

# Agroforestry Opportunities for East Timor: Forage banks and forage gardens

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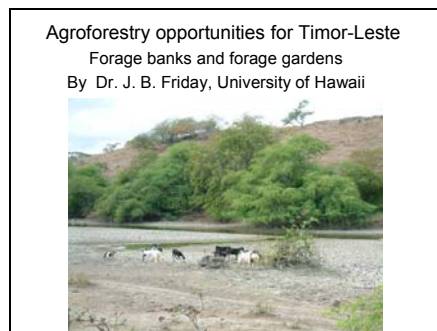
website <http://www.ctahr.hawaii.edu/forestry/data/timor.html>

*Timor-Leste Agricultural Rehabilitation, Economic Growth,  
and Sustainable Natural Resources Management Project*

Timor-Leste Ministry of Agriculture, Forestry and Fisheries  
University of Hawaii at Manoa  
U.S. Agency for International Development

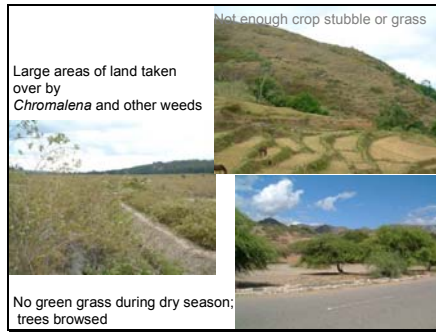


Slide 1



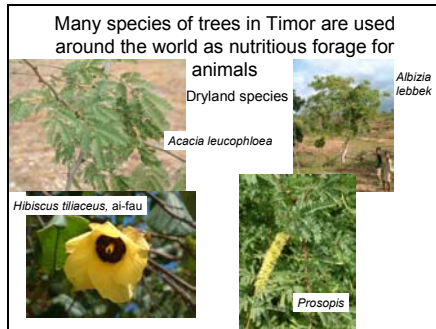
Most farmers in Timor-Leste, like farmers in developing countries everywhere, cannot afford to spend much time and money growing timber trees which will be harvested decades into the future. Resource-poor farmers need immediate sources of income. One way farmers can realize income from planting trees is by raising forage banks and forage gardens to feed their livestock. The photograph in the picture shows a typical roadside scene in Manatuto, Timor-Leste, with goats in the foreground and heavily browsed legume trees (*Acacia* and *Prosopis* spp.) in the background.

Slide 2



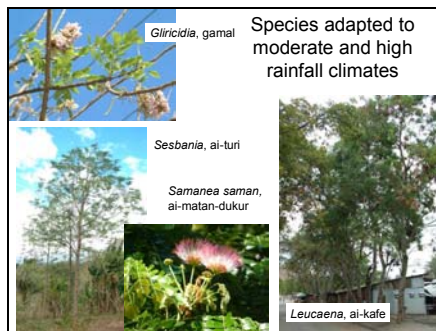
Farmers in Timor-Leste need additional sources of forage, especially in the dry season. Many areas are already overgrazed, such as the field above the rice terraces in the photograph at top, taken in Venilale. Large areas of former grazing land have been taken over by noxious weeds, such as the *Chromolaena odorata* in the photograph on the left, taken in Seical. Trees in coastal areas, such as these *Prosopis* trees in Manatuto, are grazed as high as the livestock can reach.

Slide 3



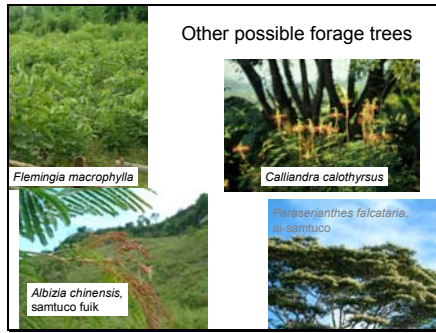
Many species of trees in Timor are used around the world as nutritious forage for animals. Dryland species suitable for forage include ai-puti (*Acacia leucophloea*), *Albizia lebbek*, ai-fau (*Hibiscus tiliaceus*), and ai-mama (*Prosopis* spp).

Slide 4



Agroforestry trees with potential for forage in areas with moderate rainfall include gamal (*Gliricidia sepium*), ai-turi (*Sesbania grandiflora*), ai-matan-dukur (*Samanea saman*), and ai-kafe (*Leucaena leucocephala*). Ai-kafe is widely used for cattle forage in Australia, West Timor, and throughout the tropics.

Slide 5



Other possible forage trees which already exist in Timor-Leste include *Calliandra calothyrsus*, ai-samtucuo (*Paraserianthes falcataria*), and samtucuo fuik (*Albizia chinensis*). *Flemingia macrophylla* is a popular forage shrub in the Philippines and Indonesia.

Slide 6

Why trees for forage?

- Trees stay green during at least part of dry season
- Legume tree leaves high in protein and highly palatable to livestock
- Branches may be used for firewood after leaves are used as forage
- Nitrogen-fixing trees improve soil fertility
- Trees grow rapidly and can compete with weeds
- Branches from trees can be harvested repeatedly
- Trees are easy to grow
- Reforesting areas with forage trees may help decrease grazing pressure and improve watershed health

There are many reason to use trees to produce forage for farm livestock: Trees stay green during at least part of dry season  
 Legume tree leaves are high in protein and highly palatable to livestock  
 Branches may be used for firewood after leaves are used as forage  
 Nitrogen-fixing trees improve soil fertility  
 Trees grow rapidly and can compete with weeds  
 Branches from trees can be harvested repeatedly  
 Trees are easy to grow  
 Reforesting areas with forage trees may help decrease grazing pressure and improve watershed health  
 The photograph shows a hedgerow of ai-kafe (*Leucaena*) repeatedly cut for forage on an experimental farm in Hawaii.

Slide 7

Forage gardens: supply both grass and legume tree forage for confined animals

- Improved animal nutrition
- Confined animals gain more weight, stay healthy, don't destroy crops



Forage garden of napier grass, flemingia, and cassava in Bandung, Java

Forage gardens supply both grass and legume tree forage for confined animals. Having a good supply of accessible forage can lead to improved animal nutrition. Confined animals gain more weight than free-ranging animals, contract fewer disease, and don't destroy crops. The photographs show a mixed species forage garden with napier grass, *Flemingia*, and ai-farina (cassava) and confined goats in Bandung, Java, Indonesia.

Slide 8

Forage banks: trees which can be cut to supply forage during the dry season

- Animals may be free-ranging some of the time
- Legume trees are protein reserves
- Grass banks are energy reserves



Trial of different *Leucaena* (ai-kafe) selections for forage in Hawaii

Forage banks are trees which can be cut to supply forage during the dry season. Animals may be free-ranging some of the time. Legume trees are naturally high in protein and these may be thought of as protein reserves. Grass banks may be thought of as energy reserves. The photograph shows a trial of different ai-kafe (*Leucaena*) selections for forage in Hawaii.

Slide 9

Demonstration feed garden and confined goat house at the International Institute of Rural Reconstruction in the Philippines



Feed garden includes *Gliricidia* (gamal) and napier grass

These photos show a demonstration feed garden and confined goat house at the International Institute for Rural Reconstruction in the Philippines. The feed garden includes gamal (*Gliricidia sepium*) and napier grass.

Slide 10



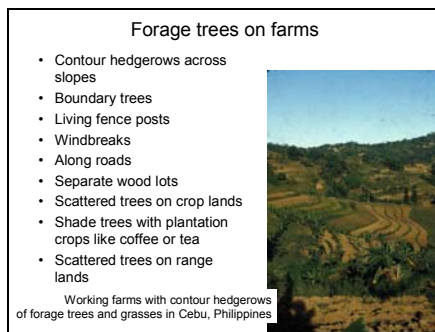
Hedgerows of legume trees may also be planted along the contours of cultivated fields to prevent erosion. The upper photo shows a boy harvesting napier grass from a contour hedgerow in Cebu, the Philippines. In this community, all the available land is used for crops, so farmers must grow their own fodder for their livestock. A little bit of grass is cut each day and fed to the goats.

Slide 11



After the animals are fed cuttings from the hedgerows of grass and legume trees, the animal manure is carried back to the fields to be used as fertilizer. Note how well the corn is growing below the goat house! The photograph on the left shows goats eagerly eating *Calliandra calothyrsus*.

Slide 12



Forage trees on farms can be used in many ways:

- Contour hedgerows across slopes
- Boundary trees
- Living fence posts
- Windbreaks
- Along roads
- Separate wood lots
- Scattered trees on crop lands
- Shade trees with plantation crops like coffee or tea
- Scattered trees on range lands

The photograph shows a landscape of actual working farms with contour hedgerows of forage trees and grasses in Cebu, Philippines.

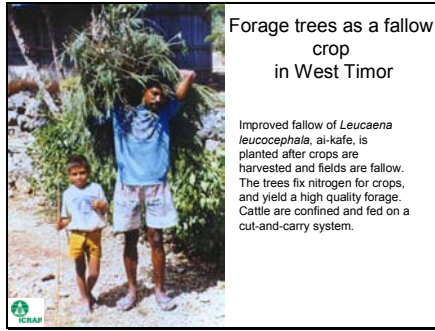
Slide 13



Another shrub which is used for forage for goats is the sunflower, *Tithonia*. This plant often grows on waste lands. The photograph shows a farmer feeding goats cut sunflower leaves in Java.

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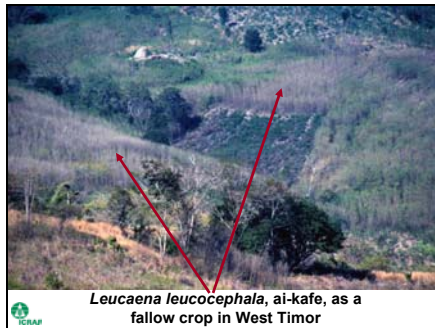
Slide 14



Forage trees are an important part of a cyclical agroforestry system in West Timor. An fallow crop of *Leucaena leucocephala*, ai-kafe, is planted after crops are harvested and fields are fallow. The trees fix nitrogen for crops, and yield a high quality forage. Cattle are confined and fed on a cut-and-carry system. This system has been in place since the 1930s.

Photograph is © Tony Djogo from the World Agroforestry Centre Southeast Asia (formerly ICRAF), Bogor, Indonesia, from the slide show ICRAF Southeast Asia Lecture Note No. 4: Indigenous Fallow Management, by Malcolm Cairns, Kurniatun Hairiah and Paul Burgers, available at: <http://www.worldagroforestry.org/se/a/Products/Training/Materials/SlideSeries/IFM.htm>

Slide 15



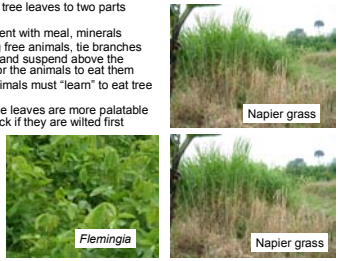
The landscape is transformed to a patchwork of different-aged ai-kafe (*Leucaena*) stands interspersed with cropped fields.

This slide is © World Agroforestry Centre Southeast Asia (formerly ICRAF), Bogor, Indonesia (used by permission), from the slide show ICRAF Southeast Asia Lecture Note No. 4: Indigenous Fallow Management, by Malcolm Cairns, Kurniatun Hairiah and Paul Burgers, available at: <http://www.worldagroforestry.org/se/a/Products/Training/Materials/SlideSeries/IFM.htm>. The photograph is by Malcolm Cairns.

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**Feeding livestock**

- One part tree leaves to two parts grass
- Supplement with meal, minerals
- If feeding free animals, tie branches together and suspend above the ground for the animals to eat them
- Some animals must "learn" to eat tree leaves
- Some tree leaves are more palatable to livestock if they are wilted first



The slide contains three images. The top right image shows a bundle of Napier grass. The bottom left image shows Flemingia leaves. The bottom right image shows another bundle of Napier grass.

Basic guidelines for feeding livestock include:

Feed one part tree leaves to two parts grass

Supplement with meal, minerals as needed

If feeding free animals, tie branches together and suspend above the ground for the animals to eat them

Some animals must "learn" to eat tree leaves

Some tree leaves are more palatable to livestock if they are wilted first

Slide 17

**Maintaining forage trees**

- Let grow 12 to 18 months before cutting
- Cut trees at 1 meter height
- Cut green shoots up to once per month; less often in the dry season
- Cut shoots before leaves start to fall during the dry season
- Don't let animals browse the trees continuously: they'll kill them
- Use leftover branches for firewood



The image shows a man in a blue shirt and cap standing next to a forage tree, pointing towards the green shoots.

To maintain forage trees:

Let the trees grow 12 to 18 months before cutting

Cut trees at 1 meter height

Cut green shoots up to once per month; less often in the dry season

Cut shoots before leaves start to fall during the dry season


Don't let animals browse the trees continuously: they'll kill them

Use leftover branches for firewood

Slide 18

**Possible Difficulties**

- Will farmers cut and carry forage to livestock?
- Will farmers be able to protect seedlings so that livestock don't destroy them?
- Will farmers confine livestock?
- Do farmers know how to plant trees?
- Can farmers get seeds or cuttings to plant trees?
- Can farmers get pots and potting mix?



The image shows a close-up of a goat's head, looking towards the camera.

Despite all the apparent advantages, raising forage trees is not yet popular in Timor-Leste.

Many questions remain to be answered, among them:

Will farmers cut and carry forage to livestock, or will it be considered to much work?

Will farmers be able to protect seedlings so that livestock don't destroy them?

Will farmers confine livestock?

Do farmers know how to plant trees?

Can farmers get seeds or cuttings to plant trees?

Can farmers get pots and potting mix to raise seedlings?

Slide 19

The farmers have the answers

Development of forage banks or any other agricultural system needs to come from the farmers.  
We professionals can facilitate but they are the ones who decide.



In the end, the farmers have the answers and make the right decisions for their own farms and livelihoods. Development of forage banks or any other agricultural system needs to come from the farmers. Agency staff, NGO staff, consultants, and other professionals can facilitate but the farmers are the ones who decide. Photograph by Harold McArthur.