Dr Sayed Ahmed Safina 2018/2019

Organic cultivation of sugar cane

Saccharum officinarum L.

Botany

Genetically, sugar cane (*Saccharum officinarum*) originates from New Guinea. The plant belongs to the Gramineae (grasses) family.

Sugar cane is a C4 plant with a high rate of photosynthesis (its rate lies around 150-200% above the average for other plants).

It is a perennial crop with a high self-tolerance. The plant tillers 4-12 stems, depending on the variety and site conditions, which can grow to between 3 and 5 metres in height. The sugar content (saccharose) fluctuates between 11% and 16%.

Site requirements

- **Sugar cane is a very adaptable crop that is grown between latitude 37° North and latitude 31° South.**
- **Good site conditions are necessary for successful organic cultivation. Under natural conditions, the plant seeks its place in an eco-system amongst the canopy, and therefore needs to reach above the additional crops.**

- **Relatively wet conditions on organic cultivation systems tend to cause more difficulties than do sites that are too dry.**
- **This due to a more involved mechanical tilling of weeds, and also to the difficulties the shoots have in developing.**
- **Ideal site conditions are met with average temperatures of 20-28ºC and little fluctuation between night and day.**

- **The ideal amount of rainfall is around 1700 mm, whereby a drought occurring during harvesting is perfect. The soil should be deep, humus-rich, well-aerated and drained.**

Uses and contents

- Sugar cane is chewed in all of the producing countries because of its sweet cell juice.
- Sugar cane juice is obtained by pressing the sugar canes, and is mostly used to sweeten foodstuffs, but can also be consumed as fresh or fermented juice.
- Processing into thickened sugar cane juice.

- White sugar from organic cultivations is only rarely available on the market.
- Many producers also offer molasses (thickened sugar cane juice) and alcohol (a byproduct of sugar processing) in organic quality.
- Organic alcohol is used in the manufacture of cosmetic and pharmaceutical products.

Varieties and countries of origin

- **Sugar cane only rarely produces seeds capable of germination.**
- **Most of the several hundred usable clones are cross-fertilisations between *S. officinarum* (high sugar content), *S. sinensis* (adaptable), *S. spontaneum* and *S. robustum* (disease resistant).**
- **The most common clones are octaploid, and are propagated vegetatively.**

- The production of cane sugar for home consumption on small farms is wide-spread in many regions of Asia and Latin America.
- Large scale cultivation of sugar cane, though, is only possible in combination with commercial or industrial processing.
- The most important producing countries of organic cane sugar are currently Brazil, Paraguay, Philippines, USA, Mauritius and the Dominican Republic.

Varieties

Recommend varieties for organic sugarcane production in Tamil Nadu are Co 8021, Co 86032, Co 86249, CoC 90063, CoG 93076, CoG 94077 and CoSi 95071.

Land preparation

Deep ploughing once or twice with disc plough followed by shallow ploughing three or four times using cultivator.

Spacing

Adopt minimum row spacing of 90 cm. For varieties the spacing can be increased upto150 cm. Furrows must be formed at 20-30 cm deep.

Organic manure

Apply farmyard manure or compost or well-decomposed press mud at 80 t/ha either before last ploughing or in the furrows before planting.

However, the quantity of organic manure could be adjusted in such a way to supply 280kgN/ha.

Through one or more sources like farmyard manure, compost, press mud etc., depending upon their N content.

GreenManures

Organic Fertilizers & Manures

Biofertilizers

Organic Special Inputs

Compost

Vermicompost

Coir Compost

Sugarcane Trash Composting

Composting of poultry wastes

Crop Residue Composting

Planting material

Collect setts from 6-8 months old disease free nursery crop.

Two budded setts are better than three-budded setts.

It is always advisable to collect the seed Material from organically grown sugarcane crop.

Seeds and seedlings

- **In principle, recommended varieties for organic sugar cane cultivation are those that have proven themselves under the prevalent climatic conditions on site.**

- **Seedlings must come from organic nursery fields (own, or from specialized institutes).**
- **Seedlings are taken from unripe sugar cane, whereby the cane is cut into 30 cm pieces.**

In contrast to perennial field cultivation of sugar cane, the nursery fields need to undertake a strict regimen of crop rotation, in order to prevent infestation by soil-borne diseases and pests, such as, e.g., nematodes, sugar cane smut and Red rot .

Sett rate and planting

By adopting 90 cm spacing, 75,000 two-budded setts are required for planting one hectare.


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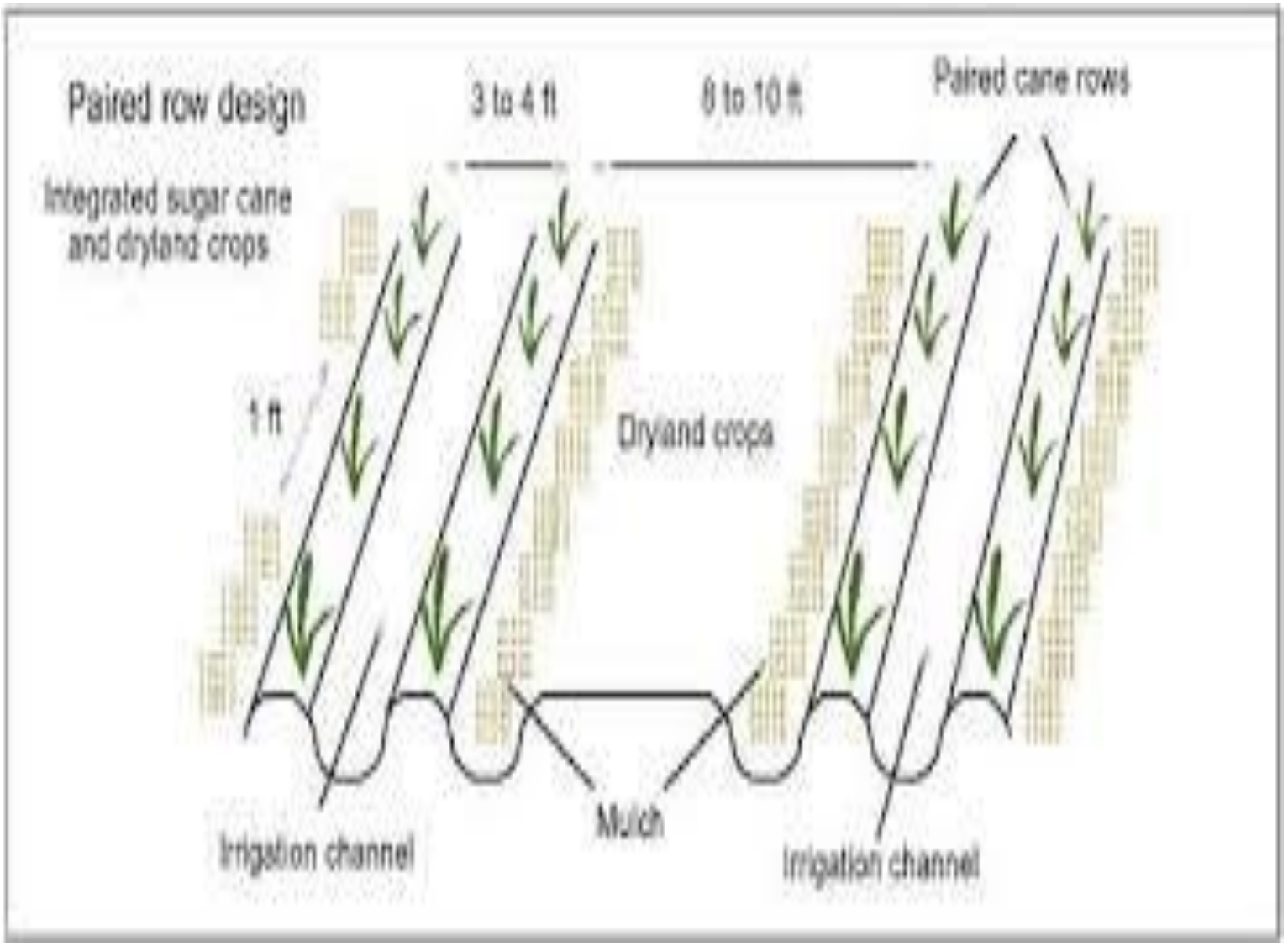
Paired row design
Integrated sugar cane and dryland crops
3 to 4 ft
8 to 10 ft
Paired cane rows
1 ft
Dryland crops
Mulch
Irrigation channel
Irrigation channel

- **On organic sugar cane cultivations, the best results have been achieved with double rows (40-50 cm gap between two single rows and 110-180 cm distance to the next double row).**
- **It is necessary to plant legumes on newly developing organic plantations**

- **The broad middle gap between the rows of new plantations is for the sowing of legumes.**
- **On farms with enough labour available for the manual harvest, these can be beans (*Phaseolus vulgaris* in drier, and *Vigna spp.* in wetter regions), which, in addition to supplying nitrogen, are also an important source of food, and therefore useful to the economics of the plantation.**

- **Care must be taken during the bean harvest to leave the entire foliage of the bean plants in the middle row. Sugar cane will then be planted in precisely this row during the next season.**

Green manure intercrop

Sow green manure crops like daincha or sunhemp on one side of the ridges on 3rd or 4th day after planting sugarcane and raise it as an intercrop with sugarcane.

Harvest and *insitu* incorporate the intercrop around 45 days after transplanting.

Weed management

Hand hoeing and weeding at 30, 60 and 90 days after planting.

Follow only non-chemical weed management technologies like hand weeding and Mechanical weed control methods.

Biofertilizers

Apply 5 kg each of *Azospirillum* and Phosphobacteria respectively on 30 and 60 days after planting of sugarcane.

Mix the biofertilizers thoroughly with 500 kg/ha of farmyard manure to increase the bulkiness and apply. Give light earthing up and irrigate immediately.

What is the method of application of bio fertilizer in Sugarcane?

(A)Types of bio fertilizer for sugarcane: Acetobactor,Azotobactor, Azoospirillum&Phosphate Solublizing Bacteria (PSB)

(B) Rate of application : 12-15 kg / ha

(C) Mode of application :

1. Set Treatment: Suspended & mixed thoroughly 5 kg bio fertilizer for one acre in 100 lit of water Treat cane sett by dipping in this suspension before planting.

2. Soil Treatment: Suspended 5 kg of bio fertilizer per acre in 10 liters of water & mixed with thoroughly with 80-100 kg of FYM. The mixed bio fertilizer in FYM is sprinkled over cane setts in the rows at the of planting .Immediately rows should be covered.

Trashing

Remove the dried and senescent leaves at 5th and 7th month and apply as mulch in alternate furrows.

Irrigation schedule

The above schedule is for medium type of soils. Reduce the intervals for light soils and increase for heavy soils.

When there is rain adjust the interval depending on the account of rainfall.

Ridges and furrows method is cheap and best .

Convey the irrigation water from source to the field head through pipelines to reduce conveyance loss.

Germination (up to 35 days)	**:**	**7**
Tillering (36- 100 days)	**:**	**10**
Grand growth (101-270 days)	**:**	**7**
Maturity (271 days to harvest)	**:**	**15**

Prevention of lodging

At 7th month after trashing, a wet earthing up will help to reduce lodging of canes. Tying the canes with trash-twists (trash twist propping) will also help to reduce lodging.

Biological methods of plant protection

- Diseases and pests

Burning off and mulching

Organic sugar cane cultivation consciously rejects the burning-off method in favor of a "green harvest" for the following reasons:

- **· The sugar cane biomass remaining after harvesting is the basis for long-term sugar cane cultivation.**
- **· Mulch encourages N-fixing, from independent and symbiotic N-fixers.**

- **Mulch suppresses unwanted growth.**
- **In combination with the measures outlined above, this method serves to improve the humus content and die structure of the soil.**
- **High nutrient and energy loss is caused by carbon and nitrogen compound gases escaping.**

Cane harvest

Harvest the canes when they are fully mature. The sucrose content in juice of a mature crop will be more than 16 % and the purity of the juice will be more than 85%.

In general, harvesting at the age of around 12 months is advantageous.

Harvest the canes 2 to 3 cm below the ground level using a hand axe. Topping should be done at the point of break.


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Mechanized harvest of sugarcane

Cane yield

When all the package of practices are carried out appropriately in time, the cane yield will be around 150 t/ha. In well-drained fertile deep soils, the cane yield can go up to 250 t/ha.

Ratoon cane yield

If the ratoon crop is managed well with all the appropriate package of practice, the cane yield from the ratoon crop will be almost equal or marginally lower (around 5%) compared to that of the previous plant/ ratoon crop.

Storage

- **Because whole cane sugar is very hygroscopic (draws water), it should be stored.**
- **Air-tight in a dry place. When the product is incorrectly stored, yeasts may begin a fermentation process. Under ideal storage conditions (dry, dark and no smells),**
- **Whole cane sugar can be stored for 12-18 months.**


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Organic
SUGAR


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MINDFULLY DELICIOUS
Organic
Cane Sugar