

## Community forage bank demonstrations

UH-MAFF project, Baucau, East Timor

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Website: <http://www.ctahr.hawaii.edu/forestry/data/Timor/TimorForage.html>

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**Introduction** Forage banks are plantings of trees which can be cut back and the leaves used to feed livestock. Trees can provide green, fresh, nutritious forage for livestock in the dry season and so are especially relevant to East Timor, where livestock suffer from lack of forage in the dry season. If the trees are left to grow in the wet season they can also provide firewood for the farmer. Confined Bali cattle are raised on *Leucaena* forage in West Timor. The main obstacle to establishment of forage banks in East Timor is that free-ranging goats browse and kill any unprotected tree seedlings. One way to help trees survive is to plant them around the inside edge of fenced garden plots.

**Approach** We began working with community groups in several communities in the Seical river watershed in the fall of 2003. In January 2004 we conducted a participatory rural appraisal exercise, where we spoke with the communities about their agricultural needs and desires. One need was for marketable agricultural produce. Another concern voiced was the loss of grazing land due to the infestation of the weed *Chromolaena odorata*. As a result of what we heard, we began working with several groups to develop fenced community gardens in different localities. These were planted with vegetables and other crops during the rainy season of 2004. In June 2004 we conducted a series of workshops on nursery production of agroforestry trees, and MAFF started production of several species and cultivars of multi-purpose agroforestry trees which would be useful for animal forage in the MAFF nursery in Triloca. The Café Cooperativa Timor (CCT) also provided seedlings from their nursery in Dili. We conducted training workshops on the use of trees for animal forage in three communities in December 2004 and distributed extension booklets and posters done in Tetun. Extension materials are available on the project website:

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

or from the UH-MAFF project staff. Demonstration trials of several species of forage trees were planted around the inside edges of the fenced community gardens at the onset of the rainy season in December 2004.

**Demonstration Sites** The community gardens in Venilale (suco Fatulia), Gariuai, and Vermasse established by the UH-MAFF project. All sites are in the Baucau district, on the north side of the island. The Venilale site is approximately 850 m elevation and the wettest site with acid soils; the Gariuai site is about 400 m elevation with slightly acid soils, and the Vermasse site is at sea level and the driest site with slightly alkaline soils.

**The tree Species** Many tree species in East Timor can be used for animal forage. The following were used for the community demonstration gardens.

Scientific name	Tetun name	Common names	Sites
<i>Leucaena</i> var PG79	Ai-kafe	Koa haole (Hawaiian), lamtoro (Indonesian)	Vermasse, Gariuai, Venilale
<i>Leucaena</i> var Kx2	Ai-kafe	Koa haole (Hawaiian), lamtoro (Indonesian)	Gariuai, Venilale
<i>Leucaena</i> var. "Tarramba"	Ai-kafe	Koa haole (Hawaiian), lamtoro (Indonesian)	Vermasse, Gariuai, Venilale
<i>Gliricidia sepium</i>		Gamal (Indonesian)	Vermasse, Gariuai, Venilale
<i>Calliandra calothyrsus</i>		Kaliandra (Indonesian)	Gariuai, Venilale
<i>Sesbania grandiflora</i>	Ai-turi	Katurrai (Filipino)	Gariuai, Venilale
<i>Hibiscus tiliaceus</i>	Ai-fau	Hau (Hawaiian)	Vermasse

Other species which could be included are *Albizia chinensis* (samtuco fuik), *Acacia leucocephala* (ai-puti).

### Characteristics of the trees

*Leucaena* var PG79. Fast-growing, high in protein as a fodder tree. Good firewood, some use as timber. Tolerates heavy cutting. High content of chemical mimosine makes it unsuitable as a forage for non-ruminants such as pigs and horses. Variety of unknown ancestry developed in Indonesia. Not tolerant of acid soils. Older varieties of *Leucaena*, probably UH varieties K8 and K28, also exist in East Timor.

*Leucaena* var Kx2 Fast-growing, high in protein as a fodder tree. Good firewood, some use as timber. High content of chemical mimosine makes it unsuitable as a forage for non-ruminants such as pigs and horses. Hybrid developed at the University of Hawaii for use as animal fodder; tolerant of cooler weather. Tolerates heavy cutting. Not tolerant of acid soils.

*Leucaena* var. "Tarramba" Fast-growing, high in protein as a fodder tree. Good firewood, some use as timber. Tolerates heavy cutting. High content of chemical mimosine makes it unsuitable as a forage for non-ruminants such as pigs and horses. Variety developed in Australia from the University of Hawaii var. K636. Very productive. Not tolerant of acid soils.

*Gliricidia sepium* Nitrogen-fixing legume tree. May be propagated by cuttings. Livestock may need to "learn" to eat it. Tolerates heavy cuttings, acid soils. Rare in East Timor.

*Calliandra calothyrsus*. Livestock may need to "learn" to eat it. High tannin content. Tolerates heavy cuttings, very productive on acid soils. Favorite agroforestry tree in Java, rare in East Timor.

*Sesbania grandiflora* Nitrogen-fixing legume. Popular agroforestry tree in East Timor. Not as productive as other forage trees and does not tolerate heavy or frequent cutting. Flowers edible by humans.

*Hibiscus tiliaceus* Popular coastal plant and animal forage in East Timor. Propagated by cuttings. Not a legume nor nitrogen-fixing.

**Layout and Experimental Design** The trees were planted in a replicated design in each site, with three replications. Not all trees were tested at each site. Each garden is 38 m by 8 m, for a total of 92 m perimeter, and trees were planted in a double row around the perimeter. Each plot held 18 seedlings from each species, for a total of about 400 seedlings per site. Seedlings were staggered and set out at 50 cm apart. The total area of the trees, when they've grown out, will be about 200 m<sup>2</sup>. The project measured height and survival of trees in the first year and will measure forage yield in the second year in order to start developing recommendations for East Timor.

**Source of seedlings** The seedlings came from the following sources.

<i>Leucaena</i> var PG79	Ai-kafe	CCT
<i>Leucaena</i> var Kx2	Ai-kafe	MAFF from seeds supplied by UH
<i>Leucaena</i> var "Tarramba"	Ai-kafe	CCT
<i>Gliricidia sepium</i>		MAFF, locally collected seeds
<i>Calliandra calothyrsus</i>		MAFF, locally collected seeds
<i>Sesbania grandiflora</i>	Ai-turi	MAFF, locally collected seeds
<i>Hibiscus tiliaceus</i>	Ai-fau	MAFF from cuttings

**Management** Planting stock was raised in poly bags or dibble tubes. Cuttings of approximately 75 cm long were used for the *Hibiscus tiliaceus*. The trees were watered by hand at outplanting and weeded by hand. Forage harvests should start only after the trees have become well established. That will take a year and a half. Forage will be available in the dry season of 2006, but cutting the trees for forage in 2005 would be too soon and would result in greatly reduced vigor and life span for the trees.

**Community involvement** is crucial and initial community participation was enthusiastic. The community in Vermasse requested extra trees and planted these on the beach to provide shade. The community in Gariuai has interplanted *Gmelina arborea* (teca puti) along with maize as an improved fallow crop.

**Results and Discussion** April 2005. Most trees established quickly. There was some wilting observed at the drier sites. Height growth for *Sesbania* at Gariuai was 1.5 m in two months and over 1 m for *Calliandra*. *Hibiscus tiliaceus* cuttings sprouted within two months at the Vermasse site. The PG79 died after outplanting at the Vermasse site. Both *Calliandra* and *Sesbania* were

taller than 1 m at the Venilale site after two months, while the *Gliricidia* was approximately 0.5 m tall.

July 2005.

Seven-month growth and survival of forage trees at three locations:

Species	Location								
	Vermassee			Gariuai			Venilale		
	Survival %	Height m	CV height	Survival %	Height m	CV height	Survival %	Height m	CV height
<i>Calliandra calothyrsus</i>	na	na	na	100	2.2	27%	90	1.7	25%
<i>Gliricidia sepium</i>	90	1.2	36%	90	1.5	14%	90	1.3	8%
<i>Hibiscus tiliaceus</i>	23	x	x	na	na	na	na	na	na
<i>Leucaena</i> var Kx2	na	na	na	100	1.4	1%	87	1.7	17%
<i>Leucaena</i> var PG79	0	m	m	93	2.6	20%	90	2.0	3%
<i>Leucaena</i> var Tarramba	97	x	x	100	1.6	27%	67	x	x
<i>Sesbania grandiflora</i>	97	2.9	6%	87	3.1	11%	87	2.2	11%

The forage tree demonstration at Gariuai was growing well. The demonstrations in Venilale and in Vermasse were damaged by goats and people harvesting the leaves from the *Leucaena* seedlings for animal forage. The community in Vermasse has abandoned the site and the plot was not maintained. The species that were not browsed (*Sesbania* and *Gliricidia*) grew well. *Sesbania grandiflora* showed the best height growth at all three sites. While palatable to goats, it grew above goat browse line before the fences collapsed, in contrast to *Leucaena*. It should be noted that *Sesbania* usually grows back slower after coppicing than *Leucaena*, *Gliricidia*, or *Calliandra*, so initial height growth may not be a good index of forage production. While the *Gliricidia* was not browsed by goats early in the dry season, it may be browsed later as alternate forage becomes scarce. The *Leucaena* var. PG79 from Indonesia grew much better than varieties Kx2 from Hawaii and Tarramba from Queensland at both the Venilale site (850 m elev) and the Gariuai site (400 m elev.) Kx2 and Tarramba were severely attacked by the *Leucaena* psyllid at the Gariuai site while PG79 was not. *Leucaena* var. Kx2 was not attacked as severely at the higher Venilale site as it was at the Gariuai site, and PG79 was not attacked by the psyllid at either site. One hundred percent of the PG79 died soon after outplanting at the sea-level Vermasse site, while almost 100% of the Tarramba survived, despite frequent goat browsing. Photos and plans for the forage tree demonstrations maybe seen on the Timor agroforestry program website, <http://www.ctahr.hawaii.edu/forestry/data/Timor/TimorForage.html>.

Forester Domingos Pereira of the MAFF Viqueque district office has established a forage garden of 20 x 20 m with over 600 trees in Ossu with assistance of UH and the MAFF Baucau nursery. The garden includes *Gliricidia*, *Sesbania*, and *Leucaena* intercropped with maize. He intends to build a goat house as a demonstration of raising confined livestock.