

Bagalunga (*Melia dubia* Cav.): An indigenous fast-growing multipurpose tree species in Eastern Visayas, Philippines

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ABSTRACT

This study was conducted through site surveys and interviews. *Melia dubia* Cav. belongs to family Meliaceae and is found out to be indigenously growing in Eastern Visayas, Philippines. Commonly named "bagalunga", *M. dubia* grows in sites within 10°00' to 11°30' north latitude and 124°30' to 125°15' east longitude; along beaches, narrow alluvial plains, and in undulating to sloping landscapes with elevation of 5 m to 370 m above sea level. It grows in mixture with shrub and other pioneering tree species in grassland and abandoned clearings that are developing toward a second growth forest; thrives on calcareous and non-calcareous soils that developed from limestone, shale, sandstone and rock materials of igneous origin and recent alluvial deposits; on sand, sandy loam to clay and clay loam soils with poor to fairly rich in OM content. The sites have an (average) annual rainfall of 1666 to 2428 mm more or less evenly distributed throughout the year. In general, local inhabitants use the species for timber production, ecological rehabilitation and agroforestry. *Melia dubia* is fast-growing and possesses strong potential as a reforestation and agroforestry species.

Keywords: *Melia dubia*, multipurpose tree, ecology, seed germination, research needs

INTRODUCTION

With increasing human and livestock population and growing cultural demands, there is increasing pressure on all natural resources including forests. Rates of retrogression of tropical moist forests are proceeding at enormous proportion (Burley, 1985). The traditional practice in the tropics of allowing nature to repair the damaged ecology can no longer go on as timber depletion and population growth are vigorously

outpacing it. Massive and expeditious reforestation activities on degraded mountainsides and upland farms are direly needed. The use of tree species, which have shown versatility as multipurpose tree species (MPTS) for the uplands appears to be a viable alternative.

Genetic resources, especially the endemic tree crops that are rich in genetic diversity must be conserved for the management and improvement of forest resources. Most agroforestry and reforestation efforts that have taken place through-

out the tropics have relied on trees selected from a very short list of internationally-known species. Yet research is showing that utilizing greater diversity in forest plantations by drawing on indigenous species can lead to increased productivity due to site-specific species and environmental interactions (Butterfield, 1992). Lim and I. Faridah-Hanum (1992) also reported numerous other advantages of using indigenous species: they are already adapted to the local conditions; the genetic base is easily accessible; the supply of seeds may not be as difficult as anticipated, there is a wealth of information available locally that can be usefully exploited; the available species can often provide more than one product. Current observations have shown that MPTS growing indigenously in some localities have potential for domestication in the uplands (Nasayao *et al.*, 1993). In Leyte, Philippines, "bagalunga" (*Melia dubia* Cav.) has captured the interest of many farmers to grow it in farms and tree home gardens. This species has diverse uses and it can be domesticated in massive scale if given the necessary research attention.

METHODOLOGY

Site surveys and interviews were done to document the botany, growth characteristics, geographic distribution and uses of "bagalunga". Interviews conducted were unstructured as the respondents were simply asked about the uses, date of planting and age of "bagalunga" trees found in their localities. Ocular investigations and laboratory analysis were conducted to describe the morphology of the species and soil characteristics. These information were validated using bibliographic references and other pertinent sources of information.

Initial results of germination were generated through an experiment.

RESULTS AND DISCUSSION

Botanical description

Nomenclature

M. dubia Cav. belongs to family Meliaceae. It is commonly called "bagalunga" in the Philippines. Local inhabitants in Eastern and Central Visayas call it "baganga" and "bagalnga."

Tree size

This indigenous species grows relatively very fast. Depending on site conditions, the tree can reach a diameter of 110 cm and total height of 30 m (Figs. 1 and 2). Field interviews showed the following information (Table 1):

Table 1. Growth of *Melia dubia* Cav. in three sites in Leyte.

Location	Soil	Dia. (cm)	Total Ht. (m)	Approx. Age (years)
Tolosa	Sandy loam	51	15	8
Maasin	Clay	36	9.5	5
Matalom	Clay	69	16	15

Simple anatomical investigation of a fallen 6-year old, 51 cm-diameter "bagalunga" tree in Tolosa, Leyte showed 6-8 growth rings or layers. Each growth layer may be a product of one season's growth but various environmental conditions may induce the formation of more than one growth layer in one season. In general, the ability to develop growth layer is determined by the genetic constitution of the individual species and is observed in trees of both temperate and tropical zones (Esau, 1977). This observation



Figure 1. Tree of *M. dubia* in Tolosa, Leyte (A) and in Maasin, Southern Leyte (B), Philippines about 51 and 36 cm in trunk diameter, respectively.

concluded with the information on the relative fastness of growth of "bagalunga" from the local inhabitants.

Other morphological features

Foliage is deciduous, dark green and bipinnately compound (Fig. 3). The compound leaf is large when young and decreases in size by about 25-50% at maturity. It is spiral in phyllotaxy. The leaflets are crenate and acuminate.

The tree bears a cluster of white flowers from March to May. The mature fruit which can be collected between August and November has a yellow covering. Its endocarp is very hard, about

2 mm in thickness. It averages 6.3 mm in diameter at the center and 10.8 mm in length. The fruit is a capsule containing 2-5 seeds.

The bark is smooth when young, then it becomes fissured at maturity. The tree is sympodial in terms of crown structure. *M. dubia* has a very good coppicing ability (Fig. 4a), and like *M. azedarach* (F/FRED, 1988) its roots produce sprouts (Fig. 4b).

Comparison with *Melia azedarach* L.

M. dubia very closely resembles with *M. azedarach*. At a distance, these two species can hardly be distinguished. Closer scrutiny reveals



Figure 2. *M. dubia* tree measuring 110 cm in diameter and about 30 m in total height in Malapoc Norte, Maasin, Southern Leyte, Philippines.

they are not totally alike. Distinguishing characteristics of these relatives are reflected in Table 2.

Table 2. Distinguishing characteristics of *M. dubia* Cav. and *M. azedarach* L.

Features	<i>M. dubia</i>	<i>M. azedarach</i>
Lenticels or twigs	Profuse	Scanty
Color of twig bark	Mint green	Dub brown
Leaf base interval	Wide	Narrower
Crenate	Deeper & broader	Shallow & narrow
Petioles	Broadly swollen	Less swollen
Rachis	Big	Small
Leaflets	Small	Big
Fruits	Small	Big
Color of flower	White	Purple

Distribution

Melia dubia Cav. is paleotropic and subtropic by origin and distribution. It is one of the only two species under genus *Melia* of the *Meliaceae* family found in the Philippines. The other one is *Melia azedarach* L. *M. dubia* is indigenously growing in Eastern Visayas, Philippines particularly in sites within 10°00' to 11°30' north latitude and 124°30' to 125°15' east longitude (Fig. 5). It is found growing along beaches, narrow alluvial plains, lower footslopes of calcareous and non-calcareous hills, and in undulating to sloping landscape with elevation of 5 to 370 m above sea level. *M. dubia* is also an endemic species in Cebu and Negros provinces in Central Visayas, Philippines.



Figure 3. Leaf blade configuration of *M. dubia*.

M. dubia grows in mixture with shrub and other pioneering tree species in grassland and abandoned clearings that are developing toward a second growth forest (Fig. 6). Usually, it comes out after an area is burned.

Soil characteristics and rainfall

M. dubia grows in a wide range of soil types. It thrives on alkaline and acidic soils that developed from limestone, shale, sandstone and rock materials of igneous origin and recent alluvial deposits; and on sand, sandy loam to clay and clay loam textures. Table 3 shows the parent material of areas or sites where *M. dubia* is abundantly growing.

Table 3. Parent materials of soil in *M. dubia* sites.

Sites	Parent Material
Tolosa-Dulag area	Tuff breccia Green tuff
Baybay-Mahaplag area	Tuff Tuffaceous sandstone
Leyte-Leyte	Sandstone
Naval	Andesite (volcanics)
Isabel	Limestone
Matalom	Limestone Sandstone Shale Conglomerate Tuff
Maasin	Limestone Shale Sandstone Conglomerate Tuff Ultramafic

The species exists in sites with soil pH of 5.3 to 8.35, low to high in nitrogen and phosphorus, deficient in potassium and poor to fairly rich in organic matter. The sites have an average annual rainfall of 1666 to 2428 mm, more or less evenly distributed throughout the year (Fig. 7).

Uses

Survey and interviews conducted and reports of Balbarino *et al.*, (1992) revealed that *M. dubia* has diverse uses. Local inhabitants use it as/for:

Timber production

- Wall boards
- Door panel
- Furniture
- Manufacture of farm implements (like wooden plow)
- Jalousies
- Flooring
- Boxes and crates



Figure 4a. Ability of *M. dubia* to coppice.

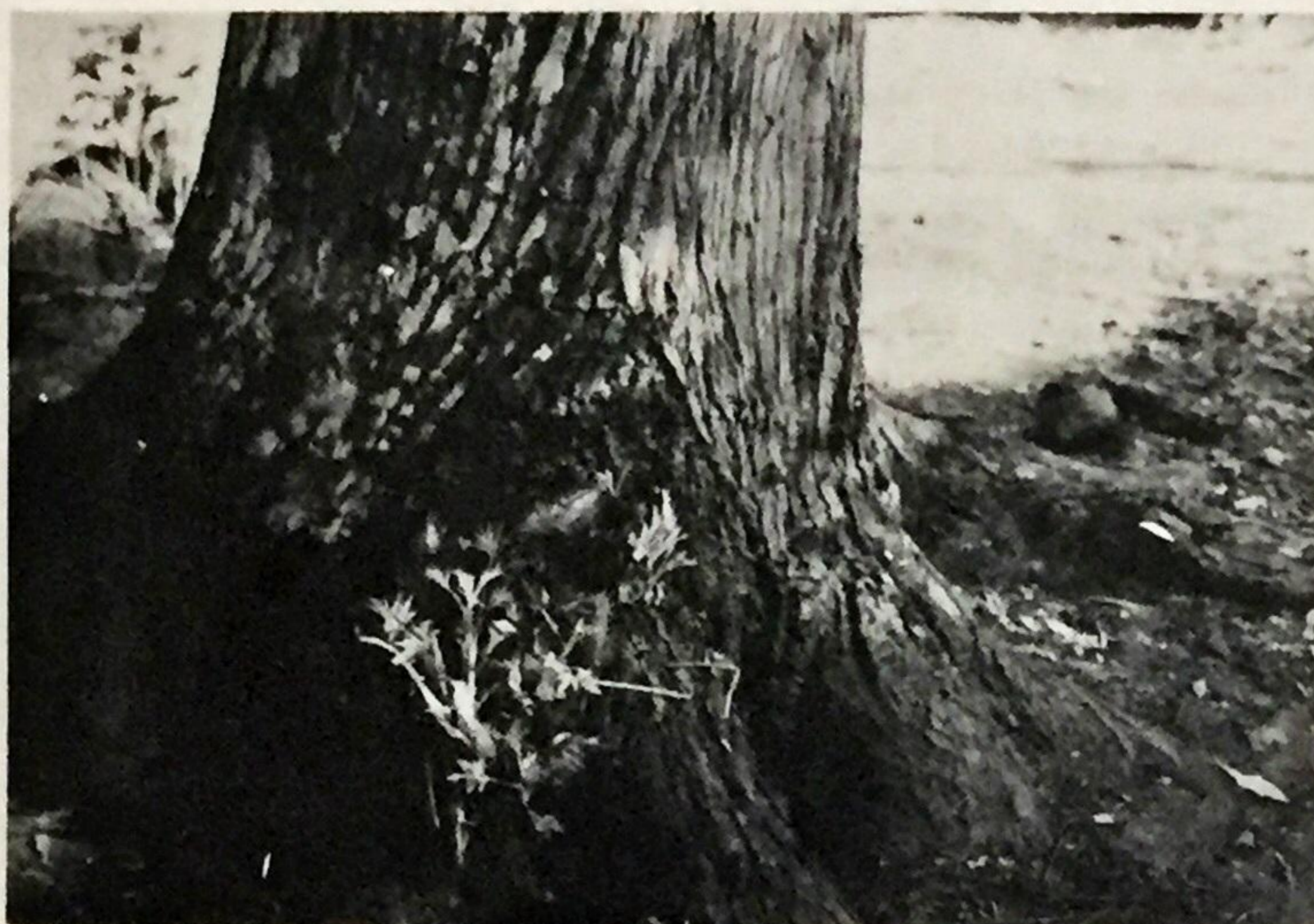


Figure 4b. Sprouts growing from root.

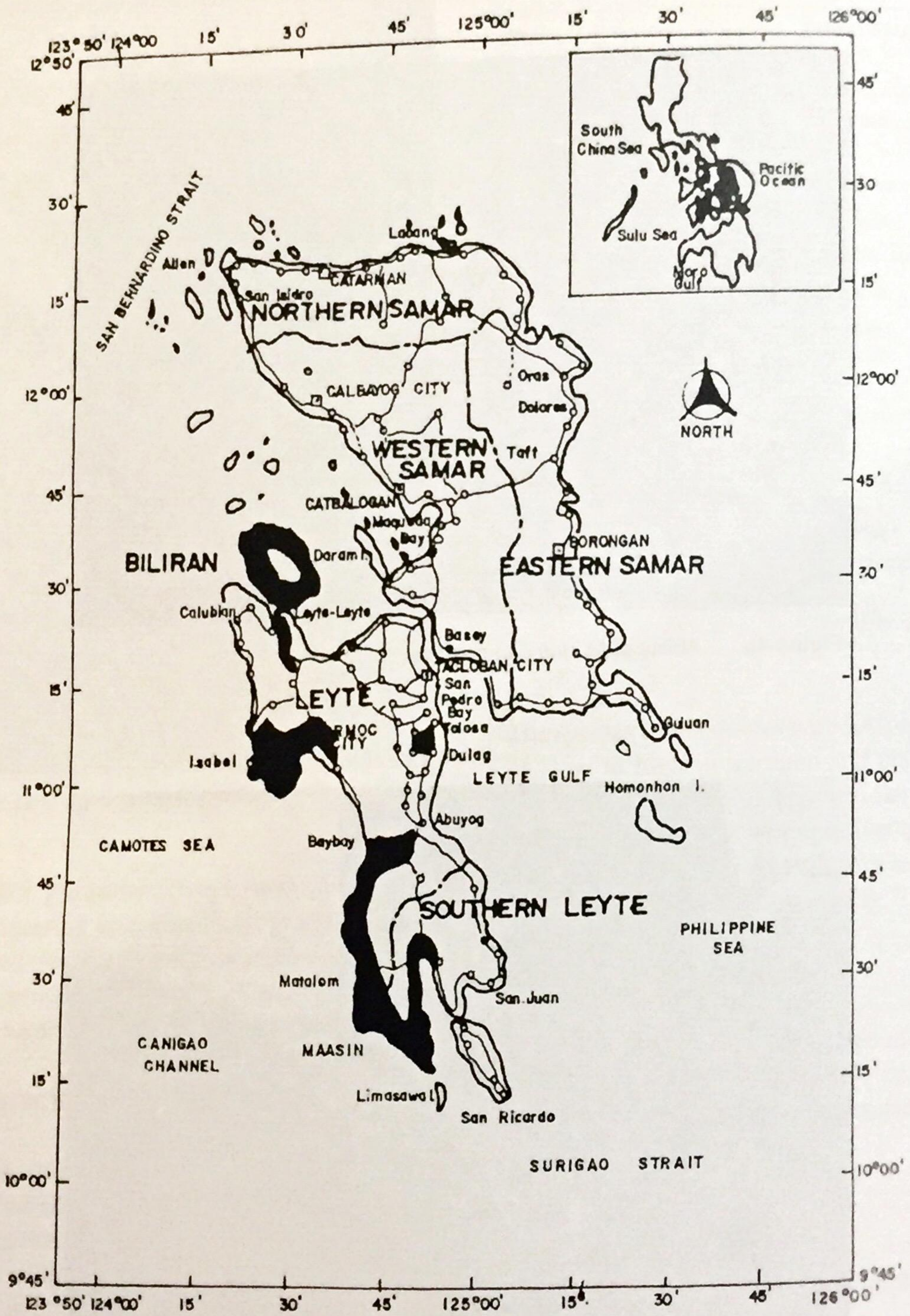


Figure 5. Eastern Visayas, Philippines and sites (darkened portions) where *M. dubia* is found.

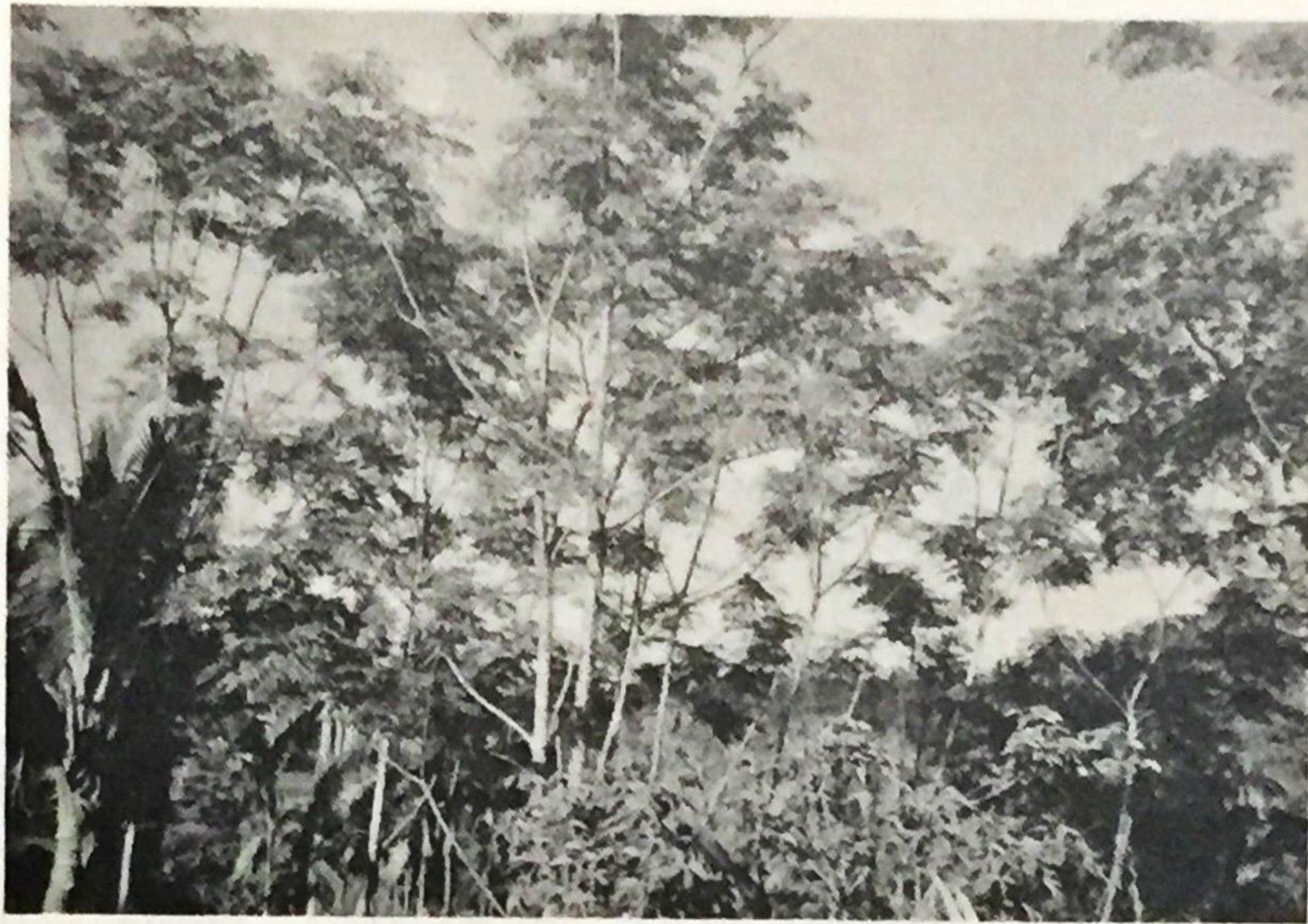


Figure 6. *M. dubia* growing in association with shrubs and tree pioneers in abandoned upland farm.

Ecological rehabilitation/protection

- Soil fertility recovery because of its high biomass
- Forest regeneration due to its ability to regenerate easily
- Watershed protection because of its tendency to grow densely

Agroforestry

- Component of the home garden and farm land use system
- Shade tree for abaca plantations
- Firewood
- Insect repellent

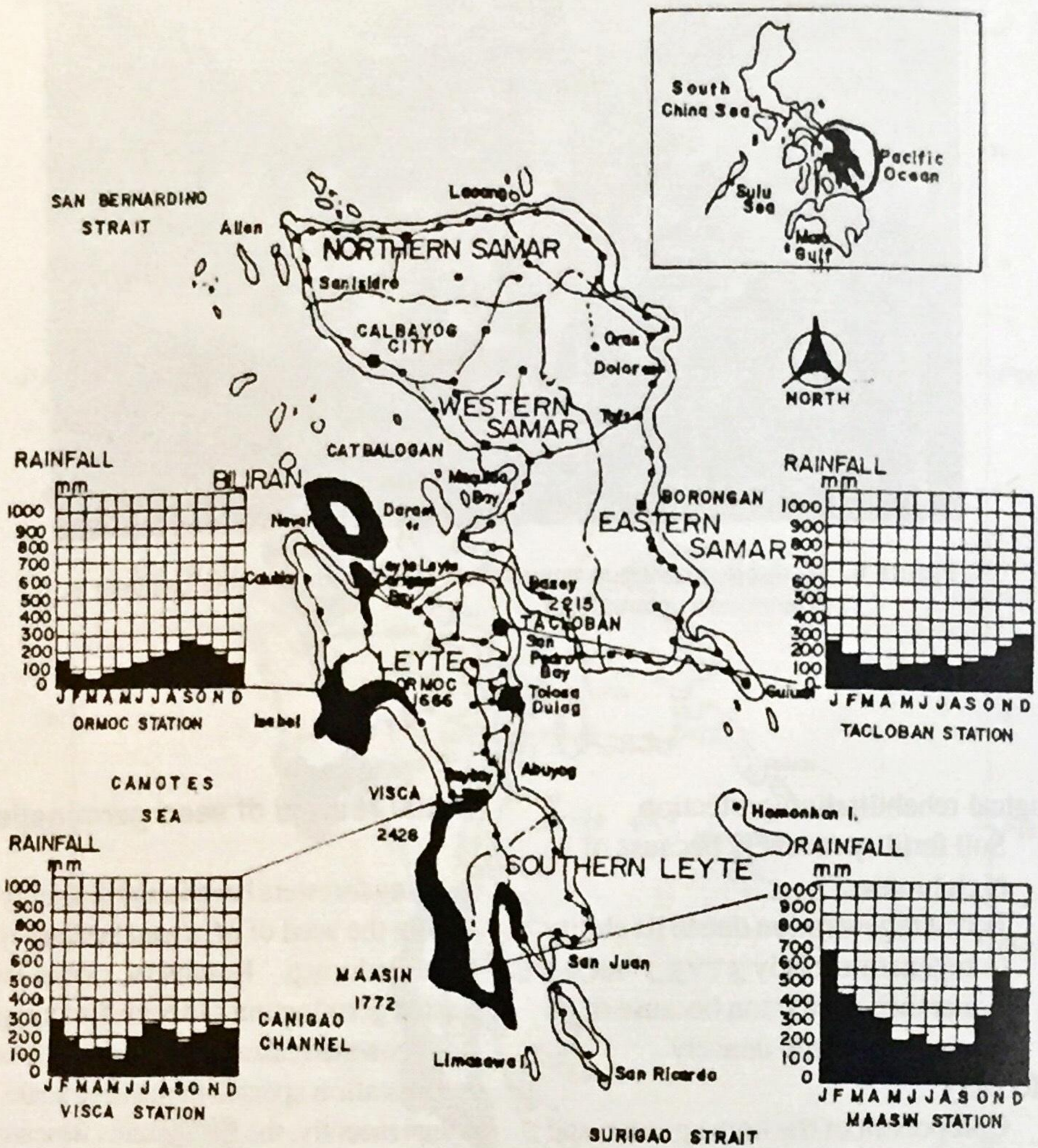
Others

- Leaves to hasten ripening of banana
- Pound leaves mixed with coconut milk for delousing
- Powdered charcoal used as inert or component material for firecracker

Initial results of seed germination

Many foresters have found difficulty in germinating the seed of *M. dubia* because of the very hard endocarp. Results of earlier attempts to hasten germination had been discouraging. This has been the reason why *M. dubia* is not used as reforestation species in massive scale.

Just recently, the Ecosystems Research and Development Service of DENR Region 8 conducted a germination experiment and obtained encouraging results. It was found that seeds subjected to hot and cold treatment germinated much earlier than the seed in the other treatments (Table 4). The treatment was consisted of heating the seeds at 50°C in a drying oven for 24 hours and then soaking in cold water for 15 minutes. Seeds started to germinate 15 days after sowing. This activity is not a total success yet but it has at least given a signal that more in-depth studies can lead to breakthroughs in seed technology of *M. dubia*.



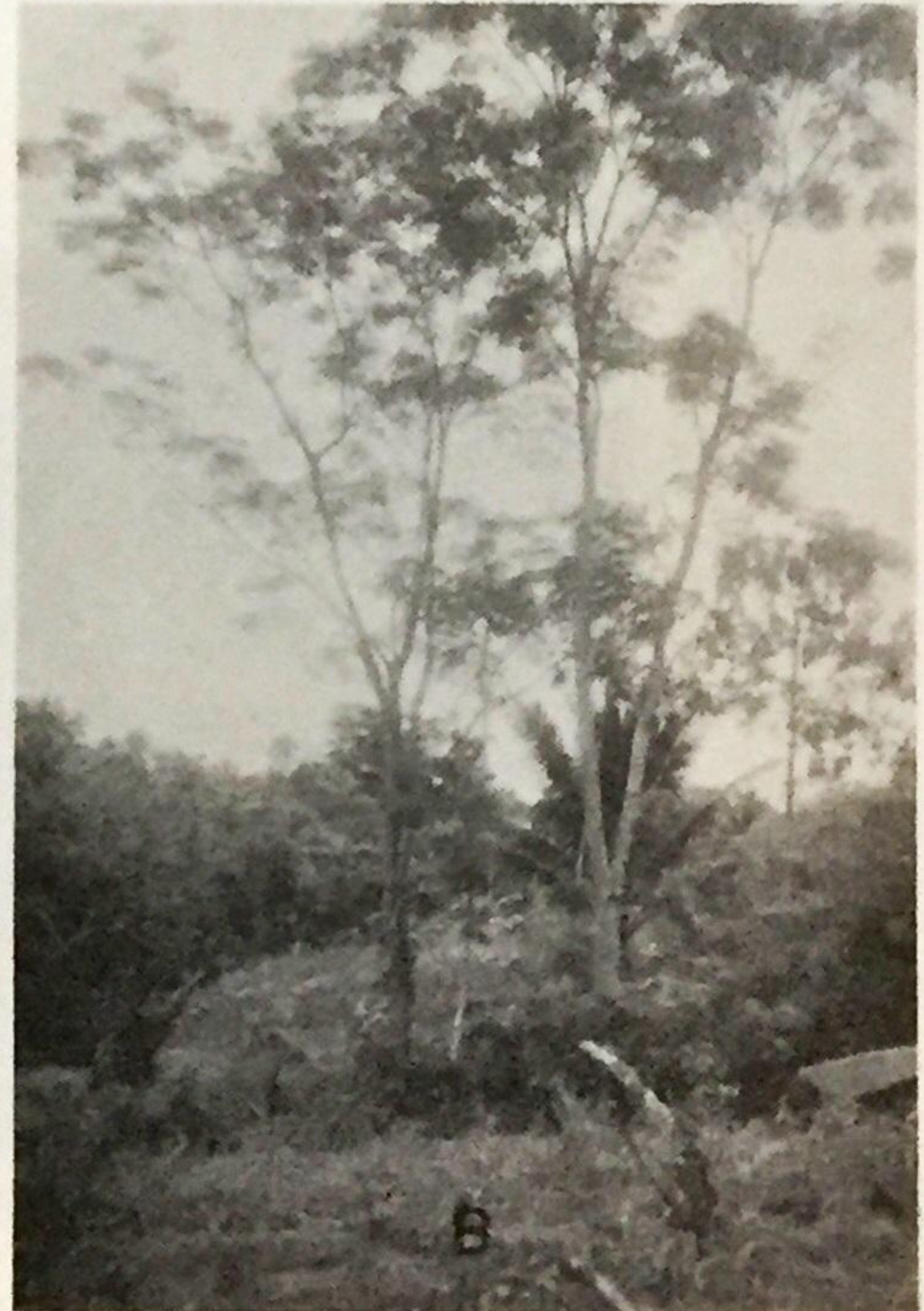
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Figure 7. Pattern and distribution of rainfall in sites where *M. dubia* is growing.

Table 4. Pre-germination treatments of *M. dubia* seeds.

Treatments	Total No. of Seeds Sown	Total Germination	Percent Germination	Date Sown
Soaking in boiling H ₂ O for 15 minutes. Cool off for 1 hour.	400	0	0	Sept 17
Hot and cold treatment by heating the seed at 50°C for 24 hours using an oven then soaking in cold water for 15 minutes.	400	85	21.25	Sept 17
Hot and cold treatment using fire then soaking in cold water for 15 minutes.				
Acid scarification using 100 ml concentrated H ₂ SO ₄ solution	400	0	0	Sept 18
Field burning simulated by burying the seeds 1 cm. deep, covered with debris then burned.	400	0	0	Sept 18
Nicking	400	0	0	Sept 18

**Figure 8.** *M. dubia* tree as component of tree home garden (A) and farm land use system (B).

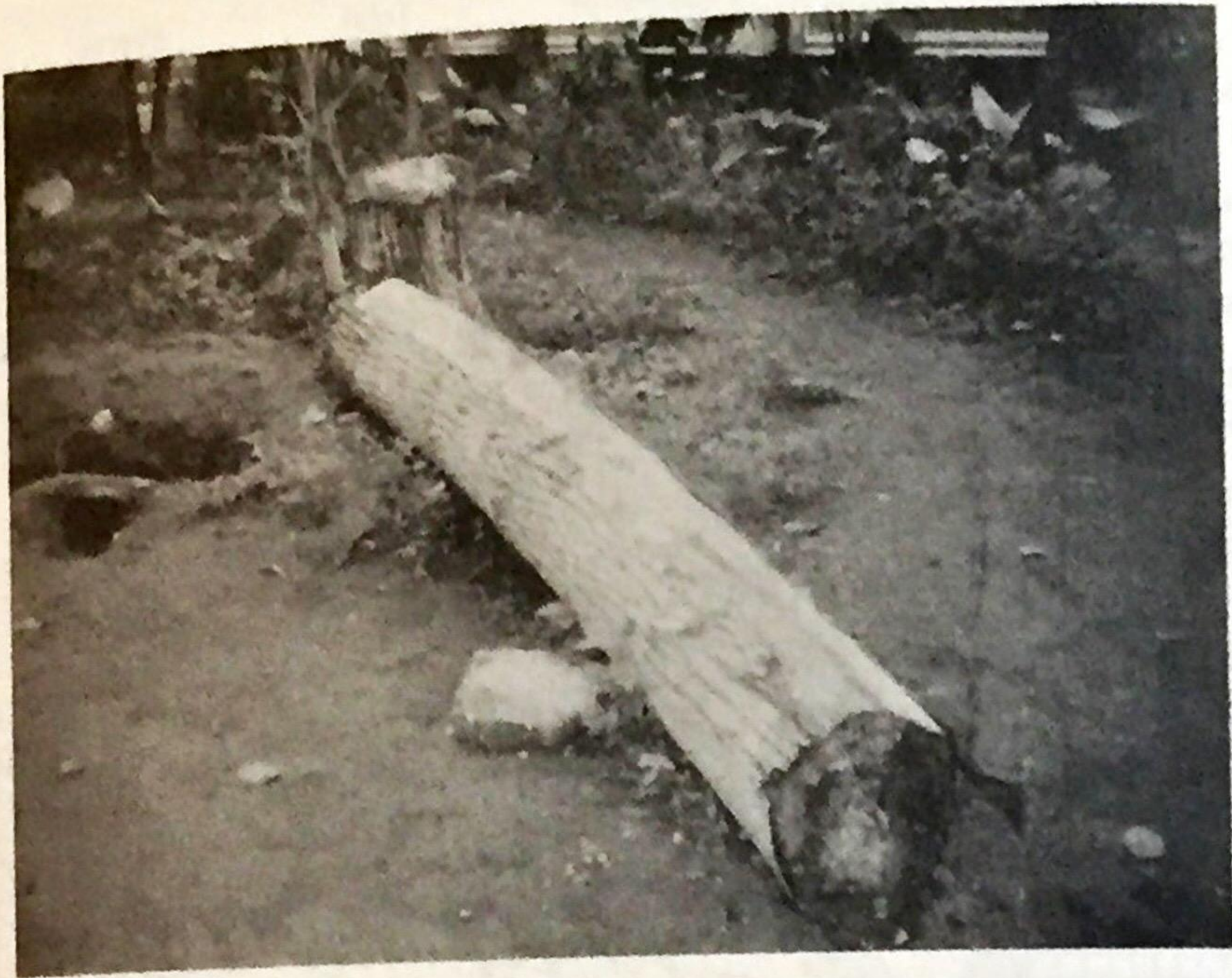


Figure 9a. Log of *M. dubia*.

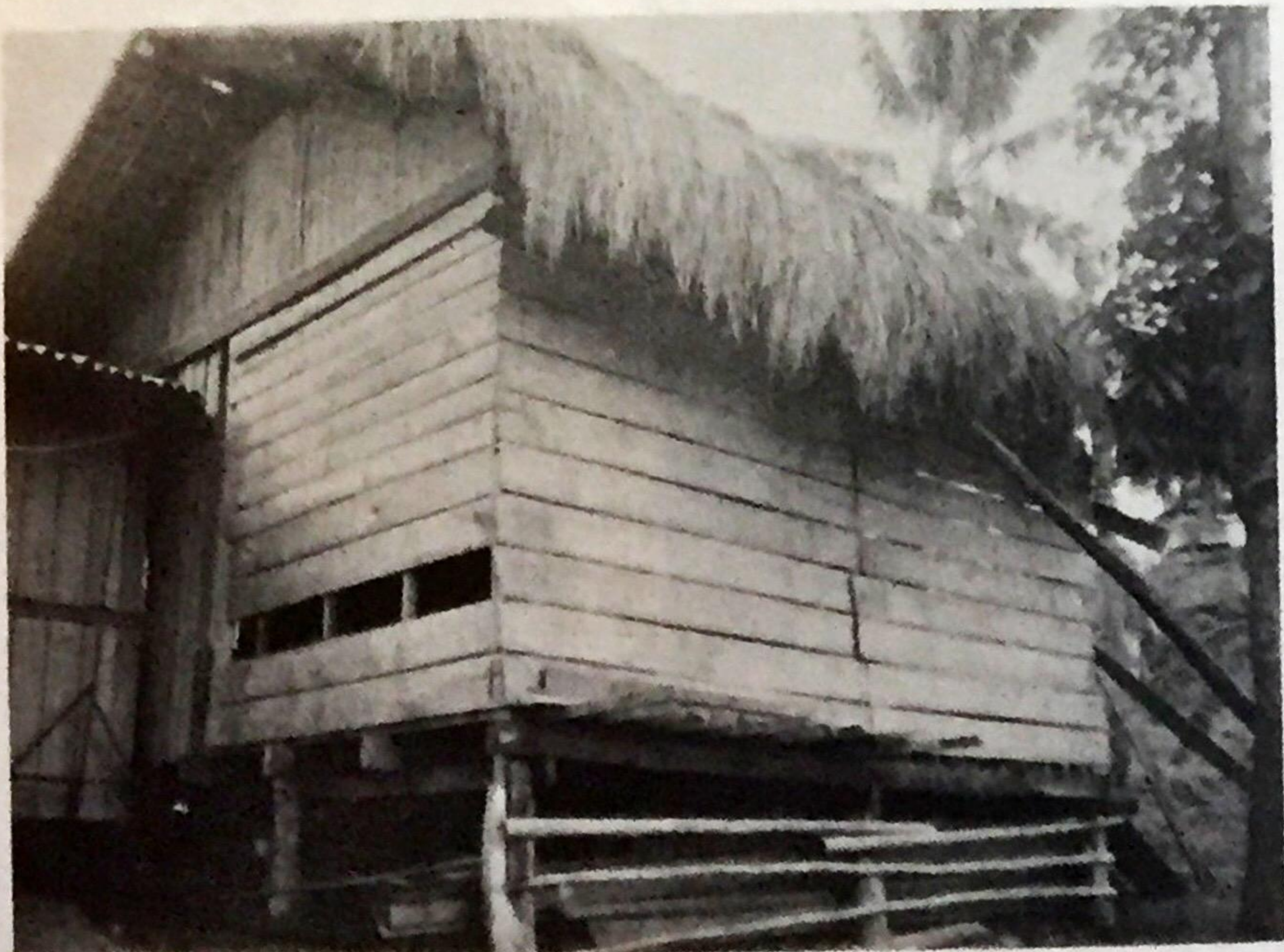


Figure 9b. Wall boards from timber of *M. dubia*.

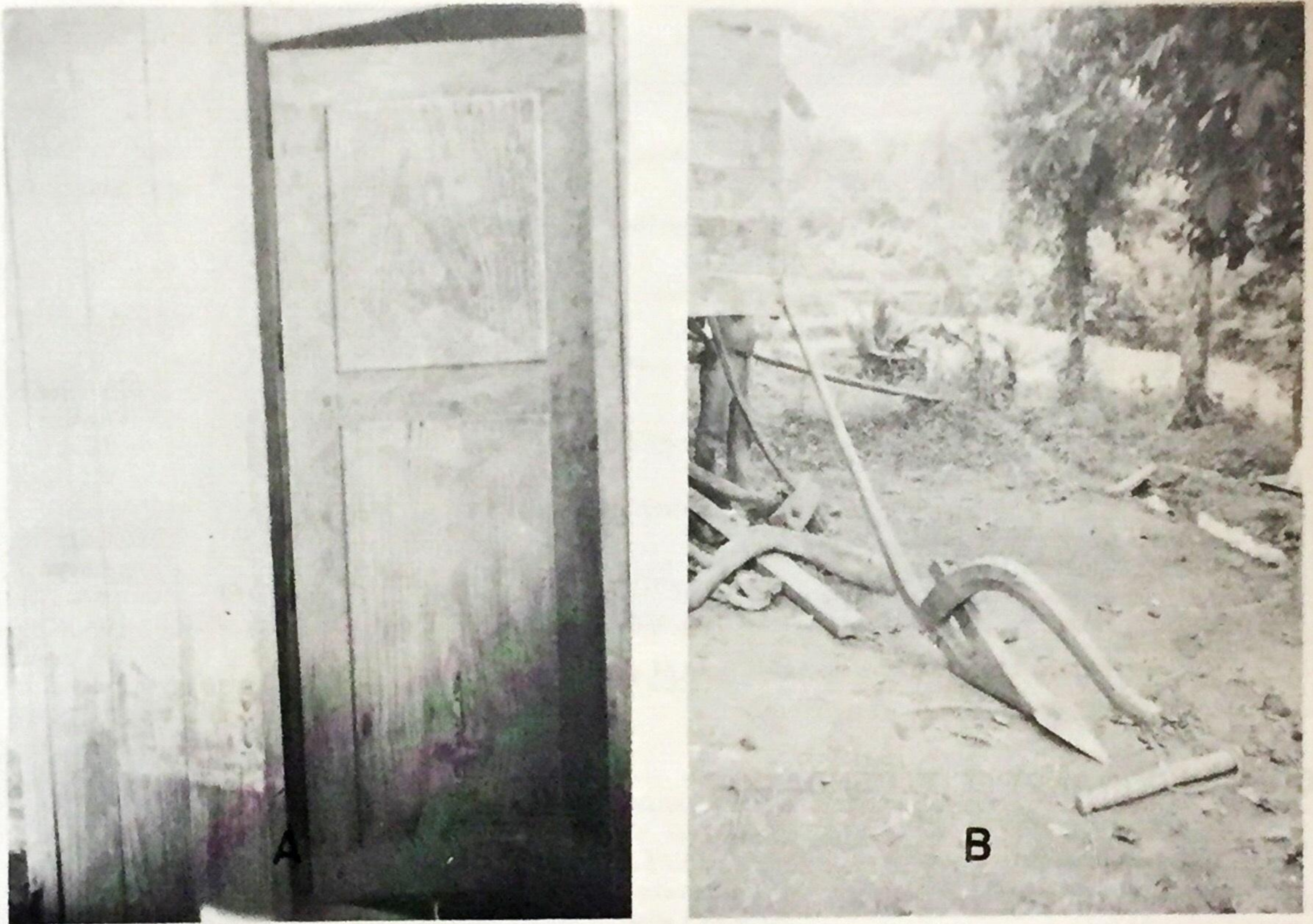


Figure 10. *M. dubia* timber used as door panel (A) and in the manufacture of farm plow (B).

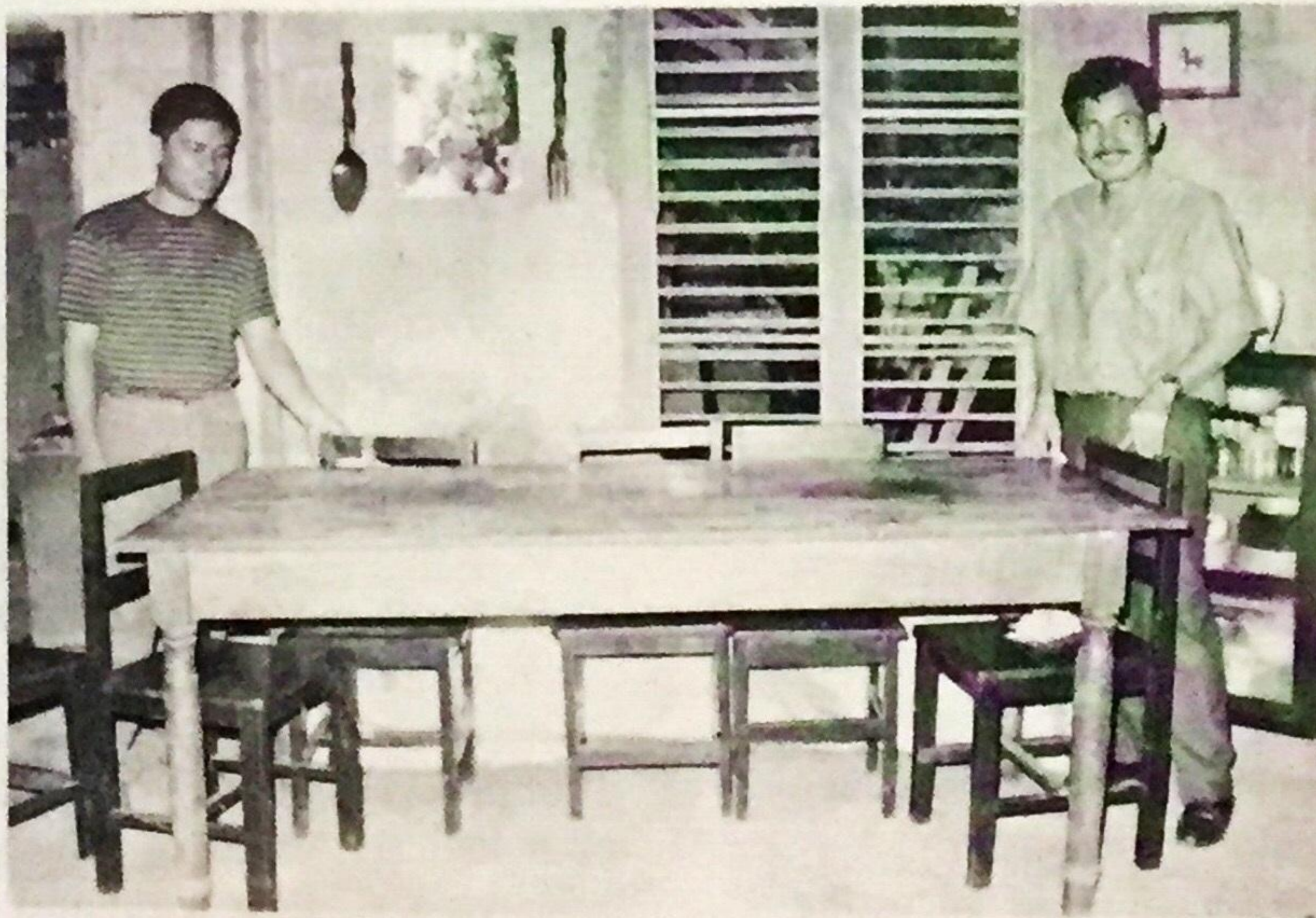


Figure 11a. "Bagalunga" wood used as table top.

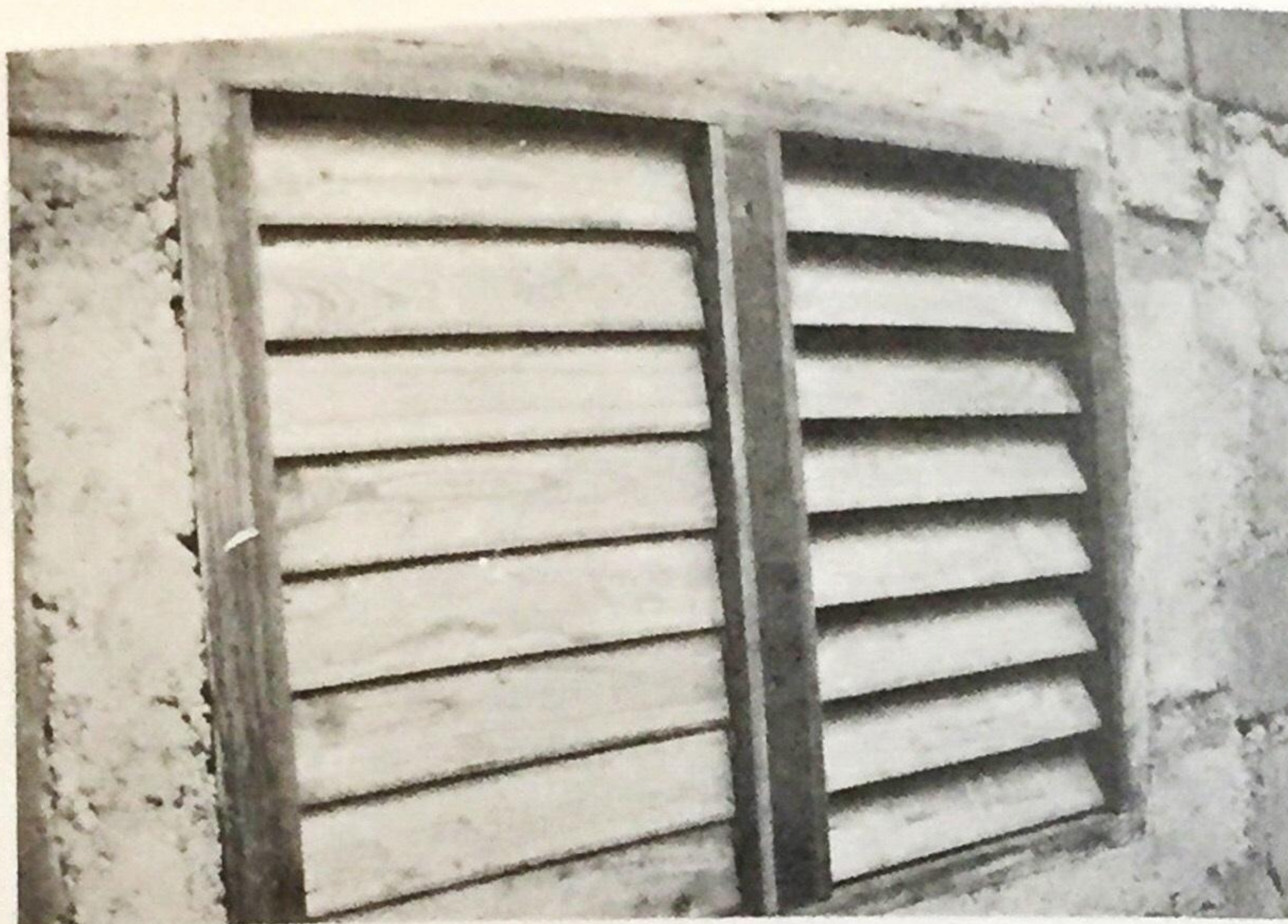


Figure 11b. Window jalousies from *M. dubia*.

CONCLUSION AND RECOMMENDATION

Like other indigenous species, *M. dubia* has not been the focus or object of so much scientific works. Although its uses are already recognized and appreciated by local inhabitants, its full protective, productive and economic potential are yet to be extensively investigated. Thus the following research activities on *M. dubia* are needed:

- Seed technology and silvicultural management practices
 - seed quality and germination
 - seed storage and treatment
 - propagation techniques
 - seedling management
 - improving seedling quality
 - improving tree vigor
 - pest and disease control
 - tree farming practices
 - silvicultural practices at farm scale
 - tree plantation development
- Product diversification and processing
 - uses of the species as veneer, plywood,

- paper, furniture and other wood products
- improved use of the species as an insecticide
- log and lumber processing
- Germplasm preservation and tree improvement
 - gene bank establishment
 - provenance selection/screening
- Soil and water conservation
 - erosion control
 - hydrologic response and influences on microclimate
 - agroforestry
 - fallow systems
- Socio-economics
 - economic feasibility of *M. dubia* tree farms and tree plantations
 - adoption of growing *M. dubia* in other areas

With people's thorough understanding of the technological advances of growing and using *M. dubia* vis-a-vis their traditional practices, domestication of *M. dubia* can be done extensively.

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