INTERNSHIP REPORT

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I would also like to show my gratitude towards Asst. Professor Gandita, for offering me this new opportunity.

Lastly, I would like to acknowledge all my friends that supported me through this internship and where always available to help and assist me.

ABSTRACT

Culturing aquatic organism has been consistently growing for the last few years, as the artificial conditions created are becoming very similar to the natural environment. This acquires a result that are more reliable and consistent

By performing an internship, knowledge and competences were acquired regarding the culturing of aquatic organism in recirculating aquaculture system, learning different techniques like aquaponic, aquarium maintenance and ornamental fish bredding. The knowledge gathered and the task performed during the internship as well as additional tasks are documented in this report

OBJECTIVES

- ✓ To understand the various aspect and knowledge of fisheries farm management
- ✓ To understand the potential of fisheries in Goa
- ✓ To understand the socio-economic development of fisheries and to set up entrepreneurship in fish farm
- ✓ To understand the potentially and scope of ornamental fisheries in Goa

CONTENT

➢ INTRODUCTION

Fish farming involves raising fish commercially in tanks or enclosures, usually for food. The major freshwater farming environments in India are pond, cage, pen, rice field, sewage feed and air breathing. Polyculture is the dominant culture system practiced. The major species are carp, freshwater prawn and catfish. Basically, India's aquaculture is carp-oriented and the contribution of other species is marginal. Fish culture in India can be classified as extensive, semi-intensive or intensive and stocking rate is high at 18,408 fish/ha. Both the central and state governments have come up with schemes to help the cause of the farmers.

MSC zoology program is intended to develop learning zoology and significance of fauna ranging from single cell to multicellular system it also focuses on various application based on skilled based courses such as fishery sciences, fish farm management food processing. Every student must go for the internship programme for 1 month under selected institution/industry with on goa for the internship programme at state fishery farm private fish farm, fish processing unit. Fish farm involves commercial breeding of fish, usually for food, in fish tank or artificial enclosures such as fish ponds private fish farm is of a person having no official or public role or position.

Mr. Edgar is an entrepreneur who has an idea and works to create a product or service that people will buy. Having his own private fish farm, on most of the risk and initiative for his business is often known as a visionary or innovator

With the knowledge and interest from having his own fish tank to having his own fish farm, from breeding guppies to breeding the pearl spots, from selling the fishes for ornamental purpose to commercial purpose. Mr. Edgar has entered the world of entrepreneurship dealing with the risk, investment loss and profit

It is said “knowledge is not power, the sharing of knowledge is power” and in this one month of internship sir Edgar has shared his knowledge with us, to build a community and learning culture of our tradition (horticulture, aquaculture, poultry) with modern output and ideas.

➢ TYPES OF FISHES

the type of fishes we encountered during the internship can be divided into ornamental fishes and edible fishes. Ornamental fishes includes the platies, betta fish, sword tail and molly. Edible fishes include the seabass, pearlspot, catfish and tilapia.

ORNAMENTAL FISHES

1) *PLATIES*

Platies are a popular livebearer in the freshwater. Platies grow to around 2-3 inches (5-7 cm) in size, but dwarf platies (which have been selectively bred for their shorter body length) usually stay around 1 inch (2.5 cm). These friendly livebearers can be kept with any similar-sized community fish. New colours and patterns are constantly being produced.

2) *BETTA FISH*

they live in the shallow water of marshes, ponds, or slow-moving streams. Male bettas are devoted fathers who build bubble nests for their young with their mouths and fiercely protect their babies from predators. Bettas are carnivorous animals who, in nature, eat mostly insects and insect larvae. With ample space and hiding areas, female bettas may be able to live in a peaceful group. While males will fight with other males

3) *SWORDTAIL*

Swordtail fish are a lovely and popular freshwater species in the aquarium community. The most defining feature of the swordtail fish is the male's caudal fin. The lower lobe is elongated, creating a sword-like protrusion that can be just as long as the rest of the body. Some of the most widespread morphs are red, orange, and black. The most important things that swordtail fish

need are space and some plants for hiding. Swordtail fish are natural omnivores that eat just about anything in the wild

4) *MOLLY*

Molly fish are a staple of freshwater fishkeeping, and have been popular among aquarists for quite a while! These fish are known for their low-maintenance care requirements and wide selection of possible species to choose from. Mollies are one of the most popular freshwater species in the aquarium trade. Often sold for a few bucks each, they're the perfect species for beginners. Peaceful by nature, the molly is great for freshwater community tanks. They're easy to care for and can adapt well to most standard tank setups.

5) *GUPPY*

Also called the million fish because of their ability to produce so quickly in large quantities. Guppies have different colours, guppies are omnivorous, can feed on mosquito larvae. Guppies can survive long period without food

EDIBLE FISHES

1) *TILAPIA*

Tilapia are a good fish for warm water aquaculture. They are easily spawned, use a wide variety of natural foods as well as artificial feeds, tolerate poor water quality, and grow rapidly at warm temperatures. These attributes, along with relatively low input costs, have made tilapia the most widely cultured freshwater fish in tropical and subtropical countries. Red tilapia is a not a species of tilapia, it is instead a name used for several different manmade tilapia variants that sport and attractive red colouration. These variants are the result of continuous selective breeding.

2) *PEARLSPOT*

pearlspot (Etroplus suratensis) is a high valued food fish endemic to peninsular India and Sri Lanka. It has an elevated laterally compressed body and a small cleft mouth. In the natural habitat, the fish is light green in colour with eight vertical bands. Most of the scales above the lateral line have a pearly white spot. The species was declared as the 'State fish of Kerala' in the year 2010. It is considered as one of the potential candidate species for aquaculture, because of its high market demand, hardy nature, non-predatory habits and ability to breed naturally in confined waters.

3) *CATFISH*

The catfish is known by many different local names. In the American South, it is sometimes called a mud cat or chucklehead. Introduced by humans into various non-native environments for the purposes of farming, this is one of the top invasive species in the world. It can cause serious damage to the ecosystem by consuming much of the local plants and animals. The catfish is known by many different local names. In the American South, it is sometimes called a mud cat or chucklehead.

4) *SEABASS*

Chonak Fish one more type of fish available in goan fish markets,in English its called as Giant sea perch or Asian sea. Sea bass is a rich source of vitamin B-6, containing 20 percent of your daily value, which is three times more than you'll get from freshwater bass.

➢ TYPES OF AQUARIUM PLANTS

LUDWIGIA PLANT

Floating lily like aquatic plant help to absorb the excess the nutrients within the water column. Also provide a safe haven for smaller fishes

WATER LETTUCE

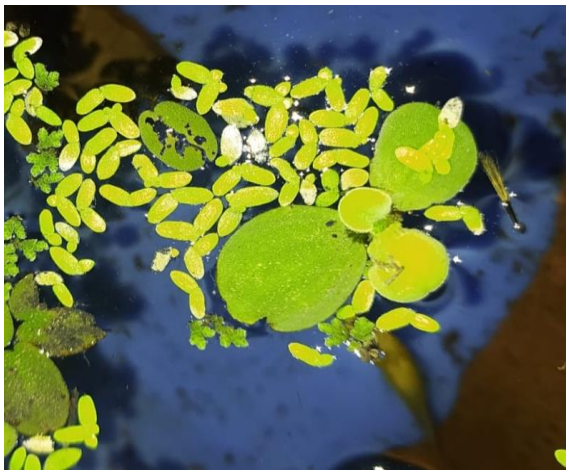
Water lettuce is great for cleaning the water decomposition byproducts and used to keep water healthy for fishes and aquatic life. It ia a home for the baby fishes

EGERIA DENSA

Absorbs excess nutrients from the water. Provide cover and serves as a source of food for various fishes. This plant is considered beneficial for the pond ecosystem

CABOMBA CAROLINIANAS

Cabomba carolinianas feeds on fish waste, act as a good medium for spawning for fishes to eggs, it acts as a oxygen generator



DUCK WEED

Duck weed filters the water tank, great food source for aquatic life containing 40% protein, 25% fiber, and 5% fats. It controls the spread of algae, it provides cover and protection and also aerates the tank

AZOLLA

Azolla can be a great food source for aquatic animals including fish and other aquatic life. its clumping growth can provide a shelter for animals from predators that hide beneath the mass.

HYDROCOTYLE VULGARIS

➢ TYPES OF FISH TANK

Fish tank are the container of water in which the live fish and other water creatures and plants are kept

1) Plastic fish tank

This are large plastic boxes of around 1m I length and ½ meter in height. This plastic tanks are easy to maintain as compare to the glass aquarium. This tank type of tank is suitable for the fishes like guppy, platy, fighters and other small fishes. This tanks are covered with a net ad are placed outside exposing to the environment, which provide efficient diffusion of oxygen to the water without any aeration.

2) Glass bowl

A betta fish is placed in a glass container

3) Concrete fish tank

Concrete pond/tanks are constructed using cement block. Concrete ponds can be classified as

- Stagnant concrete tank/container: in the stagnant concrete tank/ container, water in the tank seldom replaced, no water flow out channel is provided, this type of containers are cheaper as compare to the aquarium of the fish bowl and require less maintenance

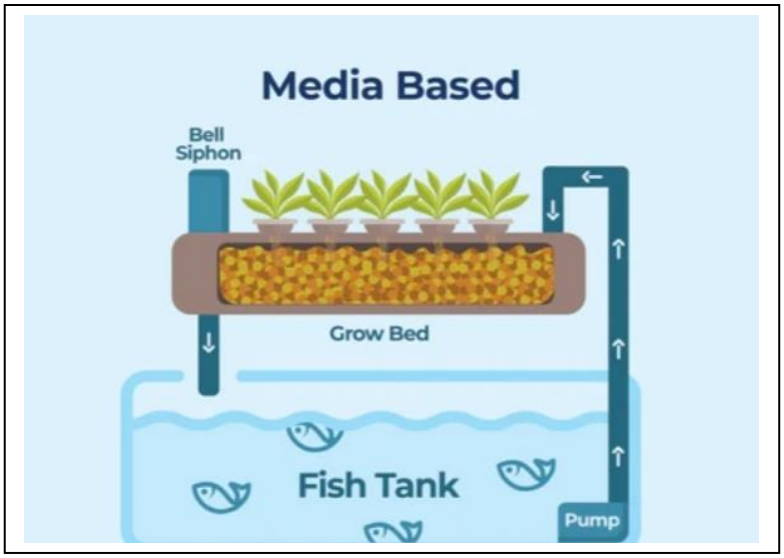
- Water recirculating concrete tank: the construction of this type of tank includes complete water refining system, the system involves high water efficiency, water is circulated and flows freely from the height into the water, waste water out of the tank is either stored or passed directly through a biofilter recirculation, it is a combined action

➢ RECIRCULATING AQUACULTURE SYSTEMS

Recirculating aquaculture systems (RAS) are used in home aquaria and for fish production where water exchange is limited and the use of biofiltration is required to reduce ammonia toxicity. Other types of filtration and environmental control are often also necessary to maintain clean water and provide a suitable habitat for fish. The main benefit of RAS is the ability to reduce the need for fresh, clean water while still maintaining a healthy environment for fish.

RAS must at least contain ways to “remove waste solids, oxidize ammonia and nitrite–nitrogen, remove carbon dioxide, and aerate or oxygenate the water before returning it to the fish tank”, even though other upgrades and supplementary equipment can be introduced to improve the quality of the water in the aquatic system, in the event of specific requirements being considered necessary for a certain experiment or organism

System designed



- Water is captured by a pump inside the main tank and sent into the initial rack where there is a mechanical filter passes through and falls into the secondary compartment where the biological filtration occurs provided by air stones that are connected to a filtered air distribution pipe with holes to let the water flow down.
- Aeration occurs when the water falls down into the system by a waterfall.

The RAS process includes: Filtration, Oxygenation, Aeration, pH control, Temperature, Salinity, ammonia

Biological Filtration: in the aqueous environment. Ammonia transforms into nitrite through the process of nitrification by autotrophic bacteria (Nitrosomonas) this process becomes essential since aquatic organisms have a higher tolerance to nitrate than ammonia or nitrite.

Aeration/Oxygenation: The purpose of an aeration system is to create conditions for the exchange of gases between water and air. the most common aeration design used by sir Edgar is by creating a water cascade, forcing the air to contact with a larger surface area by gravity and by the use of air stones To provide aeration through air stones, injection needs to occur to force the air to mix with the water by introducing into the water.

Salinity: salinity was maintained using common rock salt

➢ INTEGRATING RAS WITH AQUAPONICS

Aquaponic systems are recirculating aquaculture systems that incorporate the production of plants without soil. Recirculating systems are designed to raise large quantities of fish in relatively small volumes of water by treating the water to remove toxic waste products and then reusing it. In the process of reusing the water many times, non-toxic nutrients and organic matter accumulate. These metabolic by-products need not be wasted if they are channelled into secondary crops that have economic value or in some way benefit the primary fish production system. Systems that grow additional crops by utilizing by-products from the production of the primary species are referred to as integrated systems. If the secondary crops are aquatic or terrestrial plants grown in conjunction with fish, this integrated system is referred to as an aquaponic system.

System Design

The design of aquaponic systems closely mirrors that of recirculating systems in general, with the addition of a hydroponic component and the possible elimination of a separate biofilter for removing fine and dissolved solids. The essential elements of an aquaponic system are the fish-rearing tank, a settleable and suspended solids removal component, a biofilter, a hydroponic component, and a sump

Effluent from the fish-rearing tank is treated first to reduce organic matter in the form of settleable and suspended solids.

Next, the culture water is treated to remove ammonia and nitrate in a biofilter. Then, water flows through the hydroponic unit where some dissolved nutrients are taken up by plants and additional ammonia and nitrite are removed by bacteria growing on the sides of the tank and the underside of the polystyrene sheets (i.e., fixed-film nitrification). Finally, water collects in a reservoir (sump) and is returned to the rearing tank.

The biofilter and hydroponic components can be combined by using plant support media such as gravel or sand that also functions as biofilter media. Sand and gravel hydroponic substrates can remove solid waste from system water. Solids remain in the system to provide nutrients to plants through mineralization. With the high potential of sand and gravel media to clog, bed tillage or periodic media replacement may be required.

one popular aquaponic system uses small beds (8 feet by 4 feet) containing pea gravel ranging from 1⁄8- to 1⁄4-inch in diameter. The hydroponic beds are flooded several times daily with system water and then allowed to drain completely, and the water returned to the rearing tank. During the draining phase, air is brought into the gravel. The high oxygen content of air (compared to water) speeds the decomposition of organic matter in the gravel. The beds are inoculated with red worms (Eisenia foetida), which improve bed aeration and assimilate organic matter.

- **RAFT HYDROPONIC SUBSYSTEM**

Raft hydroponic subsystem is ideal for the cultivation of leafy green and other types of vegetables. System uses a raft hydroponic tanks the channels are lined with low-density polyethylene liners Net pots are placed in holes in the raft and just touch the water surface. Two-inch net pots are generally used for leafy green plants, while 3- inch net pots are used for larger plants such as tomatoes or okra. Holes of the same size are cut into the polystyrene sheet.

A lip at the top of the net pot secures it and keeps it from falling through the hole into the water. Seedlings are nursed in a greenhouse and then placed into net pots. Their roots grow into the culture water while their canopy grows above the raft surface. The system provides maximum exposure of roots to the culture water and avoids clogging. The sheets shield the water from direct sunlight and maintain lower than ambient water temperature, which is a beneficial feature in tropical systems. A disruption in pumping does not affect the plant's water supply as in gravel, sand and NFT subsystems. The sheets are easily moved along the channel to a harvesting point where they can be lifted out of the water and placed on supports at an elevation.

System design

- Place three fish tank at three different height in the decreasing order of their gravity
- Drill a hole to the tank and connect the three tank with valves
- Place a motor at the 3rd tank
- Connect a raft at a height above the fish tank, this raft will act as biological filter
- Fill the raft with gravel and place some net pots with a vegetable plant.

Process

water is captured by a pump inside the main tank and sent(1) into the initial rack where there is a mechanical filter (2); passes through and falls into the secondary compartment where the biological filtration occurs (3), sometimes even having additional racks just as its illustrated in this case; aeration also occurs when the water falls down into the system by a waterfall (4); Another pump (5) pushes the water to the skimmer (6), releasing the water into the cascade (7) (mechanical filter and biological filtration) ; and finally another source of aeration (8) is provided by air stones that are connected to a filtered air distribution pipe

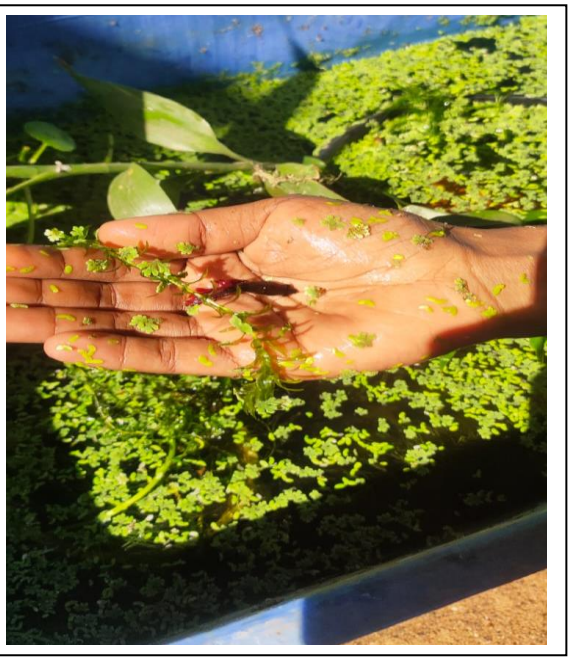
➢ TASKS PERFORMED AT INTERNSHIP

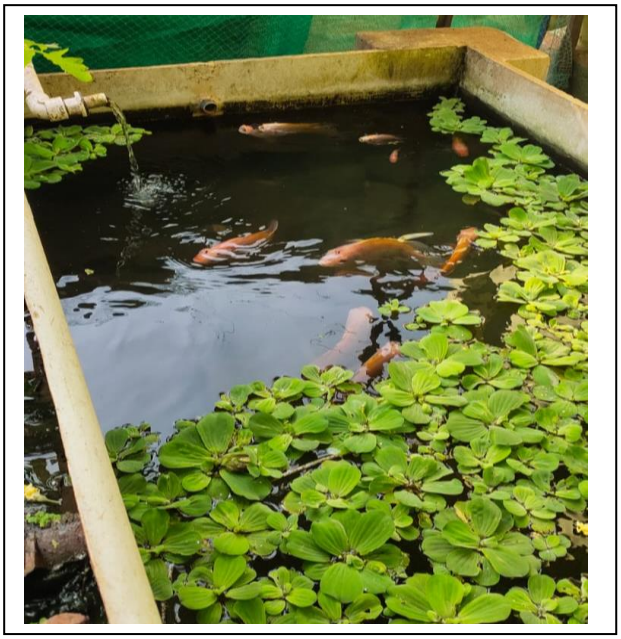
As part of my internship, I performed several tasks that were essential to my formation of skills in aquaculture. There were some tasks that needed to be done daily while others could be performed in a larger time spectrum. During the internship, any decision I made or was asked to do was questioned in order for me to understand the reasoning behind that decision, which facilitated my learning process. This way, whenever I performed an action, I would question and reflect on the consequences of that same action, as the tasks done in the facility would directly affect living organisms.

- ✓ Observation of aquatic organisms and systems
- ✓ Cleaning of tank
- ✓ Feeding the fishes
- ✓ Breeding of ornamental fishes (betta fish and guppy)

o Observation of aquatic organisms and systems

Upon entering the facility, the observation of aquatic systems was the most significant task to be performed before any other. The system verification was made in all aquatic systems within the common area, the purpose of this task was to detect any discrepancy in the aquatic systems and observe the behaviour of the organisms. From one day to the other and even during the course of the day some components of system can fail and endanger the organisms: a pump that turned off or was clogged; aeration that may not be working; mechanical filter could be clogged and overflow. If these components fail, it could cause fatalities to some more susceptible organisms. It was important to check any components that were powered by electricity, for instance pumps in order to detect if they were disconnected from the electric font or were not functioning properly. Organism's observation could sometimes reveal a fatality, which needed to be removed as quickly as possible so that the body would not decompose and consequently deteriorate water quality





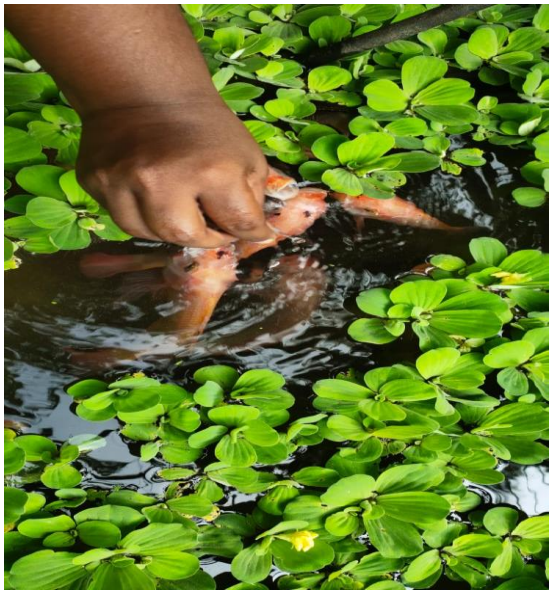
- **Cleaning of the tank**

we had the responsibility of managing several aquatic systems. There were four static systems, each one of them containing a significant number of organisms needing a total water exchange. Since it was a static system, no filtration was used and only aeration was provided. Thus, total water exchange was performed on all systems. pumps were removed from the

system and opened, disassembled and cleaned to remove any debris. All the tubes and pipes within a system were also cleaned to improve the water flow.

- **Feeding the fishes**

Another task for us to fulfill was feeding aquatic organisms in all the tank. The food was provided 3 days a week: Monday, Wednesday and Friday. Thus, the feeding time was spread as evenly as possible to reduce the feeding interval in the weekends, by feeding the last and first day of the week. The size, quantity and type of food would depend on the species, the life stage and the purpose of the system., only the essential quantity of feed was given. On the contrary, other systems existing in the farm have different purposes; hence a more appropriate feed could be given.



Betta fish breeding

While your bettas are settling in their separate two tanks, they were condition them by feeding them live food. For the male, live food like brine shrimp and insect it will also help build strength for your female fish.

Male betta fish forms a bubble nest

Betta fish were introduced using an open top vase (with the breeding tank water line below the top of the vase), or a divider within the tank. Once placing the vase or tank divider to your breeding tank add your female and allow her to adjust to the new setting for 30 minutes or so.

Now add your male to either the open topped vase, or on the side of the divider where the female isn't. Allow him to swim freely and observe. Once your male notices the female he'll turn a more vibrant color and begin displaying his fins to show off. He might attempt to bite the glass, but this is normal behavior.

This initial interaction will continue off and on for about an hour, after which the male begin to build his bubble nest. While the male continues to show off for the female while building his nest you'll want to leave them separated overnight to let tensions build.

add the male to the breeding tank (whether it's by lifting the divider or transferring him from the vase to the tank) the female will likely ignore him and go straight to the bubble nest. If the nest is not up to the female's standards she might try to destroy it or swim away.

Male betta fish chasing the female betta fish

Betta Fish Mating Dance

After the male figures out that he can reach the female he'll begin to flirt even more aggressively, chasing her around the tank eager to start the mating dance.

The breeding process has now officially begun and can take a few hours to complete. For the next 2 to 6 hours you'll see a lot of chasing and biting, be sure to keep a close eye on the new breeding pair just in case things start to turn violent.

The bettas mate after nosing into each other until the male flips the female upside down and wraps himself around her, the pair will then float or sink. The male fish will release the female and allow her time to recover before repeating the process several more times.

After mating the female will enter into a coma-like state while she drop eggs, she'll float sideways and dead but will revive shortly. This is a good time to remove the female as she's easy to move and when she wakes, the male will perceive her as a threat. The male now takes over parenting the bubble nest and attending to the eggs until they hatch.

Mating

After the female betta has finished dispersing the eggs, immediately remove her into her own private tank. The male betta will start transferring the eggs to the bubble nest and begin his vigil, watching over it day and night.

Once the fry hatch their wiggling will likely knock them loose from the bubble nest. The male betta will quickly begin putting them back. The betta fry will hang tail down for the first few days and slowly move into a more horizontal position. It takes roughly 2 days after hatching for the fry to start swimming.

Male betta fish collect the eggs and place it in a bubble nest and guards the nest

➢ FARM AND FISH POND

A farm is an area of land that is devoted primarily to agricultural processes with the primary objectives of producing food and other crops. Sir edgar farm includes a area of 10000m2 approx. consisting various types of trees like mango tree, almond tree, velvet apple coconut and other crops vegetables like reddish, watermelon, red and white amarathon. The farm is fenced with electrifying shock. It has a house where equipment's are stored. Water from the bore well is used to water the plants

A pond is constructed at the end of the farm, which is close to river sal. Fishes such as tilapia, pearlspot and cat fishes are reared in the pond which are than harvested in the month of May. These fishes are also fed with the commercial fish fed every day at the same time (evening). Aquaponics set up was constructed under the guidance of sir using brinjals an tomato plant and molly as an aquatic organism.

Farm also act as a home for various diversities of birds