

# INTERNSHIP REPORT

TERI (The Energy and Resources Institute)

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MSc. Part II

# **INTRODUCTION**

TERI (The Energy and Resources Institute) is an autonomous, multidisciplinary organization with knowledge of research, policy, management, and administration. For over four decades, TERI has primarily focused on areas such as change in the energy, environment, climate change, and sustainability spheres.

The organization has the notion that now the key to innovative, sustainable, and accessible progress resides in waste management and resource efficiency. The work done by TERI in many domains is concentrated on:

- Promoting efficient use of resources
- Increasing access and uptake of sustainable inputs and practices
- Reducing negative impact on environment and climate

The TERI organization is headquartered in New Delhi and has campuses and regional centers in Gurugram, Bengaluru, Guwahati, Mumbai, Panaji, and Nainital.

The TERI office in Goa was established in 1996 with the objective of conducting policy research at the intersection of environment and development. It has developed expertise in the area of coastal and marine research, biodiversity mapping and water resource management. It promotes sustainability by encouraging grassroots solutions, policy research, education, and awareness generation.

# **OBJECTIVES**

1. Formulation of fish feed using whole algae and de-oiled algae.
2. Conduction of a feeding experiment and comparison of growth of fishes with formulated fish feed and growell fish feed.
3. To set up a small scale aquaponics setup.

# WORK DONE

200 Fingerlings of *Labeo rohita* (Rohu) were brought in a plastic bag. The bag was rinsed with water. The bag was kept open in a half filled bucket to submerge for fingerlings to come out on their own to get acclimatized with the environment. The fish were then weighed. According to the different weight ranges, the fish were segregated into 12 different experimental tanks. There were 3 tanks prepared for each experimental diet plan with 6 fingerlings. The tanks were labelled according to the different diet plans. Each diet was fed to 18 fingerlings (3 tanks) for 14 days.

## 1. PREPARATION OF AQUAFEED

3 different experimental diets were prepared using various ingredients.

Ingredients (%)	Control	Diet 1a	Diet 1b	Diet 2
De-oiled algae		0.40	0.40	-
Whole algae		-	-	0.40
Fish meal		0.1	0.1	0.1
Wheat bran		0.15	-	0.15
Groundnut oil cake		0.31	0.31	0.31
Vitamins and Minerals		0.02	0.02	0.02
Binder		0.02	0.02	0.02

# About Aquafeed

Fish have different nutritional requirements depending on their feeding habits, digestive system, size, and reproductive status. Environment factors, such as temperature and the type and availability of natural foods, have an impact on feed requirements as well.

Fish need the same nutrients that the majority of other animals do. Water, proteins (amino acids), lipids (fats, oils, fatty acids), carbs (sugars, starch), vitamins, and minerals.

Fish are classified as carnivorous (consume mainly animal material), herbivorous (consume primarily plants and algae), or omnivore (consume both plant and animal materials) depending on their major diet. Irrespectively of how they are classified as feeders, fish can be trained to eat a variety of prepared diets that are nutrient-rich in captivity.

A diet can be designed as a complete formulation when no other foods are available, or it can be used to complement natural foods that are already present in the production system. An ideal diet should have the right size, texture, and be nutritionally balanced, palatable, and moisture resistant. The feed must be supplemented with natural or synthetic colours if natural items are not included in the diets.

## Fish feed preparation set-up

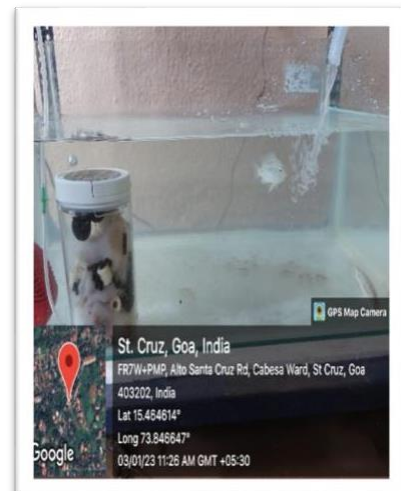
The equipment's that were used for the preparation of the fish feed were small farm scale mixer cum grinder, pelletizer and solar dryer. All the ingredients that were required for the preparation of feed were first mixed and powdered using the grinder. The finely powdered mixer of feed ingredients were then pelletized using a pelletizer fitted with desired size of the die to obtain different diameter of fish feed for juvenile to adult fish feed. The fish feed pelletized is then dried in the solar dryer. Feed was formulated to meet the requirements of fish fry/fingerlings incorporating de-oiled algae as a potential feed ingredient. Feed processing includes (grinding, premixing, mashing, pelletizing, drying and packing), storage, handling and feeding systems. Feed ingredients such as fishmeal and de-oiled algae were already in powdered form. The ingredients were sun-dried for sterilization/disinfection. Ingredients such as groundnut cake and coconut bran were dried and powdered using a food processor. Mill flour residues were dried and sieved to remove larger particulates. The ingredients were premixed in appropriate quantities by hand before adding warm/hot water for at least 5 minutes in order to ensure even distribution of ingredients within the mixture. Each mixture was made into a dough using 500ml of water per kilogram to form a mash and dough-like mixture. Depending on the need either crumble/powder/pellet it was further processed. For Crumble feed the dough was spread on a sterile surface (plastic tray with foil) to increase its surface area and was allowed to dry in the sun. The dried pieces were allowed to further dry in a shaded area and then powdered or crumble using a food processor. For pelletizing the feed, a lab scale feed pelletizer used to obtain different sizes of pellets. The prepared feed was weighed as per the diet requirements of the fish was being tested (6% of total body weight of fish) with the remaining was stored.

- The proximate analysis of all three experimental diets was done.
- The fishes were fed for 14 days and then the fishes were weighed.

# About Aquaponics

The setting up of an aquaponics unit was done during the last week of the internship. A rough sketch of the set up was drawn on paper which was later approved by the guide incharge. Following this, material required were purchased. These include, 4 PVC pipes of 1-meter length and 3 inch diameter, hydroponics pots/vases, hi pressure pump, silicon pipe, sealants, biofilter, clay balls etc.

To make the set-up, 4-5 holes of 3 inch diameter were drilled equidistant from each other with the help of a hole saw drill. The pipes were then installed on a metal stand and fastened with zip ties in a zig zag fashion keeping in mind the desired angle of tilt for ensuring proper flow of water. The tank containing the fish was placed right below the level of the 4 pipe. In this set up, gravity is used to create aeration and to direct flow of water through the large pipes. A high pressure aquarium pump was placed in the tank and using a silicon pipe, the water was made to climb up and supply the top most pipe mounted on the racks. From the end of the 4 pipe, the water was made to fall via action of gravity back into the fish tank from a gradient in order to induce bubbling. The system was checked for leaks and if any, they were sealed using M seal or silicone sealant. The pots were then placed into the holes drilled into the pipes. Expandable clay balls were introduced into the pots which provided a medium for plants to grow. Finally the fish were introduced into the tank and plants were planted into the system, the plants planted were ferns, hydrilla and crotons.



# **CONCLUSION**

In the feeding experiment conducted it was found that fishes fed with Growel feed showed a higher growth rate (weight and length) as compared to fishes with the experimental diet consisting of de-oiled and whole algae. A small scale aquaponics setup was built using easily available materials.

# **LEARNING OUTCOME**

In this 1 month internship programme,

1. We learnt to formulate fish feed.
- 2.
3. We attained Skill on maintenance of tank, fingerlings and on measurement of weight and length.
- 4.
5. We also gained an experience on setting up of small scale aquaponics system.