



FOREST LANDSCAPE RESTORATION PROJECT

ACIAR ASEM/2016/103 Enhancing Livelihoods through Forest & Landscape Restoration

Selecting Mother Trees — OF TIMBER SPECIES —



VISAYAS
STATE UNIVERSITY



NESTOR O. GREGORIO - ARTURO E. PASA - ROTACIO GRAVOSO - JOHN HERBOHN

Selecting Mother Trees — OF TIMBER SPECIES —

NESTOR O. GREGORIO
ARTURO E. PASA
ROTACIO S. GRAVOSO
JOHN L. HERBOHN

A training guide on selecting mother trees
for Q -Seedling production in smallholder nursery

ALL RIGHTS RESERVED 2020

SELECTING MOTHER TREES OF TIMBER SPECIES
(Revised April 2020)

Nestor O. Gregorio, Arturo E. Pasa, Rotacio S. Gravoso,
& John Herbohn

©2009 VISCA Foundation for Agricultural Research and Development, Inc.
and College of Forestry and Environmental Science, Visayas State University,
Visca, Baybay City, Leyte, Philippines. All Rights Reserved.

Published by the Visayas State University funded by the Australian Centre for
International Agricultural Research, Watershed Rehabilitation Project,
College of Forestry and Environmental Science, Visca, Baybay City, Leyte, Philippines.

Layout and Design: Ian Gahoy and Lady Love Tangcawan
Illustrations: Domingo Flandez

ASEM 2016/103
Enhancing Livelihood Through Forest and Landscape Restoration

Project Office:
B12, College of Forestry and Environmental Science,
Visayas State University,
Baybay City, Leyte
6521-A Philippines

Seedling Quality

The quality of planting stock is generally assessed based on two aspects - physical quality and genetic quality

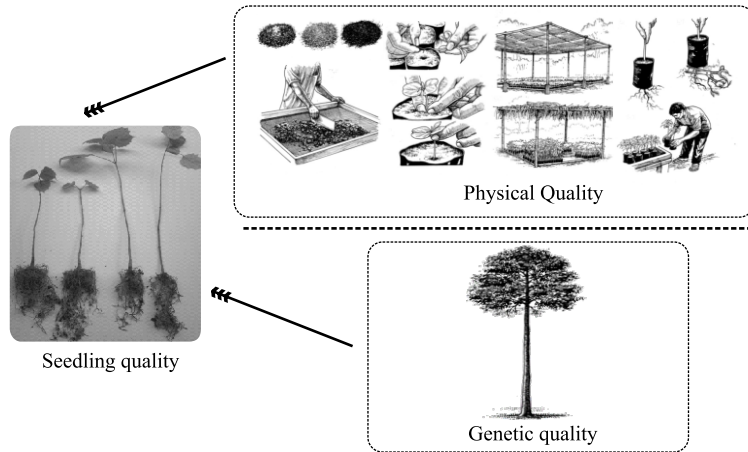


Figure 1. Main factors shaping-up seedling quality

Physical Quality

reflective of the nursery silvicultural treatments

Genetic Quality

based on the genetic make-up of the mother tree

1. Genotypic Characteristic — cannot be seen readily; total genetic inheritance
2. Phenotypic Characteristic — observable characteristics of an organism (including size, shape and color); interaction of genotype to the environment

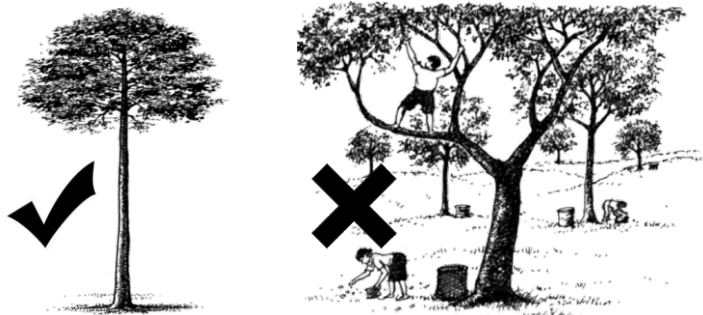


Figure 2. Illustration of ideal and undesirable mother tree for timber species

Seed Sources

Seed sources — refer to individual trees or stands from which seeds are collected

1. **Seed orchard** — stands established for the specific purpose of seed production. Consist of families of superior genetic quality and planted at a regular spacing and specific design
 - ✗ Should be established at least of 30 families from seed orchard
 - ✗ 2-3 thinning of poor trees will be done
 - ✗ Isolation should be done to maintain the quality of seeds produced
2. **Seed Production Areas** — stands of trees either in natural forest or plantations that are improved for the specific purpose of seed production
 - ✗ Improvement consists of selective thinning to achieve optimal spacing for seed production and to remove poor quality trees, including those that have been attacked by pests and diseases
 - ✗ Thinning should be done so that the superior trees retained are evenly spaced
 - ✗ Should be isolated from the contamination of pollen from undesirable stand of the same species
 - ✗ As general rule, seed orchards and SPAs are isolated by a distance of at least 200m
3. **Seed stands** — are groups of trees either in natural forests or plantations, identified as having superior characteristics such as straight stem form or rapid growth
 - ✗ Managed for seed production but seldom benefit from selective thinning or other management intended to improve the quality of seeds produced from the stand
4. **Seed trees** — are individual trees from which seed is collected, either in natural forest or tree plantations; most common source of germplasm for smallholder forestry

| Character | Seed source | | | |
|-------------------------|---------------------------|------------------------------------|---|---------------------------------------|
| | Seed orchard | Seed production area | Seedstand | Seedtrees |
| Planting purpose | Seed production | Not for seed production | Not for seed production | Not for seed production |
| Seed origin | identified | Identified and unidentified | Unidentified | Unidentified |
| Quality of mother trees | Selected and tested trees | Selected stands, thinned, untested | Selected stands, unthinned(or thinned) untested | selected trees from unselected stands |
| Seed quality | Very good | Good | Fairly good | Intermediate |
| Level of management | Very intensive | intensive | intermediate | some |

Table 1. Characteristics of several seed sources

Common Practice

1. Germplasm used in smallholder seedling production is taken from unselected mother trees; collected without the conscious selection of seed sources



Figure 3. poorly formed trees which are common seed sources of nurseries

2. Germplasm from poor trees will result to poor plantations



Figure 4. An example of plantation established using germplasm from unselected mother trees

3. Poor stem form commands low price of timber and low sawing recovery



Figure 8. Quality of timber and waste due to undesirable stem form



Figure 9. Desirable stem form of trees in a plantation

Assessment of the Phenotypic Characteristics of Mother Trees

| Criterion | Parameter |
|---------------------------|--------------------------------|
| Stem growth | Total height (m) |
| | Diameter at breast height (cm) |
| Stem form | Stem straightness |
| | Forking/stem branching |
| | Circularity of the stem |
| Health | Tree health |
| Branching characteristics | Branch angle |
| | Branch thickness |
| | Branch persistence |

| Grading Scale | |
|---------------|-----------------------|
| 1 | Very unacceptable |
| 2 | Unacceptable |
| 3 | Stem straightness |
| 4 | Moderately acceptable |
| 5 | Highly acceptable |
| 6 | Ideal |

Diameter at breast height

The size of the stem in relation to its age. This parameter relates to the sturdiness of the tree and measured using a diameter tape at 1.3 meters from the ground. Figure 5 presents the scores for various diameters at breast height.

Score:

- 6 - the tree attained the normal dbh given its age
- 5 - the tree attained 90% of its dbh given its age
- 4 - the tree attained 75% of its dbh given its age
- 3 - the tree attained 50% of its dbh given its age
- 2 - the tree attained 40% of its dbh given its age
- 1 - the tree attained 20% and below of its normal dbh given its age







| Class | Ideal | Highly acceptable | Acceptable | Moderately acceptable | Unacceptable | Very unacceptable |
|-------|---|---|---|---|--|---|
| Grade | 6 | 5 | 4 | 3 | 2 | 1 |
| |  |  |  |  |  |  |

Figure 2. Scores for different diameters at breast height.

Total height

This refers to the height of the tree in relation to its age. The total height was measured from the ground up to the tip of the crown using the laser hypsometer . Figure 4 shows the height categories of the mother tree and the respective score.

Score:

- 6 - the tree attained the normal height given its age
- 5 - the tree attained 90% of its normal height given its age
- 4 - the tree attained 75% of its normal height given its age
- 3 - the tree attained 50% of its normal height given its age
- 2 - the tree attained 40% of its normal height given its age
- 1 - the tree attained 20% and below of its normal height given its age

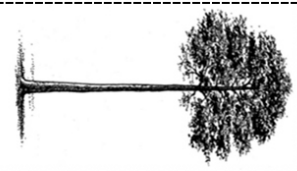
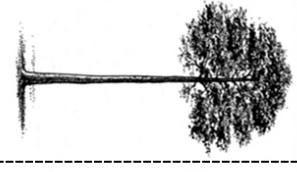


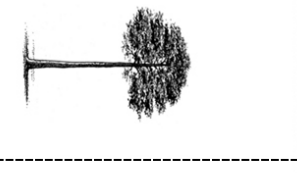

| Class | Ideal | Highly acceptable | Acceptable | Moderately acceptable | Unacceptable | Very unacceptable |
|-------|---|---|---|---|--|---|
| Grade | 6 | 5 | 4 | 3 | 2 | 1 |
| |  |  |  |  |  |  |

Figure 1. Height of the mother tree and corresponding score.

Forking and multiple stem leaders

The presence of multiple stems instead of the normal single stem. Forking reduces wood quality, quantity and economic value of the wood. The degree of forking was rated according to the number of forked stems and the position of the stem where the fork has developed. The degree of forking is illustrated in Figure 7.

Score:

- 6 - not forking
- 5 - two stem leaders developed above 5 meters from the ground, one stem is considerably smaller than the main stem
- 4 - two stem leaders developed above 5 meters from the ground, the stems are of the same size
- 3 - two stem leaders developed within 5 meters from the ground
- 2 - three stem leaders developed within 5 meters from the ground
- 1 - more than three stem leaders developed within 5 meters from the ground

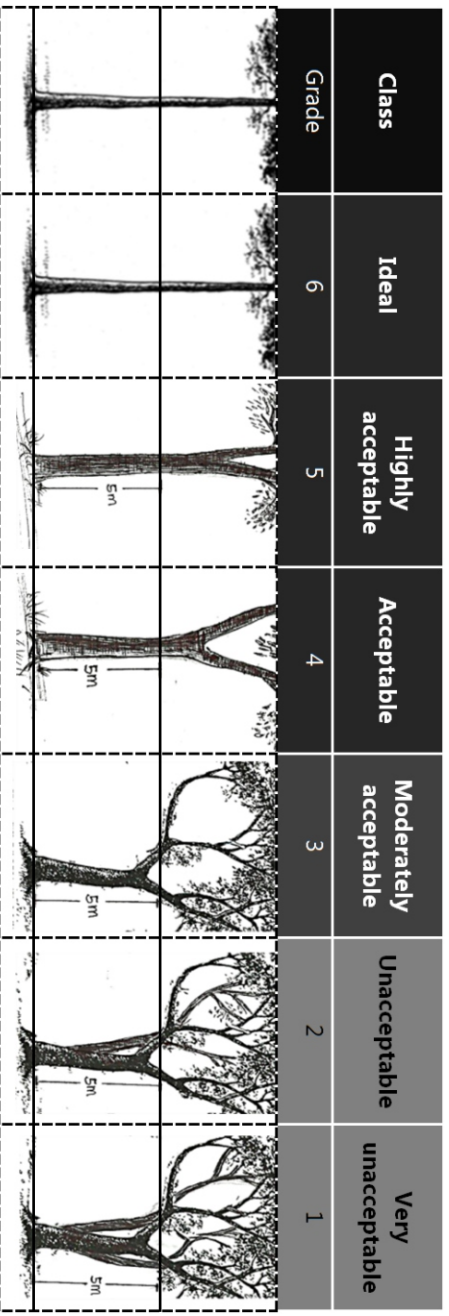


Figure 4. Forking categories and respective scores.

Stem straightness

This describes the position of the stem in relation to the vertical axis. Stem straightness is directly related to wood quality. Figure 6 illustrates the stem forms and corresponding scores.

Score:

- 6 - straight stem
- 5 - with a narrow bend (less than 10 ° from the vertical axis) occurring at 1-2 meters from the ground
- 4 - a single bend of about 10 ° occurs on the middle part of the stem length
- 3 - a pronounced bend of about 15 ° from the vertical axis is formed on the middle part of the stem length
- 2 - two bends about 20 ° within the merchantable length of the stem
- 1 - two bends greater than 20 ° within the merchantable length of the stem

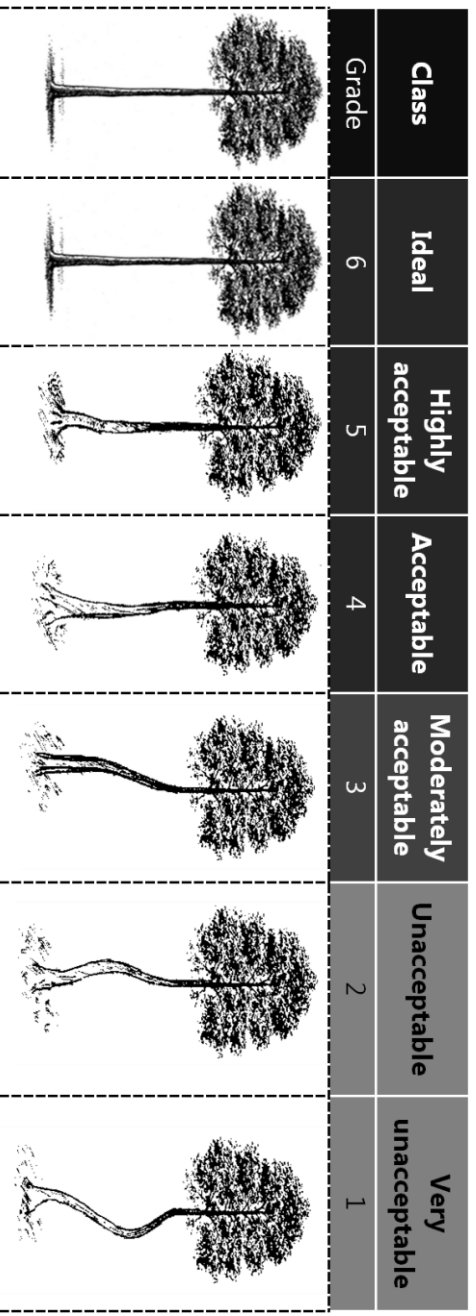


Figure 3. Stem forms and corresponding scores.

Tree health

The absence of symptoms and signs of pests and diseases. Tree health profoundly affects the quality of seeds and wildlings. The health of the mother tree is assessed through ocular observation of the color of the crown and degree of damage caused by pests and diseases. The crown health categories and scores are presented in Table 2.

Score:

- 6 - the crown is not chlorotic and not damaged by insects and pathogens
- 5 - 10% of the crown is chlorotic or damaged by insects and pathogens
- 4 - 25% of the crown is chlorotic or damaged by insects and pathogens
- 3 - 50% of the crown is chlorotic or damaged by insects and pathogens
- 2 - 75% of the crown is chlorotic or damaged by insects and pathogens
- 1 - 100% of the crown is chlorotic or damaged by insects and pathogens

| Class | Ideal | Highly acceptable | Acceptable | Moderately acceptable | Unacceptable | Very unacceptable |
|-------------------|-------------------|----------------------|----------------------|-----------------------|----------------------|-----------------------|
| Grade | 6 | 5 | 4 | 3 | 2 | 1 |
| Crown not damaged | Crown not damaged | Crown is 10% damaged | Crown is 25% damaged | Crown is 50% damaged | Crown is 75% damaged | Crown is 100% damaged |

Table 6. Health categories of the crown and corresponding scores.

Stem Circularity

Normally, a tree exhibits a cylindrical stem. However, environmental and genetic factors affect stem development causing the tree to produce irregular or eccentric stem. The circularity of the stem affects woods quality and lumber recovery. Stem circularity was determined using the overall appearance of the stem from the breast height and at 5 meters interval along the length of the stem. Figure 7 presents various degrees of stem circularity as observed on the cross section

Score:

- 6 - straight stem
- 5 - with a narrow bend (less than 10° from the vertical axis) occurring at 1-2 meters from the ground
- 4 - a single bend of about 10° occurs on the middle part of the stem length
- 3 - a pronounced bend of about 15° from the vertical axis is formed on the middle part of the stem length
- 2 - two bends about 20° within the merchantable length of the stem
- 1 - two bends greater than 20° within the merchantable length of the stem

| Class | Ideal | Highly acceptable | Acceptable | Moderately acceptable | Unacceptable | Very unacceptable |
|-------|-------|-------------------|------------|-----------------------|--------------|-------------------|
| Grade | 6 | 5 | 4 | 3 | 2 | 1 |
| | | | | | | |

Figure 5. The degree of stem circularity and corresponding score.

This refers to the angle the branch forms with the vertical axis of the tree stem. The branch angles are described in Figure 10.

Score:

- 6 - majority of mature branches are 90° from the stem axis
- 5 - majority of mature branches are 75° to 90° from the stem axis
- 4 - majority of mature branches are 60° to 75° from the stem axis
- 3 - majority of mature branches are 50° to 60° from the stem axis
- 2 - majority of mature branches are 45° to 50° from the stem axis
- 1 - majority of mature branches are less than 45° from the stem axis

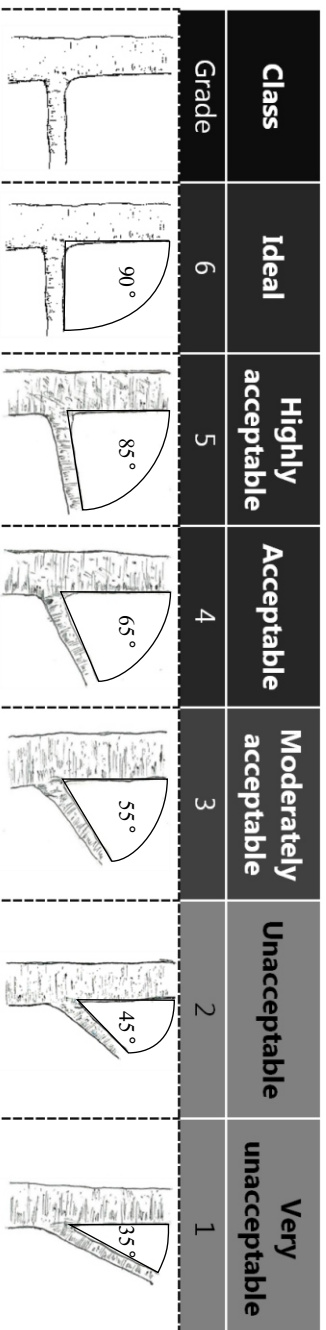


Figure 8. The branch angles and respective scores

Branch persistence

This pertains to the attachment of dead branches on the stem. Ideally, dead branches fall readily after canopy closure.

This will avoid embedded branch base which leads to development of wood defects including knots. Only branches with a diameter of not less than 5 cm were considered in assessing this parameter. Only branches with a diameter of not less than 5 cm were considered in assessing this parameter. Figure 10 shows the degree of branch persistence and corresponding score.

Score:

- 6 - when less than 3 dry branches with a diameter of at least 5 cm remain attached on the stem
- 5 - when 3-5 dry branches with a diameter of at least 5 cm remain attached on the stem
- 4 - when 6-8 dry branches with a diameter of at least 5 cm remain attached on the stem
- 3 - when 9-12 dry branches with a diameter of at least 5 cm remain attached on the stem
- 2 - when 12-15 dry branches with a diameter of at least 5 cm remain attached on the stem
- 1 - when more than 15 dry branches with a diameter of at least 5 cm remain attached on the stem

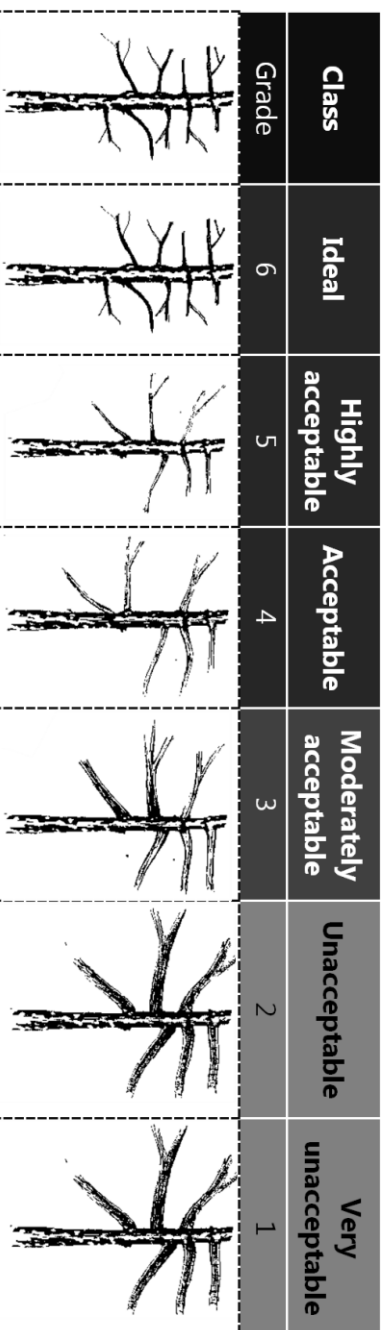


Figure 7. Branch persistence and respective scores

Tally Sheet

| Criterion | Points |
|--------------------|--------|
| Stem straightness | |
| Stem branching | |
| Stem circularity | |
| Health | |
| Branch angle | |
| Branch thickness | |
| Branch persistence | |
| Mean score | |

Example

| Parameter | Score |
|-------------------|---|
| Stem straightness | 5 |
| Stem branching | 4 |
| Stem circularity | 3 |
| Health | 6 |
| Branch angle | 5 |
| Branch thickness | 4 |
| Branch pruning | 5 |
| Mean score | 4.6 ~ 5 = <small>HIGHLY ACCEPABLE</small> |

Materials

- ✍ Tally Sheet
- ✍ Pencil
- ✍ Diameter T ape
- ✍ Hypsometer
- ✍ Spray Paint
- ✍ Bolo

Name of Tree ID expert: _____

TREE IDENTIFIER NOTES

| Plot No. | Remarks |
|----------|---------|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |

