

OECD GUIDELINES ON THE PRODUCTION OF FOREST REPRODUCTIVE MATERIALS



March 2013

OECD FOREST SEED AND PLANT SCHEME

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT



FOREWORD

These Guidelines primarily focus on production procedures of forest reproductive materials for moderate climate zones. They will be revised at a later stage to include procedures that are typical to tropical countries.

The application of these Guidelines is not obligatory but provide guidance on the implementation of procedures. They are particularly useful for new Member countries, or countries in the process of developing a national certification system for forest reproductive materials.

These Guidelines were approved at the 2012 Annual Meeting of the Forest Seed and Plant Scheme.

ACKNOWLEDGEMENTS

These Guidelines have been developed by the OECD Forest Seed and Plant Scheme. The OECD Secretariat acknowledges the work of the original author, Fabio Gorian of the Ministry of Agricultural, Food and Forestry Policies of Italy, State Forestry Authority, National Centre for Forestry Biodiversity Conservation.

The OECD Secretariat is also grateful for the contributions provided by Lorenzo Gui and Giuliano Da Zanche of the Ministry of Agricultural, Food and Forestry Policies of Italy, State Forestry Authority, National Centre for Forestry Biodiversity Conservation, and Alessandro Rossato, Quality Systems Developer. Member country delegations of the Scheme provided useful comments. The contribution of Andrew Gordon, European Forest Nursery Association, is particularly appreciated for his review and editing of the Guidelines. Document editing was provided by Michèle Patterson and Csaba Gaspar of the OECD Secretariat.

TABLE OF CONTENTS

1.Planning of production.....	4
• Seeds (for sale, planting or storage).....	4
• Plants.....	5
2.Identifying areas for seed and fruit collection.....	5
3.Organisation of seed and fruit harvest.....	6
4.Collection.....	7
• Ordinary collection.....	7
• BDV Collection.....	8
5.Transportation and delivery of the collected material to the seed processing centres issuing of master certificate	10
6.Extraction, cleaning, grading, sampling, quality control of seed ...	11
• Extraction.....	11
• Cleaning.....	11
• Sampling.....	12
• Checking the seed quality.....	12
7.Sale and storage of the seed produced.....	13
8.Seed sowing and transplanting of seedlings produced.....	14
9.The use of BVD material in reforestation.....	16
Annex I. FRM Annual Collection Programme.....	17
Annex II. FRM Collection.....	18
Annex III. FRM Upload.....	19
Annex IV. FRM Processing.....	20
Annex V. Seedling Production.....	21
Annex VI. Seedlings Cultivation	23
Annex VII. Daily Collection Report.....	26

OECD GUIDELINES ON THE PRODUCTION OF FOREST REPRODUCTIVE MATERIALS

These OECD guidelines are designed to give guidance on the collection, processing, selling, sowing and storage procedures for forest reproduction and are intended to describe a pathway to help producers obtain certified, traceable and quality Forest Reproductive Material (FRM). These guidelines present the written procedures and documentation that guarantee the exact application of the rules in this area.



1. PLANNING OF PRODUCTION

SEEDS (FOR SALE, PLANTING OR STORAGE) ¹

In order to produce the necessary amount of seeds, the following should be taken into consideration.

- QUANTITY OF SEED STOCK.
- TRENDS IN PURCHASE ORDERS.
- YIELD OF SEEDS FROM FRUITS AT HARVEST TIME.
- FUTURE FORESEEABLE ORDERS.
- PERISHABILITY OF THE SEED TO BE PRODUCED (ESPECIALLY RECALCITRANT/ORTHODOX).

It is on this basis that a producer can make a reasonable estimation of the quantity of seed to be produced. The collection of fruit must take place in seed sources, stands and seed orchards which have been registered in individual member states.

To comply with OECD Rules, harvest can take place only with approved basic material which is Source Identified, Selected, Qualified, or Tested. Certification of the harvest is normally made under the control of the National Designated Authority (NDA).

1. SEE ANNEX I.

1. PLANNING OF PRODUCTION

PLANTS²

In order to produce the necessary number of plants, the following should be taken into consideration.

- | | | | |
|-------------------------------------|-------------------------------------------------------------------|-------------------------------------|-------------------------------------------------------------------|
| <input checked="" type="checkbox"/> | AVAILABLE MATERIAL (SEEDLINGS). | <input checked="" type="checkbox"/> | PURCHASE TREND OF ORDERS. |
| <input checked="" type="checkbox"/> | FUTURE FORESEEABLE ORDERS. | <input checked="" type="checkbox"/> | THE TECHNICAL ENVIRONMENT. |
| <input checked="" type="checkbox"/> | THE SUSCEPTIBILITY OF THE SEED TO PEST OR DISEASE ATTACKS. | <input checked="" type="checkbox"/> | THE CAPACITY OF THE SEED TO GERMINATE IN THE CURRENT YEAR. |

In the case of certified production, sowing can only be carried out with material which has been certified and derived from Source Identified, Selected, Qualified or Tested material.

The producer can make a reasonable estimation of the necessary quantity of seed to be used for sowing based on the above information.

2. IDENTIFYING AREAS FOR SEED AND FRUIT COLLECTION

Once the required quantity of seed has been determined, the producer needs to identify the collection area and the harvest team who will make the collection.

The collection areas are normally selected by the NDA. Where the initial selection is made by a private organisation, approval of the area must be carried out by the NDA. In general, these areas have specific characteristics which identify them as being superior to similar areas. These requirements may relate to the quality of the wood, the ecological importance of the site, and/or the need to protect and conserve forest biodiversity. This is also dependent on the importance given to these criteria by the country itself.

The ideal area is not always suitable for collection in a given year, as natural events may influence how successful production will be. Therefore, it is advisable in the planning stage to choose reserve areas which can compensate for shortfalls in the production from the forest areas initially selected.

2. SEE ANNEX V.I.

3. ORGANISATION OF SEED AND FRUIT HARVEST ³

Seed producers should be properly trained and preferably recognised by an official body which authorises them to carry out the harvest. Authorisation can normally be obtained by completing an appropriate training course held by an expert.

To ensure traceability and certification of the lot, the official body which is responsible for the relevant forest area must be informed prior to collection. The landowner should also give permission for the harvest, where necessary.

After obtaining the necessary permission for collection, the producer (the seed company/nursery) needs to inform the actual collection team in writing of the conditions that apply for each harvest operation. These conditions need to be accepted by the team and a copy of the signed document should be returned to the producer who is responsible for checking the degree of flowering and fruiting in the collection area. In this regard, the degree can be estimated on a scale ranging from 0 to 4, where the extreme value of 0 indicates there is absolutely no fruiting and the value 4 means an abundant seed production year. In order to obtain the maximum genetic biodiversity, it is important to collect during a year of good fructification or, better, a year with value 4.



4. COLLECTION

There are presently two types of collection. The first type is known as ordinary collection and does not take into account the conservation of biodiversity. The second type, sometimes known as BDV (biodiversity), takes fully into account the genetic diversity of the population. It is carried out in a much more complex way than the first procedure.

ORDINARY COLLECTION

The quantity of seed/fruit to be collected should be known if planning was done correctly by the seed company or nursery. Information collected would include the name of species, the place, and the amount of seed/fruit to be collected. Before starting any operation, the organisation ultimately paying for the collection must ensure that all permits have been issued. The stage of ripening of the fruit must be assessed before collection can begin. All material from a particular area should be stored in bags or other suitable container identified in some way as associated with that area. If collection lasts several days, the numbering should continue from where it left off on the previous day. The collector should complete a form⁴ every day that records the following.

- | | |
|----------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| <input checked="" type="checkbox"/> DATE. | <input checked="" type="checkbox"/> PLACE. |
| <input checked="" type="checkbox"/> COLLECTED SPECIES. | <input checked="" type="checkbox"/> COLLECTION PLACE. |
| <input checked="" type="checkbox"/> TEMPORARY STORAGE OF THE COLLECTED MATERIAL. | <input checked="" type="checkbox"/> NAME OF COLLECTOR OR COLLECTION COMPANY. |
| <input checked="" type="checkbox"/> QUANTITY OF SEED COLLECTED. | <input checked="" type="checkbox"/> HOURS SPENT ON HARVESTING. |
| <input checked="" type="checkbox"/> NUMBER OF FILLED PACKAGES. | <input checked="" type="checkbox"/> IDENTITY NUMBER OF EACH PACKAGE. |

The team leader will countersign the form.

NB. If collectors are paid by piece-work rates, the above information will have to be kept for each collector and the material collected by each individual collector kept separate at all times until measured and recorded.

4. SEE ANNEX VII.

4. COLLECTION

BDV COLLECTION

The quantity of seed/fruit to be collected is already known if the planning was done properly. This plan is prepared by the seed company or nursery and includes the name of the species, the place, and the amount of seed or fruit to be collected.

The same amount of material should be collected from each mother plant (collection unit) so that the sum of the collection is the total quantity needed. The number of mother plants harvested depends on the total size of the area to be represented by the collection, but should never be less than 40 collection units, except in exceptional circumstances. The collection supervisor should ensure that collectors do not just concentrate on units with heavy crops. The exact site of the collection unit must be geo-referenced. In the case of shrub species, the collection unit would be a group of bushes together with their neighbours. The various collection units must be evenly distributed over the entire collection area.

Before starting any operation, the organisation ultimately paying for the collection must ensure that all permits have been issued. The fruit ripening stage must be assessed before collection. All material should be stored in consecutively numbered bags or other suitable containers. The seed/fruits collected from different trees must be kept separate.

If the collection lasts several days, the numbering should continue from where it left off the previous day. The supplier should complete a form daily, recording the following information.

- | | |
|----------------------------------------------------------------------------------|-----------------------------------------------------------------|
| <input checked="" type="checkbox"/> DATE. | <input checked="" type="checkbox"/> PLACE. |
| <input checked="" type="checkbox"/> COLLECTED SPECIES. | <input checked="" type="checkbox"/> COLLECTION PLACE. |
| <input checked="" type="checkbox"/> NUMBER OF COLLECTION UNITS. | <input checked="" type="checkbox"/> QUANTITY OF SEED COLLECTED. |
| <input checked="" type="checkbox"/> NAME OF COLLECTOR OR COLLECTION COMPANY. | <input checked="" type="checkbox"/> HOURS SPENT ON HARVESTING. |
| <input checked="" type="checkbox"/> TEMPORARY STORAGE OF THE COLLECTED MATERIAL. | <input checked="" type="checkbox"/> NUMBER OF FILLED PACKAGES. |
| <input checked="" type="checkbox"/> IDENTITY NUMBER OF EACH PACKAGE. | |

4. COLLECTION

BDV COLLECTION

The collection supervisor should countersign the form.

In both ordinary and BVD collections, a new form should be completed daily and each time the species or the place of collection is changed.

In both types of collection, the official body responsible for the relevant forest area should issue a document testifying that the collection of a species has been completed in that particular place. Ideally, it should be issued before transportation of the collected material to the processing plant or storage facility, although transportation of delicate material should not be delayed nor left loaded on transport vehicles while awaiting the arrival of said official. Indeed, it is important to co-ordinate this procedure with officials to avoid harming or wasting valuable material due to slow bureaucratic procedures. The document must include the general data previously recorded in the daily work sheets and the total amount of the produced forest fruit. It should be issued in two copies: one copy for the issuing body and the other to be given to the transporter.



5. TRANSPORTATION AND DELIVERY OF THE COLLECTED MATERIAL TO THE SEED PROCESSING CENTRES: ISSUING THE MASTER CERTIFICATE⁵

The transportation of material from the collection point to the seed processing centre should occur only if accompanied by all required documentation (daily collection statement, statement of transactions, transport document).

The conditions during transportation must be such as to ensure that the material does not sustain physical or biological damage. This normally means that the material should be stacked loosely and allowed to breathe in order to prevent a build-up of heat from respiration of the material.

The processing centre should check the material to ensure that it is in compliance with the order (species, quantity, origin, sanitary and phytosanitary conditions). If it is not, the details should be recorded and photographic evidence taken and documentation should state the conditions in which the material was received.

The accepted material is given a code and registered in the processing plant records. At this stage, the material should be stored in such a way as to preserve its quality (which will depend upon the type of material, e.g. dry cones, green cones, fleshy fruit, etc.) before being processed or, processed immediately if the lot is fragile. A master certificate can be required by the official body for all reproductive material derived from approved basic material.



6. EXTRACTION, CLEANING, GRADING, SAMPLING, AND QUALITY CONTROL OF SEEDS⁶

In all stages of seed processing, the lot must be traceable and accompanied by labelling (manual, bar code, Quick Read (QR) code). In the case of BDV material, each collection unit should be treated as a single batch if it is intended for natural restoration. With the agreement of the consumer, the individual batches can be mixed together.

EXTRACTION

The appropriate protocol for each species must be applied for the extraction of seed from the fruit. The extraction can be hot or cold, depending on whether the process requires the use of an oven, hot or cold water, or mechanical processing. For example, nearly all conifer seeds are extracted in a warm oven and almost all hardwood seeds are cold extracted, although there are exceptions, i.e. alder conelets are hot extracted and some pines are cold extracted. Depulping of fleshy fruits is normally done with cold water in custom-built machines and dewinging machines usually operate in a dry state. Some species have a fruit from which the seed can be easily removed with a simple separation. For example, oak acorns must be separated from the cupules and in the case of maple and ash, the individual seeds must be separated.

CLEANING

Following the hot or cold extraction procedure, the seed material produced is full of impurities such as blemished or broken seeds, dust, pebbles, twigs and leaves. The cleaning and later grading is done with special machines, including vibro-screening machines, and gravimetric and densimetric tables. For many conifers, the grading is preceded by de-winging which involves the removal of the seed wings.

Once the cleaning and grading is finished, the moisture content of the seed needs to be checked and adjusted to that appropriate for the species.

At this stage, the batch is also sampled for quality analysis.

6. EXTRACTION, CLEANING, GRADING, SAMPLING, AND QUALITY CONTROL OF SEEDS⁶

SAMPLING

Sampling must be done only by qualified persons. Depending on the species, quantity and purpose, the sampler produces the submitted sample for quality analysis by the repeated halving technique. A small amount of seed is retained in order to carry out a moisture test in a thermo-balance or some other suitable piece of apparatus. If the issuance of an ISTA certificate is required, an appropriate procedure must be followed. Note that in case of a large lot stored in many containers (bags, sacks, etc.), sample to be tested can be obtained by gathering a fistful of seeds at random. Where practicable (with orthodox species), it is recommended that a second sample from the same source be stored for at least one year.

CHECKING THE SEED QUALITY

The following tests should be carried out on samples during the laboratory analysis.

- CUT TEST.
- PURITY.
- GERMINATION TEST (FOR SEEDS NOT SUBJECT TO DORMANCY)
- THE WEIGHT OF 1 000 SEEDS.
- VIABILITY TEST WITH TETRAZOLIUM SALTS (FOR SEEDS SUBJECT TO DORMANCY)

Other officially recognised viability tests which can be used are as follows.

- EXCISION OF EMBRYOS.
- X-RAY.



6. SEE ANNEX IV.

6. EXTRACTION, CLEANING, GRADING, SAMPLING, AND QUALITY CONTROL OF SEEDS⁶

CHECKING THE SEED QUALITY

Quality tests after a storage period could be required, i.e. in case of long-term storage or when a buyer is not satisfied with the quality of the received seed. A quality test can be made thus on the sample stored by the dealer.

All data should preferably be recorded in a database by the laboratory. Because the quality of FRM is so variable, no absolute standards are set but if a batch does not match up with expected norms it may be decided not to offer it for general sale. The ratio between the seeds produced and the quantity of fruit collected gives the seed yield of the lot. It is usually a reasonably well-defined value, having a range as a result of many lots. Therefore, any deviant result means that something occurred in the production line-up to sampling or, for example, the crop collected did not match the check sample taken in terms of percentage full seed.

7. SALE AND STORAGE OF THE SEED PRODUCED

A sale may involve freshly produced or stored material. The material offered for sale should always be labelled. Depending on whether the material is Source Identified, Selected, Qualified and Tested, the labels must be in yellow, green, blue and rose respectively. The weighing of the material for sale should be done on regularly calibrated scales. The bags used for shipping, or envelopes in the case of small quantities, must be sealed when filled. The material offered for sale must be removed from the rolling stock register. In addition to the label, the packages should be accompanied by all documentation required for shipment, which might also be a legal requirement.

7. SALE AND STORAGE OF THE SEED PRODUCED

If the quantity of forest reproductive material produced exceeds the quantity of material needed for a sale, it should be stored in special climatic, normally cold, chambers. The climatic characteristics may be changed in the chambers according to the type of species stored. Normally only the so-called orthodox species are stored, i.e. species that can be dried to below 10% without damage to the physiological condition of the seed. In contrast, in the case of recalcitrant species, it is unwise to produce surpluses in order to create a stock as they cannot be dried below 35%. There are also intermediate species whose conservation may be more or less difficult and have moisture content between 10 and 20%.

Finally, the material can be used for sowing in a nursery to produce seedlings.

8. SEED SOWING AND TRANSPLANTING OF SEEDLINGS PRODUCED⁷

In the case of BDV material intended for natural restoration, the individual collection units will be sown, transplanted and transported separately.

At all stages during the sowing, transplanting, lifting, grading and storing, plants must be properly separated from other lots and properly labelled with the following information.

- | | |
|-------------------------------------------------------------------------------|---------------------------------------------------------------------|
| <input checked="" type="checkbox"/> SPECIES. | <input checked="" type="checkbox"/> CATEGORY. |
| <input checked="" type="checkbox"/> TYPE OF BASIC MATERIAL. | <input checked="" type="checkbox"/> REGION OF PROVENANCE. |
| <input checked="" type="checkbox"/> ORIGIN. | <input checked="" type="checkbox"/> REGISTER REFERENCE. |
| <input checked="" type="checkbox"/> NUMBER OF SEED CERTIFICATE ISSUED BY NDA. | <input checked="" type="checkbox"/> BATCH NUMBER (WHERE AVAILABLE). |

7. SEE ANNEX V-VI.

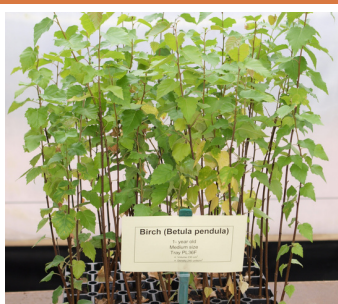
8. SEED SOWING AND TRANSPLANTING OF SEEDLINGS PRODUCED ⁷

Any species which show the phenomena of dormancy should be subjected to treatments that induce the breaking of dormancy. The most commonly used methods are stratification (often called pre-treatment) in sand or chemical or physical scarification. All material sown should be labelled with an indelible label; a map of the sowing in the nursery should be kept along with other records. Sowing can be carried out in containers or in beds, both having advantages and disadvantages. During the cultivation of seedlings, the normal nursery practices should be applied, such as irrigation, weeding, fungi and pest control, and shading in warmer climates.

Very often the material must be lifted and transplanted after one or two years to grow on for a further period, e.g. conifers if they are grown in open seedbeds. This period can last two to three years depending on the species. Transplants for reforestation are lifted from the lines after the appropriate period. In some countries, seedlings may be grown in the seedbed for one or two years. After lifting, these plants are subjected to a handgrading procedure with the aim of eliminating any poorly developed and unhealthy plants.

In the case of material grown in a container nursery, the cultivation period should not exceed a certain number of years, especially for species with tap roots (otherwise the main roots will have a bad shape). This is a defect which the plant cannot correct throughout the course of its life.

All material offered for sale should always be labelled and must be removed from stock. Provided the plants have been fully certified at all times they can also be used for reforestation programmes.

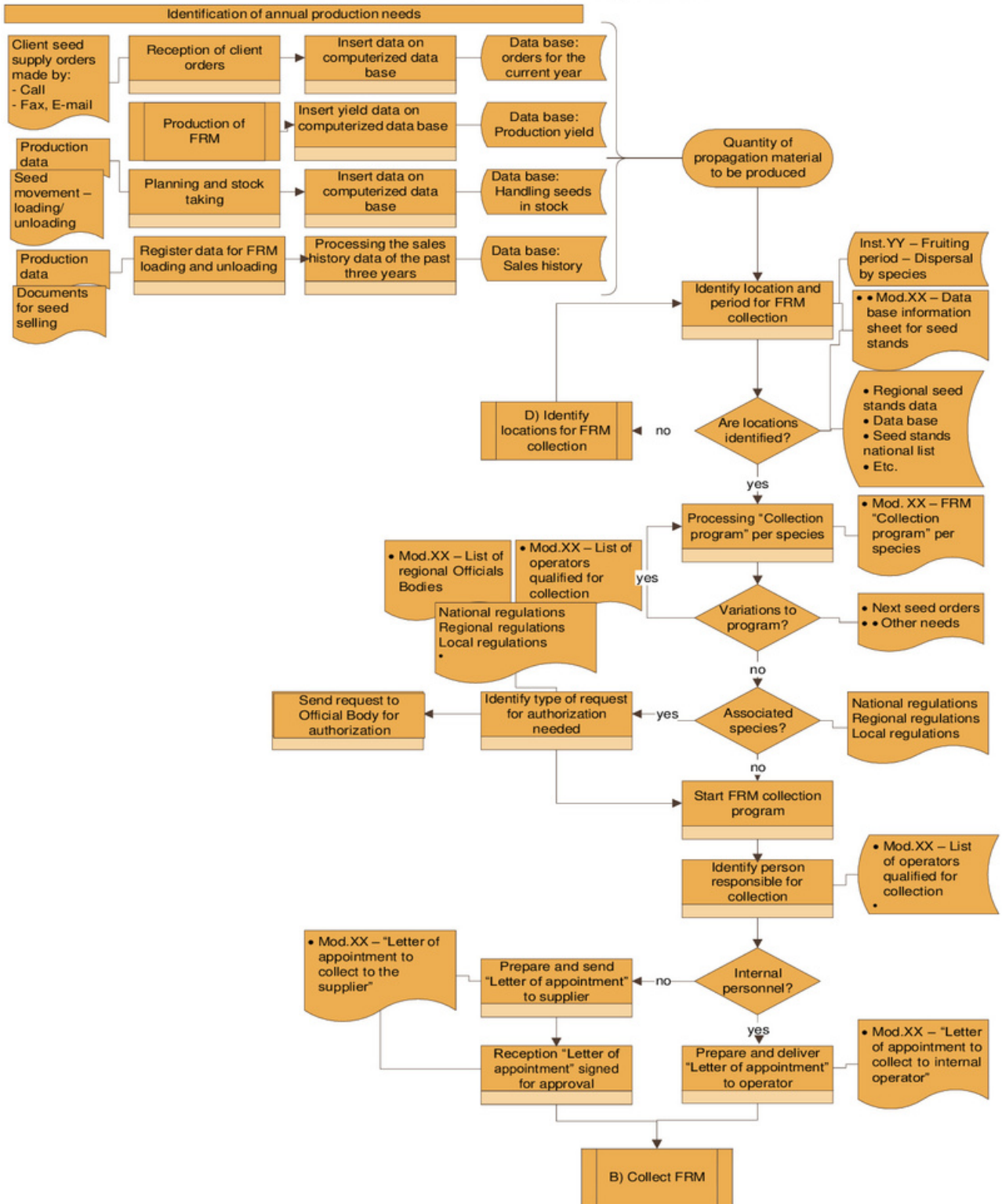


9. THE USE OF BVD MATERIAL IN REFORESTATION

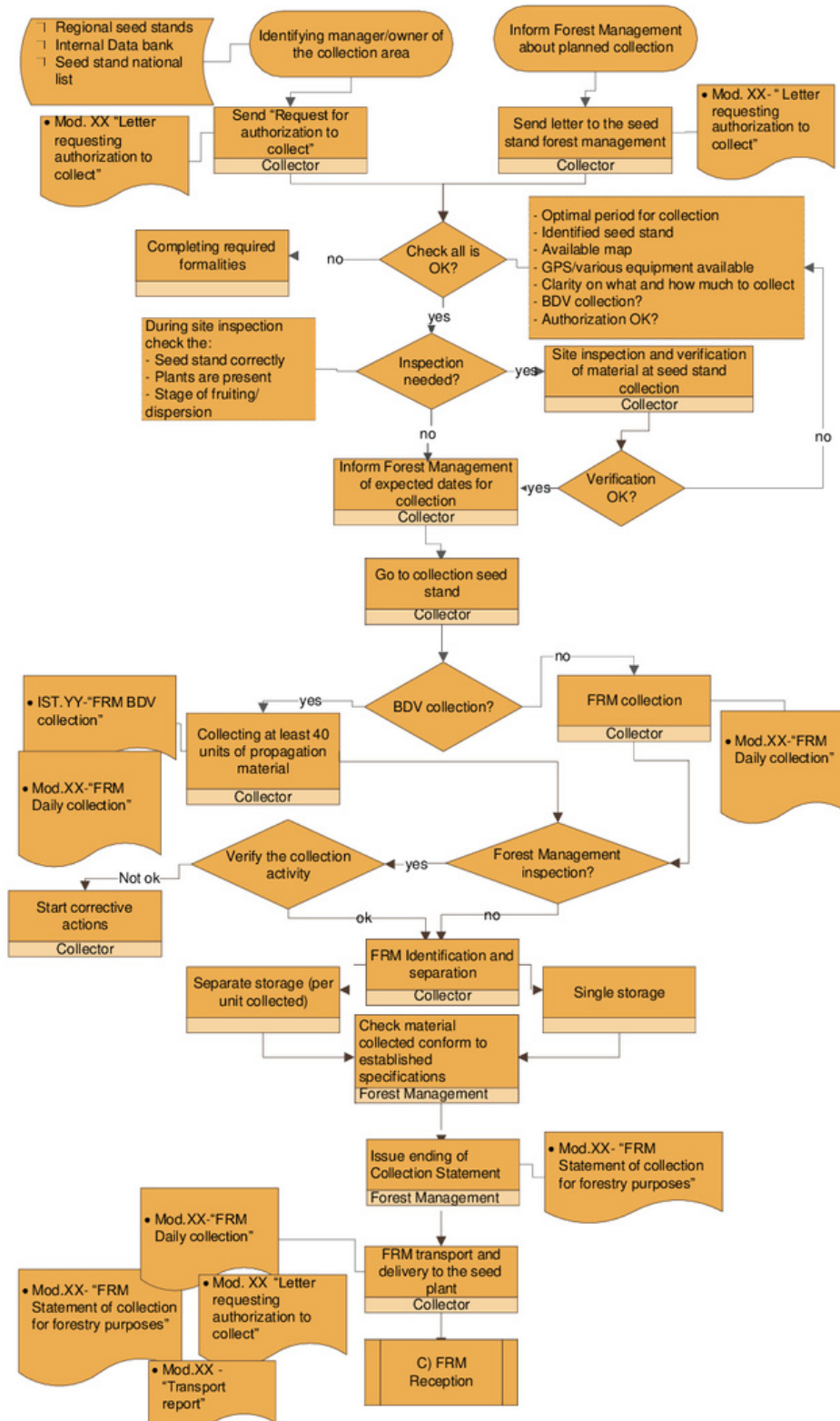
Some authorities recommend that BVD materials should be used in the case of reforestation although this is by no means universal. The area intended for reforestation should be prepared, cleared from weeds, plants of other species, stones, and then ploughed and rotovated if necessary. The holes, which will host the plants, should be prepared well in advance. The area and plantation should be georeferenced using an integrated Geographic Information System (GIS). The plantation is subject to normal cultural practices and post-plantation management for some years. Over time, the dead plants should be replaced when necessary.



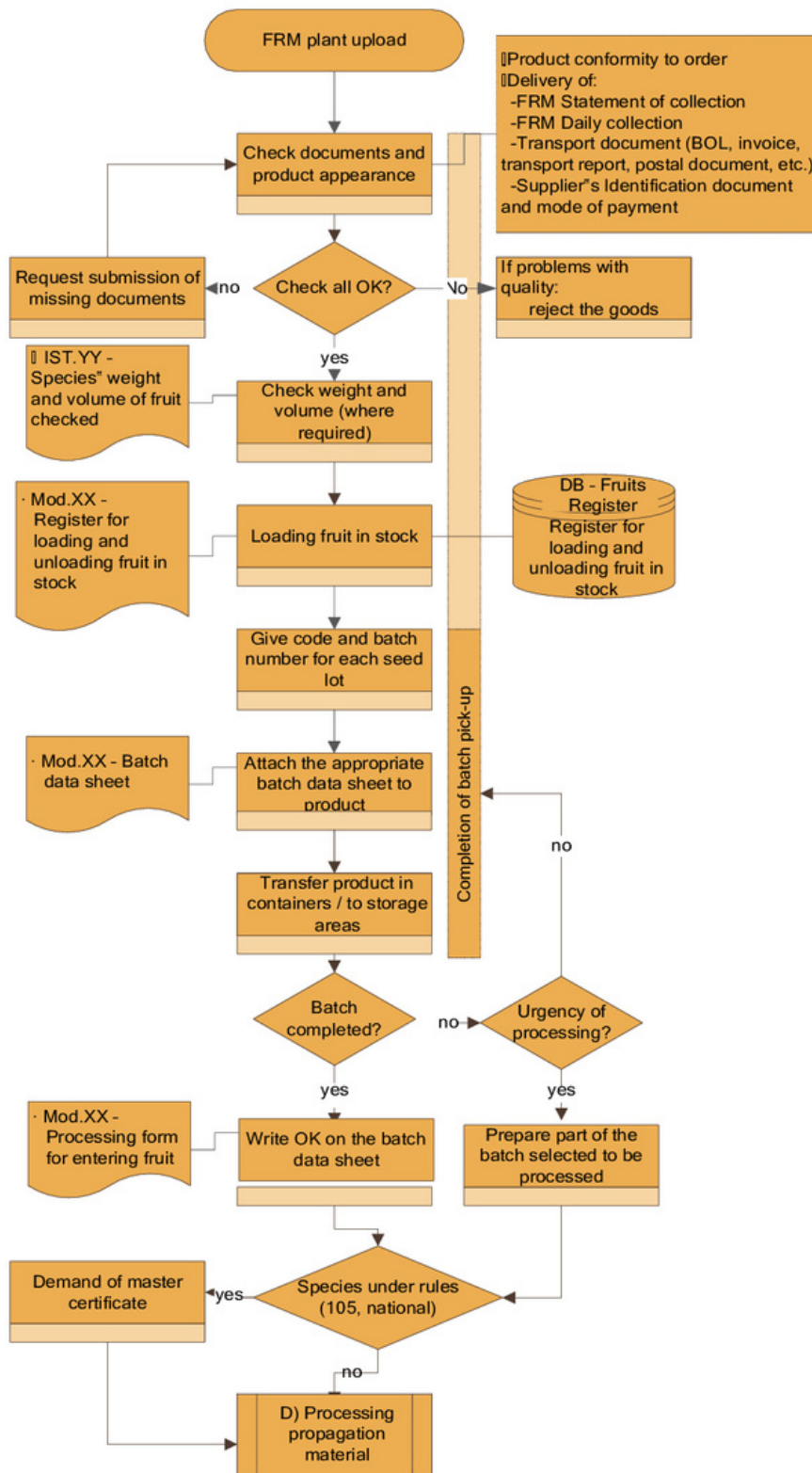
ANNEX I. FRM ANNUAL COLLECTION PROGRAMME



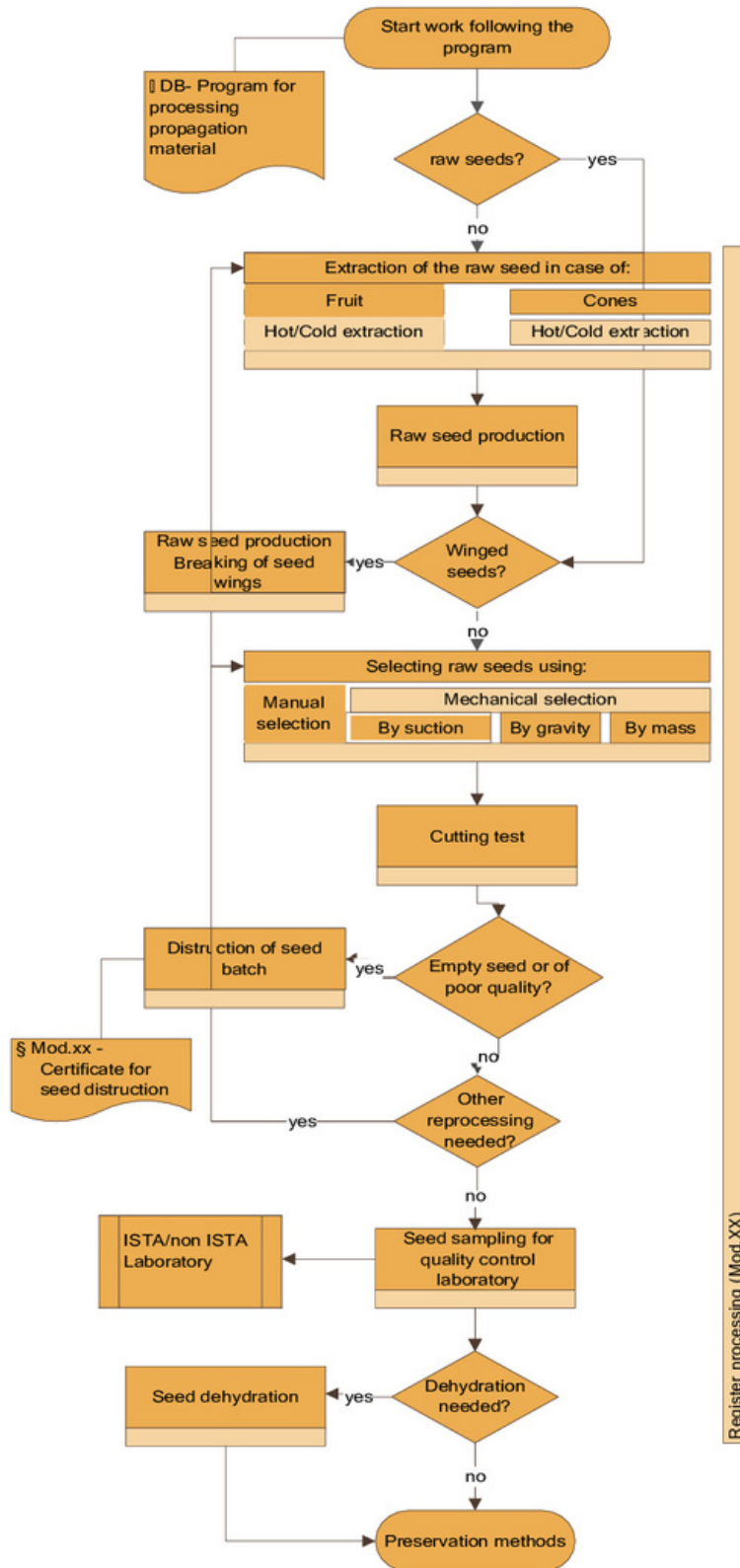
ANNEX II. FRM COLLECTION



ANNEX III. FRM UPLOAD

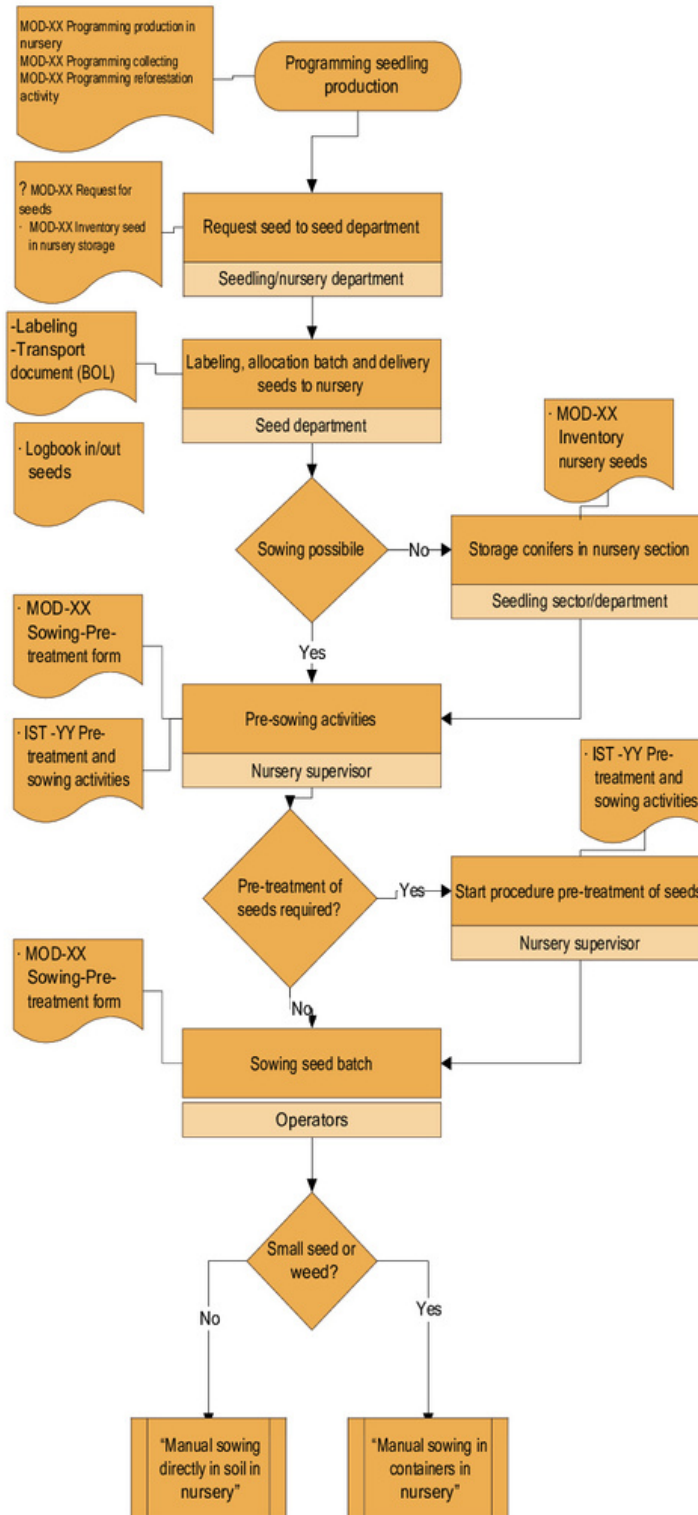


ANNEX IV. FRM PROCESSING



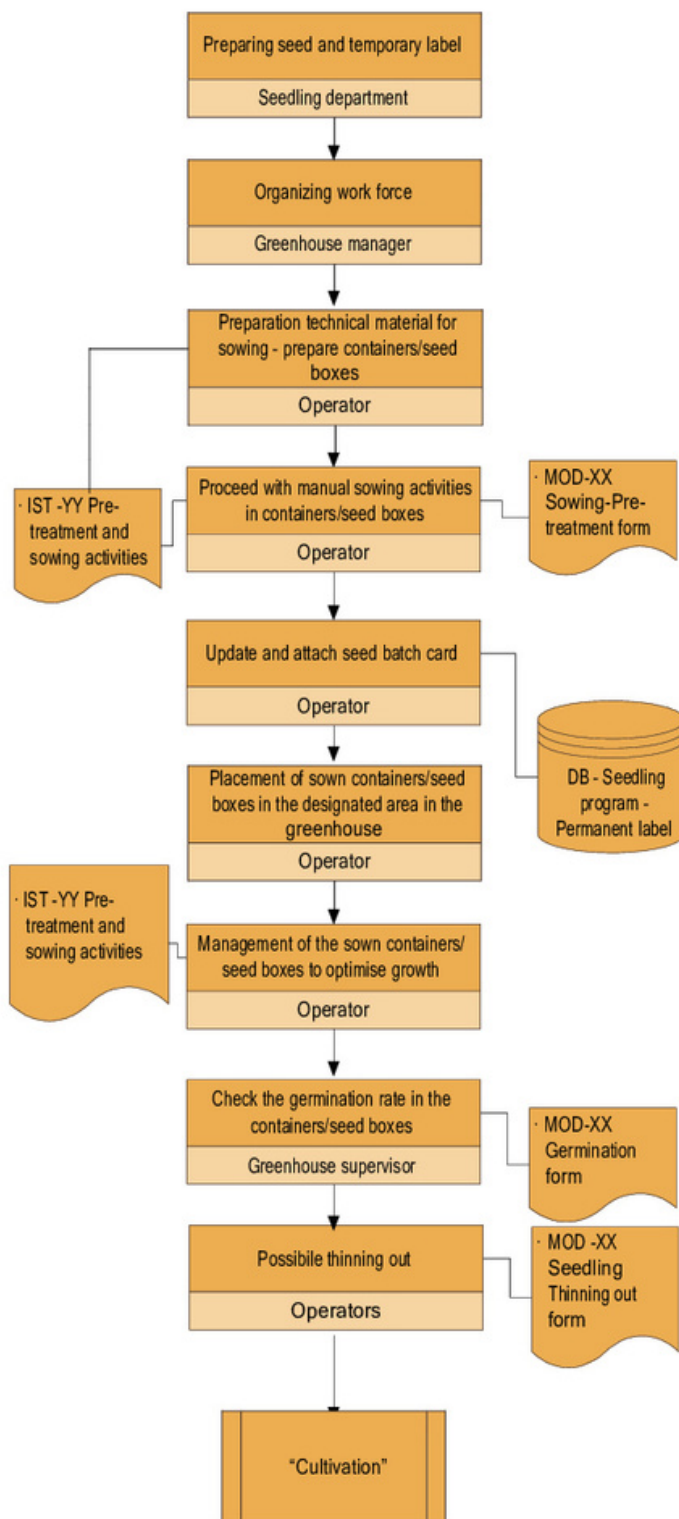
ANNEX V. SEEDLING PRODUCTION

1. PREPARATION OF SEED BATCHES



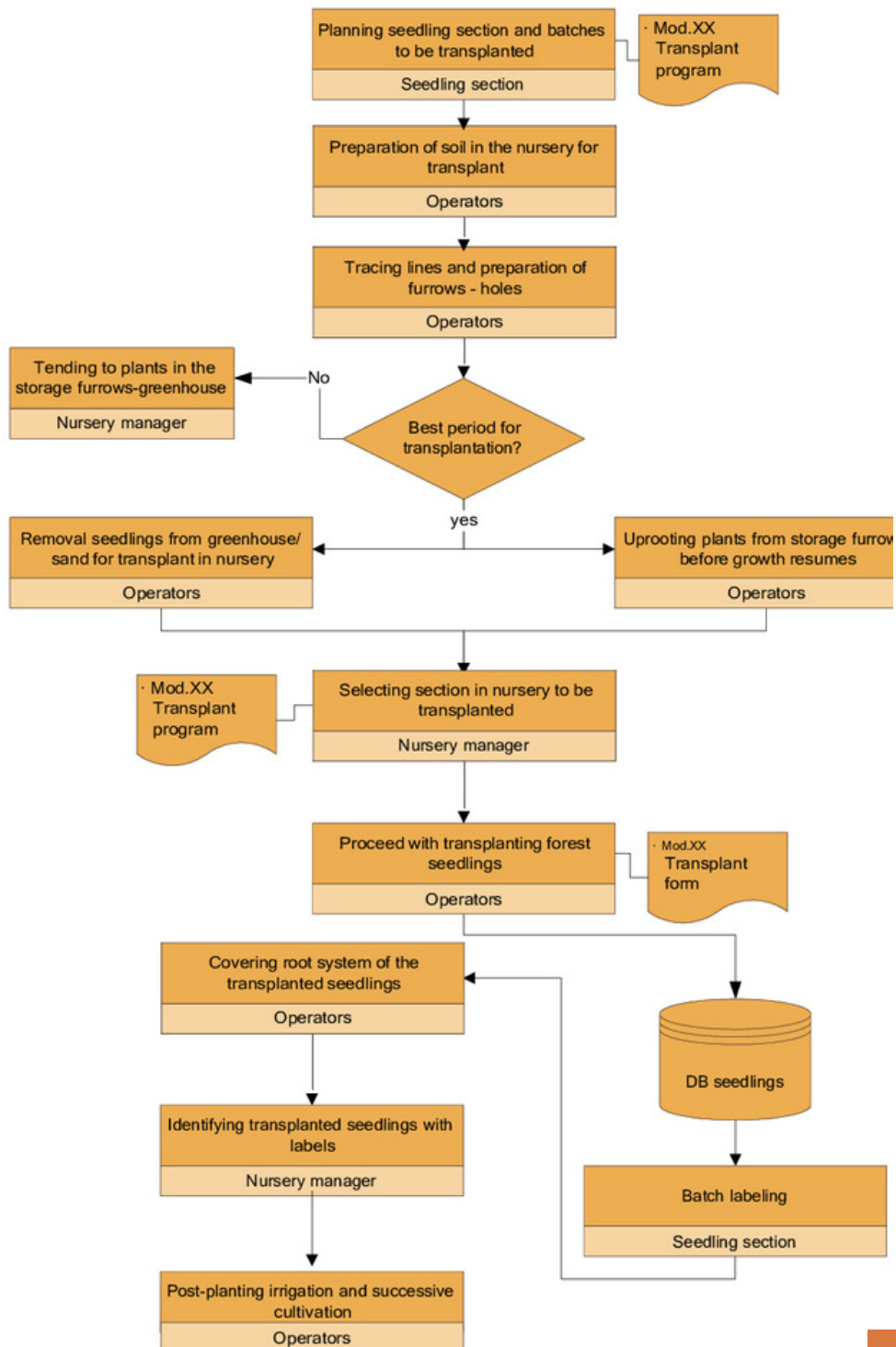
ANNEX V. SEEDLING PRODUCTION

2. MANUAL SOWING CONTAINERS/SEED BOXES



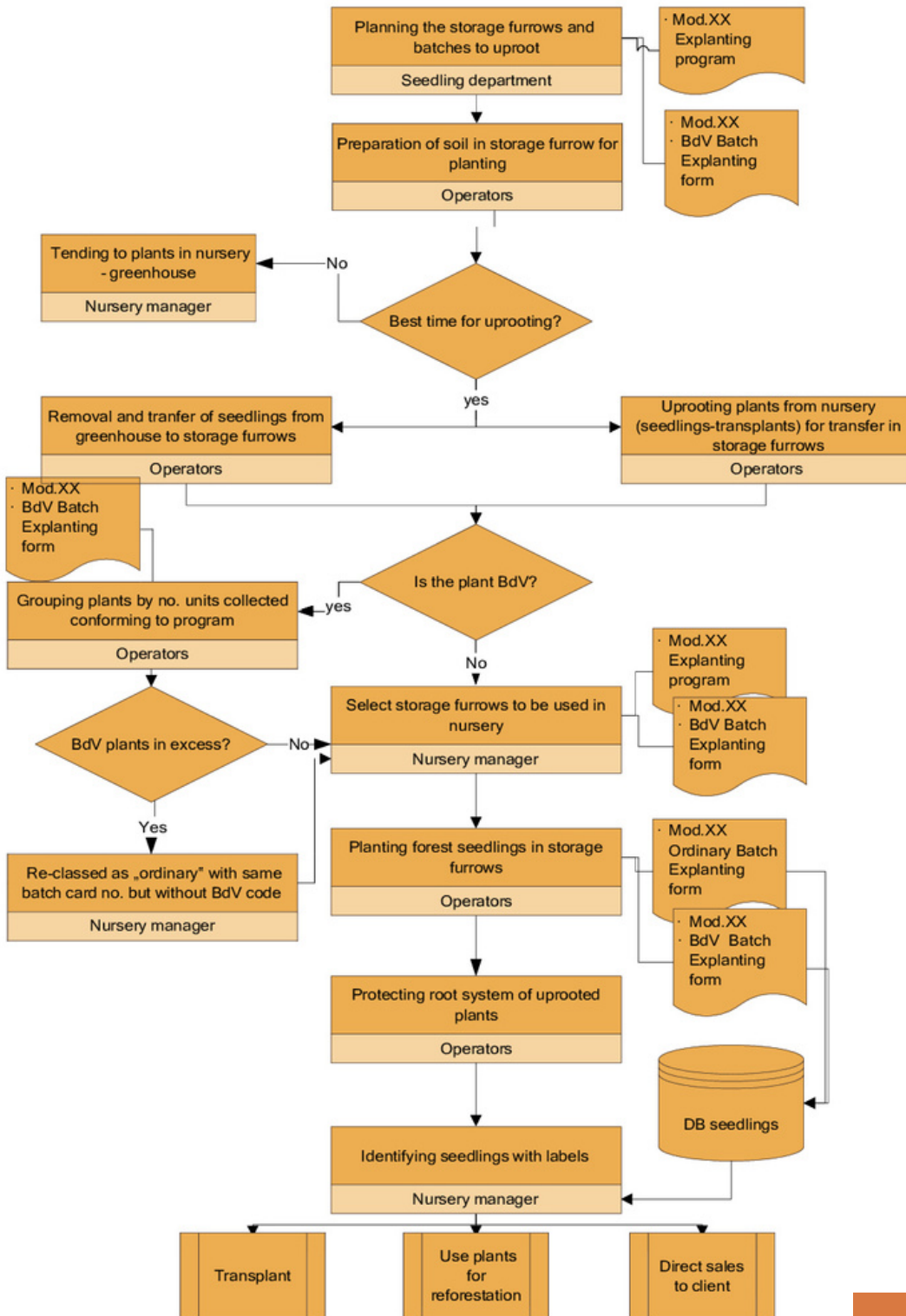
ANNEX VI. SEEDLINGS CULTIVATION

1. TRANSPLANTING FOREST PLANT SEEDLINGS IN NURSERIES



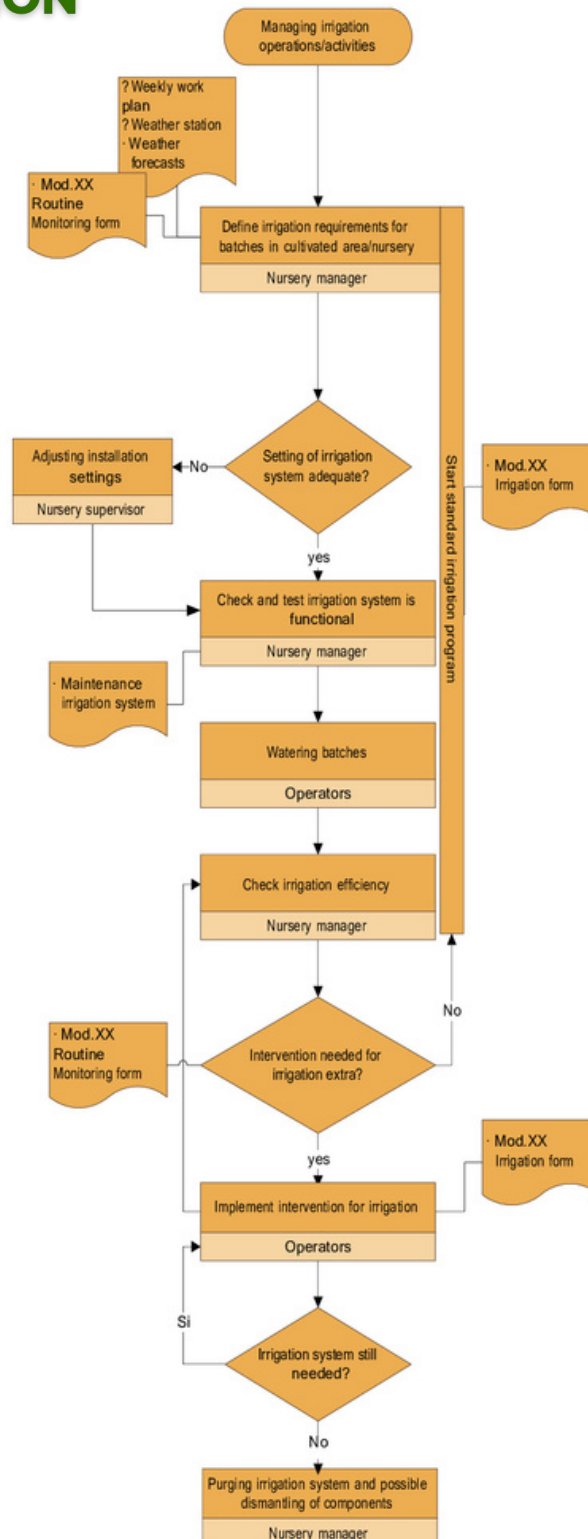
ANNEX VI. SEEDLINGS CULTIVATION

2. EXPLANTING SEEDLINGS



ANNEX VI. SEEDLINGS CULTIVATION

3. IRRIGATION



ANNEX VII. DAILY COLLECTION REPORT

1. Section to be completed by the person in charge of the collection (Supplier-team manager etc.)



REPORT DATE _____
COLLECTING PROPAGATION MATERIAL

OPERATORS/WORKERS :

NAME	SURNAME	HOURS

QUANTITY COLLECTED Kg _____ L _____

SPECIES _____

SEED STAND (indicate number or Data Sheet) _____

BDV COLLECTION? Yes No

IF BDV COLLECTION INDICATE THE NUMBER OF PLANTS FROM WHICH THEY WERE COLLECTED: No. _____

CUTTING TEST? Yes No IF YES INDICATE THE VALUE % _____

THE ASSIGNED WORK WAS:

finished

to finish

THE COLLECTED MATERIAL HAS TEMPORARILY BEEN STORED AT: _____

THE COLLECTED MATERIAL HAS BEEN TRANSPORTED FROM THE FOREST TO TEMPORARY STORAGE IN (No.) _____
PACKAGES NUMBERED PROGRESSIVELY FROM No. _____ / _____ (Id Order details / Container number)
TO No. _____ / _____ (Id Order details / Container number)

Did the Official Body personnel check/do site inspections during the collection stages? Yes No

OPERATOR _____

2. Section to be compiled by the person responsible for the pick-up for shipment

Suitable material

Non suitable material – Reason _____

Quality controller: _____ Control Date: _____

**CONTACT PERSON**

Csaba Gaspar
Head of Codes and Schemes
OECD Directorate for Trade and Agriculture

**EMAIL**

csaba.gaspar@oecd.org

**ADDRESS :**

2, rue André Pascal
75775 Paris, Cedex 16 - France

**WEBSITE :**

<https://www.oecd.org/agriculture/forest/>

JOIN THE OECD FOREST SEED AND PLANT SCHEME!
