

RESILIENT AGROSILVOPASTORAL SYSTEMS

CGIAR RESEARCH PROGRAM ON LIVESTOCK

Aims to increase the productivity of livestock agri-food systems in sustainable ways across the developing world.

Managing agrosilvopastoral systems: promoting multipurpose species

Aloe vera (L.) Burm.f.: a multipurpose plant for arid climates and poor soils

Aloe vera grows in a large variety of climates including temperate and subtropical areas. This plant is native of southern and eastern Africa, and has been introduced to the Mediterranean region.

Aloe vera is a spiky cactus-like xerophyte, a succulent plant with CAM photosynthesis. It is a clump-forming perennial with thick fibrous roots and produces large basal leaves, usually 12–16 per plant, weighing up to 1.5 kg when mature. The plant matures when it is about 4 years old and has a life span of about 12 years. The leaves are up to 0.5 m long and 8–10 cm across at the base, tapering to a point, with saw-like teeth along their margins. The leaves are covered by a thick cuticle and grey-greenish in color. Plants flower from October to January and the long inflorescence has a large number of small bright yellow flowers. Fruits develop from February to April.

Benefits:

- Grows in a large variety of climates and soils
- A succulent plant with Crassulacean Acid Metabolism (CAM) photosynthesis
- Suitable for arid and semi-arid regions
- Tolerates high pH levels
- Its water-soluble component contains a number of nutritive compounds: polysaccharides, vitamins, enzymes, amino acids, minerals, and trace elements



Photo credit:
<https://es.gardenmanage.com>

Scientific name:

Aloe vera (L.) Burm.f. *Aloe barbadensis* Miller

Common names:

Desert cacti, burn plant, first aid plant, medicine plant, lily of the desert, elephant's gall
(الأوفيرا)

Locations:

Southern & eastern
Africa

Aloe vera can be grown in dry climatic conditions in poor soils. It requires sandy loam soil with adequate drainage and a temperature of around 20–22°C. It is suitable for arid and semi-arid regions and tends to tolerate high pH levels of up to 8.5. The aloe plant is propagated by sowing, suckers, rhizome cuttings, and in vitro. Sexual reproduction is not always possible due to lack of seeds, pollen sterility, and self-incompatibility. In conventional production systems, each mother plant produces three to four suckers throughout the growing season. To prevent diseases, before transplantation in the field, selected suckers (15–30 cm long) should be subjected to slight moisture stress under shaded conditions (about 5–10 days). Using rhizomes to reproduce aloe on large scale is impractical due to the time required for a completely developed plant (2 years), and to exposure to phytopathogens as a result of the cuts. Plant tissue culture (in vitro propagation) is proposed as an alternative for mass-propagation of *Aloe vera*.



Acclimated *Aloe vera* plants in the greenhouse



Aloe vera mature plants in the field
Photo credit: <https://es.gardenmanage.com>



Cut leaf of *Aloe vera*

Establishment and Management

In open fields under irrigated conditions, transplanting is carried out throughout the year, except in winter. Land preparation is limited to the surface to prevent erosion, which is common in recent plantations. The optimal layout is 90 cm between rows and 45 cm among plants, with a double quincunx row arrangement (25,000 plants per ha). After planting, the soil around the root zone must be firmly pressed and proper drainage ensured to prevent water stagnation.

For aloe plants under warm climate conditions and rainfed cultivation, four weed controls are necessary, three during the rainy season and the fourth during the dry season. Chemical control of weeds is not permitted by aloe industrial regulations. When the aloe plants are small it is possible to use machinery to eliminate weeds; however, this is not recommended when plants are growing, because the machinery can damage the plants. The best method is to eliminate weeds manually. As an alternative method, farmers introduce goats and lambs to consume the weeds, since these animals do not feed on aloe. The use of industrial aloe leaf waste, known as bagasse, is commonly used as an organic cover to prevent weeds. Bagasse also preserves the soil humidity, and the organic matter is incorporated into the soil.

In open field cultivation, in arid and semi-arid climates, it is necessary to irrigate to ensure both continuous growth and gel production. An excessive volume of water is thus avoided, which could damage the collar and cause rotting.

Organic (30–60 t of compost per ha) and inorganic fertilizers (150 kg nitrogen per ha) may enhance both growth and yield.

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Harvest and Post-harvesting

Employing good agronomic practices can provide two harvests per year (May and October). Each harvest involves the removal of four leaves (eight leaves per year per plant). The mean weight of a mature fresh leaf reaches 500 g, thus obtaining 4 kg per plant and corresponding to 80 t per ha. The older outer leaves are generally harvested, leaving the fresh and young leaves at the top. The plants can be removed manually or with the help of a tractor-drawn disk harrow or cultivator. Only mature well-developed leaves are collected, which are 60–80 cm in length and with width at the base of around 8–10 cm.

Aloe vera leaves contain two major parts: the outer green skin and the inner colorless pulp. This pulp or parenchyma tissue contains a viscous gel, the cell walls, and organelles constituting 98.5% water. The gel contains 99.5% water. The remaining 0.5% solid fraction contains 80% water-soluble components that include a number of nutritive compounds such as polysaccharides, vitamins, enzymes, amino acids, minerals, and trace elements. The non-nutritive compounds include organic acids, phenolic compounds, phytosterols, and other compounds. The plant possesses several pharmacological properties, such as promoting the healing of wounds and burns in addition to showing anti-inflammatory, antifungal, hypoglycemic, and gastroprotective activities.

Effective Management

- Optimal density 25,000 plants per ha
- Proper drainage to prevent water stagnation
- Weeds are eliminated manually
- Bagasse preserves the soil humidity and organic matter
- Organic and inorganic fertilizers enhance both growth and yield

ICARDA's Rangeland Ecology and Forages unit (REF)

The REF team promotes advances in rangeland ecology and pasture management in the dry areas. This series of factsheets is dedicated to the characterization of promising range and forage species aimed at alleviating the feed gap, limiting water runoff and soil erosion, restoring degraded rangelands and maintaining a healthy ecosystem.