
Hydroponics – A New Horizon to Green Fodder Cultivation

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Introduction

Green fodder feeding to livestock ensures optimization of productivity. Though India is the top producer of milk in the world insufficient livestock feed, fodder is one of the constraints affecting growth, health, production and reproduction potential of livestock. Green fodder is essential to feed livestock but the reduced availability of land, lack of water and more labour requirement. It is become difficult to produce required quantity green fodder throughout the year also the lack of quality fodder hampers the growth production and reproduction of livestock. Green fodder plays major role in feed of milch animals, there by providing required nutrients for milk production and health of the dairy animal. Rapid urbanisation and mining areas has caused shrinkage of grazing and fodder producing lands. Due to non-availability of quality green fodder throughout the year, milk producers are forced to utilize extra concentrates for optimum milk production. Non availability of irrigated lands for fodder production, higher labour cost, and small land holdings has left dairy farmer with many challenges for milk production in the Country. It is quite evident that with decreasing cultivable land and depleting natural resources, sustainable technology would be the key driver of the dairy industry in the years to come.

Production of the natural diet for livestock, Green Fodder, to meet the current demand has

become a greatest challenge among livestock farmers. India statistically utilizes only 4.9% of gross cropped land for cultivating green fodders and facing a deficit of 35.6% green fodder, 26% of dry fodder and 41% of concentrate feed ingredients. Realizing the need and gap between demand and supply of the green fodder, Hydroponic fodder production technology has revolutionized the green fodder production in the 21st Century.



The Reasons of Scarcity of green Fodder

- Rapid urbanization has caused decrease of land available for grazing and fodder cultivation.
- Fragmentation of land reduces land holdings.
- The farmer prefers to cultivate commercial and food crops.
- There is a scarcity of water for irrigation, due to water table depletion.
- Most farmers are poor and not able to fence their land which leads to free grazing cattle and wild animals enter the fields and causes menaces in the fodder field.
- Labour shortage is an acute problem in agriculture and animal husbandry allied activities. eg cultivation of green fodder, cutting, chaffing it and feeding the same to the cattle.
- In forest areas/coastal areas adequate land are not available for forage cultivation.
- In diversified climate of India, the climate is not suitable for fodder production.

What is hydroponics?

The word hydroponics has been derived from the Greek word 'water working'. Hydro means water' and ponics means 'working' and it is a technology of growing plants without soil, but in water or nutrient rich solution for a short duration in an environmentally controlled houses or machine.

The concepts of hydroponic fodder are date back to the 1800's or earlier, from the 'Hanging Gardens of Babylon' era, when European dairy farmers fed sprouted grains to their cows during winter to maintain milk production and improve fertility. It is a viable friendly alternative technology for landless farmers for fodder production without soil. It

is also called fresh fodder biscuits, sprouted fodder or sprouted grain or alfa-culture. Fodders including maize, barley, oats, sorghum, rye, alfalfa, horse gram, ragi, bajra, jowar and triticale can be produced by hydroponic technology.

Importance hydroponic fodder production

Conservation of water

Hydroponic system minimizes water wastage since it is applied directly to the roots and is often recycled and used several times. The research findings concluded that hydroponic system equates to only 2-5% of water used in traditional fodder production system. It has been reported that only 1.5 – 2 litre of water is enough for 1 kg hydroponic fodder production compared to 73, 85, and 160 litres of water to produce 1 kg green fodder of barley, alfalfa, and Rhode's grass under conventional field conditions respectively.

Precise use of Space

Hydroponic systems require much less space and makes ideal for urban dwellers with limited yard space. Using hydroponics technology, up to 1000 kg maize fodder can be produced daily from 45-50 m² area which is equivalent to conventional fodder produced in 25 acres of cultivable land. It is also easy to start a hydroponic system indoors where number of racks with multiple tiers thereby resulting in land preservation. Practically, one square meter area can produce ample fodder for two cows per day and the milk yield was increased by 13%.

Reduces growth time

Hydroponic technology takes only 8 days to develop from seed to fodder where it took at least 45 days for a conventional fodder to grow.

Fodder yield

Fodder production is accelerated by as much as 25% by bringing the nutrients directly to the plants without developing large root systems to seek out food. One kg of un-

sprouted seed yields 8-10 kg green forage in 7-8 days. The hydroponics maize fodder yield on fresh basis is 5-6 times higher than that obtained in a traditional farm production and is more nutritious.

Source of essential nutrients

Compared to the un-sprouted seed, the content (DM basis) of Crude Protein (CP), Neutral Detergent Fibre (NDF), Acid Detergent Fibre (ADF) and Calcium increased but organic matter and Non-Fibrous Carbohydrates (NFC) decreased in the hydroponic green forage. Hydroponic fodder is a rich source of vitamin A, vitamin E, vitamin C, thiamin, riboflavin, niacin, biotin, free folic acid, anti-oxidants like β -carotene and minerals. The biomass conversion ratio is as high as 6-7 times that of the conventional green fodder grown for 65-80 days. Besides, hydroponic fodder is a good source of bioactive enzymes, essential fatty acids, chlorophyll and minerals which directly responds fodder growth and improves the performance of livestock.

Persistent flow of green fodder

Fodder can be produced round the year irrespective of the failure of the monsoon, land availability, natural calamities and labour shortage that leads to sustainable agriculture and livestock production.

Reduced carbon footprints

Hydroponic is more environment friendly compared to traditional agriculture in relation to use of inorganic chemicals. This condenses GHGs emissions and lessens considerable global warming. Hydroponic systems help in reducing the fuel consumption for transportation of product from distant agricultural farms and carbon emissions in turn.

Limits of pesticides, insecticides and herbicides

Traditional outdoor farming must rely on

herbicides, fungicides and/or insecticides for optimum production. Hydroponic fodder is grown in a controlled environment without soil and therefore no soil borne disease resulting minimizing use of pesticides, insecticides and herbicides. The susceptibility of any infection can easily be ruled out with specific compound in hydroponically grown fodder.

How to grow hydroponic fodder ?

One of the most important considerations for starting a fodder hydroponically is the kind and availability of the seeds. Choose the seed based on animal dietary needs, availability and weather condition. In summer maize (corn) and barley is best suitable crop but in winter oats and wheat.

The process of growing Hydroponic fodder

- Dry the seeds under direct sunlight one day prior to seed washing. Remove broken seeds and dirt's from the seeds. Store seeds in a dry and safe place.
- Weigh the seeds accordingly for each tray. As our fodder tray, 2 ft x 1.5 ft x 3 inches can take 1 kg of seeds, weigh it and then add to a plastic bucket. The seeds should be submerged in water, all the seeds which are floating would not germinate, remove them. Wash the seeds till the dirt is gone.
- Leave the seeds in the bucket for 12 hours. To prevent any contaminates add 50 gm of salt or dilute bleach or a horticultural-grade hydrogen peroxide solution.
- After soaking in water for 12 hours, drain all the water in the bucket. Next process is germination, you can do it in two ways. One way is clear all the water in the buckets, add the soaked seeds and allow the bucket to open air. The second way is to add these soaked seeds into a gunny bag. Both processes require 12 hours. If the germination doesn't happen, due to weather leave it for 24 hours. If the seeds are sprinkled some water over the seeds.

- After a total of 24 hours (1 day) transfer the seeds to the clean plastic tray as measured(1 kg of seeds). The plastic trays should not have any blockage for the drain holes and also clean from fungal infection. Its good practice to clean the plastic tray once used with any bleaching agent.
- The partially germinated seed is regularly sprinkled with water. For effective & uniform water application, sprinklers & timer assembly is used. The timer is useful for periodically switching on fogger. You can manually sprinkle the water 3 to 4 times a day.
- All seeds should come in contact with water, as the extra water is drained out through holes in the tray.
- Within a period of 7 to 8 days, there is profuse growth of fodder which is ready for feeding to the animals.
- The technique has its utility because of the high ratio of seed to fodder. One kg of seed can yield 6 to 8 kg of green fodder within a limited time span of 7 days. Harvest on the appropriate day: day 4 for poultry, day 6 for pigs and day 8 for cow.
- The cost of production of maize fodder works out to be Rs 2 per kg.
- Do not keep the fodder for more than 9 days, the nutrient contents will be low.

Conclusions

For sustainable dairy farming, quality green fodder should be fed regularly to dairy animals. Hydroponic fodder is a good option in front of the farmer because it grows fast, it

contains a high nutrient value, and the most important thing is animals like to eat. Fodder obtained from hydroponics consists of grass with grains, roots, stem, and leaves as compared to the only stem and leaves the part in conventionally grown fodder.

Traditional fodder production requires a major investment for the purchase of land in addition to the investment of agricultural machinery, equipment, infrastructure for harvesting including handling, transportation and conservation of fodder. It also requires labour, fuel, lubricants, fertilizers, insecticides, pesticides and weedicides. On the other hand, hydroponic fodder production requires only seed and water as production inputs with modest labour inputs. Further, it minimizes post-harvest losses without requirement of fuel. Likewise, this novel technology takes only 7-8 days to converts seeds into fodder compared to fodder production by traditional system.

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