

Ubiquitous Urban Farming Robot

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Abstract: In the recent past agriculture as a profession is losing its charm among the farmers. This has been attributed to several reasons; important among them are spiraling cost of inputs coupled with uncertainty in the price of the product. This has been aggravated by non-availability of assured irrigation due to depletion in ground water. This has in turn manifested as distress among the farmers in substantial areas in Andhra Pradesh, Maharashtra, Karnataka and Kerala, which are otherwise considered as agriculturally developed areas. A couple of committees have gone into the root cause of distress and suggested that alternate income generating opportunities can be a major remedy for such disappointment among the farming community. Animal husbandry is one such alternative available to such distressed farmers. Azolla, hitherto used mainly as a green manure in paddy has tremendous potential to meet the growing demand for fodder among the small farmers taking up animal husbandry. As green manure, Azolla is grown alone for two to three weeks in flooded fields. To cultivate this water fern plant in urban area, our project will provide an automated farming robot which can be easily maintained in smaller space at cities and apartments. In future, Azolla will become an important food that is replacement for fast and junk foods. Our project will keenly explain the production and cultivation of this manure at urban area with the implementation of automated robot.

Index Terms-- Azolla, Automated robot, Urban agriculture

I. INTRODUCTION

1.1 Azolla

Azolla is an aquatic floating fern, found in temperate climate suitable for paddy cultivation. The fern appears as a green mat over water. The Blue Green Algae cyanobacteria (*Anabaena azollae*) present as a symbiont with this fern in the lower cavities actually fixes atmospheric nitrogen. The rate of nitrogen fixed is around 25 kg/ha. As green manure, Azolla is grown alone for two to three weeks in flooded fields. Afterwards, water is drained out and Azolla fern is incorporated in the field before transplanting of paddy. Otherwise, 4-5 q of fresh Azolla is applied in standing water one week after planting of paddy. Dry Azolla flakes can be used as poultry feed and green Azolla is also a good feed for fish. It can be used as a bio-fertilizer, a mosquito repellent, in the preparation of salads and above all as a bio-scavenger as it takes away all heavy metals.

1.2 Features of Azolla

- i. It easily grows in wild and can grow under controlled condition also.
- ii. It can easily be produced in large quantity required as green manure in both the seasons – Kharif and Rabi.
- iii. It can fix atmospheric CO₂ and nitrogen to form carbohydrates and ammonia respectively and after decomposition it adds available nitrogen for crop uptake and organic carbon content to the soil.
- iv. The oxygen released due to oxygenic photosynthesis, helps the respiration of root system of the crops as well as other soil microorganisms.
- v. It solubilizes Zn, Fe and Mn and makes them available to the rice.
- vi. Azolla releases plant growth regulators and vitamins which enhance the growth of the rice plant.
- vii. Azolla can be a substitute for chemical nitrogenous fertilizers to a certain extent (20 kg/ha) and it increases the crop yield and quality.
- viii. It increases the utilization efficiency of chemical fertilizers.

1.3 Nutrition value in Azolla

Azolla is very rich in protein (25-35%), Calcium (67 mg/100g) and Iron (7.3 mg/100g). For traditional methods of rearing, the feed requirements are met out from agriculture residues and very rarely the farmers can afford to provide green fodder and oil cakes. In rare cases, green fodder is provided to the animals in the form of grass collected from the field or in few cases fodder is grown in the backyard. Even then the supply of green fodder is restricted to 5 to 6 months when water is available. Azolla, if grown for fodder is essentially required to be grown in hygienic environment and there should be regular supply throughout the year.

The comparative analysis of the nutrient content of Azolla versus other fodder source is depicted in the following table.

S. No	Item (Feed used)	Annual production of biomass (MT/ha)	Dry matter content (MT/ha)	Protein content (%)
1	Hybrid Napier	250	50	4
2	Kolakattao grass	40	8	0.8
3	Lucerne	80	16	3.2
4	Cowpea	35	7	1.4
5	Subabool	80	16	3.2
6	Sorghum	40	3.2	0.6
7	Azolla	1,000	80	24

Table [1]: Comparison of biomass and protein content of Azolla with other fodder

II. URBAN FARMING

While there is a growing awareness about the role of urban agriculture in the context of food security and poverty alleviation for the urban populations, urban and peri-urban agriculture (UPA) still largely remains an informal sector that is not being integrated in agricultural policies or urban planning. This makes it vulnerable and also jeopardizes its sustainability. Urban and peri-urban agriculture contributes to local economic development, poverty alleviation, in recognition of the human right to food, the social inclusion of the urban poor and women in particular, as well as to the greening of the city and the productive reuse of urban wastes.

Urban and peri-urban agriculture contributes to food security, nutrition and livelihoods in a combination of ways:

- 2.1 Providing for family self-consumption, thus contributing to healthy diet and allowing for saving on food expenditures
- 2.2 Providing a source of income, through sale of surplus or specialized and intensified commercial oriented production systems
- 2.3 Improving the supply of local markets with fresh and micronutrient rich foods at competitive prices
- 2.4 Ensuring a continuum of tree cover through landscape management and use of agroforestry systems, hedgerows and woodlots

III. URBAN FARMING ROBOT

The main purpose of this urban farming robot or automatic agricultural robot is to initiate farming among urban areas and cities where the space needed to cultivate Azolla is not available. It can easily fit in a narrow space or at window shade. This farming method can describe under vertical farming method of agriculture. Azolla can be used as fodder and also used for pest control.

It can be easily portable and washable. It automatically collects the Azolla after 6-7 days of growth with help of lifting arm in the robot. The podder is poured in the tray and made to float on the water with level of half to the size of the tray. The liquid feed or nutrition is given through the solenoid in an even period of time interval to provide feed to Azolla.

The block diagram explains about the mechanical working of the robot.

It contains of,

- i. Solenoid valve
- ii. Motor
- iii. Collection tray
- iv. Lifter
- v. Water feeding pump

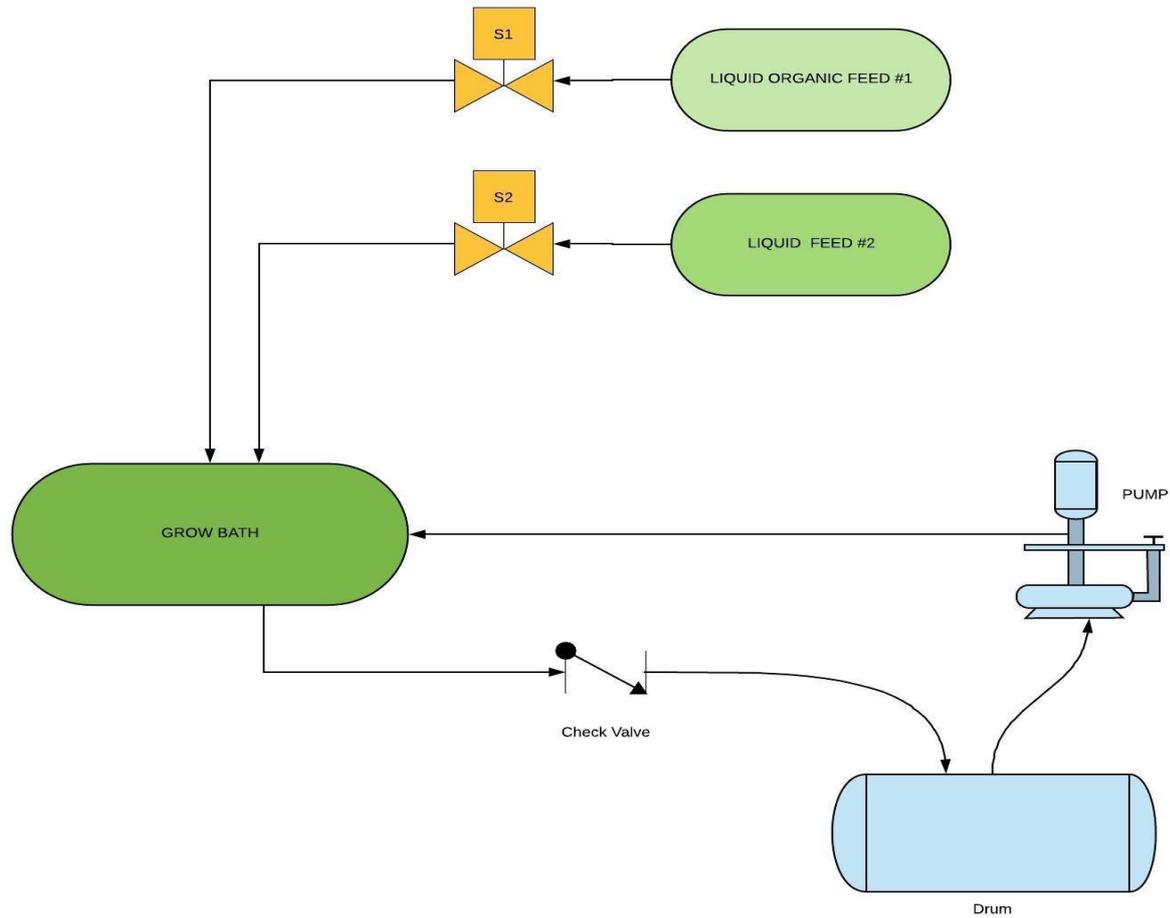


Fig 1.1 : Pictorial representation of robot

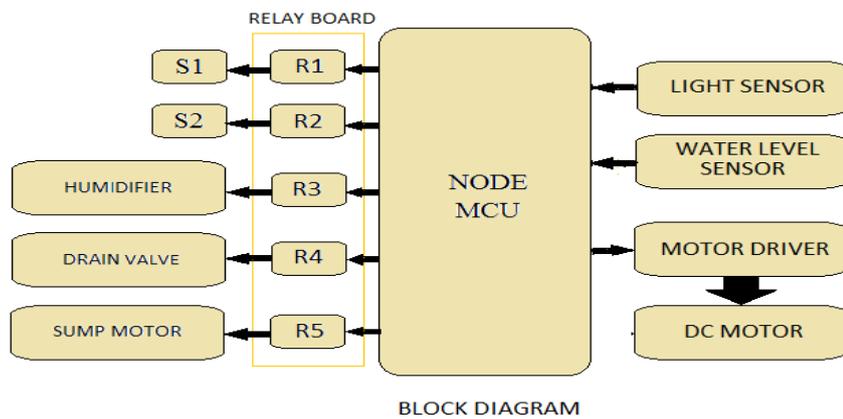


Fig 1.2: Block diagram of the parts

The above diagram shows the internal architecture of the robot which can be easily portable and fit anywhere. The main components used in this robot are

- i. NODE MCU
- ii. Light Sensor
- iii. Water level
- iv. Motor Driver
- v. DC Motor
- vi. Humidifier
- vii. Drain Valve
- viii. Sump Motor
- ix. Relay Board

IV. CONCLUSION

This project will be more useful for farmers also as its product cost is low and can be easily accessible. Azolla as fodder has been experimented in many places; important being Vivekananda Ashram in Kanyakumari, Coimbatore District Co-operative Milk Producers' Union Ltd., livestock programme implemented by BAIF in Guntur etc. In Andhra Pradesh, Azolla fodder cultivation is being taken up in Gangavaram, V. Kota and Punganur mandals in Chittoor through Mandal Mahila Samakhyas with the cooperation of Animal Husbandry and Rural Development Departments of Government of Andhra Pradesh. Individual dairy farmer can take up this activity to supplement feed requirements of the cattle. Alternatively, an entrepreneur can take up azolla cultivation as an income-generating activity in a larger scale to supply feed to dairy farmers in a cluster.

V. REFERENCES

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