

AZOL  
UNIT  
2024

# VIVEKANANDA GLOBAL UNIVERSITY, JAIPUR

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## Experimental Learning Unit Report

### Azolla

**B.Sc.(Hons.) Agriculture Session 2024-25**

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# Azolla Unit VGU, Jaipur

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## Introduction

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. Again, availability of quality fodder to the animals is the major impediment in scientific management of animals because India, having only 2.4% of the world's geographical area sustains 11% of the world's livestock population. It accounts for 55% of the world's buffalo population, 20% of the goat population and 16% of the cattle population. This has put unbearable burden on our natural vegetation.

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.

## About 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.

## Advantages of Azolla

1. It easily grows in wild and can grow under controlled condition also.
2. It can easily be produced in large quantity required as green manure in both the seasons – Kharif and Rabi.
3. It can fix atmospheric CO<sub>2</sub> 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.
4. The oxygen released due to oxygenic photosynthesis, helps the respiration of root system of the crops as well as other soil microorganisms.
5. It solubilises Zn, Fe and Mn and make them available to the rice.
6. Azolla suppresses tender weeds such as Chara and Nitella in a paddy field.
7. Azolla releases plant growth regulators and vitamins which enhance the growth of the rice plant.
8. Azolla can be a substitute for chemical nitrogenous fertilizers to a certain extent (20 kg/ha) and it increases the crop yield and quality.

9. It increases the utilisation efficiency of chemical fertilizers.

10. It reduces evaporation rate from the irrigated rice field.

#### Nutrition value in Azolla

Azolla is very rich in protein (25-35%), Calcium (67 mg/100g) and Iron (7.3 mg/100g). The comparative analysis of the nutrient content of azolla vis-à-vis other fodder source is depicted in the following table.

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

S. No.	Item	Annual production of biomass (MT/ha)	Dry matter content (MT/ha)	Protein content(%)
1	Hybrid Napier	250	50	4
2	Kolakattaa 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	<b>Azolla</b>	<b>1,000-2000</b>	<b>80</b>	<b>24</b>

In addition to their farming activity, small and marginal farmers are generally capable of rearing 2 to 3 units of cow/ buffaloes. 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 fodder plot, if set up by these small farmers can cater to the fodder requirements of remaining part of the year. Azolla can be supplemented with regular feed of the animal @ 2-2.5 kg of azolla per animal.

Azolla, if grown for fodder is essentially required to be grown in hygienic environment and there should be regular supply through out the year. The fodder plots should preferably be near the homestead, where the female member of the family can attend to nurturing and maintenance.

#### Requirements for Azolla Growth

- i. **Water:** 10-15 cm fresh current water is necessary in multiplication pond. Maintenance of adequate water level (at least 4 inches in the pond) is essential.
- ii. **Temperature:** Day/night temperatures ranging between 32°C and 20°C have found to be most favorable. The optimum temperature for luxurious growth of Azolla is 25-30°C.
- iii. **Light:** It prefers to grow well under partial shade.
- iv. **Relative Humidity:** The optimum relative humidity requirement is 85 to 90 per cent.
- v. **Soil pH:** Azolla grows well in slightly acidic soil having 5.2 to 5.8 pH.
- vi. **Nutrition:** Being an N fixing fern Azolla does not require nitrogenous fertilizer for its growth. Phosphorous @20 kg/ha is desirable for good bio-mass production.

#### Steps of Azolla Culture

### 1. Selection of pond location:

- ❖ It is better to select an area near to the house to ensure regular upkeep and monitoring of the pond.
- ❖ A suitable water source should be nearby for regular water supply.
- ❖ The site under partial shade is ideal or else, shade has to be created to reduce the evaporation of water and also, for better growth of Azolla.
- ❖ The floor area of the pond should be free of pointed stones, roots and thorns that can puncture the sheet and cause leakage of water.

### 2. Pond size and construction:

- ❖ Size of pond depends on factors like number of cultured species, quantity of supplemental feed required and availability of resources.
- ❖ 4 units in an area of 10 feet X 4 feet for Azolla cultivation can produce about one kg of supplemental feed per day.
- ❖ Selected area should be cleaned and levelled. The side walls of the pond can be of either bricks or raised embankment with the excavated soil.
- ❖ After spreading the durable plastic sheet (silpauline, a polythene tarpaulin) in the pond, all the sides have to be secured properly by placing bricks over the side walls.
- ❖ After the inoculation of culture, the pond needs to be covered with a net to provide partial shade and also, to prevent the fall of leaves and other debris into the pond.
- ❖ Thin wooden poles or bamboo sticks are to be placed over the pond walls to support the shade net.
- ❖ Bricks or stones can be used as weights on the edges for securing the plastic sheet and also, the net over the pond area.



Pic. 1 Pond size of Azolla

### 3. Production of Azolla:

- ❖ Sieved fertile soil mixed with cow dung and water need to be spread uniformly in the pond.
- ❖ About 1 kg of fresh Azolla culture is needed for a pond of 6 X 4 feet size which need to be applied uniformly in the pond.
- ❖ Biogas slurry can also be used instead of dung.
- ❖ The depth of water should be four to six inches.
- ❖ During the monsoon season, if rain water can be harvested from the roof tops and used for cultivation of Azolla, it will ensure its excellent and faster growth.
- ❖ If the total salt content of the water used for growing Azolla is high, it will adversely affect the growth.



Pic. 2 Spreading of Azolla is uniformly in Pond

### 4. Maintenance of the pond:

- ❖ Application of about one kg of cow dung and about 100 grams of super phosphate once in two weeks will ensure better growth of Azolla.
- ❖ Any litter or aquatic weeds seen in the pond should be removed regularly.
- ❖ The pond needs to be emptied once in six months and cultivation has to be restarted with fresh Azolla



Pic. 3 & 4 Maintenance of Azolla

## 5. Harvesting and Feeding:

- ❖ Depending on the initial quantity of culture added, environmental conditions and nutrition, Azolla growth in the pond will be complete in about two to three weeks time.
- ❖ It can be harvested daily after the full growth. Plastic sieves can be used to harvest the biomass from the pond's surface.
- ❖ About 800 to 900 grams of fresh Azolla (mean yield per day in a season) can be produced from an area of 10 X 4 feet.
- ❖ Azolla can be fed to the livestock either in fresh or dried form. It can be given directly or mixed with concentrates.
- ❖ Azolla has to be washed thoroughly with fresh water to remove the smell of dung.



Pic. 5 & 6 Azolla is ready for harvesting

6. **Yield of Azolla:** Azolla produces around 8-10 tonnes of Green mass which is equal to 25-30 kg N<sub>2</sub> which is again equal to 55-66 kg of urea).
7. **Economics of Azolla:** The expenditure on preparing a 10 × 4 feet pond is minimal at Rs.500 (sheet plus labour cost). A farmer can realize a net profit of over Rs. 3000-4000 per annum from the additional fish production and reduced usage of concentrates' feeding for cultured fish species.

### Precaution to be adopted

1. Maintenance of pure culture free from contamination is essential for good yield.
2. Azolla should be harvested regularly to avoid overcrowding.
3. Temperature is an important factor for good growth. It should be around 35 degrees Celsius. The fodder plot is to be covered with a plastic sheet in cold regions so as to reduce the impact of cold weather. Places with direct and adequate sunlight should be preferred. A shady place yields less.
4. pH of the medium should be between 5.5 to 7.
5. Suitable nutrients such as cow dung slurry, micronutrients should be supplemented as and when required.

### Additional Information about Azolla :

$$\begin{aligned} \text{Cost of units preparation ( Fixed cost)} &= (\text{Rs. } 4000 @ 4 = 16000) 10 \times 4 \\ &\text{square feet} = 40 \text{ s.f or } 3.05 \text{m} \times \\ &1.22 \text{m} = 3.70 \text{ m}^2 \\ &3.7 \times 4 \text{ m}^2 = 14.8 \text{ m}^2 \end{aligned}$$

Total Production = 494 kg from 4 units  
Consumption = 494 kg (in Poultry unit)

### Cost of cultivation of Azolla

Items	Rate	Rs.
Cost of Single Super Phosphate	2 kg@ 4= 8 kg@25	200.
Cost of Azolla seed	4 kg @400	1600
Neem Product pesticide		250
Labour	300	1200
Bucket plastic	4@Rs. 100	400
Strainer	4 per unit 45.00	180
Maintenance cost		1450
<b>Total cost of cultivation</b>		<b>5280</b>

Cost of cultivation = Rs. 5280

Gross return = 494 kg@ Rs.28 = Rs.13832

Net Return = Gross return-cost of cultivation= Rs. 13832 -Rs. 5280=

B: C ratio=8552/5280=1.6