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Hydroponics Fodder

Modal Project Report

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Introduction

What is hydroponic farming?

hydroponics meaning is to growing plants without soil, with the sources of nutrients either a nutrients solution or nutrient-enriched water, and that an inert mechanical root support may or may not be used. The word "Hydroponics" was coined by Dr. W.F. Gericke in 1936 to describe the cultivation of both edible and ornamental plants in a solution of water and dissolved nutrients. The simple meaning is derived from the Greek "Hydro"- meaning water, and "Ponos"- meaning labor. In this method of cultivation, plants are provided with the nutrients required for growth by a “nutrient” solution which is basically nutrient enriched mineral water. This nutrient solution can be circulated around the roots by either the passive force of gravity or the active force of an electromechanical pump. Some systems simply bath the roots in nutrient solution and use an air pump to oxygenate the solution from below to prevent stagnation and provide the roots with important oxygen.

Fodder

Fodder, a type of animal feed, is any agricultural foodstuff used specifically to feed domesticated livestock, such as cattle, rabbits, sheep, horses, chickens and pigs. "Fodder" refers particularly to food given to the animals (including plants cut and carried to them), rather than that which they forage for themselves (called forage). Fodder (/ˈfɒdər/) is also called provender (/ˈprɒvəndər/) and includes hay, straw, silage, compressed and pelleted feeds, oils and mixed rations, and sprouted grains and legumes (such as bean sprouts, fresh malt, or spent malt). Most animal feed is from plants, but some manufacturers add ingredients to processed feeds that are of animal origin.

Hydroponics Fodder System

Fodder grown using hydroponics technology. Fodder in the form of sprouted cereal grains such as barley, and legumes can be grown in small and large quantities. Hydroponic systems can grow up to tons of sprouts to each day; year round in a carefully controlled environment.

Sprouted grains can increase the nutritional value of the grain compared with feeding the ungerminated grain to stock.[10] In addition, they use less water than traditional forage, making them ideal for drought conditions. Under hydroponic conditions, sprouted fodder at 150 mm tall with a 50 mm root mat is at its peak for animal feed. Although products, such as barley, are grain, when sprouted they are approved by the American Grassfed Association to be used as livestock feed. Hydroponics fodder is nutritious, palatable and digestible and can be grown in low cost techniques with locally home grown grains.

Against impeding climate change and less availability land hydroponics fodder production is an effective alternative technology for sustainable livestock production.

Advantage

- Consumes 98% less water than conventional method.
- Takes only 8 days duration to develop from seed to fodder while it took 45 days to grow.
- Enhanced nutritive value – as the fodder contains the seed along with the fodder, it has higher crude protein content than conventional green fodder.
- Fodder can be produced round the year irrespective of the failure of monsoon, land availability, natural calamities, labor shortage. Promotes sustainable agriculture and livestock production. As the fodder contains more crude protein that conventional fodder it reduces the feed cost spent on the concentrate feed to half.
- Hydroponic fodder along with seed and root (sprout mat) are highly edible and are rich in protein (10 – 17%).Ideal nutrients enriched fodder for livestock.
- Yellow Maize, Cowpea, Horse gram, Sun hemp, Ragi, Bajra, Foxtail millet and Jowar has been grown successfully and received good response from the livestock as a fodder.
- Fodder is grown completely natural without the use of any pesticides.
- The hydroponics production can easily be measured to cater to the needs of farmers owning just two head of cattle.
- Loss is minimal because the whole portion of plant comprising of roots, leaves, grain and stem is fed to the animals.
- The biomass conversion ratio is as high as 6-7 times that of the CGF grown for 65 to 80 days

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Hydroponic Fodder Crops

Maize

Day of growth – 8, Moisture Contains – 76 %, Production Ratio – 1:6 Full grown root length – 13 cm, Full grown shoot length- 30 cm, Number of leaves – 4

Horse gram

Day of growth – 5, Moisture Contains – 90 %, Production Ratio – 1:8 Full grown root length – 6 cm, Full grown shoot length- 11 cm, Number of leaves – 2

Sun hemp

Day of growth – 5, Moisture Contains – 90 %, Production Ratio – 1:10 Full grown root length – 6 cm, Full grown shoot length- 11 cm, Number of leaves – 2

Jowar

Day of growth – 8, Moisture Contains – 90 %, Production Ratio – 1:5 Full grown root length –20 cm, Full grown shoot length- 20 cm, Number of leaves – 2

Intake and Benefit of Hydroponics Fodder.

Animal	Type of hydroponic green fodder fed	Maximum intake / Animal/ Day
Cattle	Maize	15 Kg
Buffalo	Maize	15 Kg
Goat (Adult -Lactating)	Maize	2 Kg
Goat grower	Maize	1 kg
Goat grower	Horse gram	300 g
Goat grower	Sun hemp	250 g
Goat kid	Maize	0.5 Kg
Sheep (Adult)	Maize	1 Kg
Sheep grower	Maize	0.5 Kg
Pig – (Lactating)	Maize	2 Kg
Pregnant sow & gilt	Maize	1.5 Kg
Rabbit (Lactating)	Maize	150 g
Rabbit grower	Maize	100 g
Rabbit grower	Horse gram	100 g
Rabbit grower	Sun hemp	150 g
Turkey (Adult)	Maize	200 g
Desi chicken (Adult)	Maize	50 g
J. Quail (Grower)	Foxtail millet	50 g

Benefits of Hydroponics Fodder

Faster weight gain.
Good carcass quality.
Lower feed cost per kg of weight gain.
Improved health with low veterinary cost.
Increased fertility – large litters.
High conception rate.
Heavier, longer lactations.
High milk yield.
High fat percentage.
Low feed costs.
Increase in milk revenue.
Increased fertility – fewer replacements.
Improved herd health & longevity.
Reduced culls.

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Process for fodder production

1. Seed washing

Take good quality seeds in a container. Wash the seeds with proper scrubbing by hand. Keep for settling for 5 minutes. Remove the light weight floating seeds. Drain out water and again add water. Stir manually by wooden stick for 5 minutes, keep settling for 5 minutes. Drain water. Repeat the above steps till, dirt and dead seeds are removed completely.

2. Seed soaking

Add seeds from the above steps to the soaking container. .Close the lid and keep for soaking for 12 hours. After soaking for the given hours, drain the water.

3. Seed germination

Cover/ place the soaked seeds with the clean dry fumigated gunny bag. Keep the seeds loaded gunny bags away from direct sunlight. Sprinkle water on gunny bag every 2-3 hours so that the gunny bag remains wet. After given hours, remove the seeds from gunny bag take weight. About 35 to 40% increase in weight happen with about 90+% seed germination.

4. Loading seeds in trays and racking

Ensure that the trays are clean, washed with cleaning solution & are free from any dust / dirt etc. Transfer “after germination seeds” on the trays equally and put them in the sprout section (lower section where the height between two rows is around 5 inches) of machine Trays should be distributed evenly on both sides of the alley.

5. Shifting of trays

Shift trays to next level daily so that it move one step ahead in the growth cycle. Take the last tray out from every row and put it back on the front side of the same row. Ensure that all trays are moved one position every day Ensure that all trays receive sufficient water. If left side of the tray (in any tray) shows more growth then the right side (or vice-versa) then rotates the tray such that left side comes to the right side and right side of the tray goes to the left side. Trays on the 8th day rack are ready for harvest on the next day. Take out of the fodder mat from trays to feed livestock. Wash the trays in clean water and then in cleaning solution before reusing it for the next cycle.

Technical Specification of Automated Environmentally controlled System

Components	Specification
Structural design	The structural design enough to withstand wind speed minimum 140km/hr and having trellis mechanism to withstand minimum crop load of 25kg/msq
Structure	Complete structure made of galvanized steel PPGI Puff panel
Foundation	foundation depth of 75 mm with 3.2mm thick depending upon soil type and prevailing wind velocity, grouting of foundation column with cement concrete mixture of 1:2:4 using telescopic insertion of column
Fasteners	All nuts & bolts of high tensile strength and galvanized
Co-axial fan	Co - axial fan (ISI mark) of minimum 1200 mm diameter containing 6 numbers of GI sheet blades, mounted in a GI frame followed by aluminum louver.
Cellulose pad for cooling	Cellulose pad of thickness 4″ - 6″ thick, height: 5'-6', width as desired equipped with Anodized Aluminum frame with necessary Fittings and fixtures for its operation.
Circular pump with accessories for cooling pad	Circular pump with required capacity & accessories to be provided for wetting & circulating the pad area.
Digital controller with sensory devices	The necessary digital controller with sensory device & accessories of standard quality should be provided to operate the fan & pad system to control temperature & humidity inside the Greenhouse, The fabricator should ascertain the same

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Electric wiring	copper wire to withstand desired load of required electrical gadgets/appliances with IS1 mark
Hydroponic Tray	HDPE virgin plastic 24x18inch
Water System	16 mm lateral, j-Jeck imported fogger cum sprayer, rubber grommet, control valve, 120 mesh screen filter and other standard assemblies. Pipe and plumbing fitting.
Inner rack	GI Angle, Prefabricated,2mm
Fertigation System/Disinfection	Fitted with venture

Product Capacity – 500 kg per day

Unit Cost – INR 7.48 Lakh

Technical Specification of Semi-Automated Low Cost System

Items	Description
Inner rack	GI Angle, Prefabricated,2mm make-SK
Fodder Tray	HDPE virgin plastic 24x18inch for 10 kg/tray production
Water Irrigation	16 mm lateral, j-Jeck imported fogger cum sprayer, rubber grommet, control valve, 120 mesh screen filter and other standard assemblies. Pipe and plumbing fitting.
Fertigation System/Disinfection	Fitted with venture
Electric	0.5 HP Motor, Starter, 16 cycle auto timer
MS structure Net House	Net House with 70:30 Green Net shed fitted in MS Stricture 25x25x1.6 SHS

Product Capacity – 500 kg per day

Unit Cost – INR 2.48 Lakh

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Technical Specification of Semi-Automated Portable Fodder Machine

Items	Description
Inner rack	GI Angle, Prefabricated,2mm make-SK
Fodder Tray	HDPE virgin plastic 24x18inch for 10 kg/tray production
Water Irrigation	16 mm lateral, j-Jeck imported fogger cum sprayer, rubber grommet, control valve, 120 mesh screen filter and other standard assemblies. Pipe and plumbing fitting.
Fertigation System/Disinfection	Fitted with venture
Outer Structure	Aluminum composite panels, supported by MS SHC, Wheeled for portability

Product Capacity – 30 kg per day

Unit Cost – INR 48000.00

Technical Specification of Semi-Automated Portable Fodder Machine Net House

Items	Description
Inner rack	GI Angle, Prefabricated,2mm make-SK
Fodder Tray	HDPE virgin plastic 24x18inch for 10 kg/tray production
Water Irrigation	16 mm lateral, j-Jeck imported fogger cum sprayer, rubber grommet, control valve, 120 mesh screen filter and other standard assemblies. Pipe and plumbing fitting.
Fertigation System/Disinfection	Fitted with venture
Outer Structure	Net House with 70:30 Green Net shed fitted in MS Stricture 25x25x1.6 SHS

Product Capacity – 30 kg per day
Unit Cost – INR 28200.00

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Cost of Production of Hydroponic Fodders

Particulars	Amount (Rs)
Cost of maize seed	Rs. 14.50 Kg
Current consumption	40 units / day
Cost of one unit current consumption	Rs. 4 per unit
Cost of current for production of 1 tray (7 Kg)	0.5 unit or Rs. 2 per tray
Labour cost for production of 1 tray	4.5
Cost of production of one Kg of Hydroponic maize fodder	Rs. 2.10 (maize seed cost) + Rs. 0.20 (Current bill cost) + Rs. 0.70 (Labour cost) = Rs.3.0 per Kg

Silent feature

Up to 1000 kg green fodder can be produced from 480 square feet area daily which is equivalent to conventional fodder (Co4) produced in 25 acres of cultivable land. Use 99% less land than conventional production method.

Fodder can be produced round the year irrespective of the failure of monsoon, land availability, natural calamities, labour shortage. Promotes sustainable agriculture and livestock production.
Production cost is optimal when compared to conventional fodder production. Cost of production is 2.50 INR / kg of hydroponic maize fodder. Hydroponic machine (1000 kg capacity) consumes only 40 units of current per day.

Troubleshooting

Poor germination	-	Check the seed quality.
	-	Buy seeds from farmers rather than seed shops.
	-	Buy seeds with less wastes and unbroken tips.
	-	Do not buy seeds stored for a prolonged duration.
	-	Check the moisture content of the seed (seed should have less than 12% moisture).
	-	Check the water quality.
	-	Do not over load the trays with high quantity of seeds.
	-	Avoid fluctuation of electric current.
Fungal attack	-	Check the fungal (Afflatoxin) level in the seeds. 1 ton of grain comes with 100 billion mould spores
	-	Check the sprouted seeds for fungal growth. Do not sprout the seeds in an air tight closed chambers. Sprouts and mould grow in a warm and wet environment.
	-	Check the machine fungal growth.
	-	Check for leakage of rain water into the machine.
	-	Check the recycling water in the tank.
	-	Clean the water tank periodically.
	-	Clean the machine twice a month.
	-	Clean the sprinklers.
	-	Check for water logging inside the machine.
	-	Check the water draining holes for any block.
	-	Check for clogging of sprinklers.

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