standards

i. The Seedlings should be 12 to 18 months old.
ii. The Seedlings should be at least 1 foot in height above ground with 4-6 stems.
iii. The Seedlings should have well developed root system (Crown with several large and well-formed buds) without any spots or off-color blemishes.
iv. The seedlings should not show any evidence of freeze, injury, serious mechanical damage or pest and disease infestation.
v. Seedlings roots and crown should not be dry.

3.2. **BEANS** (*Phaseolus vulgaris*)

Field standards

Seed fields shall be isolated from the contaminants as specified below:

Contaminants	Minimum isolation distance	
	Foundation	Certified
Fields of other varieties	10 m	5 m

Field Inspection

A minimum of three inspections shall be made, the first before flowering, the second at the flowering and pod formation stage and the third at pod maturity stage and prior to harvesting.

Specific Requirement

Factor	Maximum permitted	
	Foundation	Certified
*Off-types	0.10 %	0.20 %
**Plants affected by seed borne diseases	0.10 %	0.20 %

*(Maximum permitted at flowering and pod formation) **Seed borne diseases shall be: Bacterial blight (*Xanthomonas* spp.), Anthracnose (*Colletotrichum* spp.), Bean Mosaic (*Macrosiphum pisi* Kalt).

Seed Standards

Factor	Standard for each class	
	Foundation	Certified
Pure seed (minimum)	98%	98%
Inert matter (maximum)	2%	2%
Other crop seeds (maximum)	None	None
Weed seeds (maximum)	None	None
Other distinguishable varieties (maximum)	5 Nos./kg	10 Nos./kg
Germination (minimum)	75%	75%
Moisture (maximum)	9%	9%

3.3. **BEET ROOT** (*Beta vulgaris*)

Field Standards

Seed fields shall be isolated from the contaminants as specified below:

Contaminants	Minimum isolation distance	
	Foundation	Certified
Fields of other varieties	1600 m	1000 m
Fields of the same variety not conforming to varietal purity.	1600 m	1000 m

Field Inspection

A minimum of two inspections shall be made, the first before flowering and the second at the flowering stage.

Specific requirements

Factor	Maximum permitted	
	Foundation	Certified
*Off-types	0.10 %	0.20 %

*Maximum permitted at and flowering stage

Seed Standards

Factor	Standard for each class	
	Foundation	Certified
Pure seed (minimum)	96%	96%
Inert matter (maximum)	4%	4%
Other crop seeds (maximum)	5 Nos./kg	10 Nos./kg
Weed seeds (maximum)	5 Nos./kg	10 Nos./kg
Germination (minimum)	60%	60%
Moisture (maximum)	9%	9%

3.4. **BITTER GOURD** (*Momordica charantia* L.)

Field standards

Seed fields shall be isolated from the contaminants as specified below:

Contaminants	Minimum isolation distance	
	Foundation	Certified
Fields of other varieties	1000 m	500 m
Fields of the same variety not confirming to varietal purity requirements for certification and from balsam apple. *Momordica balsamina* L., M. *cochinchinensis* Spreng.	1000 m	500 m

Field Inspection

A minimum of three inspections shall be made, the first before flowering, the second at the flowering and fruiting stage and the third at mature fruit stage and prior to harvesting.

Specific Requirement

Factor	Maximum permitted %	
	Foundation	Certified
*Off-types	0.10 %	0.20 %
**Objectionable wed plants	None	None

*Maximum permitted at and after flowering. ** Objectionable weeds shall be: *Momordica balsamina* L.; *M. Cochinchinensis* Spreng.

Seed Standards

Factor	Standard for each class	
	Foundation	Certified
Pure seed (minimum)	98%	98%
Inert matter (maximum)	2%	2%
Other crop seeds (maximum)	None	None
Weed seeds (maximum)	None	None
Other distinguishable varieties (maximum)	5 Nos./kg	10 Nos./kg
Germination (minimum)	60%	60%
Moisture (maximum)	7%	7%

3.5. **BOTTLE GOURD** (*Lagenaria siceraria*)

Field standards

Seed fields shall be isolated from the contaminants shown below:

Contaminants	Minimum isolation distance	
	Foundation	Certified
Fields of other varieties	1000 m	500 m
Fields of the same variety not confirming to varietal purity requirements for certification.	1000 m	500 m

Field Inspection

A minimum of three inspections shall be made, the first before flowering, the second at the flowering and fruiting stage and the third at mature fruit stage and prior to harvesting.

Specific Requirement

Factor	Maximum permitted	
	Foundation	Certified
*Off-types	0.10 %	0.20 %

*Maximum permitted at and after flowering.

Seed Standards

Factor	Standard for each class	
	Foundation	Certified
Pure seed (minimum)	98%	98%
Inert matter (maximum)	2%	2%
Other crop seeds (maximum)	None	None
Weed seeds (maximum)	None	None
Germination (minimum)	60%	60%
Moisture (maximum)	7%	7%

3.6. **BRINJAL** (*Solanum melongena* L.)

Field standards

Seed fields shall be isolated from the contaminants as specified below:

Contaminants	Minimum isolation distance	
	Foundation	Certified
Fields of other varieties	200 m	100 m
Fields of the same variety not conforming to varietal purity.	200 m	100 m

Field Inspection

A minimum of three inspections shall be made, the first before flowering, the second at the flowering and fruiting stage and the third at mature fruit stage and prior to harvesting.

Specific Requirement

Factor	Maximum permitted	
	Foundation	Certified
*Off-types	0.10 %	0.20 %
**Plants affected by seed borne disease	0.10 %	0.50 %

* Maximum permitted at and after flowering in the case of off-types and at the final inspection in the case of seed borne diseases. **Seed borne diseases shall be: *Phomopsis* blight (*Phomopsis vexans*)

Seed Standards

Factor	Standard for each class	
	Foundation	Certified
Pure seed (minimum)	98%	98%
Inert matter (maximum)	2%	2%
Other crop seeds (maximum)	None	None
Weed seeds (maximum)	None	None
Germination (minimum)	70%	70%
Moisture (maximum)	8%	8%

3.7. **CABBAGE** (*Brassica oleracea var. Capitat*a L.)

Field standards

Seed fields shall be isolated from the contaminants by the distances specified below:

Contaminants	Minimum isolation distance	
	Foundation	Certified
Fields of other varieties	1600 m	1000 m
Fields of the same variety not confirming to varietal purity requirements for certification and from the following varieties of *Brassica oleracea*(L)*;* *B. oleracea* (L) var. *oleracea*: Wild Cabbage *B. oleracea* (L) var. *ramosa*: Branching bush kale *B. oleracea* (L) var. *mellecapitata*: Helm: headed kale *B. oleracea* (L) var. *gemmifera*DC: Brussel sprouts *B. oleracea* (L) var. *acephala*DC: Fodder kale *B. oleracea* (L) var. *viridis*L: Collards, tree kale *B. oleracea* (L) var. *gongylodes*L: Knol-khol *B. oleracea* (L) var. *costata*L: Portugal cabbage *B. oleracea* (L) var. *subauda*L: Savoy cabbage *B. oleracea* (L) var. *italic* Plenck: Broccoli *B. oleracea* (L) var. *botrytis* L: Cauliflower	1600 m	1000 m

Field Inspection

A minimum of three inspections shall be made, the first before the marketable stage of the heads, the second when the heads are at the marketable stage and the third at the flowering stage.

Specific Requirement

Factor	Maximum permitted (%)	
	Foundation	Certified
*Off-types	0.10	0.20
**Plants affected by seed borne disease	0.10	0.50

* Standards for off-types shall be met at and flowering and for seed borne diseases at final inspection.

**Seed borne diseases shall be: Black leg (*Leptosphaeria maculans* (Desm) Ces & de Not), Black rot (*Xanthomonas campestris* pv. *campestris* (Pamm) Dawson), Soft rot (*Erwinia carotovora* L.R. Jones)

Seed Standards

Factor	Standard for each class	
	Foundation	Certified
Pure seed (minimum)	98%	98%
Inert matter (maximum)	2%	2%
Other crop seeds (maximum)	5 Nos./kg	10 Nos./kg
Weed seeds (maximum)	5 Nos./kg	10 Nos./kg
Germination (minimum)	70%	70%
Moisture (maximum)	7%	7%

3.8. **CARROT** (*Daucus carota* L)

Field standards

Carrot seed field shall be isolated from the contaminants as specified below:

Contaminants	Minimum distance			
	Mother root production stage		Seed production stage	
	Foundation	Certified	Foundation	Certified
Fields of other varieties	5 m	5 m	1000 m	800 m
Fields of same variety not conforming to varietal purity requirements for certification	5 m	5 m	1000 m	800 m

Field Inspection

Mother Root production stage

A minimum of two inspections shall be made as follows:

- The first inspection shall be made after 20-30 days of the sowing in order to determine isolation, volunteer plants, outcrosses, off-types and other relevant factors.
- Second inspection shall be made after the mother roots have been lifted to verify the true characteristics of roots.

Seed Production Stage

A minimum of four inspections shall be made as follows:

- First inspection shall be made before flowering in order to determine isolation, volunteer plants, outcrosses and other relevant factors;
- Second and the third inspections shall be made during flowering to check isolation, off-types and other relevant factors;
- The fourth inspection shall be made at maturity to verify the true nature if umbels.

Specific Requirement

Factor	Maximum permitted	
	Foundation	Certified
*Roots not confirming to varietal characteristics including forked roots (by number)	0.10 %	0.20 %
** Off-types	0.10 %	0.20 %

* Maximum permitted at second inspection at mother root production stage.
** Maximum permitted at and after flowering at seed production stage.

Seed Standards

Factor	Standard for each class	
	Foundation	Certified
Pure seed (minimum)	95%	95%
Inert matter (maximum)	5%	5%
Other crop seeds (maximum)	5 Nos./kg	10 Nos./kg
Weed seeds (maximum)	5 Nos./kg	10 Nos./kg
Other distinguishable varieties (maximum)	5 Nos./kg	10 Nos./kg
Germination (minimum)	60%	60%
Moisture (maximum)	8%	8%

3.9. **CAULIFLOWER AND BROCCOLI** (*Brasica oleracea* (L) var. botrytis & *Brassica oleracea* (L) var. Italiaca plenck)

Field standards

Seed fields shall be isolated from the contaminants as specified below:

Contaminants	Minimum isolation distance	
	Foundation	Certified
Fields of other varieties	1600 m	1000 m
Fields of the same variety not confirming to varietal purity requirements for certification and from the following varieties of *Brassica oleracea*(L)*;*		
B. oleracea(L) var. *oleracea*: Wild Cabbage		
B. oleracea(L) var. *capitata*: Cabbage		
B. oleracea(L) var. *ramosa*: Branching bush kale		
B. oleracea(L) var. *mellecapitata*: Helm: headed kale	1600 m	1000 m
B. oleracea(L) var. *gemmifera*DC: Brussel sprouts		
B. oleracea(L) var. *acephala*DC: Fodder kale		
B. oleracea(L) var. *viridis*L: Collards, tree kale		
B. oleracea(L) var. *gongylodes*L: Knol-khol		
B. oleracea(L) var. *costata*L: Portugal cabbage		
B. oleracea(L) var. *subauda*L: Savoy cabbage		

Field Inspection

A minimum of three inspections shall be made, the first before the marketable stage, the second at the marketable stage and the third at the flowering stage.

Specific requirements

Factor	Maximum permitted	
	Foundation	Certified
*Off-types	0.10 %	0.20 %
**Plants affected by seed borne disease	0.10 %	0.50 %

* Standards for off-types shall be met at and flowering and for seed borne diseases at final inspection.
**Seed borne diseases shall be: Black leg (*Leptosphaeria maculans* (Desm) Ces & de Not), Black rot (*Xanthomonas campestri s*pv. *campestris* (Pamm) Dawson), Soft rot (*Erwinia carotovora* L.R. Jones)

Seed Standards

Factor	Standard for each class	
	Foundation	Certified
Pure seed (minimum)	98%	98%
Inert matter (maximum)	2%	2%
Other crop seeds (maximum)	5 Nos./kg	10 Nos./kg
Weed seeds (maximum)	5 Nos./kg	10 Nos./kg
Germination (minimum)	70%	70%
Moisture (maximum)	7%	7%

3.10. **CELERY** (*Apium graveolens* (L) var. *dulce* (Mill.) DC.)

Field Standards

Fields should be isolated from contaminants as specified below:

Contaminants	Minimum isolation distance (meters)	
	Foundation	Certified
Fields of other varieties	500 m	300 m
Fields of the same variety not confirming to varietal purity requirements for certification and from celeriac (turnip – rooted celery): *Apium graveolens* (L) var. *rapaceum* DC.	500 m	300m

Field Inspection

A minimum of three inspections should be made:

The first inspection should be made before flowering in order to check whether isolation standards have been followed, to check for volunteer plants and other relevant factors. The second during the flowering and fruiting stage and third inspections should be carried out at maturity and prior to harvest.

Specific requirements

Factor	Maximum permitted (%)	
	Foundation	Certified
*Off-types	0.10 %	0.20 %
**Plants affected by seed borne disease	0.10 %	0.50 %

* Standards for off-types shall be met at and flowering and for seed borne diseases at final inspection.
**Seed borne diseases shall be: Leaf blight (*Septoria apiicola* Speg.) Root rots (*Phoma apiicola* Kleb.)

Seed Standards

Factor	Standard for each class	
	Foundation	Certified
Pure seed (minimum)	97%	97%
Inert matter (maximum)	3%	3%
Other crop seeds (maximum)	5 Nos./kg	10 Nos./kg
Weed seeds (maximum)	5 Nos./kg	10 Nos./kg
Germination (minimum)	70%	70%
Moisture (maximum)	8%	8%

3.11. **CHINESE CABBAGE (***Brassica chinensis* L.)

Field Standards

Seed fields shall be isolated from the contaminants as specified below:

Contaminants	Minimum isolation distance	
	Foundation	Certified
Fields of other varieties of same species	1600 m	1000 m
Fields of the same variety not confirming to varietal purity requirements for certification and from any other species of *Brassica*; *Brassica rapa* (L): Turnip *Brassica juncea* (L): Indian Mustard, Mustard Green *Brassica niger* (L): True Mustard or Black Mustard *Brassica alba* (L): White Mustard	1600m	1000 m

Field Inspection

A minimum of three inspections shall be made, the first before the marketable stage of the heads, the second when the heads are at the marketable stage and the third at the flowering stage.

Specific Requirements

Factor	Maximum permitted	
	Foundation	Certified
*Off-types	0.10 %	0.20%
**Plants affected by seed borne disease	0.10%	0.50%

*Standards for off-types shall be met at and flowering and for seed borne diseases at final inspection.
**Seed borne disease shall be: Black rot (*Xanthomonas campestri s*pv. *campestris* (Pamm) Dawson), Black leg (*Leptosphaeria maculans* (Desm) Ces & de Not)

Seed Standards

Factor	Standard for each class	
	Foundation	Certified
Pure seed (minimum)	98%	98%
Inert matter (maximum)	2%	2%
Other crop seeds (maximum)	5 Nos./kg	10 Nos./kg
Weed seeds (maximum)	5 Nos./kg	10 Nos./kg
Germination (minimum)	70%	70%
Moisture (maximum)	7%	7%

3.12. **CHILLI** (*Capsicum annum* L.*)* & Capsicum (Sweet pepper)

Field standards

Seed fields shall be isolated from the contaminants as specified below:

Contaminants	Minimum isolation distance	
	Foundation	Certified
Fields of other varieties	400 m	200 m
Fields of the same variety not confirming to varietal purity requirements for certification	400 m	200 m
Fields of Capsicum from Chilli and vice verse.	400 m	250 m

Field Inspection

A minimum of three inspections shall be made, the first before flowering, the second at the flowering and fruiting stage and the third at mature fruit stage and prior to harvesting.

Specific Requirements

Factor	Maximum permitted	
	Foundation	Certified
*Off-types	0.10 %	0.20 %
**Plants affected by seed borne disease	0.10 %	0.20 %

*Maximum permitted at and flowering in the case of off-types and at the final inspection in the case of seed borne diseases.
**Seed borne disease shall be:Leaf blight (*Alternaria solani*, Anthracnose (*Colletrotrichum capsici*)

Seed Standards

Factor	Standard for each class	
	Foundation	Certified
Pure seed (minimum)	98%	98%
Inert matter (maximum)	2%	2%
Other crop seeds (maximum)	5 Nos./kg	10 Nos./kg
Weed seeds (maximum)	5 Nos./kg	10 Nos./kg
Germination (minimum)	60%	60%
Moisture (maximum)	8%	8%

3.13. **CORIANDER** (*Coriandrum sativum*)

Field Standards

Seed fields shall be isolated from the contaminants as specified below:

Contaminants	Minimum isolation distance	
	Foundation	Certified
Fields of other varieties	200 m	100 m
Fields of the same variety not conforming to varietal purity.	200 m	100 m

Field Inspection

A minimum of three inspections shall be made; the first is done within 45 days of planting followed by second one during 50% flowering to check isolation, volunteer plants, off-types and other relevant factors. The third inspection shall be made at maturity and prior to harvesting to verify the true nature of the plants.

Specific requirements

Factor	Maximum permitted	
	Foundation	Certified
Off-type plants	0.10 %	0.20 %
*Objectionable weed plants	None	None

*Objectionable weeds *Lathyrus*

Seed Standards

Factor	Standard for each class	
	Foundation	Certified
Pure seed (minimum)	97%	97%
Inert matter (maximum)	3%	3%
Other crop seeds (maximum)	10 Nos./kg	20 Nos./kg
Objectionable weed seeds (maximum)	None	None
Germination (minimum)	65%	65%
Moisture (maximum)	10%	10%

3.14. **CUCUMBER** (*Cucumis sativus* L.)

Field Standards

Seed fields shall be isolated from the contaminants as specified below:

Contaminants	Minimum isolation distance	
	Foundation	Certified
Fields of other varieties	1000 m	500 m
Fields of the same variety not conforming to varietal purity.	1000 m	500 m

Field Inspection

A minimum of three inspections shall be made, the first before flowering, the second at the flowering and fruiting stage and the third at mature fruit stage and prior to harvesting.

Specific requirements

Factor	Maximum permitted	
	Foundation	Certified
*Off-type plants	0.10 %	0.20 %
**Objectionable weed plants	None	None

*Maximum permitted at and after flowering
**Objectionable weeds: *Cucumis hardwickii* Royale

Seed Standards

Factor	Standard for each class	
	Foundation	Certified
Pure seed (minimum)	98%	98%
Inert matter (maximum)	2%	2%
Other crop seeds (maximum)	5 Nos./kg	10 Nos./kg
Total weed seeds (maximum)	None	None
Objectionable weed seeds (maximum)	None	None
Germination (minimum)	65%	65%
Moisture (maximum)	7%	7%

3.15. **GARLIC** (*Allium sativum* L)

Field Standards

All certified classes hall be produced from cloves contained from the bulbs whose source and identity may be assured.

Seed fields shall be isolated from the contaminants specified below:

Contaminants	Minimum isolation distance	
	Foundation	Certified
Fields of other varieties	5 m	5 m
Fields of the same variety not conforming to varietal purity.	5 m	5 m

Field Inspection

A minimum of two inspections shall be made; the first one shall be made when plants are large enough to verify isolation, off types and other relevant factors. Second one shall be made when leaves begin to fall and before lifting of the bulbs.

Specific requirements

Factor	Maximum permitted	
	Foundation	Certified
*Off-type	0.10 %	0.20 %

*Maximum permitted at final inspection. All off-type plants should be rouged out along with bulbs.

Seed (Planting stakes) Standards

i. The average diameter of each bulb shall not be less than 2.5cm or 25gm in weight.

ii. The bulb material shall be clean, healthy and firm and shall conform to varietal characteristics. The bulb not conforming to varietal characteristics shall not exceed 0.10% and 0.20% (by number) for foundation and certified seed classes respectively.

iii. Cut, bruised, cracked, immature or those damaged by insects, slugs or worms shall not exceed more than 2.0% (by weight).

3.16. **LETTUCE** *(Lactuca sativa* L*)*

Field Standards

Seed fields shall be isolated from the contaminants specified below:

Contaminants	Minimum isolation distance	
	Foundation	Certified
Fields of other varieties	5 m	5 m
Fields of the same variety not conforming to varietal purity and wild lettuce (*Lactuca serriola* L)	5 m	5 m

Field Inspection

A minimum of three inspections shall be made, the first before heads have formed in heading types, and before full growth stage in non-heading types, the second when heads have formed in heading types, and at full grown stage in non-heading types and the third at the flowering stage.

Specific requirements

Factor	Maximum permitted	
	Foundation	Certified
*Off-type	0.10 %	0.20 %
**Objectionable weed plants	0.10 %	0.50 %

*Maximum permitted at the final inspection.
**Objectionable weed shall be: wild lettuce (*Lactuca serriola* L)

Seed Standards

Factor	Standard for each class	
	Foundation	Certified
Pure seed (minimum)	98%	98%
Inert matter (maximum)	2%	2%
Other crop seeds (maximum)	None	None
Total weed seeds (maximum)	5 Nos./kg	10 Nos./kg
Objectionable weed seeds (maximum)	2 Nos./kg	5 Nos./kg
Other distinguishable weeds (maximum)	10/kg	20/kg
Germination (minimum)	70%	75%
Moisture (maximum)	8%	8%

3.17. **MUSTARD GREEN** (*Brassica juncea)* and **JAPANESE GREEN** (*Brassica rapa Chinensis)*

Field Standards

Seed fields shall be isolated from the contaminants specified below:

Contaminants	Minimum isolation distance	
	Foundation	Certified
Fields of the same variety of *Brassica* spp. (Cabbage, Cauliflower, Radish, Mustard, Chinese cabbage, Turnip)	5 m	5 m

Field Inspection

A minimum of three field inspections shall be made, the first before flowering, the second from flowering to fruiting and the third at maturity and prior to harvesting.

Specific requirements

Factor	Maximum permitted	
	Foundation	Certified
*Off-types	0.10 %	0.20 %

*Maximum permitted at and flowering stage.

Seed Standards

Factor	Standard for each class	
	Foundation	Certified
Pure seed (minimum)	98%	98%
Inert matter (maximum)	3%	3%
Other crop seeds (maximum)	5 Nos./kg	10 Nos./kg
Total weed seeds (maximum)	5 Nos./kg	10 Nos./kg
Germination (minimum)	70%	75%
Moisture (maximum)	9%	9%

3.18. **OKRA** (*Abelmoschus esculentus* L) Moench)

Field Standards

Seed fields shall be isolated from the contaminants by the distances specified in the table below:

Contaminants	Minimum isolation distance	
	Foundation	Certified
Fields of other varieties	400 m	200 m
Fields of the same variety not conforming to varietal purity and wild okra.	400 m	200m

Field Inspection

A minimum of three inspections shall be made, the first before flowering, the second during peak flowering and fruiting stage and the third at mature fruit stage and prior to harvesting.

Specific requirements

Factor	Maximum permitted	
	Foundation	Certified
*Off-types	0.10 %	0.20 %
**Objectionable weed plants	None	None

*Maximum permitted at and after flowering
**Objectionable weeds shall be wild okra: *A. ficulneus, A. manihot* and *A. moschatus*

Seed standards

Factor	Standard for each class	
	Foundation	Certified
Pure seed (minimum)	99%	99%
Inert matter (maximum)	1%	1%
Other crop seeds (maximum)	None	None
Objectionable weed seeds (maximum)	None	None
Other distinguishable varieties (maximum)	10 Nos./kg	20 Nos./kg
Germination including hard seeds (minimum)	65%	65%
Moisture (maximum)	10%	10%

3.19. ONION (*Allium cepa* L) and BUNCHING ONION (*Allium fistulosum)*

Field Standards

Onion seed fields shall be isolated from the contamination as specified below:

Contaminants	Minimum distance			
	Mother bulb production stage		Seed production stage	
	Foundation	Certified	ɔundation	Certified
Fields of other varieties	5 m	5 m	1000 m	500 m
Fields of same variety not conforming to varietal purity requirements for certification.	5 m	5 m	1000 m	500m

Field Inspection

Mother bulb production stage

A minimum of two inspections shall be made as follows:

- The first inspection shall be made after transplanting of seedlings in order to determine isolation, volunteer plants, off-types including bolters and other relevant factors;
- The second inspection shall be made after the bulbs have been lifted to verify the true characteristics of bulbs.

Seed production stage

A minimum of four inspections shall be made as follows:

- The first inspection shall be made before flowering in order to determine isolation, volunteer plants, off-types including bolters and other relevant factors;
- The second and third inspections shall be made during flowering to check isolation, off-types and other relevant factors;
- The fourth inspection shall be made at maturity to verify the true nature of plant and other relevant factors.

Specific requirements

Factor	Maximum permitted	
	Foundation	Certified
*Bulbs not conforming to varietal characteristics	0.10 %	0.20 %
**Off-types	0.10 %	0.20 %

* Maximum permitted at second inspection at mother bulb production stage.
**Maximum permitted at and after flowering at seed production stage.

Seed Standards

Factor	Standard for each class	
	Foundation	Certified
Pure seed (minimum)	98%	98%
Inert matter (maximum)	2%	2%
Other crop seeds (maximum)	5 Nos./kg	10 Nos./kg
Weed seeds (maximum)	5 Nos./kg	10 Nos./kg
Germination (minimum)	70%	70%
Moisture (maximum)	8%	8%

3.20. **PARSLEY** (*Petroselinum crispum* (Mill.) Nym)

Field Standards

Fields should be isolated from contaminants as specified below:

Contaminants	Minimum isolation distance	
	Foundation	Certified
Fields of other varieties	500 m	300 m
Fields of the same variety not conforming to varietal purity requirements for certification.	500 m	300 m

Field Inspection

A minimum of three inspections shall be made, the first before flowering, the second during flowering and fruiting stage the third at maturity and prior to harvesting.

Specific Requirements

Factor	Maximum permitted	
	Foundation	Certified
*Off-types	0.10 m	0.20 m
**Plants affected by seed borne disease	0.10 m	0.50 m

*Standard for Off-types shall be met at flowering and for seed borne diseases at final inspection.
**Seed borne disease shall be: Leaf spot (*Septoria petroselini* Desm.)

Seed Standards

Factor	Standard for each class	
	Foundation	Certified
Pure seed (minimum)	97%	97%
Inert matter (maximum)	3%	3%
Other crop seeds (maximum)	5 Nos./kg	10 Nos./kg
Weed seeds (maximum)	5 Nos./kg	10 Nos./kg
Germination (minimum)	70%	70%
Moisture (maximum)	8%	8%

3.21. **PEAS** (*Pisum sativum*)

Field Standards

Seed fields shall be isolated from the contaminants as specified below:

Contaminants	Minimum isolation distance	
	Foundation	Certified
Fields of other varieties	10 m	5 m
Fields of the same variety not conforming to varietal purity and wild okra.	10 m	5 m

Field Inspection

A minimum of three inspections shall be made, the first before flowering, the second at the flowering and fruiting stage and the third at mature fruit stage and prior to harvesting.

Specific requirements

Factor	Maximum permitted	
	Foundation	Certified
*Fields of other varieties	0.10 %	0.20 %

*Maximum permitted at the final inspection

Seed Standards

Factor	Standard for each class	
	Foundation	Certified
Pure seed (minimum)	98%	98%
Inert matter (maximum)	2%	2%
Other crop seeds (maximum)	None	None
Weed seeds (maximum)	None	None
Other distinguishable varieties (maximum)	5 Nos./kg	10 Nos./kg
Germination including hard seeds (minimum)	75%	75%
Moisture (maximum)	9%	9%

3.22. **PUMPKIN** (*Cucurbita moschata*)

Field Standards

Seed fields shall be isolated from the contaminants as specified below:

Contaminants	Minimum isolation distance	
	Foundation	Certified
Fields of other varieties	1000 m	500 m
Fields of the same variety not conforming to varietal purity and from winter squash (*Cucurbita maxima, C. pepo and C. mixta*).	1000 m	500 m

Field Inspection

A minimum of three field inspections should be done from vegetative to fruit maturity. The first inspection is conducted during vegetative stage before flowering followed by second one at flowering and fruiting. The final one should be scheduled during fruit maturity stage prior to harvest.

Specific requirements

Factor	Maximum permitted	
	Foundation	Certified
*Off-types	0.10 %	0.20 %

* Maximum permitted at and after flowering

Seed Standards

Factor	Standard for each class	
	Foundation	Certified
Pure seed (minimum)	98%	98%
Inert matter (maximum)	2%	2%
Other crop seeds (maximum)	None	None
Weed seeds (maximum)	None	None
Germination (minimum)	60%	60%
Moisture (maximum)	7%	7%

3.23. **RADISH** (*Raphanus sativus* L)

Field Standards

Seed fields shall be isolated from the contaminants as specified in Table below:

Contaminants	Minimum distance			
	Mother root production stage		Seed production stage	
	Foundation	Certified	Foundation	Certified
Fields of other varieties	5 m	5 m	1600 m	1000 m
Fields of same variety not conforming to varietal purity requirements for certification and rat-tail radish (*Raphanus caudatus* L.)	5 m	5 m	1600 m	1000m

Field inspection

Mother Root production stage

A minimum of two inspections shall be made as follows;

- The first inspection shall be made after 20-30 days of sowing in order to determine isolation, Off-types and other relevant factors;
- The second inspection shall be made after the roots have been lifted to verify the true characteristics of the roots.

Seed production stage

A minimum of one inspection shall be made during flowering to check isolation, Off-types, designated diseases and other relevant factors.

Specific Standards

Factor	Maximum permitted	
	Foundation	Certified
*Root not conforming to varietal characteristics (by number)	0.10 %	0.20 %
**Off-types	0.10 %	0.20 %
***Plants affected by seed borne diseases at final inspection	0.10 %	0.50 %

*Maximum permitted at second inspection at mother root production stage.
**Maximum permitted at flowering at seed production stage.
***Seed borne diseases shall be; Black rot (*Xanthomonas camperstri s*pv. *campestris*), Black leg (*Leptosphaeria maculans*)

Seed Standards

Factor	Standard for each class	
	Foundation	Certified
Pure seed (minimum)	98%	98%
Inert matter (maximum)	2%	2%
Other crop seeds (maximum)	5 Nos./kg	10 Nos./kg
Weed seeds (maximum)	10 Nos./kg	20 Nos./kg
Germination (minimum)	70%	70%
Moisture (maximum)	6%	6%

3.24. **SPINANCH** (*Spinacia oleracea* L)

Field Standards

Seed fields shall be isolated from the contaminants as specified below:

Contaminants	Minimum isolation distance	
	Foundation	Certified
Fields of other varieties	1600 m	1000 m
Fields of the same variety not conforming to varietal purity.	1600 m	1000 m
Fields of the Swiss chard, sugar beet and garden beet (beet root) for spinach beet only.	1600 m	1000 m

Field Inspection

A minimum of two inspections shall be made, the first before flowering and the second at the flowering stage.

Specific requirements

Factor	Maximum permitted	
	Foundation	Certified
*Off-types	0.10 %	0.20 %

*Maximum permitted at and flowering stage

Seed Standards

Factor	Standard for each class	
	Foundation	Certified
Pure seed (minimum)	96%	96%
Inert matter (maximum)	4%	4%
Other crop seeds (maximum)	5 Nos./kg	10 Nos./kg
Weed seeds (maximum)	5 Nos./kg	10 Nos./kg
Germination (minimum)	60%	60%
Moisture (maximum)	9%	9%

3.25. **SUMMER SQUASH** (*Cucurbita pepo* Duch.)

Field Standards

Seed fields shall be isolated from contaminants as specified below:

Contaminants	Minimum isolation distance	
	Foundation	Certified
Fields of other varieties	1000 m	500 m
Fields of the same variety not conforming to varietal purity and from Pumpkin (*Cucurbita moschata)* and Winter squash (*C. maxima* Duch).	1000 m	500 m

Field Inspection

A minimum of three inspections shall be made, the first before flowering, the second during flowering and fruiting stage and the third at the mature fruit stage and prior to harvesting.

Specific Requirements

Factor	Maximum permitted	
	Foundation	Certified
*Off-types	0.10 %	0.20 %
**Plants affected by seed borne diseases	0.10 %	0.50 %

*Standards for Off-types should be met at and after flowering and for seed borne diseases at final inspection.

**Seed borne disease shall be: Cucumber Mosaic Virus (CMV), Water Melon Mosaic Virus.

Seed Standards

Factor	Standard for each class	
	Foundation	Certified
Pure seed (minimum)	98%	98%
Inert matter (maximum)	2%	2%
Other crop seeds (maximum)	None	None
Weed seeds (maximum)	None	None
Germination (minimum)	60%	60%
Moisture (maximum)	7%	7%

3.26. **TOMATO** (*Lycopersicum esculentum* Mill.)

Field Standards

Seed fields shall be isolated from the contaminants as specified below:

Contaminants	Minimum isolation distance	
	Foundation	Certified
Fields of other varieties	50 m	25 m
Fields of the same variety not confirming to varietal purity requirements for certification.	50 m	25 m

Field Inspection

A minimum of three inspections shall be made, the first before flowering, the second during flowering and fruiting stage and the third at maturity and prior to harvesting.

Specific requirements

Factor	Maximum permitted	
	Foundation	Certified
*Off-types	0.10 %	0.20 %
**Plants affected by seed borne diseases	0.10 %	0.50 %

*Maximum permitted at final inspection.
**Seed borne diseases shall be: Early blight (*Alternaria solani*), Leaf spot (*Semphylium solani*), Tobacco Mosaic virus (TMV)

Seed Standards

Factor	Standard for each class	
	Foundation	Certified
Pure seed (minimum)	98%	98%
Inert matter (maximum)	2%	2%
Other crop seeds (maximum)	5 Nos./kg	10 Nos./kg
Weed seeds (maximum)	None	None
Germination (minimum)	70%	70%
Moisture (maximum)	8%	8%

3.27. **TURNIP** (*Brassica rapa* L.)

Field Standards

Seed fields shall be isolated from the contaminants as specified in Table below:

Contaminants	Minimum distance			
	Mother root production stage		Seed production stage	
	Foundation	Certified	Foundation	Certified
Fields of other varieties	5 m	5 m	1600 m	1000 m
Fields of same variety not conforming to varietal purity requirements for certification and other species of genus *Brassica* listed below; *Brassica pekinensis*, *B. chinensis*, *B. napus , B. juncea, B. tournefortii, B. nigra, B. alba.*	5 m	5 m	1600 m	1000m

Field inspection

Mother Root production stage

A minimum of two inspections shall be made as follows;

- The first inspection shall be made after 20-30 days of sowing in order to determine isolation, Off-types and other relevant factors;
- The second inspection shall be made after the roots have been lifted to verify the true characteristics of the roots.

Seed production stage

A minimum of one inspection shall be made during flowering to check isolation, Off-types, designated diseases and other relevant factors.

Specific Standards

Factor	Maximum permitted	
	Foundation	Certified
*Off-types	0.10 %	0.20 %
**Plants affected by seed borne diseases at final inspection	0.10 %	0.50 %

*Maximum permitted at and after flowering in case of Off-types and at final inspection in case of seed borne diseases.
**Seed borne diseases shall be: Black rots (*Xanthomonas camperstri s*pv. *campestris*) Black leg (*Leptosphaeria maculans*)

Seed Standards

Factor	Standard for each class	
	Foundation	Certified
Pure seed (minimum)	98%	98%
Inert matter (maximum)	2%	2%
Other crop seeds (maximum)	5 Nos./kg	10 Nos./kg
Weed seeds (maximum)	5 Nos./kg	10 Nos./kg
Germination (minimum)	70%	70%
Moisture (maximum)	6%	6%

4. SPECIFIC SEED STANDARDS FOR TUBER CROPS

4.1. **POTATO** (*Solanum tubersum* L)

General requirements

Registration of growers for certification

1. All potato seed growers must be registered with an association of seed growers having a set of bi-laws, which is approved by NSC or similar emerging organizations.
2. Only registered growers will be certified.

Maintenance of varieties

1. The National Potato Program (NPP) or the NSC will be responsible for maintaining all potato varieties officially released in the country in in-vitro form.
2. In the initial phase the NSC will be responsible for the production of pre-basic (G0) and basic seed (G1). Both categories will be produced in the NSC tissue culture/aeroponic system under the direct supervision of NSC or NPP.

Categories of seeds:

The accepted categories of seed shall be:

1. **Pre-basic seed:** Meaning tuber-seeds produced in vector free/ closed environments (laboratory, glasshouses, screen houses, high elevation) from pathogen-tested *in vitro* plants or tubers or through clonal selection with indexing methods or form rooted plants produced originally from *in vitro* plants
2. **Basic seed:** Seed multiplied from Pre-basic seed
3. **Certified seed:** Seed multiplied from Basic seed or from any previous approved high quality stocks/lots of certified seed

Production zone for certified seeds:

1. Fields must be located in areas with very low to minimal populations of virus vectors. Preferably choose area with altitudes above 2400masl.
2. Fields for multiplication of any seed category should be free of wart and bacterial wilt incidences.
3. The areas identified for seed tubers production should as far as possible be free from virus transmitting aphids.
4. The distance between seed fields and other potato fields must be at least 3 m if the possibility of the contact virus exists. Where virus transmission is through aphids then the isolation distance should be at least 20 m.

Field Inspections

1. The first inspection shall be made immediately before or after planting in order to verify the origin and identity of the seed, amount of seed to be planted or that has been planted, and also to verify the previous history of the field, altitude, rotation, isolation and other agronomic aspects of the field.
2. The second inspection shall be made prior to flowering stage but before the plants touch each other. The inspectors will verify the identity of the cultivar, its purity, the sanitary conditions (virus and other disease), and the field condition in general.
3. The optional third inspection shall be made after flowering but before harvesting depending on the discretion of the inspector in order to verify any particular practices or to measure again any pending factors.
4. All classes will have to be certified by certification agency

For the above crop certification the inspectors will follow standard methods described below:

i. Minimum 4 counts of 100 plants each are taken randomly on four spots in a zigzag manner in one hectare area. For every additional hectare or part thereof two samples of 100 plants each are observed for all visible mosaics, other diseases and off types.
ii. All relevant observation of each individual counts are filled in the prescribed performa (developed by certification agency). The overall appraisal of all these counts, thus inspected, will decide the rejection or selection of the seed crop in a particular field.

Finally the graded seed will be inspected for tuber grades and surface damages or infection along with packing standards.

Crop rotation

In order to avoid volunteers plants (plants from remaining tubers in the soil from the previous season) from mixing with the planted seed lots a minimum of three years rotation should be followed. Volunteer plants are also important host plants for diseases and viruses and therefore rotations will avoid spread of the diseases to the seed lots.

Rouging

Rouging is the removal of unwanted plants, which are usually off-types (variety mixtures, volunteers and diseased plants). The growers should do rouging on a regular basis and field inspectors should check that the practice is being done in the right way. It is necessary to remove the whole plant along with the tubers. These rouged plants must be removed from the seed plots and preferably destroyed.

Seed tubers Requirement

1. The seed tubers should not weigh less than 35 grams and not more than 65 grams.
2. The seed lot should be reasonably clean and free from stones, soil, and firm with characteristic eyes, color and shape of the variety.
3. The proportion of tubers with cuts and bruises, cracks and other mechanical damages should not exceed 3 % by count.
4. The seed tubers should be free from damages caused by insects and worms and free from visible symptoms arising through infections from late blight, dry or wet rots, charcoal rot, wart, black heart and freezing injury. Tolerance limits of the damage caused by the above factors should not exceed 1 % by count.

Maximum tolerance based on field inspections

Factor	Pre-basic	Basic	Certified
Mild Variety Mixture and off-type plant %	<0.1	0.2	1.0
Leaf roll and severe mosaic %	<0.1	0.2	1.0
Mild mosaic and *Rhizoctonia* %	<0.1	0.5	1.0
Total virus diseases%	0.1	0.7	1.5
Black leg %	0.0	0.2	1.0
Bacterial wilt%	Not allowed in any category		
Wart %	Not allowed in any category		

4.2. **GROUND APPLE** (*Smallanthus sonchifolius*)

Yacon is native to the Central and Northern Andes of South America and it is called as Yacon in South America. It is a relative to the sunflower family, but unlike sunflower, it forms two types of storage organs: large storage roots (tubers) that you eat and a crown of rhizomes that we can cut or break into many propagules which can be used as seed to start new plants.

Ground apple plants can be multiplied either through vegetative (stem cuttings and rhizomes) or sexual propagation (seed) methods. However, propagation through the use of seeds is mostly applied in breeding, and propagation through stem cuttings is applicable for planting in small numbers and planting in limited land area for production of rhizomes which could be used as seed in the next planting season. Thus, for proper growth and optimum productivity of tubers, good quality rhizomes which meet the following minimum standards should be used as seed.

Yacon rhizomes for use as seed

i. Rhizome crown should be broken or cut into pieces of propagules
ii. Cut surface on each propagule should be as minimum as possible to avoid desiccation in the field.
iii. Each propagule should have 4-5 growing tips.
iv. Each propagules should be not less than 200gm.
v. Propagules should be firm, fresh and un-sprouted. It should not be rubbery and sprouted.
vi. Propagules should be clean and free from soil.

5. GENERAL SEED STANDARDS FOR FRUIT CROPS AND PLANTING MATERIALS

5.1. **The 'Seedling' means-planting materials raised directly from seeds, and Grafted Plant" means –planting materials raised through grafting, budding and inarching.**

5.1.1. The seedlings should have strong and well established root system without any deformities.

5.1.2. The stem diameter of the planting material should be at least 10-15 mm above the graft / bud union.

5.1.3. The height of the seedlings should be 0.6-1m from the first lateral roots.

5.1.4. The height of the grafted planting materials should be at least 0.6-0.8 m from the first lateral roots.

5.1.5. The graft union must be at least 10-15 cm from the first lateral roots.

5.1.6. The planting material should have straight trunk.

5.1.7. The seedlings/grafted planting materials should be free from visible pests and diseases.

5.1.8. The planting materials should be treated with appropriate insecticide and fungicide prior to distribution.

5.1.9. The planting materials should be raised from notified/released varieties and properly labeled.

5.1.10. The graft union should be properly established and grafting tapes should be removed once proper union if formed.

5.2. **Field Inspection of Mother Plants**

5.2.1. The mother plants should be certified by certifying agency prior to the collection of seeds and scion woods

5.2.2. The mother plants for seeds collection should be inspected at least once a year.

5.2.3. The mother plants for scion wood collection should be inspected at least twice a year.

5.2.4. The prescribed scheduled spray should be followed and records maintained.

5.3. **Field Inspection of Fruits Nursery**

5.3.1. The field inspections shall be made each time a planting materials of any certified class is grown before distribution to the customers for genetic purity, identity or any other standards affecting planting materials certification.

5.3.2. The nursery shall be in such condition to permit an adequate inspection to determine genetic purity and identity and any other standards mentioned against each fruits and nuts crops.

5.3.3. The prescribed scheduled spray should be followed and records maintained

5.3.4. If the standards mention against each crop is not met, it will provide sufficient ground for rejection of that nursery or part of the planting materials.

5.4. **Re-inspection of Rejected Fields**

5.4.1. If a nursery grower desires to have re-inspection of a rejected nursery or planting materials, certifying agency should be notified, when shortcomings pointed out in the previous inspection have been corrected.

5.4.2. The planting materials should be certified only if the minimum quality standards of planting materials are met after rectification.

5.5. **Seed-Borne Diseases and Seed Treatment**

5.5.1. Every field for which certification is requested shall show evidence that reasonable precaution has been taken to control seed-borne diseases in cases where seed has been used for propagation.

5.5.2. The field at time of inspection shall not contain seed-borne plant diseases beyond established tolerances limit in the individual crop seed standards.

5.5.3. New diseases may create a need for new standards before they can be published. In such situations, the certifying agency shall seek the support of subject matter specialist to impose standards in the best interests of certified seed and seedlings.

5.5.4. When seed of a variety without resistance to a seed-borne disease has been subjected to possible infection with the disease it is desirable that such seed be treated with recommended seed treatment.

6. SPECIFIC SEED STANDARDS FOR FRUIT CROPS, MAPS AND PLANTING MATERIALS

6.1. **CITRUS (**Mandarin, Sweet Orange, Lime, Lemon, Pomelo, Kumquat, Grapefruit**)**

Nursery Site and Structure

1. The nursery site should be above 1200 m above sea level.
2. The nursery site should be latest 1 km away from the citrus orchards.
3. The nursery sites must be devoid of field standing citrus trees and any hosts of HLB and Psyllids.
4. All citrus planting materials including the bud wood's daughter trees should be raised under insect-proof structures with double entryways.
5. The nursery media used should be completely sterilized and free from soil borne pests and diseases.
6. All planting materials should be containerized and grown in raised benches

Planting Materials

Rootstocks

1. Rootstock(s) should be a released or notified rootstock variety
2. The seeds for rootstocks should be collected from a disease free mother tree
3. The appropriate seed treatment should be strictly followed as recommended by NPPC.
4. The seeds should be sown in raised seedbed, seed trays, or container.
5. The seedlings should be transplanted into container/polypots when the seedlings attain 3-4 leaves.
6. The seedlings with deformed main stem and bent/crooked/J-root must be completely discarded.

7. The diameter of the rootstock should be a minimum of 10mm at the time of grafting.

Seedlings

1. The seeds should be collected from released and notified mother trees free from diseases.
2. The seeds should be sown in raised seedbeds after recommended seed treatments
3. Seedling shall be of genetically pure in absolute terms.
4. The planting material should be at least one-year old at the time sale.
5. The planting material should be 0.8-1m tall and 6-10mm girth at the base.
6. The seedling must be of single stem and have strong and well developed root system.
7. The seedling lot shall be free of deformed main stem and bend/crooked/J-roots.
8. The material must be grown in container/polypots and raised in benches.
9. The source of the seeds should be labeled and their record maintained.
10. The material should be certified free from viruses, canker, greening and other known pests and diseases.
11. The lot, seedling not conforming to specified size shall not exceed 5.0% (by number)

Grafted Planting Materials

1. The rootstock and scion wood should be sourced from released and notified varieties
2. The scion/bud wood source trees should be registered and tested at least once in two years and certified free from graft transmissible diseases.
3. Both rootstock and scion wood should be genetically pure in absolute term and free from graft transmissible diseases.
4. The overall height of the plant should range from 40-60 cm at the time of sale.
5. The diameter of the grafts at 10cm above the graft union should range from 1.0-1.25 cm.
6. The graft should have preferably single stem and have strong and well-established root system.
7. The grafted sapling should be free from rootstock sprouts/suckers.
8. The source of the bud wood and rootstock should be properly labeled and recorded.
9. The grafts should be maintained completely free of flowers/fruits.
10. The material should be free from viruses, canker, HLB and other known pests and diseases at the time of sale.
11. In the planting material lot, materials not conforming to specified size shall not exceed 5.0% (by number).

6.2. **TEMPERATE FRUITS (**Apple, Pear, Peach, Persimmon, Plum, Almond, Cherry, Apricot, Kiwi**)**

Rootstocks

Seedling Rootstocks

1. The seeds for rootstocks should be collected from a disease-free mother tree.
2. The appropriate seed treatment should be strictly followed as recommended
3. The seeds should be sown in raised beds.
4. The diameter of the rootstock should be minimum of 10 mm at the time of grafting.

Clonal Rootstock

1. Land to be used for clonal propagation shall be free from volunteer plants
2. Clonal Rootstock should be free from pests and disease
3. The diameter of the rootstock should be minimum of 10 mm at the time of grafting.

Grafted planting materials

1. All saplings shall be produced by asexual methods of propagation.
2. The scion/bud wood and rootstock used for propagation should be collected from the released or notified varieties.
3. Both rootstock and scion wood should be genetically pure and free from graft transmissible diseases.
4. The source and details of the bud wood/scion wood and rootstocks should be properly labeled.
5. The grafted planting material should meet the following specified qualities:
    a. The diameter of the rootstock should range from 0.50 - 1.0 cm
    b. The diameter of the grafted plant at 10 cm above the graft union should range from 0.5 – 0.75 cm
    c. The height of the grafted plant should be 50 cm – 100 cm.
    d. The grafted sapling should be free from suckers
    e. The saplings with deformed stem & damaged roots should be discarded
6. In the sapling lot, saplings not conforming to specified size shall not exceed 5.0% (by number)
7. The uprooted saplings should be treated with fungicides and properly packed with mosses and gunny bags, and labeled prior to transportation.
8. The saplings should be free from other known pests and diseases.

6.3. **TEMPERATE NUTS (**Walnut and Chestnut**)**

Rootstocks

1. The seeds for rootstocks should be collected from a disease free mother tree.
2. The appropriate seed treatment should be strictly followed as recommended
3. The seeds should be sown in raised beds.

4. The diameter of the rootstock should be minimum of 15 mm at the time of grafting.
5. Rootstock should be at least one year
6. The stem should be straight and without deformities.

Grafted planting materials

1. The scion wood and rootstock used for propagation should be of the released or notified varieties.
2. The scion wood should be collected from disease free mother plants
3. The grafted planting material should meet the following specified qualities:
    a. The diameter of the grafted plant at 10 cm above the graft union should be minimum of 1 cm.
    b. The height of the grafted plant should be minimum of 60 cm
    c. The grafted sapling should be free from suckers
    d. The saplings with deformed stem & damaged roots should be discarded
4. In the sapling lot, saplings not conforming to specified size shall not exceed 5.0% (by number)
5. The uprooted saplings should be treated with fungicides and properly packed with mosses and gunny bags, and labeled prior to transportation.
6. The saplings should be free from other known pests and diseases.

6.4. **SUB-TROPICAL FRUITS** (Mango, Avocado, Litchi, Guava, Pomegranate, Jackfruit, Pecanut)

Rootstocks

1. The seeds for rootstocks should be collected from a disease free mother plant.
2. The appropriate seed treatment should be strictly followed as recommended.
3. The seeds should be raised in polypot.
4. The diameter of the rootstock should be minimum of 10 mm at the time of grafting.
5. Rootstock should be at least one year
6. The stem should be straight and without deformities.

Planting materials:

Propagated through grafting

1. The scion wood and rootstock used for propagation should be of the released or notified varieties.
2. The scion wood should be collected from disease free mother plants
3. The grafted planting material should meet the following specified qualities:
    a. The diameter of the grafted plant at 10 cm above the graft union should be minimum of 0.75 cm.
    b. The height of the grafted plant should be minimum of 60 cm.
    c. The grafted sapling should be free from suckers.
    d. The saplings with deformed stem & damaged roots should be discarded.

4. In the sapling lot, saplings not conforming to specified size shall not exceed 5.0% (by number).
5. The saplings should be free from other known pests and diseases.
6. The saplings should be tagged and labeled prior to distribution.

Propagated through layering

1. The sapling should be produced from disease free mother plants.
2. The sapling should have well developed root system.
3. The stem should be straight and free from deformities.
4. The height of the sapling should be minimum of 60 cm.
5. The diameter of the sapling 10 cm above first lateral root should be 0.75 cm.
6. The sapling should be free from other known pest and diseases.
7. In the sapling lot, saplings not conforming to specified size shall not exceed 5.0% (by number).
8. The saplings should be treated with fungicides and properly raised in polypot and labeled prior to distribution.

6.5. **OTHER FRUIT CROPS (**Areca nut, Banana, Pineapple, Passion fruit, Dragon fruit, Grapes, Papaya, Fig)

Planting materials:

Propagated through seeds (Areca nut, Passion fruit, Papaya, Gooseberry, Coffee)

1. The seeds should be collected from disease free mother plants.
2. The seeds collected should be from released and notified varieties.
3. The seed should be treated with recommended fungicides prior to sowing.
4. The seedling should be at least one year except for areca nut, which should be three years.
5. The minimum height of the seedling should be 50cm -1m.
6. The seedling should be free of known pest and diseases.
7. The seedling should be tagged and labeled prior to distribution.

Propagated through suckers/tissue culture **(**Banana and Pineapple)

1. The suckers/explants should be collected from disease free mother plants.
2. The suckers/explants collected should be from released and notified varieties.
3. The planting material should attain at least one year.
4. The seedling should be free from known pest and diseases.
5. The seedling should be tagged and labeled prior to distribution.

Propagated through cuttings (Grapes and Dragon fruit, Tea)

1. The cuttings should be collected from pest and disease-free mother plants.
2. The cuttings should be from released and notified varieties.
3. The sapling should have strong and healthy root system.
4. The sapling should be at least one year old.
5. The sapling should be free from known pest and diseases.
6. The seedling should be tagged and labeled prior to distribution.

6.6. **CARDAMOM (***Amomum subulatum* Roxb.**)**

Slips for vegetative propagation

Selection in the field

The planting slips should come from healthy disease free and high yielding mother plants from a field of specific variety. However repeated vegetative propagation reduces plant vigour and hence should be avoided. Moreover, vegetative multiplied cardamom slips have the disadvantage that root and soil-borne diseases can be carried on into new plantations. This will not only reduce the productivity of the new plantations but may also carry risks for other crops.

Planting slip specifications

The cardamom slips or planting material should consist of rhizomes/bulbs/slips along with 1-2 of 2-3 immature tillers/vegetative buds.

Measurements

The minimum measurements of the planting slips would depend upon the variety (table) since some varieties are more vigorous and taller than others.

Minimum requirements for cardamom slips

Variety	Diameter of rhizome (mm)	Diameter of pseudo-stem (mm)	Height of the Planting slip (cm)	Nos. of pseudo-stems	Nos. of leaves/ pseudo-stem
Bharlange	30-75 mm	5-17 mm	25-110 cm	1 and above	1 and above
Golsey	20-65 mm	5-15mm	20-100cm	1 and above	1 and above
Sawhney	30-75mm	5-15mm	25-100 cm	1 and above	1 and above
Ramsey	30-75 mm	5-17 mm	25-110 cm	1 and above	1 and above

These measurements are tentative and are required to be confirmed from plant measurements. In the fourth column (height of the planting slips) height range is high because the slips are normally transported after cutting two thirds of the plant especially when transporting long distances to prevent from drying out during transportation.

Diseases

Cardamom slips should be free from Foorkey and Chirkey viral diseases or any other diseases such as wilt, rotting and root knot. Special care should be given to check for any symptoms of root knot disease although they have not been reported in Bhutan so far.

Seeds for propagation

Since vegetative propagation has many disadvantages, the only option to obtain guaranteed disease free planting material is through seeds and tissue culture. The former is cheap and easy.

Plantation requirements

Plantation intended to be used for cardamom seed selection should be free from volunteer plants of other varieties and wild cardamom.

Field inspections

A minimum of three inspections is required: i.e. at flowering, during ripening and at maturity of capsules.

Field standards

Select well-matured seeds from plantation of the specific variety about 3-4 months after harvesting healthy, disease free, high yielding individual plants from a uniform Minimum plantation/field size should be 1 acre. Seeds are viable for

Seed standards

Parameters	Standard (%)
Germination (minimum)	30%
Pure seed (minimum)	98%
Inert matter (maximum)	1%
Other crop seeds (Max)	0.001%
Other variety seeds (max)	0.01
Weeds seeds (max)	0.01%
*Objectionable weed seeds (max)	0.01%
Seed moisture (Min for sowing immediately after harvest) air dried for 2 days	20%
Seed moisture (for spring sowing, minimum)	15-20%

*Objectionable weed seeds are wild cardamom

6.7. TURMERIC (*Curcuma longa* L.)

Application of Certification Standards

1. The General Seed Certification Standards are basic and together with the following specific standards constitute the standards for certification of turmeric seed.
2. The general standards are amplified as follows to apply specifically to turmeric.

3. All certified classes shall be produced by vegetative propagation of underground rhizome, whose source and identity may be assured and approved by the Certification Agency.

Land Requirements

1. Soil should be loose, arable and offer minimum resistance to rhizome development.
2. Soil depth 30 cm or more, high organic matter of acidic soil.
3. The crop of seed turmeric shall not be eligible for certification if grown on the land infested with *Pythium* sp., *Pseudomonas solanacearum*, and *Meloidogyne incognita.*

Field Inspection

A minimum of four inspections shall be made as follows:

1. The first inspection shall be made at the time of planting to verify isolation, rhizome rot, seed piece weight and spacing.
2. The second inspection shall be made about 45-50 days after planting to check germination, sprouting, rhizome rot and shoot borer incidence.
3. The third inspection shall be made about 120-180 days after planting in order to verify off types, shoot borer and rhizome rot.
4. The fourth inspection shall be made before harvest or between 240-250 days after planting to verify rhizome rot, scale insect and meal bug infestation.

Field Standards

General requirements

Isolation

The field/blocks of seed turmeric shall be isolated from the contaminants shown in the table below:

Contaminants	Minimum distance (meters)	
	Foundation	Certified
Fields of other varieties	2 m	3 m
Fields of the same variety not conforming to varietal purity requirements for certification	3 m	3 m

Specific requirements

Factor	Inspection stage	Foundation	Certified (Maximum)
Spacing	I	45 x30 cm	45x30cm
Seed piece weight	I	20-25g	20-25 g
Rhizome rot	I	0	0
Shoot borer	II to III	1.0%	5.0%
Off-types	III	0.5%	1.0%
Scale-insect	IV	1.0%	5.0%
Mealy bugs	IV	1.0%	5.0%

Note:

i. All Off-types and diseased plants should be rouged out along with rhizomes and destroyed.
ii. Gaps in the seed plot should not be more than 10.0%
iii. Land should be free from volunteers

Seed Standards

Factor	Foundation	Certified
Appearance	Healthy & Plumpy	Healthy & Plumpy
Uniformity (Minimum)	95.0%	85.0%
Dry rot (Maximum)	1.0%	5.0%
Scales (Maximum)	1.0%	5.0%
Mealy bugs (Maximum)	1.0%	5.0%

Note:

i. In a seed lot, rhizomes not conforming to specific characteristics of a variety shall not exceed 0.5% and 1.0% (by number – maximum) for foundation and certified seed classes, respectively.
ii. The seed material shall be reasonably clean healthy and firm.
iii. Cut, bruised, or those damaged by insects shall not exceed more than 1.0% (by weight)

6.8. **GINGER** (*Zingiber officinale* Rose)

Application of Seed Certification Standards

1. The General Seed Certification Standards are basic and, together with the following specific standards constitute the standards for certification of seed ginger.
2. The general standards are amplified as follows to apply specifically to ginger
3. All certified classes shall be produced by vegetative propagation of underground rhizome, whose source and identity may be assured and approved by the certification agency.

Land Requirements

1. Partial shade with gentle sloppy landscape
2. Soil should be loose, friable and offer minimum resistance to rhizome development. Soil depth 30 cm or more, high organic matter and pH of 6-6.5 are favorable. Virgin forest soil particularly after deforestation is ideal.

3. Planting should be avoided if soil is infested with *Pythium* sp., *Pseudomonas solanacearum*, and *Meloidogyne incognita.*
4. Land to be used for seed/planting material production of ginger shall be free from volunteer plants.

Field Inspection

A minimum of four inspections shall be made as follows:

1. The first inspection shall be made at the time of planting to verify variety, rhizome rot, seed piece weight and spacing.
2. The second inspection shall be made about 45-125 days after planting to check germination, sprouting, rhizome rot and shoot borer incidence.
3. The third inspection shall be made about 180-190 days after planting to check off types, rhizome rot and Phyliosticta leaf spot.
4. The fourth inspection shall be made before harvest of or between 240-250 days after planting to verify rhizome rot, scale insect and meal bug infestation.

Field Standards

General requirements
Isolation

The fields/blocks of seed ginger shall be isolated from the contaminants as shown in the Table below:

Contaminants	Minimum distance (meters)	
	Foundation	Certified
Fields of other varieties	3	3
Fields of the same variety not conforming to varietal purity requirements for certification	3	3

Specific requirements

Factor	Inspection stage	Foundation	Certified (Maximum)
1. Spacing	I	45 x30 cm	45x30cm
2. Seed piece weight	I	20-25 g	20-25 g
3. Rhizome rot	I	0	0
4. Shoot borer	II to IV II to III	0 1.0%	0 5.0%
5. Off-types	III	0.5%	1.0%
6. Phyllosticta Leaf spot: Bacterial wilt (*Rhizictonis solani)*	III	1.0% 1.0%	5.0% 1.0%
7. Scale insect	IV	1.0%	5.0%
8. Mealy bugs	IV	1.0%	5.0%

Note:
1. All Off-types and diseased plants should be rogued out along with rhizomes and destroyed.
2. Gaps in the seed plot should not be more than 10.0%

Seed Standards

Factor	Foundation	Certified
1. Appearance	Healthy & Plumpy	Healthy & Plumpy
2. Uniformity (Minimum)	95.0%	85.0-95.0%
3. Dry rot (Maximum)	1.0%	5.0%
4. Phyllosticta (Maximum)	5.0%	10.0%
5. Scales (Maximum)	1.0%	5.0%
6. Mealy bugs (Maximum)	1.0%	5.0%

Note:

1. In a seed lot, rhizomes not conforming to specific characteristics of a variety shall not exceed 0.5% and 1.0% (by number – maximum) for foundation and certified seed classes, respectively.
2. The seed material shall be reasonably clean healthy and firm.
3. Cut, bruised, or those damaged by insects shall not exceed more than 1.0% (by weight)

7. MINIMUM STANDARD OF MUSHROOM SPAWN

7.1. Spawn

Quality spawn is essential for mushroom cultivation. This Minimum Standard for mushroom spawn production has been developed in response to the increase in private production of mushroom spawn throughout Bhutan. This is to ensure a standard quality of vigorous, pure true to strain mushroom spawn is being supplied to growers.

The definitions of the mushroom culture, Mother culture Mother spawn and Mushroom spawn are:

i. **Mushroom culture** means mycelium of mushroom grown on media.
ii. **Mother culture** means genetically pure mushroom culture for the production of mother spawn.
iii. **Mother spawn** means genetically pure spawn for production of spawn for cultivation.
iv. **Mushroom spawn** means mycelium of mushroom grown on substrate (I.e. grains) for cultivation purposes.
v. **Certified mushroom spawn** shall be the cultivation spawn certified by the Certification Agency. Cultivation spawn shall not be used for further production of cultivation spawn and shall only be used for cultivation purposes.
vi. **Certified cultivation spawn** shall be the progeny of mother spawn, dikaryotic and its production shall be so handled as to maintain specific genetic identity and purity.

7.2. Quality assurance

1. Spawn shall be regularly inspected. Any spawn showing signs of contamination, abnormal, mutated, poor, uneven, or otherwise undesirable growth shall be disqualified.

2. Quality control assessing contamination (using either PDA (Potato Dextrose Agar), or bag and moist cotton/paper method) shall be randomly checked for each batch of spawn before distribution. Records shall be kept of the results, including photos and observations.
3. Quality control assessing clamp connections should be assessed for each batch prior to distribution.
4. Quality control measures shall be in place for visually inspecting each bottle / bag of spawn before distribution. Factors assessing quality shall include:
    a. Spawn is fully colonised with mycelia in substrate.
    b. No contamination detectible by naked eyes.
    c. Excessive water is not visible in the bottle/bag.
    d. No evidence of primordia formation.

7.3. **Labeling for distribution of mushroom spawn**

1. All certified mushroom spawn offered for sale shall have the official certification tag or label properly affixed to each pack or container. Even if all standards have been met, the mushroom spawn will not be considered certified unless properly labeled.
2. The certification tag attached to each pack or container serves as evidence of the genetic purity, identity and other quality standard of the mushroom spawn contained therein.
3. Every pack or container shall have a tagged label with the following information:
    a. Spawn producers name and address
    b. Species and variety of spawn
    c. Batch number/date of production
    d. Date of final visual inspection
    e. Minimum quantity of spawn in weight

SECTION 2: MINIMUM SEED STANDARDS FOR FORESTRY PLANTATION AND PLANTING MATERIALS

8. GENERAL STANDARDS FOR FORESTRY PLANTATION AND PLANTING MATERIALS

In Bhutan, plantation forestry is relatively significant and tree improvement program has not taken off in a big way. However, with social forestry gaining importance, work on tree planting and tree improvement is becoming essential in order to enhance productivity of community forestry and other forestry plantations. This development will warrant for exchange/ procurement of quality reproductive material. In order to ensure that identity of material is maintained while handling there is a need to set a minimum standard through certification process during collection, seed conditioning and propagule production.

8.1. **Species eligible for certificate**

The certificate standards are for forest tree species, including shelterbelts and windbreaks in fields and farms. The certification standards provide minimum requirement for the handling of forest reproductive material to guarantee that genetic identity and purity is maintained. The term "reproductive material" is generally referred to seeds, nuts, seedlings, cuttings and other types of materials that will be used to grow new trees.

8.2. **Classes and sources of seeds**

Depending on the precision with which the material is procured, four classes of materials can be identified for certification. Only the material, which meets the standards, listed below for the various classes of certification shall be eligible for certification. These classes are defined as follows:

The source-identified material requires the least precise collection procedure. Such material can be collected from seed collection stands (natural forest stand or plantation stands), several stands in an area, a geog, a group of geogs, or and other defined geographic region. The source must be accurately described but cannot be more precise than the actual area of collection. For example, blue pine seeds collected from stands across Gidakom valley and then bulked into a single lot could be identified as Gidakom Source but not as Thimphu Dzongkhag source.

Selected material can be collected from an identified seed production area or from a selected individual tree (plus tree). It should show promise of phenotypic superior traits, identifiable traits or both when compared with other material of the same species.

8.3. **Establishing the source**

Geographic location of the sources of all classes shall be given. If known, stand or tree history shall be provided to the certifying agency on request.

Height and age (or site index if known) of the parent trees shall be included for selected material.

1. In case of seeds derived from seed orchards/stands containing selected stock from a number of geographic areas, the location of the orchards/stand shall be given and the original geographic sources of individual components (clones of families) shall

be maintained in file and furnished on request. A map of the seed orchard/stand will be prepared and made available on request.

2. In case of material originated from planted or otherwise artificially established trees, the geographic origin of the parent material must be known.

8.4. **Certification Labels**

All certified materials must have an official label properly fixed to each plant, container, bale, bundle or package. Grower must follow procedures for administering Certification.

The certification label attests to the genetic identity of the material contained therein. The label shall contain the information on cones or seeds or propagules. Other information as needed by certification agency will be informed to the producers or growers and no information will be put on the label without approval from certification agency.

8.5. **Field Inspections**

Four different types of inspection are necessary to ensure adherence to the standards coordinate by any relevant agency responsible for forestry research.

8.5.1. ***Approval inspection***

Seed production areas, selected trees and seed orchards must receive one-time approval inspection to conduct thorough examination of the trees and sites for confirming compliance with field standards. Approval inspection must be made prior to flowering and pollination. In case of clonal reproductive material, approval inspection must take place before collection of materials.

8.5.2. ***Annual inspection***

Annual inspections are used to confirm adherence to standards for propagation facilities and seed conditioning facilities

8.5.3. ***Periodic inspection***

Periodic inspections are used to confirm adherence to standards for seed orchards and tested material at the time of material collection. Periodic inspections are required when certified material is being produced.

8.5.4. ***Spot inspection***

Inspection may be done without prior notice at any time during the production of certified reproductive material.

8.6. **Field Standards**

8.6.1. ***Units of certification***

A tree, an area or a portion of area may be certified. Plant materials that may be used to produce the certified seed are as follows:

1. Seed collection stands
2. Seed production areas
3. Source-identified natural stands

4. Plantations of known source
5. Selected trees, including hybrids
6. Seed orchards, clonal or seedling form

8.6.2. ***Specific Requirements for Seed collection stands***

Seed from seed collection stands may be identified as Source –identified provided that it meets the regulation pertaining to source of seed described above. No isolation zone is required.

For seed production area, the following criteria should be met to pass approval inspection:

The stand in seed production areas should contain full stocking of desired species to allow adequate rouging of inferior phenotypic quality trees and still maintain enough trees to ensure genetic diversity and adequate pollen supply.

Before approval inspection, the stand must be rouged leaving behind dominant and co-dominant trees that are insect and disease free and are superior in vigour, form and crown characteristics.

Any inferior trees with a minimum of 200 meters surrounding the seed production area should be removed to protect from pollen contaminated

8.6.3. ***Specific Requirements for a Single Tree***

Each selected tree shall be permanently marked with identification numbers. The record of each tree will contain information that explains the basis for selection and map showing its exact location.

Seeds or vegetative propagules must come from a single tree.

Tested material (from a single tree): each tree shall be permanently marked with identification numbers.

The record of each tree will contain information that explains the basis for selection and map showing its exact location.

A selected tree must possess superior characteristics in growth, form etc that can be distinguishable from other trees of the same species on the same site.

Seeds collected from a selected tree must undergo progeny testing while vegetative propagules must be clonally tested.

8.6.4. ***Specific Requirements for Seed Orchards (if any)***

1. For all species, a minimum of 200 meters surrounding the seed orchard must be free of all inferior trees producing contaminating pollen. The identity of each tree must be known and the record of known parentage must be provided. The arrangement of individual trees in the orchard should facilitate out-crossing.
2. Untested seed orchard material: Prior to completion of progeny tests seeds produced in seed orchard may be certified as untested seed orchard material

3. Tested Seed orchard material: A minimum of 200 meters surrounding seed orchard must be free of all inferior trees producing contaminating pollen.
4. The identity of each tree must be known and the record of known parentage must be provided.
5. The arrangement of individual trees in the orchard should facilitate out-crossing
6. At least 90% of the clones or family lines in a seed orchard must be progeny tested according to the testing standards. The orchard must be rouged based on the results of the progeny test.
7. Field inspection: Approval inspection is necessary for all productive material collection sites for production of selected material, untested seed orchard material and tested material.
8. Reproductive material handling: All reproductive material shall be handled so as to prevent contamination and to maintain the identity of the seed lot from time of collection throughout conditioning,

8.7. **Certification label**

The certified reproductive material which is fixed to each seed container supplied by certification authority (BAFRA) should show the following:

- Certification class, Year of seed crop, Genus and Species, Variety (if applicable), Seed origin, Producer seed lot number, Label serial number (given by certification authority).

8.8. **Field standards for propagation (nursery)**

8.8.1. ***Units of certification***

All certified seedlings must be grown from certified seeds of the respective class. The unit of production for bare root seedlings in the nursery while the unit of production for containerized seedlings is a seedlot grown in a single crop.

All certified vegetative propagules must be produced from selected trees, including hybrids. The unit of production for vegetative propagules is propagules produced from a single cone at one time.

8.8.2. ***Propagation facility inspection***

Annual inspection of each inspection lot will be carried out between sowing, planting or micro-propagating and lifting of propagules.

8.8.3. ***Specific Requirements for seedlings and vegetative propagation***

1. Each certified lot (e.g. seed lot, clone) must be handled separately during all stages of production.
2. Written record must be maintained that can be used to verify the identity of certified lots.

3. Bare-root Seedlings or vegetative propagules: Each bed area or row must be identified as to production lot with a marker. Genetic lots may not be mixed and must be separated by at least ½ meter parallel path to the sides of the bed and on the ends. Any portion of seed bed that is contaminated by chance windblown or waterborne seed from other sources and cannot be rouged must be removed from the seed lot.
4. Containerized Seedlings and Propagation: Only one lot may be grown in each container "block". Each block must be identified as to production lot with a marker.
5. Laboratory Propagules: Each propagule unit (e.g. rooting tray, culture flask/container) must be identified all the times.

8.8.4. ***Minimum germination and purity standards***

The seeds of all classes must conform to the standards as assessed using the national rules for seed testing. Since, we have not carried out any research on forest seed technology, we cannot set standards based on actual field experience. However, the following standards of forest seeds are based mainly on the studies carried out in the United States, by School of Forestry, Yale University (Toumey and Stevens 1928, Korstain 1927) and on certain experiences of field foresters in Bhutan while undertaking tree planting program (DoF 1995). These will be modified as when more field information is available. These standards will be applicable to the seeds and planting stock collected from the Source Identified Material and Selected Material only.

Main tree species for timber and industrial plantations

Tree species	Germination	Purity	Seed weight
Pinus wallichiana	65%	97%	15,000-20,000 Kg^{-1}
Pinus roxburghii	80%	98%	8-12,000 Kg^{-1}
Abies densa	40%	90%	16,000-20,000 Kg^{-1}
Picea spinulosa	65%	90%	64,000 Kg^{-1}
Tsuga dumosa	75%	86%	400,000 Kg^{-1}
Juglans regia	65%	99%	35-120 Kg^{-1}
Quercus semecarifolia	60 %	98 %	140 Kg^{-1}
Acer campbellii	75 %	70 %	15,000-20,000 Kg^{-1}
Alnus nepalensis	70%	50 %	400,000 -57,000 Kg^{-1}

Cupressus corneyana	50%	70%	290,000 Kg^{-1}
Albizia procera	65%	55%	15,000-21,000/Kg^{-1}
Cryptomeria japonica	80%	60%	250,000-300,00 Kg^{-1}
Gmelina arborea	13-50%	-	1600 kernel Kg^{-1}
Exbuckkandia populnea	75%	70%	270,000 Kg^{-1}
Michelia champaca	70%	70 %	14,000-17,000 Kg^{-1}
Teminalia belerica	80%	90%	400-520 Kg^{-1}
Daubanga grandiflora	30%	70%	24,000,000 Kg^{-1}

Important multipurpose trees for Social Forestry Program

Tree species	Germination	Purity	Seed weight
Aesandra butyracea	50-80%	-	450-600 Kg^{-1}
Exbucklandia populnea	75%	-	27,000-71,000 Kg^{-1}
Ficus neriifolia	40%	-	100,000-600,000 Kg^{-1}
Ficus roxburghii	75%	-	3000-8000 Kg^{-1}
Toona ciliate	60%	70%	350,000 Kg^{-1}
Cherospondias axillaries	60%	90%	300 Kg^{-1}
Melia azedarach	70%	85%	1200-1500 Kg^{-1}
Syzigium cumini	90%	95%	1000-1300 kg^{-1}
Quercus griffithii	93%	90%	1800 Kg^{-1}
Robinia pseudocacia	80%	85%	35,000-80,000 Kg^{-1}
Persea fructifera	50%	95%	29 Kg^{-1}

8.8.5. ***Standards for seedlings and stumps of forest tree crops***

All planting materials (e.g. seedlings, stumps) of the above tree species for all types of planting purposes should meet following criteria. Seedlings should:

1. be 20-30 cm in height, to the base of the newest leaf or buds
2. have straight, undamaged and un-forked stems
3. have stem well lignified for at least half their length
4. have root collar diameter of over 4 mm
5. be of healthy deep green color
6. be quite free of insect and fungal disease

Stumps should:

1. have root collar diameter between 7 and 20 mm, and a root diameter of at least 7 cm
2. have no forked roots and stems
3. be undamaged and straight
4. be free from pests and diseases

9. SEED STANDARDS FOR SOME SPECIFIC SPECIES

9.1. **FIR** (*Abies densa*)

1. Seeds are to be collected during October- November.
2. Seeds should be stored in gunny bags.
3. Seeds must be exposed to sun at regular intervals to prevent fungal attack.
4. Soak the seeds for 12 hours before sowing.
5. Seedlings should be grown in raised nursery beds under shade to prevent damage from rain, hail and snow, and should be protected from fungal attack.
6. Seedlings raised in poly pot or bare root should be planted when they attain 20-30 cm in height.
7. Preferable altitude for planting this species is between 2600m – 4000 (masl).

9.2. **SPRUCE** (*Picea spinulosa*)

1. Seeds are to be collected during September- November.
2. Clean and dried seeds should be stored in sealed container for 1-2 years.
3. Soak the seed in cold water for 6-12 hours.
4. Seedlings should be raised in poly pot in the nursery.
5. Seedling should be planted in planting sites when they attain 25-30 cm in height.
6. Young seedlings should be protected from fungal attack (*peridermium piceae*) by applying fungicides or spraying ash.
7. Seedlings should be planted within the altitudinal range of 2300-2600 (masl).

9.3. **BLUE PINE** (*Pinus wallichina*)

1. Seeds are to be collected during September – November.
2. Seeds should be stored after cleaning and drying.
3. Soak the seed in cold water for 6-12 hours before sowing.
4. Seedlings should be raised in polythene bag or poly pot and should be raised under shade when young.
5. Direct sowing in shallow pit is also possible.
6. Seedlings should be planted when they attain a height of 25-35 cm.
7. Young seedlings should be protected from rust disease *(Cronartium ribicola*).
8. Seedlings should be preferably be planted between 1800 to 3000m altitude.

9.4. **CHIRPNE** (*Pinus roxburghii*)

1. Seeds are to be collected during January –March
2. Seeds should be stored in sealed container.
3. Soak the seeds in fresh water for 12-24 hours before sowing.
4. Seeds should be treated with red lead before sowing to protect from pests.
5. Direct sowing in *thalis (prepared bed for direct seed dibbling) is* also recommendable.
6. Seedlings should be protected from rust disease *(Cronartium himalensis*).
7. The preferable planting size of seedlings is 20-30 cm
8. Seedlings should be preferably be planted between 900 - 1800 (masl) altitude.

9.5. **CYPRESS** (*Cupressus spp.*)

1. Seeds are to be collected during October – January.
2. Seeds should be stored in well-ventilated store up to 6-12 months but should be preferably sown fresh.
3. Soak the seed in fresh cold water for 6-12 hours before sowing.
4. Seeds should be sown in mother bed and pricked out in poly pot.
5. Seedlings should be planted when they attain 25-45 cm.
6. Seedlings should be planted preferably between 1800 – 2700 (masl) altitude.

9.6. **KHAIR** (*Acacia catechu*)

1. Seeds are to be collected during November – March.
2. Seeds should be dried thoroughly and stored in well-sealed polythene bags and should not be stored for more than 8 months, as it will become susceptible to insect attack.

3. Seeds should be pre-treated in cold water for 12 hours before sowing.
4. Direct sowing of seeds in patches or strips with worked out soil is recommended.
5. Seedlings can also be raised in poly pot in nursery.
6. Seedling should be planted when they attain 20-30 cm in height.
7. This species prefers riverbed and edges along river channel and the seedlings should be planted up to 900 m (asl) elevation.

9.7. **MANDANEY** (*Acrocarpus fraxinifolius*)

1. Seeds are to be collected during April-May.
2. Dried seeds should be stored in gunny bags or in airtight tin.
3. Seeds should be pre-treated in fresh cold water for 6-12 hours before sowing.
4. Direct sowing in patches or *thalis* is commonly practiced.
5. Seedlings are also raised in polythene bags.
6. Seedlings of this should be planted in sub-tropical area up to 1300 (masl) altitude.

9.8. **UTIS** (*Alnus nepalensis*)

1. Seeds are to be collected during December-March.
2. Dried seeds can be stored in sealed plastic bags for few months, it is preferable to sow fresh seeds as it loses viability when stored for long period.
3. Seedlings are raised in poly pot in nursery.
4. Seedling can be planted when they attain 25-40 cm in height.
5. Seedlings are also be propagated by direct sowing.
6. Seeds broadcasted directly in freshly eroded slopes also do well.
7. It is sub-tropical to temperate species, which grow in between 1200-23 (masl) elevation.

9.9. **SIMUL** (*Bombax ceiba*)

1. Seeds are to be collected during March –May.
2. Seeds should be collected along with floss and should be separated from floss manually or by threshing with stick.
3. Seeds can be stored in sealed container or plastic bags for 1 year.
4. Seeds should be pre-treated in cold water for one day before sowing.
5. Bare root seedling can be grown in nursery.
6. This species is good for cutting and stump planting prepared from nursery-raised seedlings.
7. This is a tree of mixed deciduous forest grown between 200- 1400 (masl).

9.10. **CHEKRASI** (*Chukrasia tabularis*)

1. Seeds are to be collected during March-June.
2. Clean dried seeds can be stored up to 5 months in gunny bags.
3. Soak the seeds in fresh water cold water for 1-2 hours before sowing.
4. Bare root or nursery-raised seedlings are planted.
5. Direct sowing in patches or terrace also gives good result.
6. It is subtropical species and grows in well-drained soil up to an elevation of 100 (masl).

9.11. **SISOO** (*Dalbergia sissoo*)

1. Seeds are to be collected during March-May.
2. Clean dried seed can be stored in sealed tin or gunny bays for about 6-12 months.
3. Pre-treatment with soaking in water for 6-12 hours before sowing.
4. This species is propagated by direct sowing method; seedlings can also be raised in nursery, stumps and by root suckers are also used for planting.
5. Sisoo seedlings to be protected from weeds, cattle and fungal infection.
6. This species prefer alluvial soil adjoining rivers and can grow up to 1000 (masl) elevation.

9.12. **GAMARI** (*Gmelina arborea*)

1. Seeds are to be collected April-June.
2. Seeds are collected by de-pulping and dried in sun for 2-3 days.
3. Seeds can be stored in dry ventilated room for about 6-12 months.
4. Seeds collected from animal droppings are better.
5. Seeds should be soaked in water for 2-3 days before sowing.
6. Seedlings are raised in mother bed and transplant in secondary beds.
7. Stumps are prepared for planting out when seedlings attain thump size girth.
8. Directly sowing also gives good result.
9. It is species of moist sub-tropical zone, prefers moist, fertile and well-drained soil up to 1200 (masl) elevation.

9.13. **WALNUT** (*Juglan regia*)

1. Seeds are to be collected during September-December.
2. Walnut seed loose viability when dry out, therefore it must be kept moist, cool and aerated. It can be buried them in pits since this species require cold stratification.
3. It is advisable to sow them immediately after collection.

4. Seedlings can be raised in shaded nursery beds and pricked out in polythene tube and placed them under shade.
5. Seedlings attain plantable size within one year (25-35 cm height).
6. Walnut species can also be propagated by grafting.
7. It prefers moist deep and well-drained soil, grown between 1200 –2500 (masl) elevations.

9.14. **MELIA** (*Melia azedarac*)

1. Seeds/stones are to be collected during November – March.
2. Seed/stones are dried and stored in gunny bags or in sealed tins for about one year.
3. Soak the stones in warm water for 5-6 hours or in cold water for 12 hours before sowing.
4. Poly pot seedlings can be grown in nursery.
5. Direct sowing in plantation site is also done.
6. Propagation can also be done through stumps planting.
7. Seedlings should be kept free from over head shade.
8. The preferable planting size of seedling is 20-30 cm
9. Seedlings of this species can grow up to 2500 (masl) altitude.

9.15. **CHAMP** (*Michelia species*)

1. Seeds are to be collected during July- August (*Michelia champaca*) and August-September (*Michelia doltsopa*).
2. Fruits are collected from standing healthy mother trees.
3. Seeds are extracted by gentle threshing, wash it with water and dry under shade (never dry it under direct sun) for 2-3 days.
4. Seeds loose viability while storing, most be sown after collection.
5. Soak the seeds in fresh water for few hours before sowing.
6. Seedlings are raised in mother beds and then transplanted to poly pot under shade.
7. Seedlings attain plantable size in one year (30 -45 cm)
8. *Michelia champaca* can grow in moist subtropical zone up to 1500 (masl) where as *Michelia doltsopa* can grow between 900 – 2500 (masl) elevations.

9.16. **OAK** (*Quercus spp*)

1. Seeds are to be collected during November – February (*Q.griffithii*) and June-August (*Q.semicarpifolia*).
2. Seeds loose viability while storing.
3. Seeds to be sown immediately after collection.

4. Soak the seeds in cold water for 6-12 hours before sowing.
5. Seedlings are raised in polypots.
6. Direct sowing can also be done.
7. Seedling most attains at least 20cm tall before planting.
8. *Quercus griffithii* can grow between 1500 – 2500 (masl) on drier sites while *Q.semicarpifolia* can grow between 1700 – 3800 (masl) on moist and shady area.

9.17. **SAL** (*Shorea robusta*)

1. Wing seeds are to collected during May-June.
2. Sal seeds cannot be stored as it loose viability rapidly.
3. Fresh fallen winged seeds should be sown before or within 7 days.
4. Direct sowing in plantation site (terrace or lines) with wings upward.
5. Plantation site should be ready before collection of seeds for immediate sowing.
6. This species occurs in southern foothills up to 1000 (masl) elevation.

9.18. **TEAK** (*Tectona grandis*)

1. Seeds are to be collected during December-February.
2. Seeds (bony drupe) can retain viability for long period and can be stored in well-aerated sack.
3. One-year-old drupe gives better result than fresh one.
4. Alternative soaking and drying under concrete sun for 2-3 weeks before sowing.
5. Seeds can be treated by light burning of drupe.
6. Seeds are sown in mother beds and pricked out in secondary beds when leaves appear.
7. Stumps are prepared for planting out when seedlings attain thump size girth.
8. Direct sowing can also be practiced.
9. Seedlings of *Tectona grandis* should be grown about 600 (masl) altitude& below and should not be planted in steep slopes as it deteriorate soil because of large foliage system.

10. RESTRICTED /NEW APPROVAL OF TREE SPECIES

10.1. The following tree species are restricted for cultivation/import and raising in nursery or outside for plantation due to its nature of harmfulness to human and ecosystem.

1. All *Eucalyptus species*
2. *Cedrus deodar*
3. All *Thuja species*
4. *Cyptomeria japonica*
5. *Cupressus microcarpa*
6. *Populus nigra*

10.2. **Approval of new tree species**. As per the Seed Act of Bhutan 2000 and Seed Rules and Regulations of Bhutan 2018, The National Seed Board may approve other tree species as and when required with the proposal recommended by Varietal Release Committee.

SECTION 3: MINIMUM SEED STANDARDS FOR FODDERS

11. MINIMUM STANDARDS FOR FODDER SEEDS CERTIFICATION

Criteria for Certification	Temperate		Subtropical			Winter Fodder		Legumes				Lawn
								Temperate	Subtropical			
A. Field Standard	Cocksfoot	Italian rye	Ruzi	Paspalum	Molasses	Oat	Fodder Maize	White Clover	GLD	Stylo	Lucerne	Tall Fescue
Field Inspection (frequency)	Thrice	Thrice	Twice	Twice	Twice	Thrice	Thrice		Thrice	Twice		
Isolation from fields of other varieties (m)	50	50	50	50	100	3	3	100	100	100	100	100
Field of the same variety not conforming to varietal purity requirements for certification (m)	50	50	50	50	100	3	3	100	100	100	100	100
Off-types (%)	1	1	1	1	1	1	1	1	1	1	1	1
Objectionable weed plants (%)	0.2	0.2	1	0.2	0.2	0.2	0.2	0.5	0.5	0.5	0.5	0.5
B. Seed Standards												
Pure seed (Min. in %)	75	85	80	80	80	95	95	94	90	90	95	75
Inert matter (Max. in %)	5	5	10	10	15	5	5	6	10	10	3	5
Other Crop Seeds (Max)/kg	100	100g	100g	100g	200g	50g	50g	100g /Kg	100g /Kg	100g /Kg	100g /Kg	100g /Kg
Total Weed Seeds (Max)/ kg	100	100g	100g	100g	200g	50g	50g	100g /Kg	100g /Kg	100g /Kg	100g /Kg	100g /Kg
Germination (Min. %)	70	70	> 45	45	47	95	95	75	70	40	90	70
Moisture (Max. %)	11	11	11	11	11	11	11	11	11	11	11	11

Published By:
Agriculture Research and Extension Division (ARED)
Department of Agriculture
Ministry of Agriculture & Forests
Tel# 02-322228/331316/336462/336186 (F)

Printed at United Printing Press