



KEMENTERIAN PENDIDIKAN TINGGI  
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI



# Aquaculture

I N T H E E Y E S  
O F A  
B E G I N N E R

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# **AQUACULTURE IN THE EYES OF A BEGINNER**

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**Politeknik Jeli Kelantan**

# **AQUACULTURE IN THE EYES A BEGINNER**

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# *Preface*

The utmost gratitude is extended to the presence of Allah S.W.T because with His abundance, grace, permission and grace, we were able to publish this e book entitled **Aquaculture In The Eyes of Malaysia**

This writing is expected to benefit to all the students and lecturers especially those who involved in the field of Aquaculture. We would like to express our thankfulness to all parties who have helped in the production of this e book. Hopefully this sharing of knowledge can benefit all dear readers. Thank you.



*Mardiah binti  
Mohd Zain*



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binti Mohamed Ali*



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Breeding & Fish Health



1

# INTRODUCTION TO AQUACULTURE

# Definition of Aquaculture



Aquaculture involves raising finfish, crustaceans, molluscs, aquatic plants & other aquatic species in controlled environments.  
(Andres & Clyde, 2024)

Increase food production

Generate new source of employment

**Objectives of Aquaculture**

Use rural land productively

Supplementing capture fishery production of over-exploited fish



# Aquaculture Major Organisms Cultured

**Fin Fish Culture**



**Crustacean Culture**



**Molluscan Culture**



**Live Feed Culture**



**Seaweed Culture**



# Type of aquaculture system

## Pond Culture



## Cage Culture



## Tank Culture



## RAS System



# History of Aquaculture in Malaysia

**1920**

Extensive polyculture in ex-mining pools. Introduced Chinese carps

**1930**

Developed marine shrimp trapping pond.

**1940**

Culture of blood cockles began

**1950**

Extensive culture of freshwater fish in earthen ponds.

**1970**

Extensive culture of freshwater fish in earthen ponds.

**1980**

Started commercial aquaculture and setting up of private feed mills

**1990**

Intensive commercial aquaculture with very high stocking density & dependence on supplementary feeding

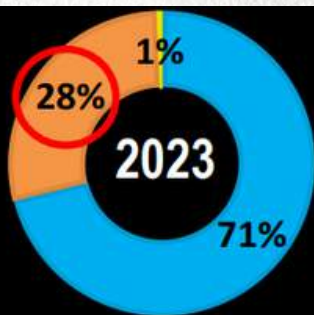
# Current Development of Aquaculture in Malaysia

According to all the policies that being used by government :-

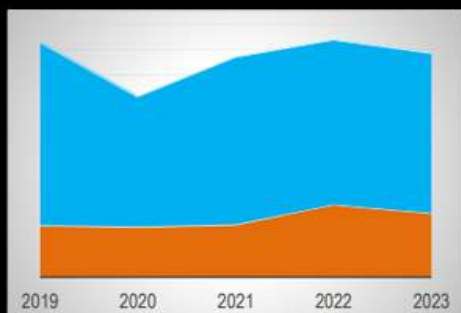


# Aquaculture Status on Year 2023

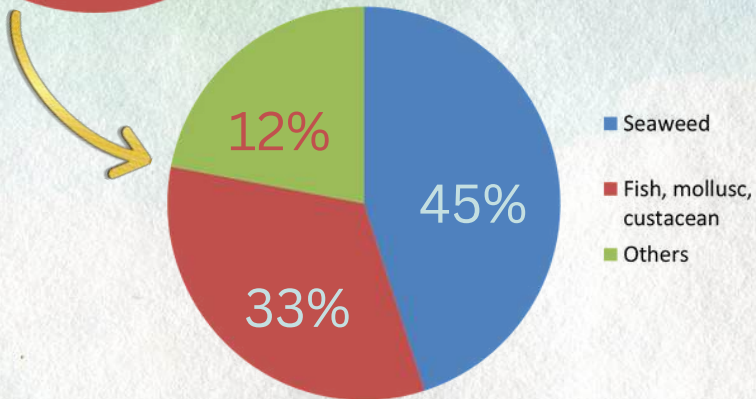
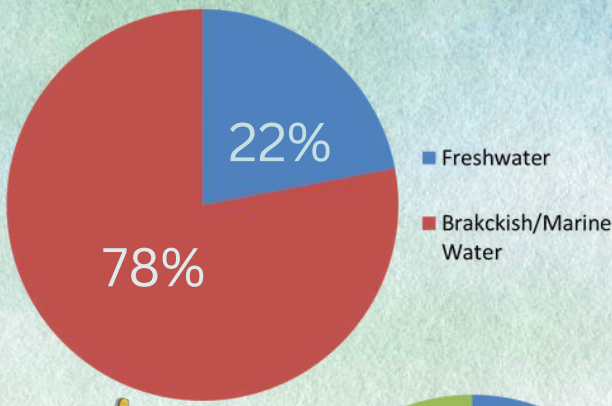
Fisheries sector produce  
1, 786,578.56 metric tons



**Capture Fisheries - 71%**  
**Aquaculture - 28%**  
**Inland Fisheries - 1%**



Production of capture fisheries and aquaculture

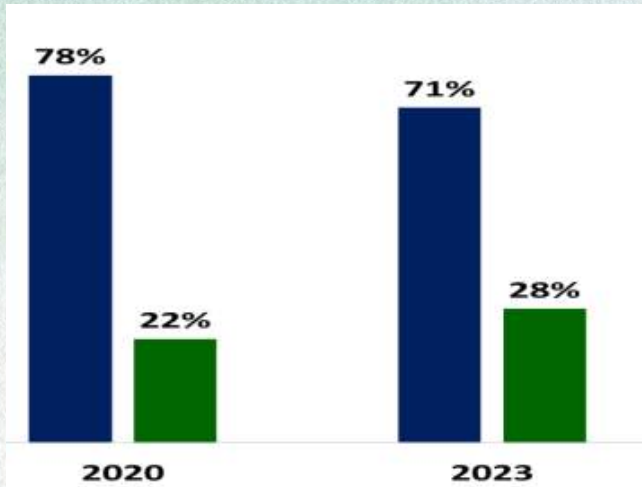


**Seaweed production : 225,077 mt**  
**Value : RM 0.1 billion**  
**Kappaphycus, Eucheuma, Laktut**

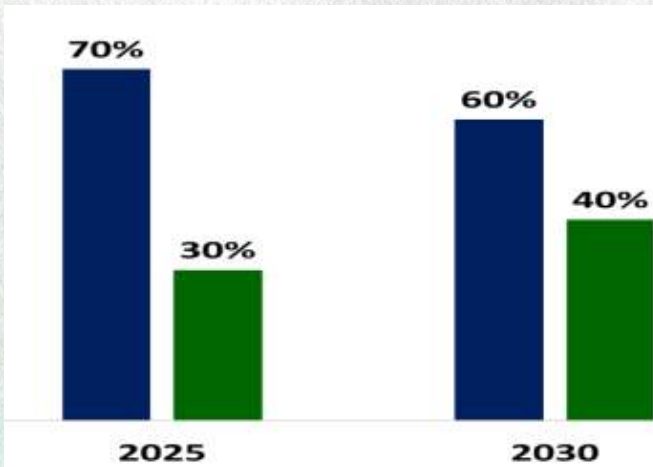
**Marine fish production : 168,719 mt**  
**Value : RM 3.3 billion**  
**Shrimp, Seabass, Grouper, Molluscan**

**Freshwater fish production : 133,070 mt**  
**Value : RM 1 billion**  
**Catfish, Freshwater Prawn, Tilapia**

# Aquaculture Production by Years



**Achievement**



**Forecast**



Main source of protein

Encourage downstream industry

Importance of Aquaculture

Contribute to national foreign exchange

Source of employment and wealth creation

# Let's Think #1

1. **State the objectives of aquaculture industry in Malaysia.**
2. **List the types of culture system in aquaculture.**
3. **Explain the importance of aquaculture industry.**

*Scan to*  
Get the Answer





2

**CERTIFICATION  
IN MALAYSIA  
AQUACULTURE  
INDUSTRY**

**Product  
safety**

**Increase  
market access**

**WHY do we  
NEED  
Certification?**

**Increase  
consumer  
confidence**

**Environmental  
Sustainability**

# Official Control, Official Analysis and Official Guarantee for fish and fish products are based on International Instruments and Laws



## Guidelines and International Agreements



## National Legislation



## Codes of Practice, Standards, Guidelines

# Development of certifications

2004

**SPLAM** - Skim Pensijilan Ladang Akuakultur Malaysia (SPLAM) Garis Panduan GAqP



2005

**SAAB** - Skim Amalan Akuakultur Baik (SAAB) Pra - pematuhan GAqP



2007

**MS 1998: 2007** - Good Aquaculture Practice (GAqP)- Aquaculture Farm General Guidelines



**2009**

**FQC - Fish Quality  
Certification for  
compliance to EU**



**2012**

**MS 2467 : 2012  
MS 2463 : 2012  
Seaweed Cultivation – Code of  
Practice Good Organic  
Aquaculture Practice**

**STANDARDS  
MALAYSIA**

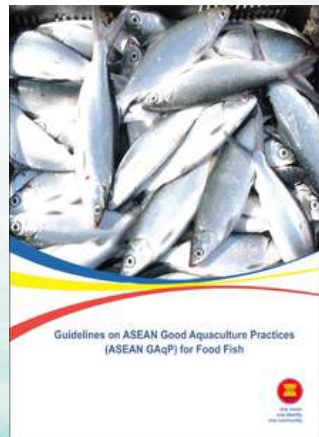
**2013**

Rebranding **SPLAM**  
to **myGAP** (Malaysia  
Good Agricultural  
Practice)



**2014**

**ASEAN GAqP**  
ASEAN Good  
Aquaculture Practice  
(GAqP)





2017

**MS 1998: 2017 &  
MS 2467 : 2017**  
Good Aquaculture Practice (GAqP)  
– 1st Revision  
Good Organic Aquaculture Practice  
– 1st Revision



2022

**DOF-SIRIM CODE OF PRACTICE  
(INDUSTRIAL STANDARD)**

- COP Shrimp Farming
- COP Marine Shrim Hatchery
- CCP Brakish Cages Culture
- COP Hatceri Ikan Air Tawar
- COP Hatceri Udang Galah

# Biosecurity Certification Scheme in Aquaculture & Fisheries

**Malaysian Good Agricultural Practice (myGAP) for Aquaculture Sector**



**Fish Quality Certificate (FQC)**

**Malaysian Good Manufacturing Practices for Fishmeal and Feed Mill (myGMP)**



**MyOrganic**



# Malaysia Good Agriculture Practice For Aquaculture



Designed procedures and protocols to encourage production and efficient aquaculture development and responsible for produce the final product quality, safety and environment friendly around

MS 1998: 2017 -  
Good Aquaculture Practice  
(GAqP)-Aquaculture  
Farm General Guidelines

Based on those :-

- Article 9, Code of Conduct Responsible Fisheries (CCRF), FAO
- Akta Perikanan 1985, Akta Makanan 1983, Akta Makanan Ternakan
- Malaysia Standard: Good Aquaculture Practice (GAqP)-Aquaculture Farm General Guidelines.
- World Organisation for Animal Health (WOAH)
- Guidelines on ASEAN Good Aquaculture Practices (ASEANGAqP) For Food Fish, 2014

# Minimum Requirement for myGAP

1

## SITE SELECTION

Approved by the authorities, Less Pollution Risk & Less conflict

2

## CONSTRUCTION

Reduce cross pollution  
cros,spread of disease and  
natural friendly

3

## FARMING PRACTICES

Not using  
antibiotics,veterinary medicine  
prohibited , good management throughout  
production chain

4

## BORDER CROSS

Fish Health Management, Control  
Movement, Alien Species , GMO Species

## **SAFETY, HEALTH AND EMPLOYEE WELFARE**

**5**

No discrimination, Good environment,  
Comply with ILO, Labor Act , Safety  
and Health

## **TRAINING**

**6**

Well trained in aspects of GAqP,  
Fish Health Management,  
Personal Hygiene, Food Safety

**7**

## **TRACEABILITY**

Aquaculture production can  
traced to the original source

**8**

## **RECORD KEEPING**

Well maintained , Update at least 2  
year ,Easily accessible

**9**

## **AUDIT**

Internal audit,corrective action  
and documented

**10**

## **SOCIAL RESPONSIBLE**

Local Community ,  
Water and Land Use

# Let's Think #2

1. Explain the importance of certification in aquaculture industry.
2. List the biosecurity certifications in aquaculture and fisheries
3. Explain the minimum requirement for myGAP Aquaculture Sector Certification scheme

*Scan to*  
Get the Answer





**3**

# **WATER SOURCES IN AQUACULTURE**

## Surface Water Sources

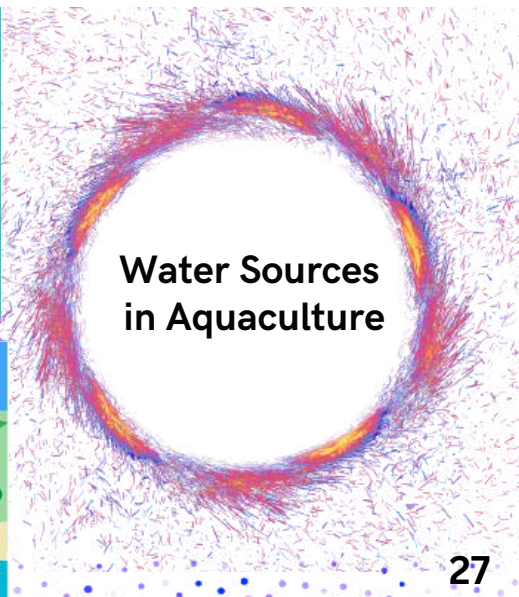
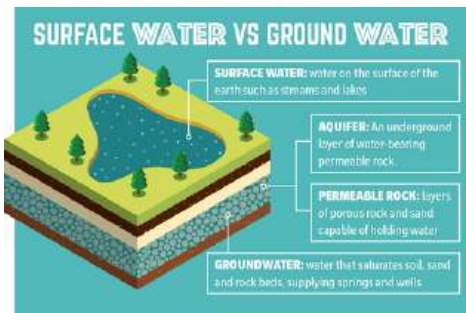
- Any water above ground, including streams, lake, wetlands, river, ocean, reservoirs and creeks.
- Often contaminated due to high level of silt, clay particles, predators, disease, pesticides and seasonal quality variation.

## Ground Water Sources

- Water found underground in the cracks and spaces in soil, sand and rock includes well and spring water.
- The most desirable water source for aquaculture.
- Consistent in quantity and quality, desirable temperature, free of toxic pollutants and less susceptible to contamination.

## Alternative Water Sources

- Water sourced from sustainable supplies, serving to mitigate the reliance on fresh surface water and groundwater.
- Examples are rainwater, reclaimed wastewater, saltwater wells, recycled water and municipal water.





WATER SOURCE	ADVANTAGES	DISADVANTAGES
<b>SURFACE WATER</b>	<ul style="list-style-type: none"> <li>• Inexpensive</li> <li>• Readily available</li> </ul>	<ul style="list-style-type: none"> <li>• May contain contaminants</li> <li>• Possibility of excessive nutrient</li> <li>• Susceptible to droughts or floods</li> </ul>
<b>GROUND WATER</b>	<ul style="list-style-type: none"> <li>• Constant temperature</li> <li>• Less contaminate</li> <li>• High mineral content</li> <li>• Less or no predators and disease vectors</li> </ul>	<ul style="list-style-type: none"> <li>• May require pumping</li> <li>• High extraction cost</li> <li>• High hardness, iron and ferum content</li> </ul>
<b>MUNICIPAL WATER</b>	<ul style="list-style-type: none"> <li>• High quality</li> </ul>	<ul style="list-style-type: none"> <li>• Expensive</li> <li>• May contain toxic chlorine or chloramines</li> </ul>
<b>RAINWATER</b>	<ul style="list-style-type: none"> <li>• Free</li> </ul>	<ul style="list-style-type: none"> <li>• Unpredictable</li> <li>• Only a supplementary sources</li> <li>• Poorly buffered</li> </ul>

# Categories of Water Quality Parameters

A fish's ability to carry out daily activities such as swimming, feeding, spawning, metabolism, development, and excretion depends on the physical, chemical, biological, and quality of the water.

A circular graphic with a blue scalloped border. Inside the circle are illustrations of a pink sea anemone, a red starfish, a pink shell, and several blue fish swimming. The text "Physical Characteristic" is centered in the circle.

## Physical Characteristic

- Temperature
- Turbidity

A circular graphic with a blue scalloped border. Inside the circle are illustrations of a pink sea anemone, a red starfish, a pink shell, and several blue fish swimming. The text "Chemical Characteristic" is centered in the circle.

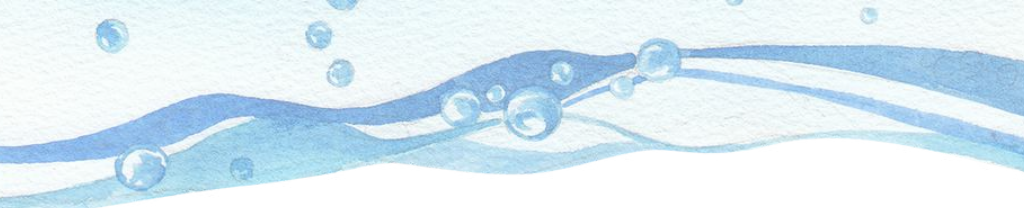
## Chemical Characteristic

- Dissolved Oxygen
- pH
- Carbon dioxide
- Alkalinity
- Ammonia
- Hardness
- Salinity

A circular graphic with a blue scalloped border. Inside the circle are illustrations of a pink sea anemone, a red starfish, a pink shell, and several blue fish swimming. The text "Biological Characteristic" is centered in the circle.

## Biological Characteristic

- Plankton
- Macrophytes



**Reduce fish mortality**

**Free from disease**

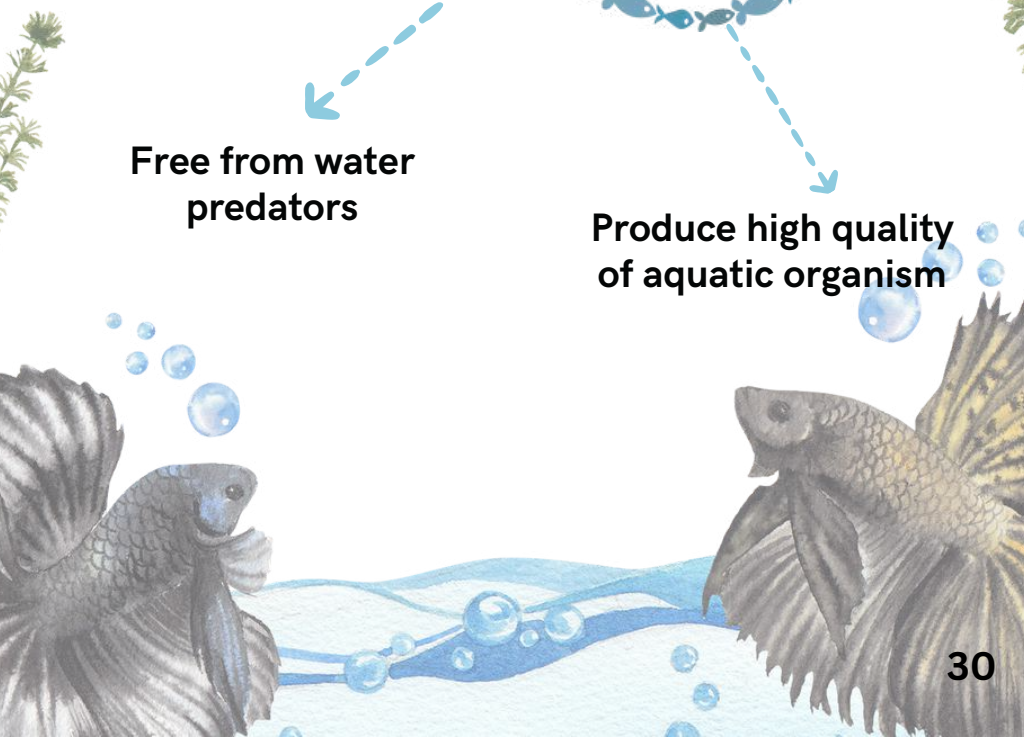
**Fish growth not affected**

**Availability of natural feed**

**Importance of Water Quality in Aquaculture**

**Free from water predators**

**Produce high quality of aquatic organism**



# Standard Optimum Value of Important Water Quality Parameters

**Temperature :**  
25 °C - 32 °C

**pH :**  
6.5 - 8.5

**Dissolved  
Oxygen :**  
Above 4 mg/L

**Ammonia :**  
Below 0.5 ppm

**Turbidity :**  
20 - 40 cm

# Water Treatment in Aquaculture

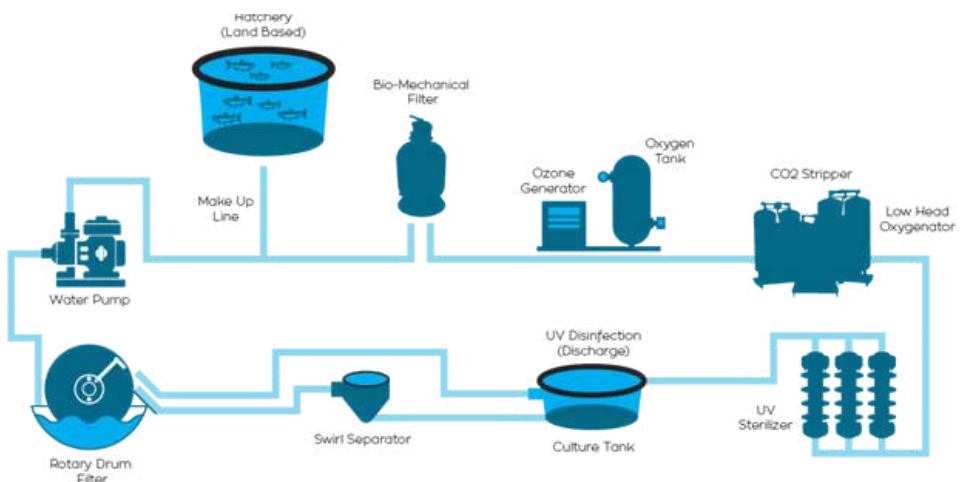


Ultraviolet (UV) radiation  
Ozone  
Chlorination

## Equipment Required for Water Filtration



Mechanical filters  
Gravitational filters  
Biological filters



# Let's Think #3

1. List three types of water sources
2. Explain the importances of water quality parameter
3. List three type of water treatment in aquaculture

*Scan to*  
Get the Answer





4

# AQUACULTURE PRODUCTION SYSTEM

**OPEN  
SYSTEM**



**SEMI - CLOSED  
SYSTEM**



**CLOSED  
SYSTEM**



**HYBRID  
SYSTEM**





# Let's Think #4

1. List four types of aquaculture production system

*Scan to*  
Get the Answer



**FOR MORE**  
Video Scan the QR






**5**

**AQUACULTURE  
MANAGEMENT -  
FISH FEED  
NUTRITION, FISH  
BREEDING AND  
FISH HEALTH**

**Human  
Intervention**

**Sustainable  
Sources**

**How to  
Manage Aquaculture?**

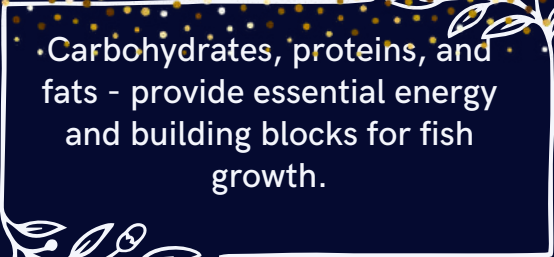


**Technology  
Driven**

**Environmental  
Sustainability**



## MACRONUTRIENTS



Carbohydrates, proteins, and fats - provide essential energy and building blocks for fish growth.

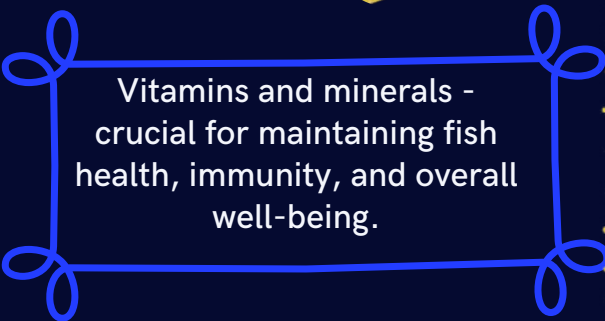


## Fish Feed Nutrition

Nutritional content  
in the formulated feed  
**for cultivated fish**



## MICRONUTRIENTS



Vitamins and minerals - crucial for maintaining fish health, immunity, and overall well-being.

# Formulating Balanced Fish Diets

## Nutritional Requirements

Specific nutritional  
needs of different  
fish species

## Ingredient Selection

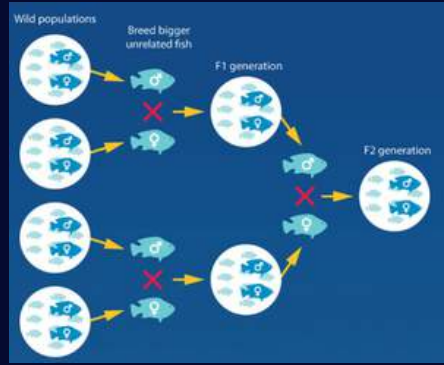
High quality &  
sustainable

## Feed Pellet Production

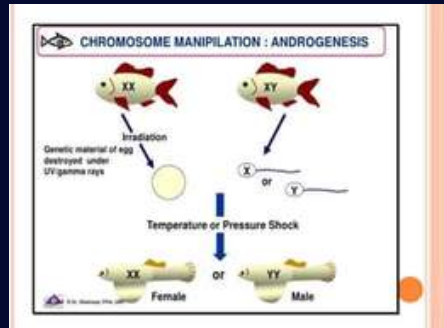
Using specialized  
machinery that  
ensures consistent  
size, density, and  
nutrient distribution

# Fish Breeding Techniques

## Selective Breeding



## Genetic Manipulation



## Hormonal Induction



## Broodstock Selection

Rapid growth, water quality tolerance, strong appetite, omnivorous feeding regime

## Broodstock Management & Spawning

**Spawning Induction** -  
Hormonal Injections,  
Environment  
manipulation

**Environmental Control**  
- Temperature, Dissolve  
Oxygen, pH

# Fish Health

## Common Disease

Ammonia poisoning,  
Anchor worms,  
Aeromonas infection, White Spot,  
Brooklynellosis,  
Columnaris,  
Dropsy, Fin Rot,  
Flukes



## Disease Prevention

Good water quality,  
providing proper  
nutrition, and minimizing  
stress to fish.

## Treatment and Management

Antibiotics,  
antiparasitics,



# Let's Think #5

1. List the macro and micro nutrients.
2. What to consider to produce balance diet?
3. State the fish breeding technique.
4. List common fish diseases.

*Scan to*  
Get the Answer 



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