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Hydroponic Tomato Farming

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The practice of growing plants hydroponically eliminates the need for soil. It entails growing plants in a medium or solution that is rich in nutrients and delivered directly to the roots. Heavy fruit-bearing plants have their roots supported by inert substances like perlite or clay pellets, among other things. Because pests and illnesses may be prevented and managed more easily in a controlled environment, hydroponic farming can minimize the need for pesticides and herbicides.

Why to grow tomatoes hydroponically?

Hydroponic tomato farming

There are several advantages of hydroponic tomatoes:

- **Water conservation:** hydroponics is indeed the best way to save water. It reduces water use up to 90%. The nutrient solution is reused or recycled rather than being lost in the soil.

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- **Faster growth:** tomatoes can grow up to 50% faster than traditional soil-based farming. This is because of the fact that the plants receive all the nutrients they need directly through their roots.
- **No environmental impact:** since the tomatoes will be grown indoors without soil, there wouldn't be any risk of soil erosion or nutrients run off and hence no environmental stress on the crop.
- **Increased yield:** with the right growing conditions, the yield can increase by 30% as compared to growing tomatoes in the soil.

Determinate Vs indeterminate tomato: which is the popular choice for hydroponic tomatoes?

DETERMINATE VARIETIES	INDETERMINATE VARIETIES
Growth factor: determinate tomato plants are usually bushier and stop growing once they reach a certain height, around 3-4 ft tall.	Indeterminate tomato plants continue to grow and produce fruit throughout a season and can reach a height of about 6-8 ft or even more.
Pruning: determinate plants do not require pruning as compared to indeterminate ones.	Indeterminate tomatoes need to be pruned to control growth and reduce the risk of diseases and pests.
Support structure: determinate tomato varieties generally need less support since they stop growing after a certain height.	Indeterminate varieties, on the other hand requires support structures such as stakes to keep the plant upright because they grow tall.
Fruit production: determinate tomato plants produce a large number of fruits over a short period of time usually in 2 weeks of time.	Indeterminate tomato plants produce fruits continuously throughout the growing season

How to grow hydroponic tomatoes?

- **Nutrient film technology or NFT:** includes applying a fertilizer solution thin layer that flows over the plant roots. In most cases, the roots are air-exposed, and the nutritional solution is recycled.
- **Drip irrigation:** it is a system that delivers nutrient solution to the plants in the form of drips. A timer is set that adjust the frequency of drips and excess solution is collected and recirculated.

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- **Ebb and flow:**most common method for growing tomatoes hydroponically. This involves placing the plants in pots that are filled with a growth medium and periodically adding fertilizer solution to the containers. The solution is then returned to the reservoir via draining.
- **Aeroponics:** a bit expensive method where the roots of the plants are suspended in the air and nutrient rich solution or water is misted or sprayed over them.
- **Dutch bucket system:**In this arrangement, the plants are placed in buckets with a support material like perlite and a growth media. It is a space-saving method that is comparable to the ebb and flow system.

Cultivars well suited for hydroponic tomato farming

- **Hybrid varieties:** With desirable characteristics including disease resistance, high yield, huge fruit size, and uniform shape, numerous hybrid types have been created expressly for hydroponic agriculture. Examples of hybrid plants are trust and bounty.
- **Cherry varieties:** Since they can be sold for a premium price and have a high production potential, they are a popular hydroponics alternative. Sun Gold, Sweet Million, and other cherry tomato varietals are examples.
- **Beefsteak varieties:** known for large size and meat like texture, very well suited for hydroponic production because of high yield potential. Examples of beefsteak tomatoes; beef master, big beef etc.
- **Roma varieties:** they are oblong and have firm texture, well suited for processed products like sauces and chutneys. Popular varieties include; Roma VF, Viva Italia etc.
- **Heirloom varieties:** very suitable for hydroponics because they have unique flavors and textures that attract a premium price. Examples of heirloom varieties; Green zebra, Black krim etc.

Factors that affect the yield and quality of hydroponic tomatoes:

- **Temperature:** tomatoes prefer warm temperature for optimum growth. Excessive heat can although lead to flower drop or reduce fruit set. The ideal temperature for hydroponic tomato production is between 21-23 degree Celsius during the day and 19-21 degree Celsius at night.

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- **pH:** pH level of the nutrient solution used should be maintained within a range between 5.5-6.5. Very low or high pH can have an impact on the nutrient uptake capacity.
- **Light:** a lot of light is required for tomato plants to grow. Adequate intensity of light is very important for vegetative growth and fruit development.
- **Nutrients:** supply of correct balance of nutrients is important for healthy vegetative growth and high yields. The amount of Nitrogen, Phosphorus and Potassium as well as all the micronutrients should be carefully monitored and adjusted as required.
- **Support structures:** tomato plants require support structures such a stake to keep them upright and prevent them from collapsing due to the weight of the fruit.

Cost of growing hydroponic tomatoes

- **Hydroponic system setup:** The price of installing a hydroponic system varies depending on the technology used. For instance, the expense of an aeroponic system or nutrient film technology is more than that of the conventional Dutch bucket approach. Per acre of land used, a hydroponic setup typically costs between ₹ 15 lac and ₹ 50 lac at the outset.
- **Seeds of tomato plants:** this depends on the variety of tomato and the seed supplier. Generally good quality seeds cost between ₹ 10 to ₹ 40 per seed.

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- **Nutrients:** the cost of nutrients varies according to the type of solution, micronutrients and hydroponic system used. On an average the cost of nutrients is about ₹ 30,000 to ₹ 1,50,000 per annum.
- **Electricity cost:** electricity is required to operate all the pumps, growing light and other machineries in a hydroponic setup. The cost of electricity depends on the local rates per unit. Average is between ₹6 to ₹18 per kw-hour.
- **Labour rates:** depends on the number of workers, size of the system, wage rates and so on. For highly skilled labour it's about ₹ 500 to ₹ 1,000 per day.

Is hydroponic tomato farming profitable?

- **Yield:** As shown above, a hydroponic system may offer greater yields than conventional soil-based farming. It is crucial that the yield per unit area is sufficient to cover the hydroponic setup's investment costs.
- **Cost of production:** It should go without saying that in order to make a profit, the entire cost of producing hydroponic tomatoes should be less than their selling price. In general, the cost of production may be decreased by limiting the cost of inputs like fertilizers and maximizing the usage of water and power.
- **Market demands:** sufficient demands for hydroponic tomatoes in the local markets is crucial to cover maintenance and investment costs of the hydroponic system.

In a nutshell, it can be argued that growing tomatoes hydroponically can be lucrative if there is a high level of market demand and the cost of production is below the selling price. However, the success of this kind of business depends on meticulous planning and technological know-how.

Conclusion:

Growing tomato production hydroponically has advantages and disadvantages. On the plus side, hydroponic systems can result in larger yields, use less water, and provide produce of superior quality. However, hydroponic tomato production also necessitates a considerable financial and time commitment in addition to solid technical training. Despite these obstacles, many farmers and business owners consider hydroponic tomato production to be a lucrative venture, especially in regions with little acreage or subpar soil. Therefore, it is more possible that this technique will become widely used in the near future when there won't be enough natural resources for traditional farming.