

Improvement of milk

yield and quality with supplemental feeding of Azolla

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Azolla is an aquatic fern that is a rich source of crude protein, essential amino acids, vitamins as well as minerals. In villages, where livestock farmers feed their milch animals mostly with dry fodder and concentrates, inclusion of Azolla a nutritive feed supplement helps to improve yield and quality of milk.

Key words: Azolla, PVC pond, Slurry

IT IS EASY to cultivate Azolla in ready to use PVC ponds of 12 × 4 feet size and harvest about 1.1 kg of fresh Azolla every day. Field testing of Azolla as supplemental feed to lactating cows done by ICAR-NIANP, Bengaluru in 4 villages under Farmer First Program of ICAR, showed 0.6 liters of increase

in daily milk yield per cow in addition to better fat content in the milk. The monthly income from milk sale improved by over ₹ 500 per cow.

Baseline survey done by ICAR-NIANP, Bengaluru in the selected villages of Doddaballapur taluk of Karnataka under the Farmer First Program indicated that dairying is

one of the major income generating activities. Ragi (finger millet) straw and concentrates are the major feeding materials for the cows due to limited opportunities for production of adequate green fodder. Scarcity of cultivated land and irrigation coupled with low and erratic rainfall are the major constraints for forage



Azolla pond with the shade provided by dry fronds of coconut



Ready to harvest Azolla in PVC pond at S. Nagenahalli village, Karnataka

production in these villages. There is a wide spread problem of under-feeding of milch animals. In villages like Timmojanahalli, even during the monsoon, less than 10% of the farmers are able to take up forage cultivation due to scanty rainfall and absence of supplemental irrigation. Due to sub-optimum feeding, milk yield and quality (fat content) are affected. *Azolla* is a free floating water fern. Among different species of genus *Azolla*, *A. pinnata* is popular. High crude protein content (about 23%) and presence of essential amino acids like lysine, vitamins like A and B₁₂ and minerals like calcium, phosphorous, potassium and magnesium (Table 1) in *Azolla* are responsible for its utility as feed supplement for the livestock.

Promotion of Azolla cultivation in the villages

ICAR-NIANP developed an easy technology for production and utilization of *Azolla*. It was tested in several locations and found to be effective. Meetings were conducted at project villages and the farmers were shown a video made by NIANP in local language (Kannada) on *Azolla* production. The potential benefits of using *Azolla* on milk yield and quality were explained. Ready to use *Azolla* ponds of 12 feet long and 4 feet wide size made of durable poly vinyl chloride (PVC) were distributed to the dairy farmers in Timmojanahalli, Lakshmidevipura and S.Nagenahalli villages in Bangalore Rural district and also, in Ragihalli village, Anekal taluk of Bangalore Urban district. *Azolla* ponds were established in locations with partial shade. In places lacking sufficient shade, dry fronds of coconut were placed on the top of the ponds with corner poles as support.

The ponds were covered on the top with white mosquito net to prevent the fall of debris like dried leaves, fruits and other litter into the pond. Old gunny bags were placed at the bottom of ponds to prevent any damage from sharp stones, roots, weeds etc., and thereby, to increase the longevity of the ponds.

Ponds were filled with water to a depth of 6 inches, and the farmers

Table 1. Composition of *Azolla*

Constituent	Content (%)
Dry matter	4.89 ± 0.13
Crude protein*	23.2 ± 0.35
Crude fibre*	14.5 ± 0.24
Calcium*	1.41 ± 0.16
Phosphorus*	0.36 ± 0.11
Lysine	4.7% of protein

(*on dry matter basis)

were advised to fill water periodically to ensure maintenance of at least 4 inches of water level to prevent drying of *Azolla*. Slurry made with 1 kg fresh dung was mixed with about half a kg sieved soil and 100 grams of super phosphate in a bucket and later, poured into *Azolla* pond. One kg of *Azolla* culture were provided to each farmer as the starter dose.

Utilization of Azolla as supplemental feed for milch animals

After the addition of culture, it took 10-15 days for full growth of *Azolla* in the pond. The average weight of fresh *Azolla* harvestable per square foot of pond area was 25 grams (1.2 kg for a pond of 12 × 4 feet size). Harvested *Azolla* was cleaned with fresh water twice in a bucket, to remove the smell of dung. The water used for cleaning was reused to top up the water level in the pond. Washed *Azolla* was mixed with concentrates and fed to the cattle for a week to make them accustomed to the smell of new feed ingredient. Later, the cattle were relishing *Azolla*, even when it was fed without mixing. Periodical monitoring was done and the farmers were trained well about the production technology. The farmers bought single super phosphate for regular application (once in 2-3 weeks) in the pond to ensure proper multiplication of *Azolla*.

The *Azolla* samples were collected from different villages and their nutrient content was analyzed. The mean values of *Azolla*'s composition is given in Table 1. The farmers could harvest 1050 to 1200 grams of fresh *Azolla* each day and used it as supplemental feed to their lactating cows.

Milk yield of animals from 15 farmers in the villages was continuously recorded for 7 weeks. For comparison, daily milk yield was

Table 2. Impact of *Azolla* feeding on milk production and economic returns (mean of 15 farmers)

Period	Milk Yield (liters/day)	Returns per day from milk sale (₹)
Initial (before intervention)	10.8	302.4
After 3 weeks of feeding	11.3	316.4
After 6 weeks of feeding	11.4	319.2

computed by averaging the weekly milk output after 3 and 6 weeks of *Azolla* feeding (Table 2). The economics were worked out by using the prevailing milk price of ₹ 28 per liter during the study period.

In addition to the milk yield improvement, the fat content in milk improved from 3.3-3.5 due to *Azolla*'s usage as supplemental feed. The average additional monthly income with *Azolla* feeding was over ₹ 500 per cow in the project villages of Karnataka. As the price of a new 12 × 4 feet size pond is about ₹ 2,500, a farmer can recover this cost within 5 months. These ponds can be used for over 5 years with proper maintenance.

SUMMARY

Field evaluation was done with *Azolla* as supplemental feed on the milk production and economics under Farmer First Program of ICAR. About 1100 grams of fresh *Azolla* was fed to the cows daily and milk yield was continuously recorded for 7 weeks. The dry matter content of *Azolla* varied between 4.7 and 5.0% and the crude protein from 22.9 to 23.5%. *Azolla* supplementation for 7 weeks improved the mean daily milk production from each cow by 0.6 liters, and milk fat from 3.3 to 3.5. The supplementation of *Azolla* improved monthly income from milk sale by over ₹ 500 per cow. This low cost technology can easily be adopted by small dairy farmers to improve their profits.

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