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AZOLLA CULTIVATION- AN APPROACH TO SUSTAINABLE INTEGRATED FARMING SYSTEM

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Azolla (*A.pinnata*) is a free floating aquatic fern and it's containing almost all the essential nutrients. And also act as bio-fertilizer and green manure (nitrogen fixation-25kg/ha) in the rice field. Nowadays, Azolla is an excellent alternative feed supplement for livestock, poultry and fish. Generally, Azolla cultivation is doing it for polythene sheets or portable HDPE Azolla beds or cement tanks. But, the tank is only using for Azolla production. So, Azolla beds are alternatively using for fish culture is sustainable way of Azolla- fish production in a single system. Then, the harvested azolla as supplemented to Japanese quail as natural food and it is reducing feed cost.

In that respect, small scale or landless peoples effectively using our terrace or backyard place for rearing **Japanese quail** (*Coturnix japonica*) and **Indian spiny loach** (*Lepidocephalichthys thermalis*) integrated with Azolla cultivation is the best results in sustainable farming practices and also making profitable and healthy livelihoods.

Aquaculture plays an important role in global food security and employment provision. In that respect, aquaculture is integrated with animal husbandry is a highly eco-friendly and economically balanced farming system for farmers. Azolla is a good source of protein and it contain almost all the essential amino acids, minerals such as iron, calcium, magnesium, potassium, phosphorus, manganese, etc. apart from appreciable quantities of vitamin-A precursor beta carotene and vitamin-B 12. Indian spiny loach or common spiny loach (*Lepidocephalichthys thermalis*) is a freshwater fish species found in India and Sri Lanka. In tamilnadu, Indian spiny loach is locally called as "**Ayirai meen**". Loaches are an important group of freshwater fishes, which demand a high market price, particularly in the state of Tamilnadu. Because it is tastiest and easier to consume all age group of peoples and also it is rich in minerals such as calcium. Usually they found in quite flowing water with a sandy substrate. However, their culture production remains to be insignificant and invisible.

And Japanese quail is one of the best meat and egg producing sectors in the poultry industry. Because it's rich source of protein and less amount of cholesterol and also produces shorter duration. So, these two livestock's are integrated with azolla cultivation as a sustainable way of producing good quality foods and generating small additional incomes.

Cultivable Species

Azolla (*Azolla pinnata*) were procured from KVK-Krishi Vigyan Kendra or recognised research stations or other farmers. Initial Stocking rate of azolla is 2kg/ azolla beds. Production capacity of azolla in 12*10*1feet size azolla bed is 1.5 to 2kg/day.

The cultivatable fish of **Indian spiny loach** (*L.thermalis*) were collected from the natural resource of the Western Ghats river system (Thamirabarani) in India. The average weight of fish is 1.25-1.58g. Stocking rate is 1000 fingerlings/azolla beds. The fish were acclimatized for 30minutes in Azolla bed and then released slowly.

The **Japanese Quail** (*Coturnix japonica*) were procured from KVK-Krishi Vigyan Kendra or recognised research stations or certified hatcheries. The average weight of Japanese quail is 6-7g (day old chicks). Stacking rate of Japanese quail is depends upon the azolla production per day. Generally, rearing 200 quails are adequate for two azolla beds.

Food and Feeding Habits

Indian spiny loach is Feeds mainly on detritus, but also feeds on algae, artemia, daphnia and sinking pellets. But, in this system doesn't require for any special feed supplementation for Indian spiny loach. Because, naturally available for live-feeds in azolla beds is sufficient for their growth.

The Japanese quail are seed eaters, but will also take insects and similar small prey. In this system, we are using azolla as a major feed supplement and also feed on less quantity of commercial feeds. The commercial feeds mainly using first week for chicks rearing. The total rearing period is 30-35days for meat purpose. In this period, per individual quail is takes 450-500g of feed and reaches 180-190g of male and 190-210g of female quail.

Farming System Set up

There are two numbers of portable HDPE Azolla beds (size-12*10*1) are installed and covered with 50% green shad nets. Then follow the azolla cultivation protocol (TNAU Standards).

The cage system of Japanese quail is 4*3*0.6feet (four racks on arranged vertically) and elevated above 2feet in the ground level. To provide the drinker and feeder set- up was outside of the cage system for preventing the wastage and contamination of foods. The stocking rate is 50quails/rack. Generally, adults require 150-180cm² per quail in laying cage. For egg production, we should maintain the sex ratio of 4:1(40F:10M/racks).



Azolla cultivation with Indian spiny loach farming



Cage system of Japanese quail rearing

Nutritional Composition

Indian spiny loach (*Lepidocephalichthys thermalis*)

Proximate composition	Amounts (%)	Proximate composition	Amounts (mg)
Moisture	80%	Vitamin C	1.0mg/100g
Crude protein	16%	Vitamin E	2.1mg/100 g
Crude fat	2%	Vitamin B9	10mg/ 100 g
Carbohydrate	0%	Vitamin B12	2.2mg/100 g
Ash	12.18%	Vitamin A	20mg/100 g
Energy value(kcal/100g)	81calories/100g	Calcium	924 mg/100 g
		Zinc	0.14 mg/100 g
		Iron	1.86 mg/100 g

Japanese quail (*Coturnix japonica*)

Proximate composition (Meat)	Amounts (%)	Proximate composition (Egg)	Amounts (%)
Moisture	73.93%	Water	74%
Crude protein	20.5%	Protein	13%
Crude fat	3.8%	Lipid	11%
Carbohydrate	1%	Carbohydrate	1%
Minerals	1.12%	Total ash	1%
		Calorific value	649KJ/100g liquid

Conclusions

The most effective way to reduce water scarcity in aquaculture is to intensify and diversify farming practices. In that respect, most preferable integrated farming system of aqua-animal husbandry is a great support for many landless and agricultural enthusiasts, as it will be possible to set up this type of integrated farm with minimum investment and in a very narrow space utilized to produce good quality meat and eggs. In this system is effectively utilizing fish and Japanese quail wastes as nutrient for azolla cultivation and azolla as a natural supplement on Japanese quail.

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