

Jatropha Seed Benchmarks, Germination & Planting Instructions

The Jatropha Organization of South Africa

Seeds for Biodiesel Plantation

Class 1: High Yielding Elite Jatropha Curcas L. Seeds

SL. No	Benchmarks	Characteristics of Ideal mother plant identified
1.	Seed germination	>70%
2.	Shelf Life of seed	Up to one year
3.	Seed weight	About 1600-1650 seeds per kg
4.	No. of seeds in a fruit	Three seeds
5.	Oil content	34%-37%
6.	No. of branches per Tree	>15 Branches per Tree
7.	Physical / Genetic Purity (Min)	90% / 80% Purity in next generations.
8.	Leaf	Five lobed
9.	Resistant to Pest and Diseases	Yes
10.	Drought Resistant	Grow in between 400 to 1200mm
11.	Acclimatization	Adoptability to any soil and most climatic conditions
12.	Low gestation period	From second year
13.	Response to cultural practices	Good response
14.	High Yielding	5-12 MT from non-irrigated to irrigated
15.	GE Free	Yes
16.	Germination Instructions	See below
Storage & Handling: Store in well-ventilated place at room temperature. Keep away from direct sunlight or heat source.		

Germination Instructions:

1. The ideal soil temperature for germination is 23-26 degrees C.
2. Proper moisture, oxygen, temperature, and sometimes light must be provided.
3. Soak seeds in cold water for 12 hrs before sowing as this is recommended for better and quicker germination.
4. Optimum temperatures for germination are between (23°C to 29 °C). A variation of 6°C between day and night temperatures stimulates the germination process. The lower temperatures should be during the dark period.
5. The germination medium must hold adequate water yet drain freely. Keep moist.

Fill 12cm x 22 cm polyethylene bags with top soil, sand and organic fertilizer in the ratio of 1:1:1, respectively. Sow at 3cm depth. The raising of Jatropha seedlings in polyethylene bags accelerates the initial growth of a plantation by at least three months. (The bags are available here: <http://www.jatropha.org.za/Jatropha%20Equipment.html>)

Transplant after 2 to 3 months but do not allow the roots to become root-bound in the bag. The development of a taproot is essential for longevity, drought resistance and high seed production.

Acclimatization

The best time to start is in early spring and throughout summer. Germination takes four to seven days sometimes longer if the soil temperature hasn't been maintained. The idea is to establish the plants long before allowing them to withstand their first cold winter out in the fields the next year.

Germination issues:

Late winter or early spring: The seeds must be germinated under cover in late winter or early spring. You will require a hothouse, hotbed or a cold-frame to maintain the soil temperature. (Not applicable in tropical climates)

Late spring/early summer: The seed may be sown outdoors without any cover during the late spring/early summer.

Summer: The seed may be germinated outdoors in bags. If the temperature in your area goes above 30 degrees you may need to keep the saplings under shade cloth but please do not allow the soil temperature to soar above 30°C while germination is taking place.

Hardening Up:

This is crucial before transplanting. If the saplings were planted in a hothouse they should be removed and left in their bags outside in the open for at least 3 weeks to a month. Transplant within the 2 to 3 month period referred to above.

Be advised: Most of the trees will lose their leaves in winter, so don't fret. Watch out for stem rot that occurs from too much moisture during winter when the plant is dormant. This applies to whether the saplings are in bags or out-planted.

Out-planting:

When establishing a Jatropha Plantation, the timing of your start up is extremely important. There is a window of opportunity during the warm/ rainfall season to out-plant trees between November and March the next year. (Southern Hemisphere) If you miss the season, your out-planting operation will have to wait until the next season to begin. The idea is to avoid the high cost of expensive irrigation and to get the saplings into the ground during the wet season so as to benefit from natural rainfall and climatic conditions.

Germination requires a soil a temperature of between 23 – 26 degrees. Filling & Seeding of your Planter Bags should therefore start in spring - September till the end of January next year. The bagged saplings in your nursery will need to be kept moist during the dry months of September and October.

Tree planting must start in November/December when the rain starts so that there's little or no need to irrigate. Stop out-planting in March so that last of the planted saplings still receive some rainfall during April and May before the dry season begins in June ending in September/ October. See chart below.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Seeding		Filling & Seeding in Planter Bags									
Tree Planting									Tree Planting		

Tree Spacing, Seed and Oil Yields

There are many variables to be taken into account when making Jatropha yield and oil production estimates.

- A. **To calculate seed yield;** multiply the number of trees by the number of known kgs that each tree produces.
This depends on the tree spacing you've chosen hence the number of trees you've planted per hectare.
- B. **To calculate kg's of oil produced;** multiply the number of kgs of seed produced by the oil extraction rate.
The oil extraction rate depends on the quality of your seed in oil content and the efficiency of your Oil Expeller. This may vary between 34 to 37%. Choose a conservative average of 35%
- C. **To calculate litres of oil produced;** divide your kg's of oil by **.916** to get the amount of litres produced.
(Point 916 is the Specific Density of Jatropha Oil and can be used to convert your kgs of oil into litres of oil)

Example: In the table below, 10 kg's have been used as an average seed yield per tree.

In the case of 2 x 2 meter spacing, the trees may yield less than 10kgs per tree whereas with wider spacing they will produce a higher yield because there will be more sunshine.

Tree Spacing in meters apart	Number of Trees per hectare	Kgs Seed production per tree (This varies)	Kgs seed per hectare	Tons Seed per hectare	Oil Extraction Rate of 35% (This varies)	Kgs of Oil Produced per Hectare	Liters Oil Produced per Hectare	m2 Occupied by each tree	Kg's propagation seed needed for one ha
2 x 2	2500	10	25000	25	35	8750	9552	4	1.68
2.5 x 2.5	1600	10	16000	16	35	5600	6114	6.25	1.08
3 x 2	1667	10	16670	16.67	35	5835	6370	6	1.12
3 x 3	1111	10	11110	11.11	35	3889	4245	9	0.75
3 x 4	833	10	8330	8.33	35	2916	3183	12	0.56
2 x 5	1000	10	10000	10	35	3500	3821	10	0.67
2.5 x 5	800	10	8000	8	35	2800	3057	12.5	0.54
3 x 5	667	10	6670	6.67	35	2335	2549	15	0.45
4 x 4	625	10	6250	6.25	35	2188	2388	16	0.42
4 x 5	500	10	5000	5	35	1750	1910	20	0.34

How to Out-plant the trees:

1. Make a straight line across the length and breadth of the planting area using a string.
2. Make a Yard-stick – Cut a piece of wood or a metal rod to the tree spacing you will be planting at. Make one for your length apart and another for your breadth apart e.g. 2 x 3 meters apart = a 2 meter length and a 3 meter length.
3. Dig each hole along the straight lines using the Yard-stick to space, then work your way onwards.
4. Holes may be made using a pick and shovel or an Earth Auger. If the soil is hard, start by making small holes and fill with water. This will make the job of digging manually or that of using the Earth Auger much easier.

5. The holes may be made 30 cm deep (that is one ruler deep). In hard or compacted soils make the hole deeper and backfill with the soil removed after soaking (No 6 below)
6. In dry soil conditions, fill each hole to the brim with water and let it soak into the ground before continuing.
7. Add one spade of an organic compost into each hole and mix with some of the soil you removed when digging the hole. (You could also place a Controlled or Slow Release Fertiliser Tablet into the planting hole)
8. Gently un-bag the sapling and try to let the contents, with roots intact, fall into the hole.
9. If the soil in the bag falls away from the roots while un-bagging, hold the sapling above the ground and gently fill with topsoil around the roots, then compress.
10. Fill with remaining soil while digging the hole and leave sufficient space for rainwater. Compress or firm into the ground the stem. Please don't bury the stem.
11. Gently place your both hands around the bottom of the stem and slightly press the soil around the bottom of the stem and roots to firm.
12. Back up any further soil left over around the perimeter of the hole to catch rainwater.
13. Immediately water the sapling with half a bucket of water.
14. Thereafter, water with half a bucket of water once a week **only if there is no rainfall**. It is expected that you will out-plant during the rainy season so please do not over water. Over watering stunts growth of the tree and could result in the dreaded stem rot.

Frost: Jatropha grows in areas where there are light or sometimes heavier frosts. Most trees once established will easily handle these climatic conditions once matured. However, if you know that your region bears frost that could possibly damage the young trees, it would be prudent to make preparation for the first two years of growth by investing in frost covers. Once the trees are established you shouldn't have any problems. **Tip:** Look after your used frost covers as we would be interested in buying them from you.