



## Livestock Feeding Through Hydroponic Fodder

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Green fodder is an important constituent in the feed of livestock. Due to many drastic changes in agriculture system, animal rearing and increased population there is shortage of green fodder to the livestock. Indian livestock industry faces a deficit of 35.6% green fodder, 26% of dry fodder and 41% of concentrate feed ingredients. Green fodder through hydroponics fodder is alternative source to overcome the fodder deficiency in livestock sector with many advantages. Hydroponics characterized by short growth period with around 7-10 days and need of a small piece of land for production. Hydroponic fodder have high protein, vitamins, fiber and mineral contents and have healthy beneficial effects on animals. Studies shows the milk production through hydroponic fodder feeding shows improvement in milk production as fed cereal grains, hay or silage. Hydroponic fodder increase milk yield by 10.07% in dairy cows and also increase in body weight gain in animal.

### Introduction

Green fodder plays major role in feed of all livestock, green fodder providing required nutrients for milk production and health of the dairy animals. Green fodder feeding to livestock is important for optimization of productivity. India is the top producer of milk in the world but there are many challenges insufficient livestock feed, fodder is one of the constraints affecting growth, health, production and reproduction potential of livestock. Now a day's scarcity of land has been shown as a great constraint of forage production for ruminant animals. The ruminant animals cannot always be dependent on cereal grains like that of monogastric animals. As the gap between the demand and supply of the green fodder for livestock becoming unconquerable, researchers and farmers are in search for an alternative for green fodder or new fodder production method, that would restore fodder and livestock production. To overcome all these shortage issue of green fodder the new hydroponics technology came into exist. Hydroponics is the technology that has revolutionised the green fodder production in the 21st century. In India only 4.9% of cropped land area is utilized for cultivating fodder. Indian livestock industry faces a deficit of 35.6% green fodder, 26% of dry fodder and 41% of concentrate feed ingredients. Using this technology as livestock feed leads to improvement of livestock performance. This technology gives a grantee for sustainable forage production and with suitable price. It is a technique of growing crops like barley without use of chemicals and artificial growth agents. It is characterized by short growth period with around 7-10 days and need of a small piece of land for production. It has extraordinary protein, vitamins, fiber and mineral contents with their healthy beneficial effects on animals.

### Principles of hydroponic fodder production

Hydroponics is growing of cereal grains with necessary moisture, nutrient and absence of solid growing medium. The sprouted shoot and root mat is harvested and fed to animals.

Germination is a response for the supplied moisture and nutrient and produce 200 to 300mm long forage green shoot with interwoven roots within 7 to 10 days. Different cereal grains can be used for fodder production with varied chemical and structural changes throughout the growing processes. Enzyme activation is found necessary for hydrolysis of nutrients to their simpler forms. Grain variety, quality, treatments like nutrient supply, pH, water quality, soaking time etc are influencing factors for the amount of sprouted and quality fodder.

### **Nutritive value of hydroponic fodders**

Hydroponic fodder show superiorities from common non-leguminous fodders in terms of crude protein, organic matter, ether extract and nitrogen free extracts. Conventional fodders are less nutritious than hydroponic fodders. Nutrient deviation occurs during sprouting which increase in crude protein, ether extract, nitrogen free extract but decrease in crude fiber, total ash and insoluble ash. They are rich with anti-oxidants especially in the form of  $\beta$ -carotene. There is no nutrients wastage as the shoots and roots of the plant consumed together. Dairy animals take 25kg/day with low concentrate and straw level. Improvement in digestibility of feed is evident with supplementation of hydroponic fodder in dairy cows.

**Digestibility:** In rumen the digestibility of the sprouts is higher than cracked grain. However, comparing the digestibility of shoot and root sprouts, shoots easily degrade in the rumen. Therefore, ruminant animals prefer leafy than stemmy.

**Energy:** Hydroponic sprouts and processed grains are both nutritious and digestible feeds. Sprouting of grains changes the starch to sugar. On dry matter bases the energy value of sprouts are less than grains with gross energy loss of 2%.

**Protein:** Animal performance is highly dependent on protein level. In sprouts crude protein, ash and all other minerals except potassium are highly concentrated on a dry matter bases than barley grains. The increase in dry crude protein content is due to loss in dry matter content particularly carbohydrate. Moreover, nutrient absorption also facilitates the metabolism of nitrogenous compounds which lead to increase the crude protein content. Nutrient solutions improve the crude protein level of the hydroponic fodder than using tap water.

**Vitamins:** Hydroponic fodder is especially rich in vitamin C and E. Sprouting improve the vitamin content of the grain. However, the increase in individual vitamins is too small that its practical use in addressing nutritional requirement of cereal-based diets makes little difference on the feed value.

**Minerals:** In hydroponic fodder, root growth helps for mineral up take which in turn changes the ash and protein contents swiftly from day four onwards. The type of irrigated water for the hydroponic fodder changes the mineral content. However, through the process of chelating sprouting make minerals more available.

### **Effect of hydroponic feed on livestock productivity**

Hydroponic fodders are highly succulent, their intake varied between 15 to 25, 0.25 to 2.0 kg/animal/day in large ruminants and small ruminants respectively or 1.0 to 1.5% of body. Hydroponic fodders are highly digestible, palatable and relished by the animals. Feeding vitamin-rich hydroponic green barley fodder did not increase bioavailability of nutrients for fattening calves. goat kids and rabbit kittens fed hydroponic horse gram or sunn hemp fodder replacing 50% of a concentrate mixture. A 90-day feeding trial on 3-month-old weaned Awassi ram lambs showed that feeding hydroponic barley fodder improved feed intake.

**Milk production:** Animal feed with hydroponic fodder show increase in milk production. Hydroponic fodder increase milk yield by 10.07% in dairy cows. Canadian dairy farmers also indicate the increase in feed intake of their cows after feeding of hydroponic fodder and improve their milk yield by 3.6kg per day over the lactation period. Naik et al. (2017) reported that feeding of hydroponic maize fodder by replacing 50% maize grains in the

concentrate mixture did not have any adverse effect on nutrient utilization and performance of low yielding lactating cows. Besides increased milk yield, conception rate, herd health and longevity were also improved (Naik et al., 2015). Furthermore, it must follow that improved animal health stemming from higher quality hydroponic fodder will reduce veterinary cost

**Meat production:** Hydroponic fodder improves the body weight gain of lambs. Moreover, the increase in body weight also reflects microbial activity in rumen and enhanced nutrient digestibility. In beef cattle average increase of 200g is achieved through feeding the hydroponic fodder than maize. Similarly 8% improvement is reported in birds and other animals.

### Conclusion

Green fodder is an important constituent in the feed of livestock. Due to many drastic changes in agriculture system, animal rearing and increased population there is shortage of green fodder to the livestock. Green fodder production through hydroponics technology can be a real beneficial alternative source to overcome the fodder deficiency in livestock sector with many advantages. Hydroponics is a smart alternative technology against scarcity of land and impending climate changes. This technology has a solution to avoid scarcity of green feed special in dry seasons and urban areas having a shortage of land for forage production. Having a characteristic of high intake palatable and digestible properties, this technology is best chosen than cereal grains and other concentrate feeding. Progressive modern farmers can also adapt this technology for their dairy animals to enhance productivity. Therefore, further research and development should be carried out for its further utilizations.

### References

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