# Hydroponics Technology for Green Fodder Production under Resource Deficit Condition

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# Hydroponics Technology for Green Fodder Production under Resource Deficit Condition

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**ABSTRACT**

*Livestock sector in India is flourishing and providing livelihood to many. But there is scarcity of green fodder in the country mainly due to shrinkage of land caused by fragmentation and urbanization, shortage of irrigation water, shortage of farm labour, lack of credit facility and climate change driven factors such as agricultural drought. An alternative to soil based fodder cultivation, hydroponics is the technique of fodder cultivation in a period of 7-8 days under nutrient rich aqueous medium. The main component of hydroponic fodder cultivation is seed constituting around 90% cost of cultivation. The hydroponic fodder has high digestibility, nutrition and palatability and therefore increases the milk production of animals. All the parts of hydroponic fodder viz. leaves, stems, roots and grains can be fed to the animals. With this regard, the hydroponically produced fodder is the best alternative under resource deficit conditions in sustainable and cost-effective manner.*

## INTRODUCTION

Livestock is considered as an important component of Indian agriculture by virtue of its crucial role in country's food security, economic wellbeing and livelihood of agrarian population. With the increase in human population, requirement of milk, milk products and meat also increased. Cultivable area is now days, decreasing day by day owing to urbanisation and increasing population load. As of now, only 5% of gross cropped area is under green fodder cultivation in India, however, the green fodder, dry fodder and concentrate requirement is expected to increase up to 855, 526 and 56 million tonnes by 2020 (Dikshit *et al.*, 2010). Moreover, fodder crops in India, generally receives less attention and priority over the other food and cash crops. Consequent to this, balance nutrition to animals becomes strenuous owing to lack of green fodder-based balance feeding. This alarming trend of resource diminution and endangered animal nutrition deserves strategic changes in fodder production system by identifying alternate and resource efficient production system which could enable enough fodder production even under resource deficit and changed climatic conditions also. With this regard, adoption of hydroponic fodder production system could help in quality fodder production under resource deficit condition in cost effective and sustainable manner.

Word hydroponic is the combination of two Greek words; hydro which means water' and ponic which stands for 'working'. Hydroponics is defined as a technique of growing the plants in nutrient rich water without soil for a short duration of time in controlled conditions. Hydroponically grown fodder utilised by chopping and feeding which popularly known as sprouted grains or sprouted fodder or alfa culture and fresh fodder biscuits. Seed is main component and contributes nearly 90% of the overall cost of production in hydroponics technology of fodder production. This technique provides green fodder to animals and increases profit to dairy farmers mainly in the conditions of deficit cultivated land and labour. Fodder grown by this technology is reported to have more nutrition, digestibility and palatability which ultimately enables enhanced milk production, maintaining animal health and reproductive efficiency owing to balance nutrition through balance feeding. The fodder produce from hydroponic technology can be fed to all the animals such as buffaloes, cows, sheep and goat. The main inputs in this farming technology are the water with added nutrients and sunlight. Compared to conventionally grown fodder where only leaves and stem is part of animal diet, in hydroponics fodder consists of root, stem, leaves and grains. The main benefit of this technology is its suitability to be grown round the year irrespective of their growing seasons which provides regular employment and satisfying returns throughout the year. Several fodder crops such as Cowpea, Bajra, Jowar, Maize, Sunhemp, Ragi, Horsegram can be grown hydroponically; however, maize is most preferred fodder crop in India. The yield of hydroponically grown fodder maize is reported as 5-6 times than the conventionally grown fodder maize. It is also profound that, if the regular diet of a cow is supplemented with 5-10 kg of fresh hydroponic fodder in a day, it can increase the milk production (8-13%) owing to enhanced digestibility and conversion efficiency of feed components. Sorghum crop is not preferred in hydroponics as it is dangerous to animals due to HCN toxicity if, it is fed to animals earlier than 45 DAS. The plastic trays with dimensions 18"x 32.5"x 2" produces about 5.5 – 7.5 kg of green fodder by using 1-1.25 kg seed rate (Ramteke et al, 2019). The produced fodder looks like a mat having a height of 20-30 cm consisting plants' stem, roots, seeds having highly digestible nutrients.

**Table 1: Comparison between conventional and hydroponic fodder production**

| Conventionally grown green fodder | Hydroponically grown green fodder |
|---|---|
| Requires large area with good fertility conditions | Very little area required, and fertility of land is not an applicable factor |
| Fodder yield depends upon climatic conditions | Grown under controlled conditions |
| Partial utilization due to wastage during harvesting | Reduction of wastage and complete utilisation of fodder |
| More labour requirement | Skilful but less labour requirement |
| Feeding required chopping of fodder | Chopping is not required |
| Fertilization is required for raising of green biomass | There is no such need |
| More energy requirement | There is saving of power and energy |
| Long growth period generally 60 to 70 days after sowing | Short growth duration generally 6 to 7 days after sowing |

**Prerequisite for Hydroponic Fodder Production**

- There should be healthy seed free from any type of contamination
- Soaking of seed should be done in normal water up to 24 hours
- After draining the extra amount of water, seed should be spread in the trays which held by specially designed structure made from pipes or local available bamboo sticks
- Always use the right amount of seed rate depending upon the particular crop
- Maintain the clean and hygienic environment inside the greenhouse
- Inspect the growing seedling trays under greenhouse regularly to prevent loss caused by insect and any other microbial infection

**Steps for Hydroponic Fodder Production**

1. Soaking of seeds in water: For proper germination of seed, soaking is required with freshwater for 4 – 20 hours depending upon the seed coat hardness. The germination is also influenced by the temperature of the water or solution used for soaking.
2. Sprouting of seeds: The seeds are spread in plastic trays or light weight metallic trays having holes up to one cm depth so that the waste solution having nutrients can be collected and recycled.
3. Traying: The trays used must be free from any dust or impurities and should be washed by cleaning solution properly. Trays are moved and placed them in sprouted section after seed germination.
4. Regular shifting of trays to next level: The seed is kept moist by sprinkling water. The trays must be shifted to the next level daily to move it to next step in the growth cycle. Also rotate the trays according to its growth.
5. Harvesting: The fodder mat is ready for harvest after 7- 8 days of sowing and can be directly fed to cattle. After harvesting the trays should be properly washed with the help of cleaning solution so it can be reused for the next cycle.

**Advantages of Hydroponic Fodder Production System**

- Easy and quick growing
- More nutritious as key source of carbohydrate, vegetable protein, vitamin and minerals
- More palatable and digestible in nature
- Easily grown in urban areas where land is limiting factors
- Fulfil the green fodder requirement round the year
- Less labour requirement
- No adverse effect of climatic conditions
- Environment friendly
- Less wastage of water
- Less attack of insect pest
- Free from pesticides and any other harmful chemicals

**Disadvantages of Hydroponic Fodder Production System**

- Requirement of efficient and skilled labour
- Higher chances to microbial infections in greenhouse conditions
- Hydroponic fodder often has *Aspergillus clavatus* infection which can cause hypersensitivity, dragging of hind legs, clonic convulsions, tremors, decreased milk yield and possibly death and should not be fed to dairy cattle

## CONCLUSION

Limited availability of green fodder is a severe constraint towards profitable and productive livestock sector. Hydroponics fodder technology is boon for dairy farmers especially for landless and urban dairy farmers which face scarcity of cultivated land, poor quality of water and higher labour cost. Hydroponic fodder is more palatable, fast growing, digestible and nutritious which helps to maintain animal productivity by the improvement in animal health and nutrition. It is a cost efficient and sustainable method of fodder production which reported to increase milk production by 8-13%. Hence, this technology needs to be promoted among dairy farmers.

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