



File 1 - Prerequisites for cultivation

Growing Artemisia is not simple. That is why certain conditions are required to start growing successfully.

1. Cultivation site

Choose a flat sunny plot, preferably with loose soil. As far as possible, avoid sites on a slope, heavy clay or sandy soil, sites subject to flooding or with poor drainage and next to the sea.

WARNING! Do not cultivate in areas contaminated by hazardous substances (heavy metals, agrochemicals and other industrial waste). Avoid any risk of soil, air or water pollution. Evaluate the impact of past land use on the chosen cultivation site (previous plantations and, in particular, any possible applications of phytosanitary products) [1].

2. Access to water

WARNING! Growing *Artemisia annua* requires a significant amount of water since **each plant must be watered generously morning and evening during the dry season. This amount of water must be reduced according to the rains during the rainy season.**

The installation of a well or borehole and/or irrigation system is often necessary! It is however possible to cultivate *Artemisia annua* in the rainy season to make significant savings on water but this can give poorer results than in the dry season. The optimal growing period is to be defined according to individual context.

Once well established, *Artemisia afra* is more resistant to high temperatures and drought. Its water needs are especially important during the first 3 months in the field.

Irrigation water must meet local, regional and/or national quality standards [1].



Irrigation water should not be contaminated by domestic animal or human materials [1].
(See AGRISUD Guide [7] p 85 to 87 - Protection of water against pollution).

WARNING: Excess water is also to be **avoided!** This can induce leaching of nutrients or reduction in root depth of the plant [2].
Moreover, ***Artemisia annua* is sensitive to waterlogging.** For this reason, drainage channels must be provided when growing *Artemisia annua* during the rainy season [3].

For reference: during the dry season at the House of Artemisia in Tivaouane, Senegal (hot and dry climate, Bsh, average 443 mm/year), plants are watered by sprinklers for 25 to 30 minutes morning and evening, every day for approximately one and a half months following transplantation and 15 minutes morning and evening thereafter. This represents 3.52 and 1.92 mm of water per day respectively.

The **choice of irrigation system** for each site must be determined according to its soil characteristics, topography, water quality and cost but also and above all according to the cultivation area and equipment available to reduce costs [4]. On small farms, using watering cans is often the most cost-effective system.

WARNING! It's important to reduce the physical impact of water on fragile seedlings to avoid destroying them [5].

At the Maison de l'Artemisia in Tivaouane, Senegal, the installation of a sprinkler irrigation system alone increased harvests by 50% compared to the drip irrigation used the previous year. It causes higher transplant mortality at the very beginning of the crop, but allows better decomposition of compost and mulch cover, leading to better growth of *Artemisia annua* [6].

To reduce the loss of young plants due to sprinkler irrigation, micro-irrigation is effective when plants are less than 1.2 m high [4].

In general, sprinkler irrigation seems to be more advantageous on sandy soil because roots develop on the surface to capture water that seeps into the soil very quickly; **however localised drip irrigation is more appropriate on clay soil** because roots are less extensive and go deeper to capture water retained in the soil.

(For more information, see AGRISUD Guide [7] p 75 to 84 - Water management).



3. Equipment

- Fences if necessary;
- Watering system: watering cans, crop sprayers (reserved for irrigation, used only with water) initially; borehole/well/electric pump/water tower and irrigation system as production and water requirements increase;
- Minimum 250 kg compost for a 200 m² trial (10 kg for the nursery and 240 kg for plants, ie 600 g/plant minimum);
- Mulch to cover the cultivated area;
- Basic gardening equipment: hoe, spade, shovel, machete, wheelbarrow, buckets, weeder, shears, sieve, ...);
- Seedbed: wooden frames or honeycombed trays or cut cans, mosquito net or wire netting; protection against direct sunlight and rain;
- Small plastic bags or salvaged pots for possible pricking out before transplanting;
- Drying: clean tarpaulins or mats with no holes in them. Drying tables, racks or solar system and thermometer when production becomes more professional;
- Shredding: machetes or hammer mill (which doesn't heat up) when production intensifies;
- Transportation (if the processing facility is off-site): clean bags;
- A freezer may be needed to guarantee quality in the event of insect problems;
- Seed collection: basins
- Storage of shredded material: clean, dry, hermetically sealed bags or boxes;
- Packaging: plastic-free kraft bags, dimensions 20*8*4 cm, with official La Maison de l'Artemisia labels and stickers, single use latex gloves, clean gowns, masks, letter-weighing scale for measuring 40 g bags;
- Office supplies: notebooks or binders, pens, ...
- No laboratory tools required.

4. Crop manager

Growing *Artemisia annua* is not easy. Daily onsite presence and a minimum of agronomical knowledge are required in order to succeed in production of this plant. In addition, pesticide-free growing requires particular care to prevent and counter pests and diseases. Finally, crop rotation is essential, as is the control of other crops. (For more information, see AGRISUD Guide [7] p 133 to 137 - Crop Succession)

A crop manager must be appointed to meet the quality requirements for traceability of production batches.



We strongly encourage **agro-ecological practices** including **crop diversification**.

(See AGRISUD Guide [7], in particular p 119 to 122 for the implementation of wind-breaking hedges and associations).

(See example of a typical House of Artemisia subtropical medicinal garden).

Advantages of crop associations: (For more information, see AGRISUD Guide [7] p 139 to 141 - Crop associations).

- Keep the soil alive and fertile ;
- Optimise use of growing space ;
- Reduce weeding, watering and improve soil by covering with mulch or creeping plants;
- NB: Artemisia growth is directly affected by weeds and soil fertility.
- Limit the use of inputs (water, fertiliser, phytosanitary products) ;
- Protect crops through the resilience effect of biodiversity;
- Improve production quality and quantity;
- Secure farmer income by diversifying production.

When choosing **crop associations with Artemisia**, consider complementarity:

- Layer crops (choose different strata of foliage allowing Artemisia to grow in the light);
- Choose plants that do not invade its poorly developed root system;
- NB: Artemisia has a pivotal root system that can draw water from deep down if necessary but does not descend if there is water on the surface as its secondary roots will develop in the upper soil horizon;
- Mix with leguminous plants as Artemisia is very demanding of nitrogen (eg: groundnuts, non-climbing beans, peas, soybeans, cowpeas, ... but avoid wheat, corn and cassava which also require a lot of nitrogen);
- Cultivate with other plants with similar water requirements [7].

What's more, Artemisia has a repellent effect on many insect pests, protecting other crops grown in association with it.

Several conclusive trials have been reported with the cultivation of melon, peanut, pea, soybean, cowpea, lentil, cabbage, carrot, amaranth, cucumber, tomato, okra, nightshade, round pepper, leek, bissap, banana, kinkeliba, herbs (mint, thyme, rosemary, basil, etc.), non-climbing beans (planted after Artemisia) and lettuce (low competition for about 20 days and then harvested to let Artemisia grow, 20 cm spacing necessary).

Leave on site cut leaves of leguminous plants cultivated in combination to produce an excellent nitrogen-rich mulch!



Consider lemongrass and other plants produced to provide mulch. WARNING! do not cultivate next to plants requiring chemical treatments!

It is vital to use only **non-toxic cultivation techniques because species of the genus Artemisia are powerful bio-accumulators!** [8]
ie, they absorb and accumulate heavy metals (Cr, Ni, Co, Fe, Mn, Cu, Zn), chemical elements and radioactive waste.

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