Dryland Systems Solutions

Producing More with Less

Pastoral and Agro-Pastoral Systems

Managing rangelands: promoting sustainable tree species

Scientific name: *Leucaena leucocephala* (Lam) De Wit
Common names: Iple Iple.
Location: Originally native to Mexico, but now common throughout tropical and sub-tropical Africa and Asia.

Leucaena leucocephala: A versatile tree producing nutritious fodder for ruminants

Overgrazing in rangelands can accelerate the loss of important forage plants and contribute to the proliferation of non-palatable weeds. As a way to reverse this trend, ICARDA favours the use of stress-tolerant trees, shrubs, and grasses to develop sustainable grazing, increase rangeland productivity, and protect the fragile biodiversity of these areas.

Originally from Central America, the tree *Leucaena leucocephala* has been naturalized in many areas throughout tropical and sub-tropical Africa and Asia, including the Pothwar region in Pakistan. Such wide distribution has given rise to many popular names including Iple Iple, and Guage in its native Mexico.

Fast-growing *Leucaena leucocephala* is well adapted to hot and humid climates, thriving in temperatures between 25°C and 30°C and yearly rainfall between 650 and 1500 mm. Values outside of this range slow down growth, and temperatures below 15°C or rainfall above 3000 mm cease all plant development. At night, the tree is very sensitive to freezing temperatures, and even light frost causes loss of leaves. Heavier frosts can destroy young stems, but mature plants are able to survive and re-grow new buds.

Despite its preference for humid and sub-humid climates, *Leucaena leucocephala* is very tolerant of periods of drought. Even during establishment, young seedlings can survive long periods of dry conditions thanks to an extensive root system, able to exploit deep underground water sources. In contrast, the tree does not cope well with poorly drained or flooded soils, and plant growth can be severely restricted during periods of waterlogging. It is best suited to deep, dry, and neutral soils, but it can adapt to a variety of soil types, including shallow limestone, coastal, or even soils with high salinity or alkalinity.

Leucaena leucocephala is used mostly as forage for livestock, both after cutting for use as fodder, or direct grazing, typically planted in hedgerows with grass. It responds well to a coppice system and branches vigorously.

Leucaena leucocephala Benefits:

- Drought-tolerant.
- Can grow in a wide variety of soils, except if waterlogged or subject to flooding.
- Annual dry matter yields can reach up to 15 tonnes/ha.
- Highly nutritious and palatable forage for ruminants.
- On average, while on this forage, livestock gain 700–850 g/day.

Seed pods of Leucaena leucocephala are long brown pods that will drop from the tree to allow for easy dispersal

Silvopasture practice using Leucaena leucocephala in combination with Pennisetum purpureum (Elephant grass)

Goats browsing Leucaena leucocephala

Establishment and management

Covered by an impermeable outer waxy coating, seeds must be scarified before planting to facilitate water absorption and promote germination. This treatment can be done by placing the seeds in hot water, but this practice often results in uneven germination rates. A more reliable method involves mechanical scarification, using coarse sandpaper for small batches or abrasive-lined rotating drum scarifiers for larger batches. Seeds can be sown in beds and transferred as bare-root plants, or in individual poly bags and transplanted as seedlings at 3 to 4 months old.

Annual dry matter yields can reach up to 15 tonnes/ha. Higher results can be achieved with intensive systems using trees planted 0.5–1 m apart in rows 1–3 m apart, whereas more extensive approaches with hedgerow planting reduce growth rates to 2–6 tonnes/ha. To maximize leaf production, cutting intervals range between 6 and 12 weeks during the growing season.

With a digestibility between 55% and 70%, *Leucaena leucocephala* is well-known for its high nutritional value, including 30%–50% nitrogen-free extract, 6%–10% ash, 6% ether extract, and 3%–4.5% nitrogen in the edible fraction. As a limitation, this forage is low in sodium, and contains 2%–6% condensed tannins in the leaves, which bind protein and block its degradation in the rumen.

Due to the presence of mimosine, a toxic amino acid, it is usually recommended not to use this forage by itself, but instead use it mixed with grasses. This poisonous substance is present in concentrations around 4%–6% in the edible fraction, but it may reach 12% in young leaves. Symptoms of excess consumption in ruminants include low levels of thyroxin, ulceration of the esophagus and rumen, excessive salivation, lack of appetite, and poor weight gain.

Livestock feeding on *Leucaena leucocephala* can achieve an annual weight gain of 250–300 kg/head, which represents, on average, 700–850 g/day for each animal. Better results can be achieved by mixing with buffel grass (*Cenchrus ciliaris*) or allowing cattle to graze directly on trees produced under irrigation to maximize plant growth.

Effective Maintenance:

- Seeds must be scarified before planting to break the outer waxy layer, either mechanically or by dipping in hot water
- Seeds can be transplanted as bare-rooted plants, or as seedlings at 3–4 months old
- Cutting can be done with 6–12 week intervals during the growing season
- Due to the presence of a toxic substance, an animal's diet should not contain more than 30% *Leucaena leucocephala*.

Rangeland factsheets:

This series of flyers is designed to build awareness of sustainable rangeland management through best practices and well-adapted species among extension workers and those working in the agricultural research and policy sector.

ICARDA's Rangeland Ecology and Management Unit

ICARDA's Rangeland Ecology and Management Unit aims to address the unsustainable use of resources induced by mismanagement, the adverse effects of climate change, and an increasing demand for food and feed in the dry areas. ICARDA programs promote the enhanced quality and productivity of crop, forage, and livestock, and the improved management of water resources through close cooperation with farmers and national researchers.

ICARDA
Science for Better Livelihoods in Dry Areas

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Contact:
Dr. Imtiaz Ahmad Qamar, Director, Rangeland Research Institute, National Agricultural Research Center Islamabad. iaqamar@hotmail.com

Dr. Muhammad Islam, Small Ruminant Production Scientist, ICARDA Pakistan. mu.islam@cgiar.org

Dr. Mounir Louhaichi, ICARDA Range Ecology and Management Research Scientist. M.Louhaichi@cgiar.org