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Fodder Hydroponics: A Creative Proceed towards Sustainable Green Fodder Production

Barsha Mansingh, Gangadhar Nanda, Sunil Kumar, Rahul Banik and Pranjeet Kalita

Abstract

The livestock sector has many facets and contributions to the farming industry and farming economy. The cattle industry supports millions of livelihoods and offer them chances for work, asset accumulation, regular income, social and financial security. The nutritional and livelihood security of small and marginal farmers of India largely depends upon livestock farming. By accessing the census carried out for livestock farming in 2019 total bovine population in India is 302.3 million and total livestock population is 535.8 million (NDDDB, 2019). From 1956 to 1997 and 2007, the livestock population showed a consistent upward trend, with increasing of 4.77%, 26.54% and 82.33% respectively and a decline in the trend was seen in 2012 to 76.27% (Sonavale *et al.*, 2020). In our country livestock population is increasing in a rocketing rate but for feeding the livestock the availability of green fodder is limited as because land allocation for green fodder production is minimum (Naik *et al.*, 2015). Also climate change partially affects the dual-purpose fodder production in major localities. Hence those problem can be solved by adopting hydroponics technology in green fodder production. Hydroponics fodder is the process of green fodder production in which fresh yield of fodder increased to 2.8 to 8 folds in a period of 8-14 days and when animals fed by hydroponic fodder about Rs. 25 to 50 additional net profit is obtained. Hydroponics fodder approach is an innovative way for green fodder production.

Introduction

Hydroponic fodder production is a method of growing nutritious animal feed using hydroponics, which is the cultivation of plants without soil, using only water and nutrients. This method involves growing sprouted grains, such as barley and oat, in a controlled environment with a constant supply of water and nutrients. Hydroponics fodder production is becoming increasingly popular among livestock

farmers as it allows them to produce high quality, nutritious feed for their animals year-round, regardless of weather conditions. It is also sustainable and cost-effective alternative to traditional methods of animal feed production. The process of hydroponics fodder production involves soaking the grains in water for a few hours to initiate the germination process. The grains are then transferred to a growing tray, where they are spread

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out evenly and kept in a controlled environment with a constant supply of water and nutrients. The sprouted grains grow rapidly and are ready for harvesting in just 7-10 days. The resulting hydroponics fodder is highly nutritious and contains a high concentration of protein, fiber and essential vitamins and minerals. It is also easier to digest for livestock, leading to improved animal health and productivity. Overall, hydroponics fodder production is an innovative and sustainable method of producing high quality animal feed that can help farmers improve the health and productivity of their livestock while reducing their environmental impact (Santosh Nagappa Nigoji *et al.*, 2020).

A Brief Knowledge about Hydroponic Farming

The definition of hydroponics is the practice of growing plants without the need of soil, the nutrient sources being either nutrient solutions or water that has been enhanced with nutrients. Dr. W.F. Gericke invented the term “Hydroponics” in 1936 to describe the growing of both edible and decorative plants in a water and dissolved nutrients mixture. The straightforward definition comes from the Greek words “Hydro” for water and “Ponics” for working or effort (Naik *et al.*, 2015). In this form of cultivation, a “Nutrient solution”, which is essentially nutrient enriched mineral water, gives plants the nutrients they need for growth.

What is Fodder?

Fodder specifically refers to food provided to the animals (including plants that have been cut and brought to them), as opposed to food that they forage

themselves. Any agricultural product used expressly to feed domesticated livestock, including cattle, rabbits, sheep, horses, chickens and pigs is referred to as fodder.

Process for Fodder Production

The fodder crops which are grown through hydroponically are Maize, Horsegram, Sunnhemp and jowar *etc.* Different processes followed for hydroponic fodder production are Seed washing, Seed soaking, Seed germination, Loading seeds in trays and racking and Shifting of trays.

Here are the steps to follow:

- ✓ Select the high-quality seeds: Choose seeds that are clean, healthy and free from disease. Common sprouting grains include wheat, barley, oats and rye.
- ✓ Rinse the seeds: Rinse the seeds thoroughly with cold water to remove any dirt, debris or other impurities.
- ✓ Soak the seeds: Soak the seeds in a container of clean water for 8-12 hours. This will help to soften the seed coat and initiate the germination process.
- ✓ Drain the water: After soaking, drain the water from container and rinse the seeds again.
- ✓ Spread the seeds: Spread the seeds evenly on a tray or in a growing container. Make sure the seeds are not too crowded to allow for good air circulation.
- ✓ Keep the seeds moist: Keep the seeds moist by spraying them with water 2-3 times a day or as needed.

- ✓ Provide light: Place the seeds in a well light area or under a grow light. This will help to promote healthy growth and prevent mold or other issues.
- ✓ Harvest the fodder: Harvest the fodder when it reaches the desired height, usually after 7-10 days of growth. Cut the sprouts just above the roots and rinse them thoroughly before feeding them to your animals.

By following these steps, one can ensure a successful hydroponics process.

Parameters for Hydroponics Fodder

Seed: fodder production ratio (kg.) of different crops.

| Types of fodder | Seed: Fodder production ratio (kg.) |
|-----------------|---|
| Maize | 1.3:6 (Rachel Jemimah <i>et al.</i> , 2015) |
| Oat | 0.6:3.84 (Mutum Lamnganbi and Surve, 2017) |
| Bajra | 1:3 (Rachel Jemimah <i>et al.</i> , 2015) |

Optimum seed rate reported by different researchers for hydroponics fodder

| Type of fodder | Seed rate |
|----------------|--|
| Maize | 6.4 -7.6 kg m ⁻² (Naik and Singh, 2014) |
| Oat | 4 kg m ⁻² (Mutum Lamnganbi and Surve, 2017) |
| Bajra | 6.7 kg m ⁻² (Dung <i>et al.</i> , 2010) |

Optimum nutrition for the production of hydroponic fodder

| Type of fodder | Nutrition |
|----------------|--|
| Maize | 19-19-19 WSF (water soluble fertilizers) Spray @ 0.5% at 5 DAS (Mutum Lamnganbi and Surve, 2017) |
| Oat | 19-19-19 WSF Spray @ 0.5% at 5 DAS (Mutum Lamnganbi and Surve, 2017) |
| Bajra | 19-19-19 WSF Spray @ 0.5% at 5DAS (Mutum Lamnganbi and Surve, 2017) |

Water use efficiency of hydroponically grown fodder crops

| Type of fodder | Water use efficiency |
|----------------|------------------------|
| Maize | 230 kg m ⁻³ |
| Oat | 130 kg m ⁻³ |
| Bajra | 122 kg m ⁻³ |

Advantages

- ✓ Higher yield: Hydroponics fodder can yield up to 10 times more dry matter per unit of land than

traditional forage crops.

- ✓ Faster growth: Hydroponics fodder can be grown in as little as 7 days, compare to several weeks for traditional forage crops.
- ✓ Consistent quality: The controlled environment of hydroponics ensures consistent nutrient levels and quality of the fodder.
- ✓ Year-round availability: Hydroponics fodder can be grown year-round, regardless of weather conditions or seasonal changes.
- ✓ Reduce water use: Hydroponics uses up to 90% less water than traditional crop farming, making it a more sustainable option.
- ✓ Reduced land usage: Hydroponics can be grown vertically, allowing for higher yields per unit of land.
- ✓ Nutritious feed: Hydroponics fodder is high in nutrients, including protein, vitamins and minerals making it a healthier food option for livestock.

Disadvantages

- ✓ Initial set up cost: Initial cost of setting up a hydroponic system can be higher than traditional forage crop farming.
- ✓ Energy usage: Hydroponics system require electricity to power grow lights and other equipment, which can lead to higher energy usages.
- ✓ Dependence on technology: Hydroponics system relay heavily on technology, and if equipment fails, it can affect the entire crop.
- ✓ Potential for disease: The closed environment of

a hydroponics systems can make it more susceptible to diseases if not properly maintained.

- ✓ Limited crop variety: Hydroponics systems may not be suitable for growing all types of crops, which limits the variety of fodder available.
- ✓ Limited plant size: The size of plants grown in a hydroponics system may be smaller than those grown in soils, which could impact the amount of yield.
- ✓ Dependency on a water supply: Hydroponic systems rely on a consistent water supply, which may not always be available in certain areas.

Conclusion

Hydroponics fodder is a modern, sustainable and efficient method of growing livestock feed that offers several advantages over traditional crop farming. It can yield higher amounts of nutritious feed with less water and land usage, while being available year-round and providing consistent quality. However, it also has some potential disadvantages, such as higher setup costs, dependence on technology and limited crop variety. Therefore, it's important for livestock farmers to carefully consider the benefits and drawbacks of hydroponics fodder before deciding whether to implement it on their farm. Overall, Hydroponics fodder has the potential to revolutionize the livestock feed industry, making it more sustainable and efficient for years to come.

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