



CULTIVATION TECHNOLOGY

THE PRODUCTIVE PLANTATION OF JATROPHA CURCAS

The practices being undertaken by the Jatropha growers currently need to be scientifically managed for better growth and production. The growth and yield of Jatropha could be improved through effective management practices.

The key factors that can influence the oil yield of Jatropha Curcas are:

1. Climate
2. Quality of the soil
3. Irrigation
4. Weeding
5. Use of fertilizer
6. Crop density
7. Genotype
8. Use of pesticide
9. Inter-cropping

PROPAGATION AND MANAGEMENT

<u>PROPAGATION METHODS</u>	
<u>GENERATIVE PROPAGATION</u>	<u>EFFECTING FACTORS</u>
Direct seeding	<ul style="list-style-type: none"> • Quality of seeds • Seding depth • Date of sowing
Transplantation of precultivated plants	<ul style="list-style-type: none"> • Type of precultivation • Length of precultivation • Age of precultivation
Seeds beds(bare roots) Poly bags	
<u>VEGETATIVE PROPAGATION(cuttings)</u>	
Direct planting	<ul style="list-style-type: none"> • Right time
Transplanting of precultivated plants	<ul style="list-style-type: none"> • Right size • Right age • Right strain • Right source
Seeds beds(bare roots) Poly bags	
<u>SUCCESSFULL PRECULTIVATION IS CHARACTERIZED BY</u>	<ul style="list-style-type: none"> • High germination rates of seeds • High sprouting rates of cuttings • High survival rates

Basing the propagation method on rainfall conditions plays a decisive role in the survival and properties of the plant in field.

Method of cultivation should be chosen on the basis of

- Maximum survival rates
- Intended utilization of the plantation

1. For quick establishment of hedges and plantation for erosion control, directly planted cuttings are best.
2. For long-lived plantations for vegetative oil production, plants propagated by seeds are better.
3. With better rainfall conditions, the plantations could also be established by direct seedling.

seeding.

Direct seeding, precultivation of seedlings, easily propagates the Jatropha transplanting of spontaneous wild plants and direct planting of cuttings. Seed should be collected when capsules split open. Use of fresh seeds improves germination. Intervals of presoaking and drying, or partial removal of the testa, are more successful than presoaking alone. With good moisture conditions, germination takes 10 days. The seed shell splits, the radicle emerges and 4 small peripheral roots are formed. Soon after development of the 1st leaves, the cotyledons wither and fall off. Further growth is sympodial

Climate

Can withstand severe heat. Likes heating and doing well in warmer areas. When cold will drop its leaves. It can withstand light frost but not for prolonged periods. The older the tree the better it will withstand. Black frost will almost certainly kill young plants and severely damage older plants

Quality of the soil

Best in sandy well-drained soils. Can withstand very poor soils and grow in saline conditions All the actors in the Jatropha sector suggest, anyway, using organic fertilizer in order to obtain higher yield.

Irrigation

It handles dryness very well and it is possible to live almost entirely of humidity in the air. - See Cape Verde where rainfall is as low as 250 mm a year. Differences are expressed in what is optimum rainfall as some readings say 600 mm and some say 800 mm whilst some areas in India report good crops with rainfall of 1380 mm. Under irrigation 1 500 mm is given.

500 - 600 mm of rainfall is the limit. Below it the production depends on the local water condition in the ground

It will also stand for long periods without water - up to 2 years - and then grow again when rains occur again.

Weeding

Standard cultural practices are timely weeding (4 times a year), proper fertilization, surface ploughing and pruning. With these management practices a yield around 15-20 kg of fruit per tree can be obtained even if the plants did not reach full maturity.

Use of fertilizer

Although Jatropha is adapted to low fertility sites and alkaline soils, better yields seem to be obtained on poor quality soils if fertilizers containing small amounts of calcium, magnesium, and Sulfur are used. Mycorrhizal associations have been observed with Jatropha and are known to aid the plant's growth under conditions where phosphate is limiting It is recommended that 1 kg of farmyard manure/ plus 100 g of Neem waste for every seedling, with a recommendation of 2500 plants per ha this comes up to 2.5 t organic fertilizer per ha. Besides it after transplantation and the establishment of the plant fertilizer such as N, P and K should be applied. Twenty gram urea + 120 g SSP and 16 g MoP should be applied annually

The possibility to return the press-cake (or part of it) to Jatropha fields should be carefully considered.

Crop density

References recommend spacing for hedgerows or soil conservation is 15cm - 25cm x 15cm-25cm in one or two rows respectively and 2m x 1.5m to 3m x 3m for plantations. Thus there will be between 4,000 to 6,700 plants per km for a single hedgerow and double that when two rows are planted.

Satisfactory planting widths are 2 x 2 m, 2.5 x 2.5 m, and 3 x 3 m. This is equivalent to crop densities of 2500, 1600 and 1111 plants/ha, respectively. Distance OF 2MX2M BE KEPT FOR COMMERCIAL CULTIVATION

Wider spacing is reported to give larger yields of fruit.

Genotype

Little genetic research seems to be performed, as Information related to the project seems to be rather restricted.

Pruning

Pruning - 1st prune

The plants need to produce side shoots for maximum sprouting and maximum flowers and seed. Between 90 and 120 Days top of all plants at 25 Cm. Cut the top off cleanly and cut top to produce 8 - 12 side branches.

It is considered good practice. In order to facilitate the harvesting, it is suggested to keep the tree less than 2 meters.

Inter-cropping

Specific intolerance with other crops was not detected. On the contrary the shade can be exploited by shade-loving herbal plants; vegetables such red and green peppers, tomatoes, etc. (SEE INTERCROPPING PAGE)

Picking

We have developed the harvest methodology between wet and dry seed crush costing applicable has been compared.

CROP YIELD

It appears very difficult to estimate unequivocally the yield of a plant that is able to grow in very different conditions.

Yield is a function of water, nutrients, heat and the age of the plant and other. Many different methods of establishment, farming and harvesting are possible. Yield can be enhanced with right balance of cost, yield, labor and finally cost per Mt

Seed production ranges from about 2 tons per hectare per year to over 12.5t/ha/year, after five years of growth. Although not clearly specified, this range in production may be attributable to low and high rainfall areas.

Without irrigation

MT/HA			
DRY			
	LOW	NORMAL	HIGH
Year 1	0.10	0.25	0.40
Year 2	0.50	1.00	1.50
Year 3	0.75	1.25	1.75
Year 4	0.90	1.75	2.25
Year 5	1.10	2.00	2.75

With irrigation

MT/HA			
IRRIGATED			
	LOW	NORMAL	HIGH
Year 1	0.75	1.25	2.50
Year 2	1.00	1.50	3.00
Year 3	4.25	5.00	5.00
Year 4	5.25	6.25	8.00
Year 5	5.25	8.00	12.50

Germplasm management

Seeds are oily and do not store for long. Seeds older than 15 months show viability below 50%. High levels of viability and low levels of germination shortly after harvest indicate innate (primary) dormancy.

Processing and handling

After collection the fruits are transported in open bags to the processing site. Here they are dried until all the fruits have opened. It has been reported that direct sun has a negative effect on seed viability and that seeds should be dried in the shade. When the seeds are dry they are separated from the fruits and cleaned.

Storage and viability

The seeds are orthodox and should be dried to low moisture content (5-7%) and stored in air-tight containers. At room temperature the seeds can retain high

viability for at least one year. However, because of the high oil content the seeds cannot be expected to store for as long as most orthodox species.

Dormancy and pretreatment

Freshly harvested seeds show dormancy and after-ripening is necessary before the seeds can germinate. Dry seed will normally germinate readily without pre-treatment. If this is the case, it is not recommended to remove the seedcoat before sowing. Although it speeds up germination there is a risk of getting abnormal seed-lings.

Uses

Uses of *Jatropha curcas* : A petrocrop

Whole plant	Roots	Leaves	Latex	Seeds	Bark	Twig
*Planted to prevent water erosion and for conservation	* Used as ethnomedicine	* Used as ethnomedicine	*Resembles shellac	*Source of oil (30-40%) suitable as fuel for diesel engine	*Yields tannins (37%)	*Used as medicine
*Promising live fence		*Yield a dye used to give tan & brown	*Used for making ink	*Useful as illuminant, lubricant, in soap and candle making		*Used as Dataun (Herbal tooth brush)
*useful as green manure		*Useful as botanical	*Used as ethnomedicine	*Used as medicine both internally and externally		*Young one cooked and eaten
*useful in controlling sand drift						
*possess Allelopathic properties						

For successful plantation we have developed Jatropha Production Technology for which our TOTAL CULTIVATION PACKAGE can be had

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JATROPHA PLANTING SCIENCE

Some of the important facts of planting Science are summaries as below:

Floral Biology

Jatropha curcas is a monoecious, perennial, deciduous shrub with flowers in racemes in a diachasial cyme pattern.

In the inflorescence a female flower is normally surrounded by a group of male flowers

Male to female flowers ratio .ranged from 18:2:1-30:8:1 in the first year and 9:8:1-16:2:1 in the second year

The provenances giving favorable male-female ratio should be identified for future breeding

The flowers open for a period of 8-10 days in the inflorescence. The female flowers open for 2-4 days only.

There is an increase of number of male as well as female flowers in subsequent years; particularly female flower has a more increase which is a positive trend towards productivity.

Rooting systems

The Jatropha curcas root system formation is directly influenced b propagation method in such a way that any damage or deformation occurred in the root early growth can not be repaired and will last for all the plant cycle reducing the plant growth and yield

The plant originated from seeds sowed directly in soil develop normal root system

The plant originated from seedlings raised in appropriate size of bags or containers also develop same type of root system provided that lifting and transplantation is executed in right manner at right time

The plants originated from cuttings develop only thin roots which is unable to explore deep layers of soil and the plant expected to be less resistant to drought and easily fallen by wind

Propagation method

Method	Advantage	Disadvantage
Direct seeding	Less investment	Less germination Less survival Damaged by animals in initial stage Flowering, fruiting in 3 rd year Success depends upon Depth of sowing Date of sowing Quality of seeds Moisture in the ground Quality of preparation of the ground Nursery raising expenditure is extra
Nursery plants	High percentage of success Good resistance to dryness Early flowering and fruiting	
Plantation of cuttings	Less investment Early fruiting	Develop wider side roots Enter in competition with other crop for moisture and food Lower longevity Low resistance to dryness Low resistance to diseases Risk of insufficiency in event of large scale plantation Success of this technique is related to Age of the plant to which cuttings are taken The position of cutting within the plant The condition of ground in which cutting be planted (drainage and ventilation) The size of cutting and number of buds it contains

It is noted that Jatropha planted by seeds (direct seeding or young seedlings) saw longer than planted by cuttings and this method is recommended for establishment of plantation

Growth in Nursery

The container volume influences the growth of Jatropha curcas seedlings

The growth of *Jatropha curcas* seedlings in small containers would be limited being a fast growing plant. Hence container size of 9"x6" shall be appropriate

Pruning

The pruning intervenes 120 days after the transplantation in the field. It consists in cutting the final bud of the plants to support the formation of side branches and to maintain the tree on an appropriate height facilitates the gathering. This practice represents a technique of control of the culture to optimize the output

Productivity & Soils

In abundant precipitations, fertile soil may lead to early fruiting

With contribution of organic matter sandy soil give best result

The clay soil is not proper as it restrict plant growth

In the flooded ground *Jatropha* dies of asphyxiation

Productivity with Sustainability

The production of *Jatropha curcas* is a function of the ecological condition of the area, nutrients and management practices applied.

In order to optimize environmental qualities of this plant, it was essential to pay attention to the condition of production of oil, i.e. of reducing to all stages, the energy expenditure, the ecological impacts and risks due to use of fertilizers. Application of organic manures gives more output than chemical fertilizers

The capsules of *Jatropha* do not mature at the same time. The ripe fruits are recognized by their yellow color. Each flower contains 3 seeds. The plants of *Jatropha* can still flower after having produced fruits, this second turn of flowering can carry out to another output if the conditions remain favorable

Productivity & Spacing

The spacing requirement will vary over different agro climatic regions and soil types

The per plant seed yield increase significantly with increase in spacing but per unit area it decrease with increased spacing

The optimum spacing should be 2 M X 2 M

Seed Cake as Fertilizer

In high rainfall area application of only chemical fertilizers as a nutrient source have limitations in cultivation of *Jatropha*. This is due to the fact that nitrogenous and potassic fertilizers like urea and MOP are prone to leaching losses in very short span of time during rainy seasons due to high solubility of such fertilizers in water.

Organic manure has the property of reducing such losses and also can give sustained supply of nutrients over a period of time.

The press cake contains some residual oil and consequently contains insecticide properties and can reduce the number of nematodes in the ground.

This is also of great significance given to the fact fruiting of *Jatropha* is staggered over a long period. *Jatropha* cake is one of such organic manure that is rich in plant essential nutrients

Over the period of time there shall be plenty of press cake which can find its way to back into the soil as manure rather than transporting it for some other purpose.

An application of 3 tons organic fertilizer mixed with press cake increase yield handsomely

Soil Improvement

The land degradation is caused by wind and water erosion leading to depletion of soil organic matter and poor soil structure stability. The *Jatropha* plantation improves soil structure within a short period of cultivation

[To know more kindly contact to:](#)

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