ITTO PROJECT PD 386/05 Rev.1(F)
TECHNOLOGICAL DEVELOPMENT FOR THE PRODUCTION OF PLANTING MATERIALS
TO SUPPORT SUSTAINABLE PLANTATION OF BALI INDIGENOUS SPECIES
THROUGH COMMUNITY PARTICIPATION

Seed Collection and Handling

Majegau

Dysoxylum densiflorum (Blume) Miq

BALI PROVINCIAL FORESTRY SERVICE
AND
REGIONAL TREE SEED CENTER FOR BALI AND NUSA TENGGARA
AND
INTERNATIONAL TROPICAL TIMBER ORGANIZATION (ITTO)

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Dysoxylum densiflorum (Blume) Miq

Eko B. Hardiyanto

BALI PROVINCIAL FORESTRY SERVICE AND
REGIONAL TREE SEED CENTER FOR BALI AND NUSA TENGGARA AND
INTERNATIONAL TROPICAL TIMBER ORGANIZATION (ITTO)
2008

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PREFACE

Bali Province has large degraded forest and land. Around 55.313 ha of land are classified as degraded and critical. In the mean time the demand on wood in Bali, particularly wood for handicraft industry has been increasing and the local wood production is not able to meet the wood demand. Wood-based local handicraft industry is an integral part of the tourism industry of Bali, taking up around 35% of wood consumption and providing a lot of job opportunities. Concern about the sustainability of the industry due to the deterioration of the resources has been growing.

The Provincial Government of Bali has addressed the above problems by embarking on the rehabilitation program of degraded forest and land by planting trees of indigenous species. The objectives are to empower local economy and improve environmental conditions, and to meet the ever-increasing demand of wood for local handicraft industry. Six indigenous species have been identified and selected in the planting program, and included in the International Tropical Timber Organization (ITTO) Project No: 386/05 Rev.1 (F) titled "Technological Development for the Production of Planting Materials to Support Sustainable Plantation of Bali Indigenous Species through Community Participation".

The availability of good quality of seeds and planting stocks as well as proper planting techniques have been identified as some of the many factors crucial for the success of planting program. This guideline is intended to provide information on seed collection and handling of (*Dysoxylum densiflorum* (Blume) Miq). The preparation of the guideline is part of the above ITTO Project and therefore the guideline is written heavily based upon the research findings generated from the same project and other experiences relevant to the subject.

The author hopes that the guideline will be useful for and benefit organizations or farmers involved in tree planting.

In this opportunity I would like to acknowledge the following individuals for their invaluable contribution to the preparation of the guideline:

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Eko Bhakti Hardiyanto
Tree Breeder and Silviculturist

Dysoxylum densiflorum (Blume) Miq
Seed Collection and Handling

Taxonomy and Nomenclature
Family : Meliaceae
Vernacular/common names: Kulut (Sumatra), Kapinango, Maranginan, Pingku (Sunda), Kraminan, Cempaga, Cepaga (Java), Kapotren, Ampeuluh, Kheuruh (Madura), Majegau (Bali), Garu purut (Lombok).

Natural Distribution and Habitat
D. densiflorum (mahogany-like tree) grows naturally in Myanmar, China, Thailand, and Malaysia. In Indonesia the species occurs in Sumatra, Kalimantan, Java, Sulawesi, Bali and Nusa Tenggara. It grows scatteredly and seldom in cluster in a variety types of forests, primary and secondary forests. The species is often found in the habitat with good drainage, ranging from clay to sandy soil, at lowlands up to the altitude of 1,700 m.

Uses
The wood belongs to the durability class III and strength class II. Due to its strength the wood is used for various constructions such as bridge, house post, and ship. The wood is also used for furniture, carving, plywood and wheel cart. In Bali the wood is often used for making sacred buildings and ceremonial constructions of Balinese Hindu.

Botanical features
D. densiflorum is an evergreen species, can reach up to 40 m in height and 150 cm in stem diameter. The wood is yellowish brown to reddish brown, glossy, beautiful colored.

Dysoxylum densiflorum tree

Stem bark is pale-grayish brown, cracked and easily peeled off. Its inner bark has sweet smell, containing dysoxylum acid. The compound leaf is spirally arranged, can achieve 1 m long. The leaflet is oblong, pointed at the apex and rounded at the base. The inflorescence forms cauliflora. The flower is yellowish white, 2 cm long, when blooming produces unique fragrance. The corolla consists of 4-6 petals. Anther number is 8-12, attached to filament surrounding the stigma.

Phenology
Pollination is by insect. In Bali flowering period commences in April. Fruits are found in July-September and ripe fruit in October-December.

Fruit and seed

Fruit is ovate, fruit skin is slightly rough, pale brown, darker when ripe. The fruit contains 3-5 locules, but ripe fruit contains 1-5 filled seed. Fruit size varies , 1.5 – 2.5 cm in length and 1.0 – 2.5 cm in diameter. Seed is ovate-flat, blackish brown. Seed size varies, 0.5 – 1.2 cm in length, 0.3 – 0.9 cm in diameter. About 4,400 seeds per kg.

Flowers, fruits and seeds of *Dysoxylum densiflorum*

Seed collection

When ripe fruit is cracked. Fruit collection should be done before the fruit starts to crack. As the fruits in the cluster are not ripe at the same time, only ripe fruit should collected. Immature fruits have low seed viability. The fruit can be collected by climbing or using ladder and picking the fruit directly. The fruit may also be collected using pole mounted with hook. The collected fruits are put in the cotton or nylon sack.

Seed collection of *Dysoxylum densiflorum*

Seed handling

Seed should be dried under shade, drying under direct sun light will kill the seed. Within 2-3 days the fruit will be dry and cracked, fruit skin and flesh should be removed to prevent the seed from decay. To increase the germination capacity, the seed is soaked in tap water for about 24 hours and then washed.

Dysoxylum densiflorum fruits in nylon sack

Dysoxylum densiflorum fruits ready to be extracted


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Nursery and Planting

Majegau

Dysoxylum densiflorum (Blume) Miq

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The availability of good quality of seeds and planting stocks as well as proper planting techniques have been identified as some of the many factors crucial for the success of tree planting program. This guideline is intended to provide information on nursery and planting of *Dysoxylum densiflorum* (Blume) Miq. The preparation of the guideline is part of the above ITTO Project and therefore the guideline is written heavily based upon the research findings generated from the same project and other experiences relevant to the subject.

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Eko Bhakti Hardiyanto
Tree Breeder and Silviculturist

Dysoxylum densiflorum (Blume) Miq
Nursery and Planting

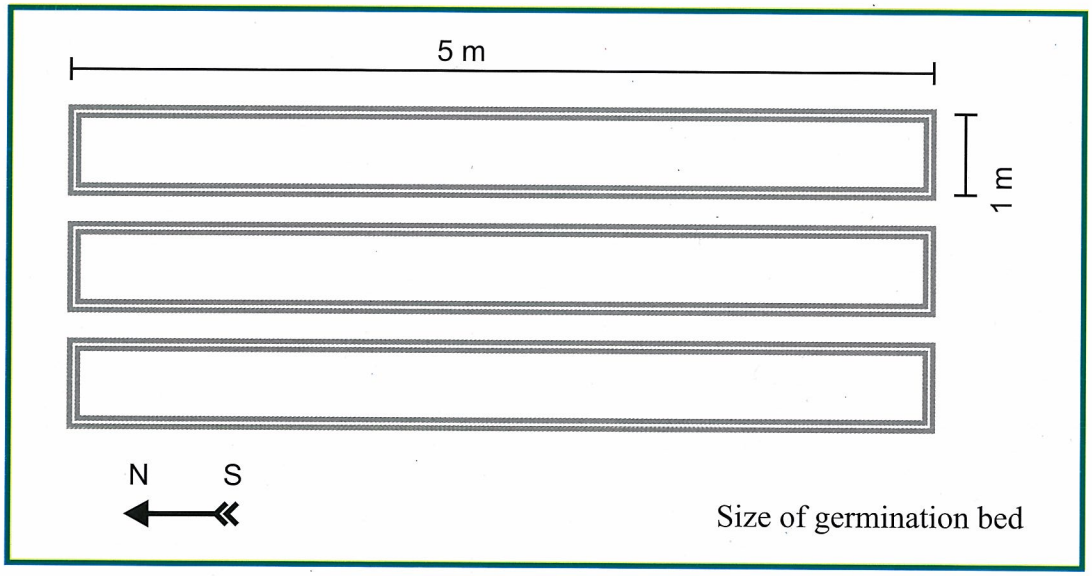
Site Selection of Nursery

The nursery site should be selected based on the followings:

a. Near the planting area to improve survival due to less damage during transport between the nursery and field.
b. Good accessibility to and within nursery.
c. Good topography (flat or gently slope) to make easy work. Low areas should be avoided as these will collect water at the low point and inhibit proper growth.
d. Ample, reliable and consistent water sources must be located nearby.
e. Workabl e soil.
f. Sufficient size to accommodate the number of seedlings needed to be raised.
g. Relatively easy to find workers.

Germination Bed

Germination bed with the size of 1 x 5 m may be prepared using brick, piece of wood or bamboo at the edge of the bed. Sowing media consist of fine sand. The media are put in the seed bed to a depth of about 15 cm. The surface of the media is leveled off to make easy for pricking and to prevent the root of seedling from damage during pricking. To reduce sun light the seed bed is put under shade using nylon net or coconut leaf (light intensity of 50%).



Size of germination bed

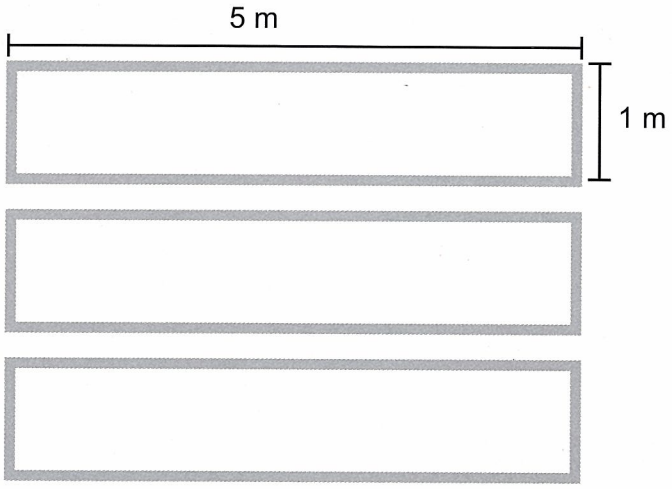
Seed Sowing

Extracted seeds should be immediately sown in the germination bed as the seed is recalcitrant which can not be stored for a long period without losing its viability. Sowing media are fine sand. The germination bed should be watered every day to maintain its moisture. Normally seed starts germinating at the second week after sowing. The germination type is hypogeous with a pair of first leaves in opposite position, often found two seedlings grow from one seed.

Germination beds and the seedlings

Nursery Bed

Nursery bed is made of brick or bamboo (arranged in north-south direction) with a size of 1 x 5 m. The polybag previously filled with media is put in the nursery bed. To reduce sun light the nursery is put under shade using nylon net or coconut leaf (light intensity of 50 %).



Size of nursery bed

Nursery beds

Potting Media

Potting media consisting of a mixture of top soil and compost/ manure with a ratio of 8:2. The media should be mixed thoroughly before being filled into polybag. The potting media are filled manually by hand into the polybag with adequate density so that the filled polybag can be raised firmly. The polybags that already filled with media are placed in the nursery beds.

Nursery of *Dysoxylum densiflorum*

Pricking Out

Generally germination starts at the second week after sowing. Pricking will start when the seedling has developed 2 leaves, and a height of about 10 cm. Pricking should be done in the morning or late afternoon. The seedlings are pulled gently to prevent from damage and their roots are then slightly soaked into the water in a plastic box . A vertical hole is made in the potting media to which the seedling will be planted using a bamboo stick. The root is then placed carefully into the hole so that it is not twisted. The seedlings are placed under partial shade (50 % light intensity) made of nylon net.

Watering in the nursery

Maintenance

Seedling maintenance includes weed control, pest and disease control and watering. Watering is regularly done, 1-2 times a day. Dead seedling should be replaced immediately. To obtain high quality seedlings at 1.5 months of age they are fertilized with NPK (15:15:15) at a rate of 10 g/l of water/m^2 of nursery bed given every week up to age of 5.0 months. Afterwards, seedling needs hardening off to make the stem lignified.

Weeding in the nursery

During hardening off phase the frequency of watering is reduced, and fertilizer is no longer applied. Seedlings with woody stem will be more robust to be transported and planted in the field. At 2 months of age the shade is progressively open as *D. densiflorum* seedlings grow better under full sun light.

Transportation

Seedling transportation should be carried out carefully as the young seedlings are delicate and prone to damage. To have high survival and optimal growth the following procedures should be taken:

a. Ideally seedling should be planted in the same day as it is transported from the nursery;
b. During transport extra care to the seedling should be taken, avoiding damage and direct exposure to sunlight;
c. If delay of planting is likely special treatment is required as follows:
   - store the seedling in a cool place and out of the direct sun at all times;
   - never let the root dry out, sprinkle them with water when necessary.

Seedling transportation

Site Selection

D. densiflorum grows at low elevations up to 1,700 m, on soil with good drainage, and various soil textures ranging from clay to sandy.

Planting

Normally seedlings are ready to be outplanted when they age 6-7 months old, 30-40 cm in height, more than 4 mm in root collar diameter and have leaves. *D. densiflorum* may be planted in forest and farm lands or wood yard. The initial spacing varies depending on the planting objectives: 3 x 3 m, 3 x 4 m, 3 x 5 m or 4 x 5 m. In an agroforestry system trees may be spaced accordingly based upon the available space, or trees may be planted in the form of fence planting. In this regard trees can be spaced 3-4 m apart.

a. Site preparation

Site should be prepared accordingly to achieve a reasonable success in terms of survival and growth. Site preparation includes the followings:

- Clearing weed and other unwanted vegetation;
- Improving physical soil properties;
- Marking out the planting spots with sticks and preparing the planting holes (40 x 40 x 40 cm). It is recommended to fill the planting hole with decomposed manure or organic compost at a rate of 3 kg per hole;
- Transporting seedling to the planting spots.

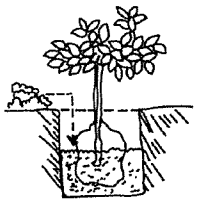
b. Planting

The following planting procedures should be undertaken:

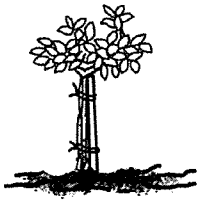
- Tear the polybag carefully, make sure that the soil media are not broken. When there are cracks in the polybag, press the polybag with hand slowly so as to remake the soil media firm. Avoid root twisted when planting since this will reduce tree growth or cause tree death in later years;
- Place seedling root down to the bottom of the planting hole carefully and hold the stem, push the soil into the planting hole until it is well filled up to the root collar;
- Pack the soils tightly around the tree roots with sole of the boots so that no air pockets are left near the tree roots. The air pocket may be filled with water which can cause seedling death due to lack of air for root;
- Carry out planting at the early rainy season if possible when the soil has enough moisture;
- Prepare additional seedling (about 10 % of the total seedling planted) for blanking. Replace the death trees with new seedlings immediately soon after planting.

Planting procedures

Prepare planting hole (40x40x40 cm)



Tear the polybag and plant carefully



Provide a stick for support

Planting in the field

Maintenance

Trees are fertilized using Urea (30-50 g/tree), applied one months after planting. The fertilizer is placed at furrow or holes at a depth of 10 cm, about 15 cm from the tree. Second fertilizer application is done at 4-6 months old with Urea at a rate of 100 g/tree.

Weed control is carried out by clearing weed around the trees. It is done until the trees are capable of competing and suppressing the weed.

Trees may have multiple stems, or forked branches starting at very low part of the stem. Multiple stems should be reduced to only single stem to improve stem form and quality. This operation is called singling. Singling is done by removing poor stems and leaving only one best stem. Singling should be done at early growth phase of trees when trees start showing multiple stems.

To increase wood quality, pruning needs also be carried out. Big branches not easily self-pruned should be pruned, otherwise the log quality will be poor.

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