



E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2019; 8(1): 1033-1035
Received: 22-11-2018
Accepted: 24-12-2018

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An experience of hydroponics fodder production by farmers of Bagalkot district

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Abstract

Hydroponics is gaining importance because of shrinking land size and increasing population. Hydroponics involves production of fodder without soil in a confined environment and is harvested at a very short period of time. Krishi Vigyan Kendra, Bagalkot has started its journey in the production of hydroponics in the year 2015-16. There after many farmers adopted this technology as an alternate to fresh fodder cultivation. In this paper, we have tried to explain the pros and cons of the hydroponics technology. Though there is a vigor in adoption of this technology, few farmers who have been practicing this technology since at least last two years were purposively selected as sample using purposive sampling method. Thus there were only 15 farmers selected purposively. Data was collected using self-structured interview schedule on their visit to KVK and analysed using simple frequencies and percentage. Majority of the farmers adopted a 72 trays model which produced on an average 4.5 fresh fodder from 500 g maize grains per tray. The daily fresh fodder production was 45 kg per day/ unit. The qualitative data was obtained from the observation of the hydroponic unit maintained at KVK Bagalkot. The results implied that, maize is the best source for producing fodder under hydroponics, the system of hydroponics can be prepared using low cost material, no soil media is used and no nutrients are added to the water used for hydroponics production. But, in rural areas, where the timer facility is not used, it was difficult to get the uniform growth of fodder. There was an incidence of not getting proper germination where the grains were infested.

Keywords: Hydroponics, fodder, maize

Introduction

Feeding green fodder ensures the productivity in animals. Though India is the top producer of milk in the world the per capita production of animal is low because of insufficient livestock feed, fodder which affects the production and reproduction. The milk production of India ranged from 55.6 million tonnes during 1991-92 to 155.5 million tonnes during 2015-16 also the per capita consumption increased from 178 g/day to 337 g/day (NDDB, 2016) [4]. But getting fresh green fodder for dairy animals every day is a question in the areas where there is no assured rainfall and no irrigation facility. Especially the small and marginal farmers and agricultural labors depend on small dairy unit to meet their everyday expenditure. These small units serve them as emergency fund. For them the hydroponics may be a very good technique. Hydroponics is a method of growing plants in water based solution without soil to produce quick and nutrients rich fodder from Maize, Ragi, Bajra, barley, oats, Cowpea and Horse gram, etc. (Bakshi *et al.*, 2017) [3]. It has been reported that about 1.5-2 liters of water is needed to produce 1 kg of green fodder hydroponically in comparison with 73, 85, and 160 liters to produce 1 kg of green fodder of barley, alfalfa, and Rhodes grass under field conditions, respectively. Under hydroponic systems this equates to only 2-5% of water used in traditional fodder production (Al-Karaki and Al-Momani, 2011; Naik, 2014) [2, 6, 7]. This is especially important in areas suffering from chronic water shortages or where the infrastructure for irrigation does not exist. In high cost hydroponics fresh water is used for irrigation of the hydroponic fodder by using manual or automatic micro-sprinklers or a knapsack sprayer at frequent intervals. In low cost hydroponic systems the internal environment of the greenhouse is more influenced by the outside climatic conditions (Bakshi *et al.*, 2017) [3]. Therefore, the types of fodder to be grown hydroponically depend upon the season and climatic condition of the locality/region. The seeds sprout within 24 h and grow up to 20-30 cm in 7-8 days, when they are ready for harvest and feeding. In Hi-tech greenhouses, about 8-15 units of electricity is required to produce 600 kg of hydroponic maize fodder daily, which can be reduced significantly in low cost shade net structures (Naik *et al.*, 2013) [5]. Though it has great advantage in producing green fodder, the farmers are still facing problems in maintaining the unit. Decades of research and farmer experience indicate that the costs associated with hydroponic fodder production are 2 to 5 times higher than those of the original

grain (Tranel, 2013) [9]. Hence this study was undertaken to analyze the advantages and disadvantages of this technology among the farmers of Bagalkot district.

Material and Methods

The hydroponics unit in KVK has started during the year 2015-16 and is serving as model unit for many farmers who visit KVK. Many farmers have adopted this technique of production of green fodder after visiting KVK. A unit of 72 trays was widely adopted in the district, and there are suppliers within and outside the district. The sampling method adopted was purposive sampling as there were few numbers of farmers who have adopted this technology covering entire district. Thus there were only 15 farmers selected purposively. Data was collected using self-structured interview schedule on their visit to KVK and analyzed using simple frequencies and percentage. The steps adopted in production of fodder were elicited through open ended questions. The data on hydroponics fodder cultivation was elicited from the observations made at KVK demo unit.

Results and Discussion

The socio-demographic profile of the farmers revealed that, all the farmers who had adopted this technology were youth farmers who were involved in agriculture, and practicing Integrated Farming system. The model adopted here was a 72 trays capacity model and was attached with a timer which sprinkles water every hour for 20-30 seconds. In this paper only the fodder produced through maize, and was fed to dairy animals was taken into consideration for economic analysis.

Table 1: Qualitative parameters observed in adoption of hydroponic technology

Model used	72 trays
Type of seed	Maize
Capacity of the tray	0.5 kg / tray
Fresh fodder harvest	4-4.50 kg/tray

Type of seeds used for production of hydroponics was only maize which was produced in their own farm. Only two farmers had purchased the seeds from market. A 72 trays

model was adopted by all the respondents. Every day 4-4.5 kg of maize seeds were required to produce green fodder and total quantity of the harvest was 36 to 40 kg from nine trays. The respondents were asked for the constraints faced in maintaining the hydroponics unit. Majority of the respondents expressed that improper germination of the grains is a problem followed by development of off odor and eye flies due to insufficient water supply, irregular power supply / no power supply, non-availability of the materials for construction of hydroponics, salt water leading to blockage of micro sprinklers, high cost of inputs, rodents problems and yellowing of fodder were the major problems faced by them. However, this technology of production of hydroponics is being introduced by the Govt. of Karnataka for the members of Milk producers associations on experimental basis in Bagalkot and Vijayapur districts (Vijaykarnataka, 2017) [10]. There are about 125 units distributed to dairy farmers in Bagalkot district, which is a highest number in the entire state.

Table 2: Constraints faced by the farmers in maintaining Hydroponics unit

Particulars	No. of persons
Seeds not germinating properly leading to development of fungal growth	11
Development of off odour due to insufficient water supply	8
Irregularities in power supply	6
Salt water leading to blockage of micro sprinklers	6
Non-availability of raw materials in local area	8
High cost of inputs	12
Development of eye flies on rotten and non-germinated seeds	10
Rodents problems	2
Yellowing of fodder	9
Costs associated with hydroponic fodder production are 2 to 3 times more than that of conventional method.	5

When the respondents were asked to explain about the usefulness of the unit (Table 3), it was revealed that, time saving, non-dependency on arable land, use of minimum quantity of water, no hassles of soil testing, less labor involvement were the factors leading to acceptability of this technology. It was extremely beneficial for commercial farmers. Its practice could yield excellent results in short span of time with proper knowledge and techniques.

Table 3: Advantages of fodder cultivation by Hydroponics method

S. No.	Particulars	No. of persons
1	Conservation of water and land	12
2	Reduced labour requirement	10
3	Reduction in growth time of green fodder	15
4	Green fodder availability round the year	9
5	Increasing nutritive value of fodder	10
6	Enhancement of milk production	8
7	Natural feed for animals	11
8	Increase in health status of animals a) Decrease occurrence of diseases b) Increase in reproductive efficiency	7

Table 4: Economics of fodder production through hydroponics method

S. No.	Particulars	Hydroponics fodder production (72 Trays Unit)	Farmer practice of fodder production (one Acre)
1	Seed cost	Rs 12 /kg of Maize seeds 72 Tray X 0.5 kg on each tray=36 kg 36 X 12=Rs 430	25 kg seeds/Acre 25 X 12= Rs 300
2	Period	8-9 Days	70-75 Days
3.	Cost of water	72 Tray X 5kg each tray=360kg green fodder 2-3 lit of water required to produce 1kg of green fodder	Amount of water required by a maize crop in its whole production period is 500 to 800mm (20 to 40lit of water required per kg of Maize fodder). (Agropedia, 2010)
4	Electricity	0.5 Hp Motor (uses 9 kwh/24hr, 1kwh= Rs 3.25, 30 sec /1hr) Rs 0.4 (20min/day)*72 Days = Rs 30 (0.4*9days=Rs.3.6)	3 Hp Motor approx (60 kwh/24Hrs, 6Hr/Week, 1kwh= Rs 4.5) 120 kwh*4.5Rs= Rs 540 for 72 d
5.	Space	10 X 10=100 Sq.ft	1 Acre (43560 ft ²)
6	Yield (Green fodder)	360 kg in 8 days and 360 X 9=3240 kg in 72 days	18-20 ton /acre in 70-75 Days
	Total	Each kg of green fodder production requires Rs. 2.84	Cost of 1kg green fodder production is Rs.0.5

Table 5: Nutritional value of hydroponically grown fodder Vs Conventionally grown fodder on dry matter basis

Nutrients	Conventional green Fodder (maize)	Hydroponics green fodder (maize)
Protein	10.67	13.57
Ether Extract	2.27	3.49
Crude Fiber	25.92	14.07
Nitrogen Free Extract	51.78	66.72
Total Ash	9.36	3.84
Acid Insoluble Ash	1.40	0.33

(Naik *et al.*, 2014, and Gebremedhin. 2015) ^[9, 11].

Selected case studies on Hydroponics fodder production

- National awardee, organic farmer Dhareppa Kittur opines that due to hydroponics technology he could save time, space and money on production of green fodder. Using the piece of land that was used for fodder cultivation in traditional method, other crops of commercial importance are being grown. Green fodder produced through Hydroponics is completely by natural source, no pesticides are used in green fodder production, and it is very much suitable technology for organic farmers.
- Another farmer Sri. Yellappa Loganvi expressed that hydroponics is a wonderful technology, our worries in production of conventional fodder by spending money, labor, and dependency on rain, irrigation has been reduced.
- In KVK Bagalkot instructional farm, there was 10 % hike in milk production. Due to feeding of hydroponics fodder there was enhancement of fertility rate has also increased.

Conclusion

The process of growing green fodder hydroponically allowed the control of climatic conditions for optimum growth with guaranteed output per day. Hydroponic production of fodder was less competitive than traditional fodder production when compared on per kg dry matter basis. High initial investment on fully automated commercial hydroponic systems and high labor and energy costs in maintaining the desired environment in the system added substantially to the net cost of hydroponic fodder production. But, in rural areas, where the electricity facility problem was more and timer facility is not used, it was difficult to get the uniform growth of fodder. There was an incidence of not getting proper germination where the grains were infested. It was the demand of the dairy owners in the district of Bagalkot, where there was small land holdings, scarcity of water, saline water, higher labor and land cost. It has proved that Green fodder production through Hydroponics technology could be a real alternative source to overcome the fodder deficiency in the district.

It was interesting to note that, there were many startups started investing in hydroponics business, and Karnataka Milk Federation has subsidized the hydroponics units so as to enable the farmers to go for adoption of this technology.

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