File 3 - Growing trial: choice of cultivar and growing period

There are several cultivars of *Artemisia annua*. It is difficult to know in advance which is best suited for a specific biotope and the optimal growing period.
The growing trial will therefore test seeds from several sources to determine which works best for a given context.
The optimal growing period is when days are long, water is available and harvesting outside of the rainy season is possible.

Objectives :

- What and when to plant? Identify the most suitable seeds and the best growing period.
- Choose the best seed suppliers! Collect seeds from the most suitable plants.

1. Schedule for growing trial

- Ideally, start new seed beds so you can transplant each month in the field 1 row of 20 new plants for each cultivar.
- If the frequency (sowing and transplanting each month) is too demanding, choose four dates based on the seasons.
- If the number of plants required is difficult to manage, transplant 1 row of 15 new plants for each cultivar on each date.

2. Site selection

- Make sure that the site is uniform (same soil type, sun exposure, water supply, ...) and as flat as possible.
- If the ground is not flat and there is risk of waterlogging, plant lines in the direction of the slope to facilitate drainage.

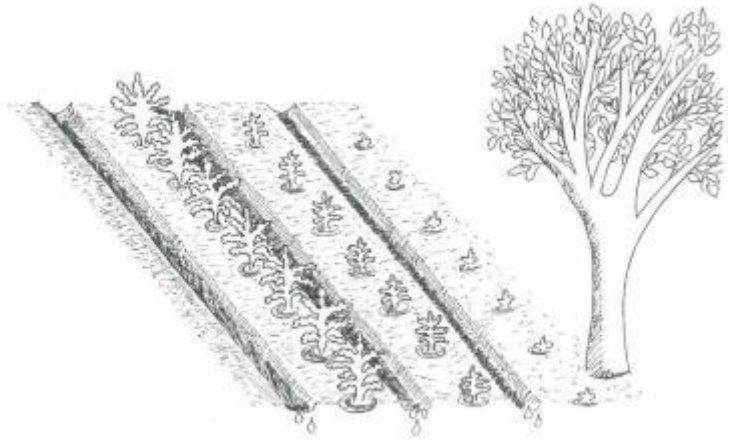

Figure 1 : Sloping trial site (Agathe Cornet-Vernet)

- If the site is not uniform, plant rows in such a way as to expose them all equally to the source of variability

Example 1 : The test plot is bordered by a row of trees to the east.

If rows are planted in a north-south line, the row closest to the trees will be impacted by shade and wind protection and the soil will be enriched in organic matter from fallen leaves…

This row of trees is a source of variability. It will influence plant growth in the same way as the choice of period or cultivar, resulting in biased test results.

Planting rows in an east-west line allows this variability factor to be "distributed" over each test row and thus not distort results.

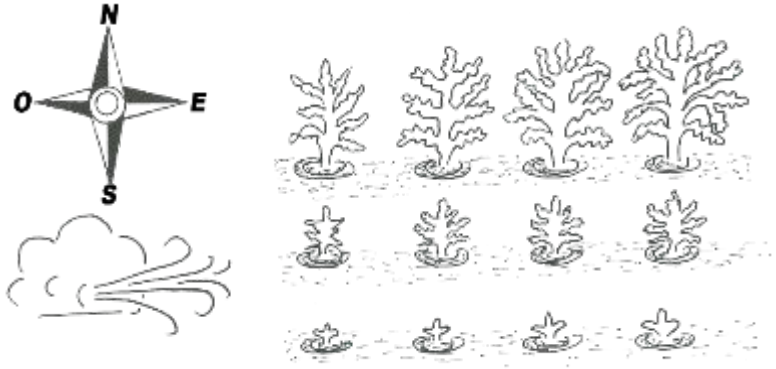

Figure 3 : Trial site with strong crosswind (Agathe Cornet-Vernet)

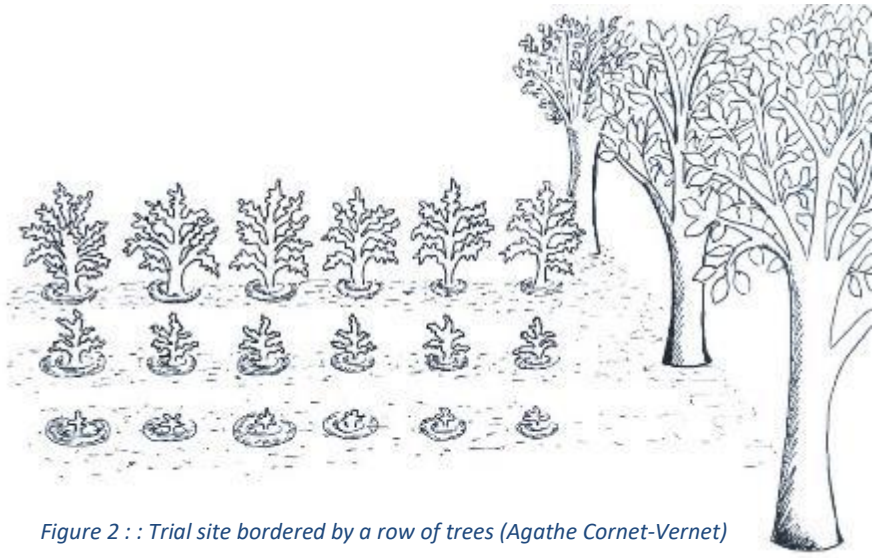

Figure 2 : : Trial site bordered by a row of trees (Agathe Cornet-Vernet)

Example 2 : If the trial site is subject to a strong crosswind from the west, plants on the west of the site will be impacted and will have more difficulty growing.

Rows should therefore be planted in east-west lines. If rows are planted in north-south lines, one could incorrectly assume that the cultivar or period trialled are to be blamed for poor growth when it is just a question of the impact of the wind.

- If several plots or fields are available, carry out the test in different locations (1 row of 20 plants per cultivar and per date).

  This is the principle of repetition: two plots of equal area, the same number of viable plants, the same cultivar and the same transplantation date that are geographically separated will give much more representative results than one plot. This will enable possible differences between plots to be taken into account and spread the risk of pests or other unexpected issues.

3. Cultivation operations

See Cultivation and Processing Manual.

Important : clearly delimit the plant beds for each cultivar! Use wooden boards to separate beds and write on the cultivar name of each zone.

- Transplant to the same density and use the same quantity and quality of water and compost for each trial!
  Density, water and compost are sometimes more important factors for growth than cultivar or growing season.
- Weed if possible with the same regularity after transplantating; as soon as necessary in the first weeks and then approximately every month.
- DO NOT USE ANY PRODUCTS, organic or not, as the objective here is to see which cultivar is best suited to local conditions.
- Harvest once only (one final cut). The objective of the growing trial is to identify which cultivar is best adapted to the growing site for each period of the year and see if the cultivar flowers prematurely, rather than to produce as much herbal tea as possible by regular cutting.

4. Observations

- Note **cultivar, sowing and transplanting dates** for each row in a notebook.
- Note information on the trial site (**sector + landmarks + possible variability factors for each row**) and the **number of plants** in each row.
- **Carefully observe plant growth** and check each week for pests, disease or other abnormalities.
- Determine and record **pest attacks** with **description** and evaluation of the **infestation rate** (% of affected plants on the plot), **impact** (evaluation of lost production per affected plant), and **mortality rate** (% of dead plants).
- When half the plants have formed flower buds, measure all the plants in the row EXCEPT those that have been attacked by pests or disease (ie with estimated 50% or more loss of production or impacted over 50%).
- Record height of the smallest plant (**minimum height**), the largest plant (**maximum height**) and the **average height** (sum of heights of all the plants ÷ number of plants in the row) taking into account only the plants that have not been seriously attacked by pests or disease.
- Record date of cutting (to be done as soon as the flower buds appear on half of the plants in the row, after taking measurements).

  IMPORTANT: Do not cut the best plants but leave them to flower for seed collection. (See: Seed Production)

- If possible, dry each row separately in order to weigh and note the **dry material production per unit (row and zone**) and calculate the **average dry material produced per plant** (taking only into account plants that have not been badly attacked by pests and disease).

Trial log: (example)

Cultivar	Sowing date	Transplan-tation date (T)	Zone(s) – n°plants	Variability factors	Density	Compost	Pests and disease attacks	Observations min, max and average height just before harvest	Harvest (per zone) - date + grams of dried plant material + average yield dried plant material per plant
Senegal	08/10/2017	24/11/2017	A - Row 1 (20 plants) B - Row 5 (20 plants) C - Row 3 (20 plants)	A - Windy B- Close to village, sloping ground C – Partly under trees (shade, leaf humus, nutrients and water pumping	0,5 x 1 m	3 handfuls of poultry manure compost/ plant at T	A - 50 % of plants with **ants** : minor impact B - 30 % of plants with **termites** on roots: **10 % dead**, 5 % weakened, 5 % ok C - 20 % **fungi** appeared on 15/04/18 on a few leaves (yellow/orange/brown) causing leaves to dry. 40 % affected on 30/04 : **20 % with black stems** ➔ **removed from the field** 20% affected leaves (about 1/5th of the plant) ➔ leaves removed	A – **Early flowering**! Wind? Min H: 83 cm Max H: 163 cm Avg H: 124 cm B – **Weak growing at first**… poorer soil? Add more compost? Min H: 140 cm Max H: 191 cm Avg H: 161 cm C - **5% malformation**, very small ecotype, « round shaped », not very productive. Min H: 77 cm Max H: 146 cm Avg H: 126 cm	**A - 05/03/2018** ⇨ 5 343 g/row (÷ 20 plants per row) ⇨ **Average 267 g/plant** **B - 25/05/2018** ⇨ 10 012 g/row (÷ 17 plants per row) (2 plants died of termites **And one kept for seed!)** ⇨ **Average 589 g/plant** **C - 13/05/2018** ⇨ 6 569 g/row (÷ 16 plants per row) (4 plants died of fungi) **Average 411 g/plant**

5. Seed selection (cultivar and period)

- Plants that are less vulnerable to pests and diseases.
  Selection of a resistant cultivar = most effective means of control and always the preferred option! Even if yield is slightly lower than with another non-resistant plant, it will avoid considerable costs and production losses when pests or disease appears again.
- **Maximum production** (average dry weight per plant).
- High **germination** rate in seedbed (with fast germination.

Example of optimal growing season in Senegal (for information)

At the House of Artemisia in Tivaouane, years of testing have made it possible to establish the following growing schedule:

Sowing is done at the end of the rainy season (October) so as to transplant the plants to the field as early as possible in the dry season (November).

Plants are irrigated and cut once the largest plants reach just over 1 m high. The final harvest takes place just before the rainy season (June) to facilitate drying. Over the 6 growing months, usually only one intermediate cut is made.

It is also possible to cultivate in the rainy season (transplanting in July, manpower permitting). In this case, only one final cut is made 3 months later, at the end of the rainy season.

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