

Extension, Economics & Marketing in fisheries

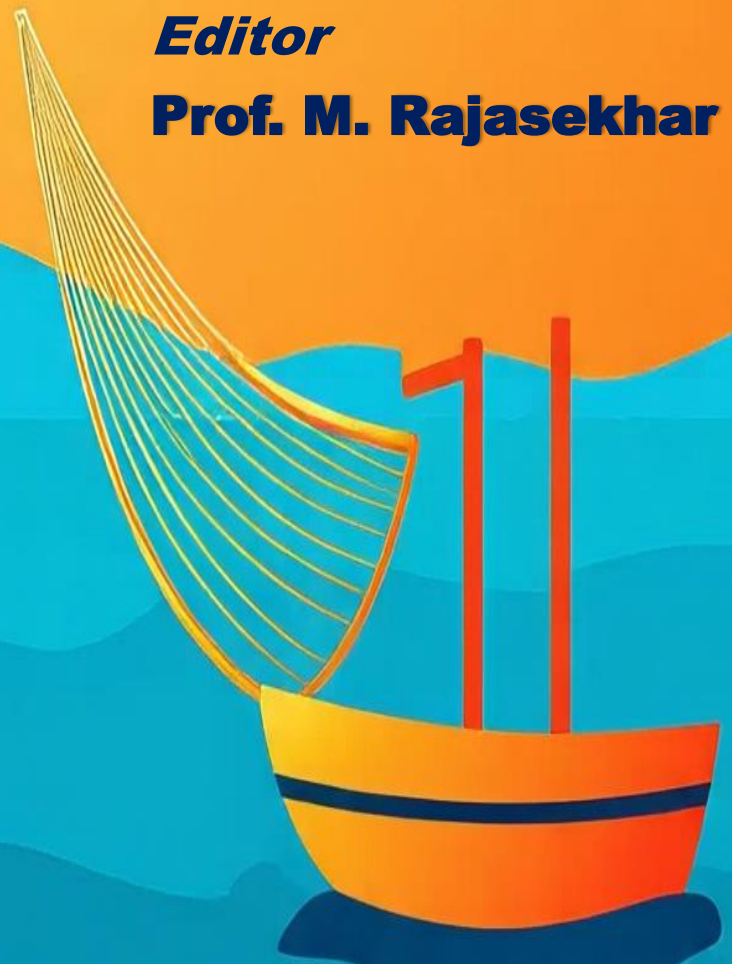
AQUACULTURE MAJOR- 5th SEMESTER – COURSE 12

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EXTENSION, ECONOMICS & MARKETING

(AQUACULTURE MAJOR-COURSE-12 e-CONTENT)

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Course No.:12 - Extension, Economics & Marketing

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UNIT I - INTRODUCTION

1-1 Meaning and scope of economics with reference to fisheries

Economics is a positive as well as a normative science. It describes what happens in an economy and prescribes what ought to be done to put it on a desired path of development.

Adam Smith is generally considered as the father of Classical economics. He defined economics as the study of the nature and causes of national wealth. Adam Smith considered the wealth getting and spending behaviour of human beings as the primary objective of economics. It is called the wealth definition of economics.

Alfred Marshall gave this definition. He shifted the focus of economics from 'wealth' to 'welfare'. Marshall defined economics as, "*the study of mankind in the ordinary business of life; it examines that part of individual and social action which is most closely connected with the attainment and with the use of the material requisites of well-being*".

Fisheries economics is the application of economic principles to the management of fisheries resources. It analyses the economic benefits and costs associated with different fisheries management strategies and their distribution among various stakeholders.

The goal is to promote sustainable practices and efficient resource utilization within the fishing and aquaculture industries.

fisheries economics involves:

- **Resource Allocation:** Examining how resources like labour, capital, and technology are used in the production, distribution, and consumption of fishery-related goods and services.
- **Economic Behaviour:** Studying the economic decisions and behaviours of individuals, businesses, and governments involved in fisheries, including fishing enterprises, processing firms, and policymakers.
- **Policy Analysis:** Evaluating the economic impact of policies on the fishing industry, such as regulations, subsidies, and trade agreements.
- **Sustainability:** Focusing on promoting sustainable fisheries management practices to ensure the long-term health of fish stocks and the marine ecosystem.

The scope of fisheries includes:

- **Commercial Fisheries:** Analyzing the economic aspects of catching and selling fish for profit, considering factors like market prices, fishing costs, and profitability.
- **Subsistence Fisheries:** Investigating the economic role of fishing for personal consumption and local community sustenance.
- **Aquaculture Economics:** Concentrating on the economic viability and sustainability of cultivating fish and other aquatic organisms in controlled environments.
- **Resource Management Economics:** Developing and applying economic models and policies for sustainable fisheries management, such as setting catch limits, establishing property rights, and controlling fishing effort.
- **Global Fisheries Economics:** Considering the economic interdependence of fisheries on a global scale, addressing issues like international trade, market dynamics, and cooperation in managing shared fish stocks.

Fisheries economics is a vital field that applies economic principles to understand and manage the complex interactions between the fishing industry, the environment, and human communities, with a focus on promoting sustainable and economically viable fisheries practices.

1-2 Basic concepts of economics goods, services, wants and utility, demand and supply, value price, market demand and individual demand, elasticity of demand

1.2.1 Economics goods:

In economics, a good is anything that provides utility or satisfaction to consumers. This can be a tangible product (like food or a car) or an intangible service (like a haircut or a concert). The core idea is that goods, in their various forms, aim to satisfy human wants and needs.

Types of Economic Goods:

Based on rivalry and excludability, economic goods can be classified into four primary categories:

- **Private Goods:** These are both *rivalrous* and *excludable*. Examples include food, clothing, and cars. If you consume a private good, someone else cannot, and access can be restricted.
- **Public Goods:** These are *non-rivalrous* and *non-excludable*. National defense, street lighting, and clean air are examples. Their use by one person does not prevent others from using them, and it's difficult to exclude anyone from their benefits.
- **Common Resources:** These are *rivalrous* but *non-excludable*. Think of fish in the ocean or timber from a forest. Anyone can access them, but consumption by one person reduces their availability for others, potentially leading to overuse.
- **Club Goods:** These are *non-rivalrous* but *excludable*. Cable television and subscription-based streaming services are examples. Access can be restricted, but multiple users can enjoy the good simultaneously without diminishing each other's experience.

Characteristics of Economic Goods:

- **Scarcity:** Economic goods exist in limited quantities, requiring choices about how to allocate scarce resources in their production. This scarcity is the driving force behind economic activity and the reason for market values.
- **Utility:** Goods satisfy human needs, desires, or wants, providing a positive value or satisfaction to consumers.
- **Transferability:** Goods can be exchanged or transferred between individuals, enabling trade and specialization in the economy.
- **Rivalry:** Some goods are *rivalrous*, meaning one person's consumption prevents another from consuming it (like eating an apple). Others are *non-rivalrous*, where consumption by one person doesn't diminish availability for others (like enjoying national defense).
- **Excludability:** *Excludable* goods can restrict consumption to those who pay for them (like a movie ticket). *Non-excludable* goods are accessible to everyone, regardless of payment (like public roads).
- **Durability:** Goods can last for varying lengths of time, from short-lived items like food to durable goods like cars or appliances.
- **Tangibility:** Goods can be *tangible* (physical objects you can touch, like clothing) or *intangible* (ideas or services that lack a physical form, like information or education).

1.2.2 services:

In economics, services are intangible activities or acts that provide value and satisfy needs or wants without resulting in the ownership of a physical product. They are a fundamental component of economic activity, alongside goods.

Characteristics of Services:

- **Intangibility:** Services cannot be touched, seen, or stored. Their value is experienced rather than possessed.
- **Perishability:** Services cannot be stored or inventoried for future use.
- **Variability:** Service quality can differ each time it is delivered, due to factors like the provider, time, and context.
- **Inseparability:** Services are often produced and consumed simultaneously, requiring interaction between the service provider and the customer.
- **Lack of Ownership:** When you purchase a service, you don't acquire ownership of a tangible item. You're paying for the benefit or experience provided.

Examples of Services:

- Financial Services: Banking, insurance, investment advice.
- Healthcare: Medical treatments, consultations, therapies.
- Education: Teaching, training, courses.
- Transportation: Bus, taxi, airline travel.
- Hospitality: Hotels, restaurants, tourism.
- Professional Services: Legal advice, accounting, consulting.
- Personal Services: Haircuts, cleaning, childcare.
- Public Utilities: Electricity, water, telecommunications.
- Fisheries: Capture, Processing

Services are valuable, intangible economic activities that fulfil needs, drive economic growth, and improve our quality of life. They are distinguished from goods by their inherent characteristics of intangibility, perishability, and variability.

1.2.3. Wants and utility

In economics, wants and utility are closely linked concepts that drive consumer behaviour and economic activity.

Wants:

- Wants are desires for goods and services that go beyond basic needs for survival.
- They are shaped by personal preferences, cultural influences, societal trends, and aspirations.
- Wants are diverse and dynamic, constantly evolving as people's circumstances, tastes, and access to new products change.

Utility:

- Utility is the want-satisfying power or capacity of a good or service.
- It's a measure of the satisfaction or benefit that individuals derive from consuming something.
- Utility is subjective, meaning it varies from person to person and depends on individual preferences and circumstances.

Relationship between Wants and Utility:

- **Wants drive the desire for utility:** People want things because they believe those things will provide them with satisfaction or utility. The stronger the want, the higher the utility they expect to derive.
- **Utility influences the pursuit of wants:** The potential utility offered by a good or service influences whether a want translates into a demand. Consumers tend to prioritize wants that offer higher utility or satisfaction.
- **Unlimited wants and limited resources:** Economic activity is driven by the reality of unlimited wants and limited resources.
- **Maximizing utility:** Consumers generally aim to maximize their total utility, meaning they try to get the most satisfaction from their limited income.

1.2.3.1 The Law of Diminishing Marginal Utility:

A key concept linking wants and utility is the law of diminishing marginal utility. This law states that as a consumer consumes more units of a particular good or service, the additional satisfaction (marginal utility) derived from each additional unit decreases.

For example, the first slice of pizza might be highly satisfying (high marginal utility), but the enjoyment from each subsequent slice diminishes as you become fuller.

The law operates for two reasons:

- i) Each want to satiable; and
- ii) Goods are imperfect substitutes for one another and they tend to be consumed in appropriate proportions. The law of diminishing marginal utility helps to explain the concept of consumer's surplus.

The excess of utility foregone or disutility suffered is called *consumer's surplus*. Hicks defined it as *the difference between the marginal valuation of a unit of good and the price which actually paid for it*. In simple terms, consumer's surplus refers to *the difference between what we are prepared to pay and what we actually pay*. The concept of consumer's surplus is seen in the case of purchase of very useful commodities yet cheap. Some of the examples include soap, salt, post card, match box, new paper etc.

Wants represent the desires and aspirations that individuals have, while utility represents the satisfaction derived from fulfilling those wants. The interplay between these two concepts is fundamental to understanding consumer behaviour, market dynamics, and the allocation of scarce resources in economics.

1.2.4. Demand and supply

Demand and supply are fundamental concepts in economics that explain how markets function and prices are determined. They describe the interaction between consumers and producers in the marketplace and are crucial for understanding market dynamics, price determination, and resource allocation.

Demand:

Demand represents the quantity of a good or service consumers are willing and able to purchase at various prices during a specific period. This is influenced by consumer preferences, purchasing power, and the relationship between price and the amount consumers desire.

- **Law of Demand:** Generally, as the price of a good increases, the quantity demanded decreases, assuming other factors are constant.
- **Demand Curve:** This graphical representation shows the inverse relationship between price and quantity demanded and typically slopes downward.
- **Factors Affecting Demand:** Key influences include consumer income, tastes, preferences, the prices of related goods (substitutes and complements), expectations, and demographic factors.

Supply:

Supply is the quantity of a good or service producers are willing and able to offer at various prices. It reflects the producer's capacity and incentive.

- **Law of Supply:** Generally, as the price of a good increases, the quantity supplied also increases.
- **Supply Curve:** This graph typically slopes upward, illustrating the direct relationship between price and quantity supplied.
- **Factors Affecting Supply:** Influences include production costs, technology, prices of related goods in production, government policies, expectations, and the number of suppliers.

Relationship between Demand and Supply:

The interaction of demand and supply determines the market equilibrium price and quantity.

- **Market Equilibrium:** This occurs when the quantity demanded equals the quantity supplied at a specific price, leading to a balanced market.
- **Equilibrium Price:** This is the price where demand and supply are equal, satisfying both buyers and sellers.
- **Disequilibrium:** If the price is above equilibrium, there's a surplus, leading sellers to lower prices. If the price is below equilibrium, there's a shortage, causing buyers to bid up prices, until equilibrium is restored.

Demand and supply are fundamental for understanding market function and price determination. Analyzing their interplay provides insights into market behaviour, consumer preferences, and resource allocation. Market equilibrium helps understand price stability and market dynamics.

1.2.5. Value - price

In fisheries economics, the terms value and price are distinct but related concepts that are crucial for understanding the market dynamics of fish and seafood.

Price

- **Definition:** Price is the monetary amount that a buyer pays for a unit of fish or seafood.
- **Determination:** Price is generally determined by the interplay of demand and supply in the market.

Price is a direct reflection of market forces and various external factors impacting supply and demand.

Value

- **Definition:** Value, in economics, is the perceived worth or benefit of a product or service to the customer.
- **Determination:** Value is subjective and depends on factors like quality, brand, features, customer needs, and customer satisfaction.
- **The value of fish and seafood to consumers is influenced by:**
 - **Quality Attributes:** Freshness, appearance, nutritional value, taste, and safety are crucial.
 - **Provenance and Traceability:** Consumers may place a higher value on products with a known origin and assured traceability.
 - **Processing and Value Addition:** Transforming raw fish into more convenient, appealing, or nutritious products can increase its value to consumers.
 - **Branding and Marketing:** Effective branding and marketing can enhance the perceived value of fish products.
 - **Health Benefits:** As consumers become more aware of the health benefits of fish, they may assign a higher value to it.

Value and Price: Value is a factor in determining the price. Consumers are generally willing to pay a higher price for products they perceive to be of higher value. Price is the price tag, the monetary amount. Value is the perceived benefit or worth, the satisfaction derived from consuming the product.

Understanding the distinction and relationship between value and price is crucial for businesses in the fisheries industry, especially when considering strategies like value addition to enhance consumer perception and demand.

1.2.6. Market demand and individual demand

In fisheries economics, understanding both individual and market demand for fish and seafood is crucial for effective management and market analysis.

Individual Demand in Fisheries Economics:

Individual demand for fish and seafood reflects the quantity a single consumer is willing and able to purchase at various prices, driven by personal factors.

- **Personal Preferences and Tastes:** Individual tastes for different species, culinary traditions, and preparation methods influence seafood choices.
- **Income Levels:** A consumer's income level impacts their ability to afford different types and quantities of seafood. For instance, higher income might lead to purchasing higher-priced or luxury seafood species.
- **Prices of Related Goods:** The price and availability of substitute goods (like other protein sources) and complementary goods (like ingredients used in seafood dishes) can affect individual seafood demand.
- **Health and Nutritional Concerns:** Awareness of the health benefits of seafood (e.g., omega-3 fatty acids) and concerns about potential contaminants (e.g., mercury) play a role in individual consumption decisions.

- **Convenience and Lifestyle:** Busy lifestyles might lead individuals to favour ready-to-eat or pre-prepared seafood options.
- **Cultural Factors:** Cultural norms and traditions can significantly influence seafood consumption patterns within specific communities or regions.

Market Demand in Fisheries Economics:

Market demand for fish and seafood is the aggregate demand of all individual consumers in a specific market. It is the total quantity of fish and seafood consumers are collectively willing to purchase at various price points.

- **Aggregation of Individual Demands:** Market demand is essentially the sum of individual demands within a given market.
- **Influencing Factors:** Market demand is influenced by the factors that affect individual demand, plus broader market factors:
 - **Population Size and Demographics:** The overall number of consumers in a market, along with their age, income distribution, and other demographic characteristics, impact the total demand for seafood.
 - **Overall Consumer Preferences and Cultural Trends:** Shifts in popular trends, culinary styles, and cultural influences at a broader market level affect seafood consumption pattern.
 - **Prices of Related Goods in the Market:** Changes in the market prices of substitutes and complements impact overall market demand for seafood.
 - **Government Policies and Regulations:** Regulations on fishing practices, imports, and exports, as well as policies related to sustainability and food safety, can affect the supply and demand of fish and seafood in the market.
 - **General Economic Conditions:** Factors like overall economic growth, consumer spending power, and inflation influence the ability of consumers to purchase seafood, especially more expensive varieties.

Individual demand focuses on a single consumer's choices and is shaped by their personal preferences, income, and other individual factors. Market demand is the collective demand of all consumers in a market and is an aggregation of individual demands, influenced by both individual-level factors and broader market dynamics.

Understanding both individual and market demand is crucial in fisheries economics for market analysis, forecasting, and developing sustainable fisheries management strategies that align with consumer needs and preferences.

1.2.7. Elasticity of demand

In fisheries economics, understanding the elasticity of demand for fish and seafood is critical for comprehending how changes in factors like price and income affect consumer purchasing decisions and overall market dynamics.

Elasticity of demand measures how the quantity demanded of a product responds to changes in a related factor. In fisheries economics, key types of elasticity include:

1. **Price Elasticity of Demand (PED):** This measures how the quantity demanded of fish or seafood changes in response to price changes.
A high PED means demand significantly changes with price, while a low PED indicates stable demand. Factors like the availability of substitutes and the proportion of income spent on seafood influence PED.
2. **Income Elasticity of Demand (YED):** This measures the change in quantity demanded of fish or seafood based on changes in consumer income. Demand typically rises with income for normal goods, increases disproportionately for luxury goods, and falls for inferior goods. Studies have often found income elasticity for fish to be income elastic.
3. **Cross-Price Elasticity of Demand (XED):** This measures how the quantity demanded of one fish or seafood product changes with the price of another related product. A positive XED indicates substitutes, while a negative XED suggests complements.

Understanding these elasticities is crucial for:

- Pricing Decisions: Businesses use elasticity data to optimize pricing.
- Marketing Strategies: Elasticity informs marketing efforts to influence demand.
- Fisheries Management: Policymakers use elasticity to assess the impact of regulations like quotas or subsidies.
- Market Analysis and Forecasting: Elasticity helps predict future consumption patterns based on changes in price, income, or substitutes.

Demand elasticity is fundamental to understanding consumer behaviour and its market impact in fisheries economics, aiding informed decisions for sustainable practices.

1.3. Theory of production, production function in fisheries

In the context of fisheries economics, the Theory of Production examines how resources (inputs) are transformed into outputs (fish or seafood products). It is a fundamental microeconomic concept that helps us understand the relationships between inputs, outputs, and the efficiency of fishing or aquaculture operations.

The Production Function is a mathematical representation of this relationship. It specifies the maximum output (catch, harvest, processed fish) that can be achieved with a given set of inputs (labour, capital, fuel, fishing effort, etc.) and a specific technology. In a fisheries context, the production function often takes the form:

$$Q = f(E, X)$$

Where:

Q: Represents the output (e.g., quantity of fish caught, biomass harvested).

f: Denotes the functional relationship.

E: Represents fishing effort (e.g., the number of fishing hours, number of vessels, amount of gear used).

X: Represents the fish stock or biomass.

Physical and financial Quantities in a Production Function

TPP and TVP

Total Physical product (TPP) = total output or yield (Y) that can be attained by using the variable input X_1 and a set of fixed inputs $X_2, \dots, X_n$. $TPP \times P_y = \text{Total Value Product (TVP)}$

APP and AVP

Average Physical Product (APP_{x_1}) = TPP due to variable input X_1 divided by the no. of units of the variable input. On average how much does each unit input produce.

$$APP = Y/X_1, \quad AVP \times P_x = AVP$$

MPP and MVP

Marginal Physical Product – This is change in TPP associated with using each additional unit of the variable input X_1 .

$$MPP \times P_x = MVP$$

$$\Delta Y / \Delta X_1 \quad \text{or} \quad \partial Y / \partial X_1$$

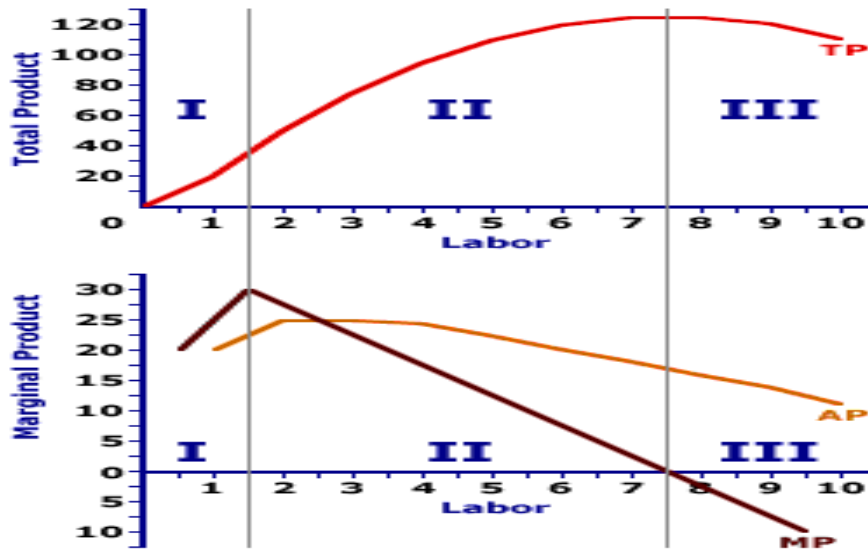
Maximum level of yield (TPP) is

$$\partial Y / \partial X_1 = 0$$

Stages of the Production Function

There are three stages in the production function namely stage I, II and III. (see Fig below) Fig showing the three stages of the production function Consider these observations about the shapes and slopes of the three product curves in Stage I. The total product curve has an increasing positive slope. In other words, the slope becomes steeper with each additional unit of variable input. Marginal product is positive and the marginal product curve has a

positive slope. The marginal product curve reaches a peak at the end of Stage I. Average product is positive and the average product curve has a positive slope.



In Stage II, short-run production is characterized by decreasing marginal returns. As more of the variable input is added to the fixed input, the marginal product of the variable input decreases. The marginal product curve intersects the horizontal quantity axis at the end of Stage II. Average product is positive and the average product curve at first has a positive slope, then it has a negative slope. The average product curve reaches a peak in the middle of Stage II. At this peak, average product is equal to marginal product. The most profitable point of operation in stage 2 cannot be determined unless both resource and product prices are known.

The onset of Stage III results due to negative marginal returns. In this stage of short-run production, the law of diminishing marginal returns causes marginal product to decrease so much that it becomes negative. Stage III production is most obvious for the marginal product curve, but is also indicated by the total product curve. The total product curve has a negative slope. It has passed its peak and is heading down. Marginal product is negative and the marginal product curve has a negative slope. The marginal product curve has intersected the horizontal axis and is moving down. Average product remains positive but the average product curve has a negative slope.

Applications in Fisheries Management:

Production functions and the theory of production are essential tools in fisheries economics and management:

- **Optimal Resource Allocation:** They aid in determining the optimal allocation of resources to maximize sustainable harvest and economic returns.
- **Policy Analysis:** Used to evaluate the economic impact of different fishing regulations and policies on fishing effort, catch, and profitability.
- **Bioeconomic Modelling:** Integrated into bioeconomic models (like the Gordon-Schaefer model) to understand the interaction between biological dynamics of fish stocks and the economic behaviour of fishing fleets.
- **Efficiency Assessment:** Analyzing technical and scale efficiency of fishing vessels or aquaculture farms helps identify areas for improvement and guide management decisions.

In essence, production functions provide a framework for understanding the core input-output relationships in fisheries, enabling economists and managers to analyze efficiency, predict outcomes of management strategies, and work towards sustainable and economically viable fisheries.

1.4 Various factors influencing fishery product price

Many factors influence the price of fishery products in the market, making it a dynamic and often volatile market.

1. Supply and Demand:

- Availability of Fish Stocks: Changes in fish populations due to biological factors (reproduction, growth rates), environmental conditions (water temperature, pollution, habitat degradation), or fishing pressure (overfishing, illegal fishing) directly affect the supply of fish. When fish stocks are abundant, prices tend to be lower; when stocks decline, prices rise.
- Catch Sizes: Fluctuations in catch sizes due to weather conditions, fishing gear restrictions, or seasonal variations impact short-term supply and prices.
- Aquaculture Production: The output of farmed fish and shellfish provides a source of supply that can influence market prices, especially for species widely produced through aquaculture.
- Consumer Preferences: Changes in consumer tastes, dietary habits, and awareness of health benefits (e.g., omega-3 fatty acids) influence demand for certain species or types of seafood.
- Population Growth and Income Levels: An increasing global population and rising incomes in key consuming regions lead to higher overall demand for seafood, potentially driving prices up.

2. Production and Processing Costs:

- Fishing Costs: Fuel, labour, fishing gear, and vessel maintenance costs all contribute to the cost of producing fish. Increases in these costs can lead to higher prices for consumers.
- Aquaculture Costs: Feed costs (including ingredients like fishmeal and soybean meal), labour, disease prevention, and water management influence the cost of producing farmed fish.
- Processing and Value Addition: Costs associated with processing raw fish into various products (fillets, smoked fish, fishmeal), packaging, and quality control can impact the final price.

3. Environmental Factors:

- Climate Change: Rising ocean temperatures, ocean acidification, and changes in currents can impact fish stocks, reproductive patterns, growth rates, and survival, leading to price fluctuations.
- Weather Events and Natural Disasters: Hurricanes, tsunamis, and harmful algal blooms can disrupt fishing operations, damage infrastructure, and cause shortages, leading to price spikes.
- Pollution and Habitat Degradation: Pollution of marine and freshwater ecosystems can harm fish stocks and reduce the availability of seafood products, affecting prices.

4. Government Regulations and Policies:

- Fishing Quotas and Regulations: Policies designed to manage fish stocks and prevent overfishing, such as quotas and fishing seasons, can limit supply and influence prices.
- Environmental Standards and Sustainability Certifications: Meeting sustainability standards and obtaining certifications can add costs for producers, potentially leading to higher prices for consumers.
- Trade Policies and Tariffs: Import and export policies, trade agreements, and tariffs can impact the cost of seafood in domestic markets.
- Subsidies and Incentives: Government support for the fisheries sector, such as subsidies for infrastructure development or financing facilities for shrimp farming, can influence production levels and prices.

5. Market and Economic Factors:

- Market Structure and Competition: The level of competition among seafood suppliers and the structure of the market (e.g., concentrated vs. fragmented) can influence pricing strategies.
- Currency Exchange Rates: Fluctuations in exchange rates can impact the cost of importing and exporting seafood products, affecting prices for both domestic and international markets.
- Market Speculation: Speculative activities by investors or traders can lead to price volatility in the seafood market.
- Economic Growth and Recession: Overall economic conditions, consumer spending power, and inflation levels can influence demand for seafood and affect prices.

The price of fishery products is a complex interplay of various factors related to supply and demand, production costs, environmental conditions, government policies, and overall market and economic dynamics. Understanding these factors is essential for analyzing the seafood market and developing effective strategies for sustainable fisheries management and market stability.

UNIT II FISHERIES MARKETING**2-1 Basic marketing functions, consumer behaviour and demand, fishery market survey and test marketing a product****2.1.1 Basic marketing functions in fishery marketing**

Marketing arises from this last approach to acquiring products. Exchange is the act of obtaining a desired product from someone by offering something in return. Exchange is the defining concept underling marketing. For exchange to take place, five conditions must be satisfied:

- There are at least two parties
- Each party has something that might be of value to other party
- Each party is capable of communication and delivery
- Each party is free to accept or reject the offer
- Each party believes it is appropriate or desirable to deal with the other party

Fishery market, like any other market, involves fundamental marketing functions to ensure fish and fishery products move from producers to consumers efficiently and effectively.

Basic marketing functions in fisheries marketing involved are:

1. **Buying and Selling**: This is the most fundamental function of any market, including the fishery market. It's the process by which fish farmers or fishermen sell their catch

to various marketing agents (like wholesalers or retailers), and ultimately, consumers purchase the fish.

2. **Assemblage/Concentration:** This involves gathering fish from scattered producers (fishermen or fish farmers) into a central location or larger lots for easier handling and distribution. This function is crucial in the fishery market because producers are often dispersed geographically.
3. **Storage:** Fish is highly perishable, so proper storage is essential to prevent spoilage and extend shelf life. Storage can involve various methods, including chilling (using ice), freezing (in cold rooms or freezers), or other preservation techniques.
4. **Sorting and Grading:** Categorizing fish by species, size, quality, or other characteristics is important for efficient marketing. Sorting allows for easier handling and pricing, and grading helps differentiate products and caters to consumer preferences.
5. **Packaging and Labelling:** Packaging protects fish from damage and contamination, aids in handling and transportation, and enhances its appearance to attract consumers. Labelling provides essential information about the product, including its origin, species, processing method, weight, and shelf life.
6. **Transportation:** Moving fish from fishing grounds or farms to processing facilities, markets, and ultimately to consumers is a critical marketing function. Efficient transportation, especially refrigerated transport, is essential to maintain the quality and freshness of fish.
7. **Processing and Value Addition:** Transforming raw fish into various products (like fillets, fish fingers, canned fish, etc.) to enhance convenience, nutritional value, shelf life, and market appeal. Value addition creates opportunities to utilize underutilized species and by-catch, expand market reach, and generate higher economic returns.
8. **Risk Bearing:** Marketing agents take on risks associated with price fluctuations, spoilage, and market demand.
9. **Market Information:** Gathering and disseminating information about supply, demand, prices, and market trends to help inform decision-making throughout the supply chain.
10. **Financing:** Providing the necessary funds for various marketing activities, including purchasing fish, storing, processing, and transporting.
11. **Standardization:** Setting and enforcing standards for fish quality, size, and processing to ensure consistency and facilitate trade. Standards help protect public health and prevent fraud.

These marketing functions work together to ensure that fish and fishery products reach consumers in a timely and cost-effective manner while maintaining their quality and safety.

2.1.2 Consumer behaviour and demand in fishery marketing

Consumer behaviour and demand are crucial aspects of successful fishery marketing. Understanding what drives consumers to purchase fish and fishery products, as well as the factors influencing their demand for these items, is essential for producers, processors, and marketers to thrive in the market.

2.1.2.1 Consumer Behaviour:

Consumer behaviour in the fishery market refers to the decision-making process individuals go through when selecting, purchasing, consuming, and disposing of fish and related products. Several factors influence this behaviour:

1. Product Attributes:

- **Quality:** Freshness, taste, texture, appearance, and absence of defects are paramount for fish consumers.
- **Price:** Affordability is a major factor, with consumers often seeking value for money.
- **Convenience:** Ease of preparation, availability of pre-prepared or ready-to-eat options, and accessibility of retail outlets are increasingly important for busy consumers.
- **Nutritional Value:** Fish is recognized for its health benefits, including being a good source of protein, omega-3 fatty acids, and essential micronutrients, which attracts health-conscious consumers.
- **Sustainability:** Growing consumer awareness about environmental and social issues related to seafood production is leading to increased demand for sustainably sourced fish and products with eco-labels.
- **Species:** Consumers often have preferences for specific species based on cultural factors, taste, and familiarity.
- **Origin:** Some consumers prefer locally sourced fish or are interested in knowing the origin of their seafood, especially when linked to sustainability or safety concerns.

2. Individual Characteristics:

- **Demographics:** Age, gender, income level, and family size can influence fish consumption patterns and purchasing behaviour.
- **Lifestyle:** Modern lifestyles, including busy schedules and a desire for healthy eating, drive demand for convenient and nutritious food options like fish.
- **Dietary Habits and Cultural Factors:** Fish consumption is often deeply embedded in cultural traditions and dietary habits, particularly in coastal regions and communities where fish is a staple food.
- **Attitudes and Values:** Consumers' beliefs and values related to health, sustainability, and ethics influence their purchasing decisions.

3. Environmental and Situational Factors:

- **Availability:** The availability of desired fish species and products in the market is crucial for meeting consumer demand.
- **Market Environment:** The retail environment, including traditional markets, supermarkets, and online platforms, affects consumer choices.
- **Seasonality:** The availability and price of certain fish species may vary seasonally, influencing consumption patterns.

Understanding consumer behaviour is vital for fishery marketing. By analyzing the factors that influence consumers' choices, including product attributes, individual characteristics, and environmental factors, businesses can develop effective marketing.

2.1.2.2 Demand in Fishery Marketing:

Demand for fish and fishery products is shaped by various factors, including:

- **Population Growth:** A growing population naturally leads to increased demand for food, including fish.
- **Economic Growth:** Rising incomes and increased wealth enable consumers to afford higher quantities and more expensive varieties of fish and seafood.
- **Urbanization:** Rapid urbanization, particularly in developing countries, is associated with shifting dietary preferences and increased demand for convenient and diverse food options like fish.

- **Dietary Shifts:** Growing awareness of the health benefits of fish is driving increased consumption.
- **Availability and Accessibility:** Efficient distribution networks and access to markets are crucial for meeting consumer demand.
- **Market Development and Infrastructure:** Investments in cold chain logistics, processing facilities, and modern retail outlets contribute to increased availability and accessibility of fish products.
- **Marketing and Promotion:** Effective marketing strategies, including targeted campaigns and value-added product development, can stimulate demand.

Understanding consumer demand is vital for fishery marketing, by which effective marketing strategies to meet market demand with sustainable growth in the industry.

2.1.3 Fishery Market Surveys and Test Marketing a New Product:

2.1.3.1 Fishery Market Surveys:

Fishery market surveys are essential tools for understanding the market landscape for fish and fishery products. They gather information about various aspects of the market to inform decision-making, identify opportunities, and refine marketing strategies.

1. Purpose of Fishery Market Surveys:

- **Understanding Market Demand:** Surveys help assess the demand for specific fish species, product types (fresh, frozen, processed), and value-added products.
- **Identifying Consumer Preferences:** Surveys gather information about what consumers are looking for in terms of quality, taste, price, sustainability, and convenience.
- **Analysing Existing Market Channels:** Surveys can map out how fish moves from producers to consumers, identifying key intermediaries and their roles.
- **Assessing Price Sensitivities:** Understanding what consumers are willing to pay for different products is crucial for pricing strategies.
- **Identifying Marketing Challenges and Opportunities:** Surveys can reveal weaknesses in the existing market infrastructure, transportation bottlenecks, and potential areas for improvement.
- **Gathering Socio-economic Data:** Surveys can provide insights into the socio-economic context of fishing communities and the role of women and children in the fish industry.

2. Methods for Conducting Fishery Market Surveys:

- **Questionnaires:** Using standardized forms to collect data from fishers, traders, processors, retailers, and consumers.
- **Interviews:** Conducting structured or open-ended interviews to gather more in-depth information about market practices, challenges, and opportunities.
- **Focus Group Discussions:** Facilitating discussions among small groups of market participants to explore specific topics in detail.
- **Direct Observation:** Observing market activities, fish handling practices, and consumer behaviour.
- **Secondary Data Analysis:** Analyzing existing data sources like fisheries statistics, market reports, and research papers.

2.1.3.2 Test Marketing a New Fishery Product:

Test marketing is a crucial step before a full-scale launch of a new fish or fishery product. It allows companies to gather feedback, assess market viability, and refine their marketing strategy in a controlled environment.

Steps Involved in Test Marketing a Fishery Product:

1. **Define Objectives:** Clearly outline what you want to achieve with the test market (e.g., assess consumer acceptance, gather feedback on pricing, refine packaging).
2. **Select a Test Market:** Choose a representative geographic area or market segment that reflects your target audience.
3. **Develop a Marketing Mix:** Define the product, price, place (distribution channels), and promotion strategy for the test market.
4. **Launch the Product:** Introduce the product into the chosen test market using the defined marketing mix.
5. **Gather Data:** Collect information on consumer reactions, sales performance, feedback, and market response.
6. **Analyze Results:** Evaluate the collected data to assess the product's performance and identify areas for improvement.
7. **Refine Strategy:** Adjust the product, pricing, packaging, or marketing message based on the test market results.
8. **Decide on a Full-Scale Launch:** Based on the test market outcome, decide whether to proceed with a broader launch or make further refinements.

Benefits of Test Marketing in the Fishery Industry:

- **Reduced Risk:** Test marketing helps identify potential problems and gather insights before committing to a larger investment, reducing the risk of a failed launch.
- **Gathering Customer Feedback:** Provides valuable insights into consumer preferences and reactions, enabling product improvements.
- **Refining Marketing Strategies:** Allows companies to fine-tune their marketing messages and approaches before a wider rollout.
- **Estimating Sales Potential:** Helps gauge the potential market size and demand for the new product.
- **Competitive Advantage:** Enables companies to gain a competitive edge by introducing successful new products into the market.

By combining market surveys and test marketing, businesses in the fishery industry can gain a deeper understanding of their target audience, develop successful products, and launch them effectively, ultimately contributing to their growth and profitability.

2-2 Fish marketing prices and price determination of fishes

Fish marketing involves a complex system, with prices being determined by a combination of factors related to supply, demand, and the marketing chain.

Factors Affecting Fish Marketing Prices:

- **Fish Species:** Different species of fish command varying prices based on their demand, availability, and perceived value.
- **Size and Weight:** The size and weight of fish significantly influence their price per kilo. Larger fish of the same species often sell for a higher price.

- **Quality:** The quality of the fish is a major determinant of price. Live fish, for instance, tend to fetch a higher price than iced fish. Quality can be influenced by factors such as freshness, handling, and storage.
- **Market Structure:** The presence of intermediaries like traders, wholesalers, and retailers affects the final price consumers pay, as each adds their marketing costs and profit margins.
- **Transportation and Infrastructure:** Costs associated with transporting fish from landing centers to markets, as well as the availability of facilities like cold storage, impact the overall cost and price.
- **Supply and Demand:** Seasonal variations in fish production, unpredictability of catches, and the perishability of fish lead to fluctuations in supply and demand, which directly impact prices.
- **Seasonal Price Variation:** Some fish species experience noticeable price changes depending on the season.

Price Determination in the Fish Marketing System:

- **Minimum Price:** A minimum price may be set to ensure producers receive a reasonable profit, covering their production costs.
- **Auction:** In some cases, fish may be auctioned, with the sale price reaching or exceeding the predetermined minimum.
- **Negotiation:** Fish collectors often negotiate prices with farmers based on factors like species and size before transporting them to assembly markets.
- **Market Price:** Ultimately, the interplay of various factors in the market determines the final price of fish.

Price Information Systems: Platforms like the **Fish Market Price Information System (FMPIS)** aim to provide real-time information on fish prices, trends, and availability, assisting stakeholders in informed decision-making.

Fisheries sector in some regions remains largely unorganized, making it challenging to implement uniform price regulation and support for fisherfolk. Global trends like the phasing out of subsidies under the World Trade Organization (WTO) regime are expected to further emphasize the importance of improving production and marketing efficiency for profitability and sustainability.

2-3 Marketing institutions- primary (producer fishermen, fishermen cooperatives, and fisheries corporations) and secondary (merchant/agent/speculative middlemen)

2.3.1 Fishery Primary Marketing Institutions (producer fishermen, fishermen cooperatives, and fisheries corporations)

Primary marketing institutions in the fisheries sector include individual producer fishermen, fishermen's cooperatives, and fisheries corporations.

These entities represent the initial point of sale and distribution of fish products. Fishermen's cooperatives play a crucial role in supporting fishermen and can handle various aspects of the fish marketing process, including processing, storage, and transportation. Fisheries corporations, often government-supported, can also play a significant role in marketing and distribution.

- **Producer Fishermen:** Individual fishermen or groups who catch or cultivate fish and are directly involved in the initial sale of their product.
- **Fishermen Cooperatives:** Organizations formed by fishermen to collectively handle various aspects of their business, including marketing, processing, and input supply.

- **Fisheries Corporations:** Public sector or government-supported entities that participate in or facilitate fish marketing, potentially including activities like providing infrastructure, subsidies, or direct procurement from fishermen.

Roles and Functions:

1. Producer Fishermen:

- **Initial Sale:** Fishermen are the primary link in the marketing chain, bringing their catches to landing sites or local markets.
- **Direct Sales:** Some fishermen sell directly to consumers or retailers, potentially capturing a larger share of the final price.

2. Fishermen Cooperatives:

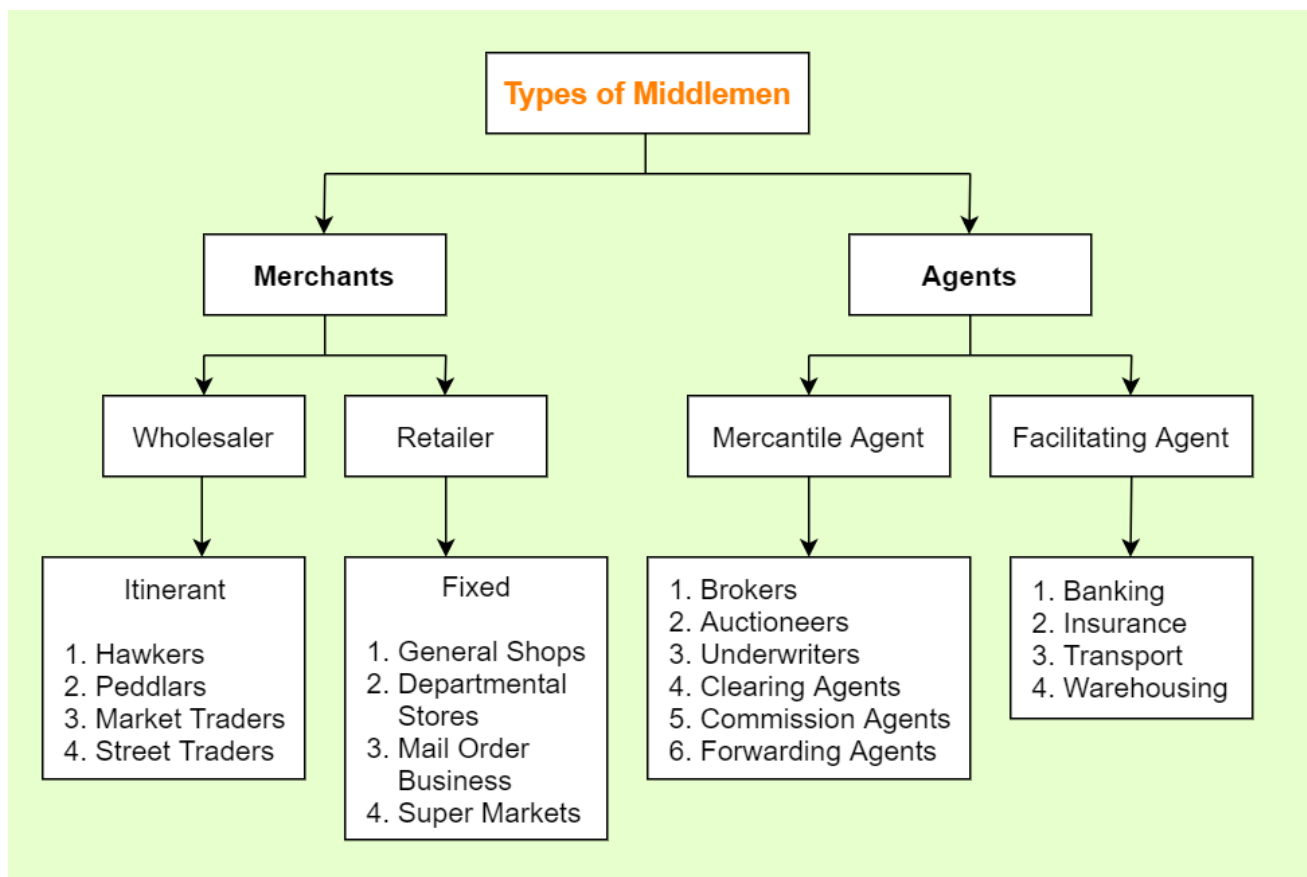
- **Marketing and Processing:** Cooperatives can handle marketing and processing functions on behalf of their members, often leading to better prices and efficiency.
- **Strengthened Bargaining Power:** By pooling their resources and production, cooperatives can negotiate better prices with buyers and reduce dependence on intermediaries who may exploit them.
- **Access to Resources:** Cooperatives can facilitate access to credit, fishing gear, and other essential inputs for their members.
- **Socio-economic Development:** Beyond economic benefits, cooperatives can also promote social and economic improvement in fishing communities through various activities like creating employment opportunities in fish processing, storage, and transportation.
- **Sustainable Practices:** Some cooperatives also promote sustainable fishing practices and can play a role in resource management

3. Fisheries Corporations:

- **Infrastructure Development:** Public sector corporations can establish and operate facilities like cold storage, fish landing centers, and wholesale markets to improve efficiency and reduce post-harvest losses.
- **Marketing Support and Facilitation:** They can offer subsidies, finance, training, and guidance to fishermen and cooperatives to improve marketing operations.
- **Direct Marketing Channels:** Some corporations, like the Tamil Nadu Fisheries Development Corporation in India, operate their own retail outlets to provide consumers with fresh fish at affordable prices and to offer fishermen a direct market channel, bypassing intermediaries.
- **Export Promotion:** Government agencies and corporations can provide support for efficient marketing of fish and fishery products for export.

Primary marketing institutions in the fisheries sector play a vital role in ensuring that fish and fishery products reach consumers efficiently and that producers receive fair returns for their efforts. The effectiveness and impact of these institutions can vary depending on various factors, including the type of institution, the level of government support, and the specific context of the fishing industry.

2.3.2 Fishery secondary marketing Institutions (merchant/agent/speculative middlemen)



In the context of fishery marketing, **secondary marketing institutions** primarily consist of various types of middlemen who facilitate the movement of fish and seafood from producers (fishermen) to consumers.

Middlemen can be broadly classified as:

1. Merchant Middlemen: These intermediaries take ownership of the fish and seafood products, buying and selling them on their own account.

- **Wholesalers:** They buy fish in large quantities, often directly from fishermen or primary markets, and then sell them to retailers or other wholesalers.
- **Commission Agents or Arhatias:** They facilitate sales, taking physical possession of the fish and selling it to retailers on a commission basis.
- **Retailers:** They purchase fish from wholesalers or other intermediaries and then sell them to consumers in smaller quantities.
- **Itinerant Traders and Village Merchants:** These middlemen operate at a smaller scale, purchasing fish directly from fishermen in villages and then selling them in nearby markets.
- **Mashakhores:** These are smaller wholesalers or larger retailers who primarily deal in fruits and vegetables, and also handle substantial quantities of fish and seafood.

2. Agent Middlemen: These intermediaries act as representatives of either the seller (fishermen) or the buyer (wholesalers, retailers, or consumers), negotiating deals and facilitating transactions without taking ownership of the fish.

- **Commission Agents or Arhatias:** In this case, they act on behalf of the sellers (fishermen) at primary markets, arranging the sale of their catch, collecting payment, and remitting the balance after deducting their commission.
 - **Brokers:** They bring together buyers and sellers to negotiate a deal, but they do not take physical control of the fish or handle the transaction themselves.
- 3. Speculative Middlemen:** These intermediaries buy fish with the expectation of making a profit by holding it for a period and selling it when prices are higher. They often buy during peak seasons and sell during off-seasons or periods of high demand.

Secondary marketing institution's role in the fishery supply chain by:

- **Aggregating and Distributing Fish:** They collect fish from various sources, transport it, and distribute it to different markets.
- **Facilitating Trade:** They connect buyers and sellers, negotiate prices, and manage transactions.
- **Providing Storage and Transportation:** They handle the logistics of storing and transporting fish, which is particularly important given its perishability.
- **Sorting and Grading:** They may also sort and grade fish based on size, quality, and species, potentially adding value to the products.
- **Reducing Costs:** They can reduce transaction costs by consolidating purchases, specializing in specific market functions, and leveraging their networks.

Presence of too many intermediaries lead to:

- **Increased Price Spread:** The more intermediaries involved, the higher the price spread, potentially reducing the share of profits going to both producers (fishermen) and consumers.
- **Exploitation:** Middlemen can exploit their position to pay low prices to fishermen and sell at high prices to consumers, leading to an unfair distribution of profits.
- **Market Inefficiencies:** Too many intermediaries can increase complexity, lead to higher transaction costs, and potentially create barriers to entry for smaller fishermen or businesses.

Government policies and initiatives aim to minimize middleman:

- **Promote Fishermen's Cooperatives:** Cooperatives empower fishermen by enabling them to collectively market their catch, negotiate better prices, and bypass some of the intermediaries.
- **Improve Market Infrastructure:** Investing in infrastructure like cold storage facilities, processing plants, and efficient transportation can improve the overall efficiency of the supply chain and reduce post-harvest losses.
- **Provide Market Information:** Disseminating timely and accurate market information to fishermen can help them make informed decisions and get better prices for their catch.
- **Explore Direct-to-Consumer Market Models:** Initiatives that connect fishermen directly with consumers can help reduce reliance on intermediaries and increase their earnings.

Promoting sustainable marketing practices, governments and organizations can help ensure that the fishery sector benefits both producers and consumers fairly and efficiently

2-4 Preparation of project and project appraisal

In the fisheries sector, preparing a project and appraising it is crucial for ensuring the success and sustainability of a venture. This process helps stakeholders, such as fish farmers, investors, and government agencies, make informed decisions about whether to proceed with a project and how to best manage it.



1. Preparation of a Fisheries Project:

Project preparation involves outlining of the main report are organized in sections arranged in sequence, any project usually include the following:

- Summary.
- Introduction.
- Background.
- The project area or the sub-sector.
- The proposed project.
- Organization and management.
- Markets and prices.
- Financial and/or economic implications.
- Project justification and risks.
- Outstanding issues and follow-up action required.

Project Identification: This involves identifying a potential fisheries project based on factors like demand and supply of fish, resource availability, market survey, and technical expertise.

- **Feasibility Studies:** These studies examine the viability of the proposed project from various perspectives, including:

- **Technical feasibility:** Assessing the suitability of the location, water quality, and infrastructure for the chosen species and farming system.
- **Market feasibility:** Analyzing the demand for the fish species, competition, pricing, and potential market channels.
- **Financial feasibility:** Estimating the initial investment, operating costs, projected revenue, and profitability.
- **Environmental feasibility:** Evaluating the potential environmental impact of the project and identifying mitigation strategies.
- **Legal and regulatory feasibility:** Determining the necessary permits, licenses, and compliance requirements.

Project Formulation: Based on the feasibility studies, a detailed project proposal or report is prepared, outlining the project's background, objectives, technical details, implementation plan, cost estimates, and expected outcomes.

The contents of the report

Writing a good report is a skilled job. The team leader should follow five recognized basic principles writing reports, namely keeping the report:

- Simple, avoiding any unnecessary jargon.
- Direct, avoiding digressions, unless they serve a specific purpose.
- Lucid, being understandable by any intelligent reader and free of any ambiguity.
- Vigorous, sustaining the reader's interest, presenting arguments with convictions, and conclusions with confidence.
- Brief, but not to the point of sacrificing important material for the sake of limiting the length of a section of text.

2. Project Appraisal in Fisheries:

Project appraisal is the process of evaluating a proposed project to determine its merit, worth, or significance based on various criteria. This helps stakeholders decide whether the project is worth investing in and whether it aligns with their goals and objectives.

Common project appraisal techniques used in fisheries include:

- **Financial Appraisal:** This focuses on the financial viability and profitability of the project, using techniques like:
 - **Net Present Value (NPV):** A discounted cash flow technique that calculates the present value of future net cash flows minus the initial investment.
 - **Benefit-Cost Ratio (BCR):** Also known as the Profitability Index, it is the ratio of the present value of future net cash flows to the initial investment.
 - **Internal Rate of Return (IRR):** The discount rate at which the NPV of a project becomes zero.
- **Economic Appraisal:** This considers the broader economic impacts of the project, such as employment generation, contribution to the local economy, and food security.
- **Social Appraisal:** This assesses the social impacts of the project, including the welfare of fishers and fish farmers, community development, and equitable distribution of benefits.
- **Environmental Appraisal:** This evaluates the environmental sustainability of the project, ensuring compliance with environmental regulations and minimizing negative impacts on aquatic ecosystems.

- **Risk Analysis:** This involves identifying and assessing potential risks associated with the project, such as disease outbreaks, natural disasters, and market fluctuations, and developing mitigation strategies.

By combining thorough project preparation with a comprehensive project appraisal, stakeholders can increase the likelihood of success for their fisheries ventures while contributing to sustainable and responsible development of the fisheries sector.

UNIT-III FISHERIES ECONOMICS

3-1 Aquaculture economics- application of economics principles to aquaculture operations

Aquaculture economics involves applying economic theories and methods to understand and manage the aquaculture industry. It focuses on the costs, benefits, market dynamics, and policy influences that shape aquaculture operations, crucial for informed decision-making by farmers, policymakers, and consumers.

Concepts and Applications of Aquaculture Economics:

Cost Analysis: Aquaculture economics explores into the various costs involved in production, such as feed, labour, and infrastructure.

Feed costs, often the largest component (up to 70%), can be managed through improved feed conversion ratios or sourcing cheaper alternatives.

Labor costs, especially in non-mechanized settings, represent another significant expense.

Revenue Streams: Aquaculture operations generate revenue primarily through the sale of farmed products. Other potential revenue sources include government subsidies and ecotourism activities.

Profitability and Efficiency: Analyzing costs and revenues helps determine the profitability and efficiency of aquaculture enterprises. For instance, studying production functions in the short and long run helps optimize resource utilization and identify the most efficient production techniques.

Market Analysis: Understanding market trends and structures is vital for aquaculture farmers and policymakers to make sound decisions. This involves considering factors like market demand, competition from other producers and capture fisheries, and the potential for niche markets and value-added products.

Cost-Benefit Analysis: This is a crucial tool for evaluating the desirability and efficiency of aquaculture projects. It involves comparing the costs (including initial startup and operational expenses) with the projected revenues and other benefits over time. A positive Net Present Value (NPV) indicates economic desirability, meaning the project generates more economic benefits than costs when considering the time value of money.

Risk Management: Aquaculture operations face diverse risks, including biological, environmental, market, regulatory, and operational risks. Risk management strategies include diversification, insurance, implementation of best management practices, monitoring, surveillance, and collaboration among stakeholders.

Sustainability: Aquaculture economics plays a significant role in promoting sustainable practices, ensuring the long-term viability and profitability of the industry. Sustainable aquaculture benefits the environment through responsible resource management and can lead to increased productivity and access to premium markets for certified products.

Aquaculture economics provides a framework for understanding and optimizing the economic aspects of aquaculture, contributing to its sustainable growth and development as a crucial global food source.

By applying economic principles, stakeholders can make informed decisions, improve efficiency, manage risks, and ensure the long-term profitability and sustainability of aquaculture operations.

3-2 Cost and earnings of aquaculture systems carp culture, shrimp farming systems, hatcheries, Cost and earnings of fishing units and freezing plants

3.2.1 Cost and earnings of aquaculture systems- carp culture

Carp culture, a widely practiced form of aquaculture, involves raising various carp species in ponds or other confined water bodies. The costs and earnings associated with carp culture can vary significantly depending on factors like:

Intensity of the farming system: Low-input systems rely heavily on natural pond productivity, while high-input systems use substantial amounts of supplementary feed and fertilizer to maximize yield.

Location and market conditions: Regional differences in input costs (e.g., feed, labor), market demand for specific carp sizes, and prevailing fish prices can influence profitability. Scale of the operation: Small-scale, backyard farms will have different cost structures compared to larger commercial farms.

Management practices: Adoption of improved farming techniques, including disease prevention and management strategies, can impact production costs and ultimately, income.

1. Common Costs in Carp Culture:

a. Variable Costs: These costs fluctuate with the level of production.

Fish seed (fingerlings): The initial investment in stocking the pond.

Feed and fertilizer: Supplementary feed is often a major expense, especially in semi-intensive and intensive systems. Fertilizers are used to enhance natural productivity.

Labour: Hiring labour for pond preparation, feeding, monitoring, harvesting, and post-harvest activities.

Pond preparation: Costs associated with cleaning, repairs, liming, and pest control.

Water management: Pumping costs for filling or draining ponds, water quality monitoring.

Medicines and chemicals: Used for disease prevention and treatment, though minimal in well-managed systems.

b. Fixed Costs: These costs remain relatively stable regardless of the production level.

Lease amount or rental value of land: A significant fixed cost, particularly for those who lease ponds.

Interest on capital: Costs associated with initial investment in pond construction or renovation.

Depreciation of farm implements: Cost of wear and tear of equipment used.

Permanent labour: Salaries for permanent staff.

2. Potential Earnings in Carp Culture:

Sale of marketable fish: The primary source of revenue from carp farming.

Sale of fish seed: Some farmers may also engage in seed rearing and sell fingerlings to other farmers.

Value-added products: Processing carps into products like fish patties or fingers can create additional income streams, as demonstrated by the potential for carp processing to boost income by INR 39,000 per month from value-added products in a study from Punjab.

Integrated farming systems: Combining carp culture with other farming activities, like raising ducks or vegetables, can generate extra income and improve overall farm profitability.

Example: Cost-Benefit Analysis

To assess the economic viability of a carp farming operation, a basic cost-benefit analysis (CBA) can be performed. This involves comparing the total benefits (revenue from fish sales and other sources) with the total costs (both variable and fixed costs).

A key indicator in CBA is the **Net Present Value (NPV)**, which accounts for the time value of money. If the NPV is positive, it suggests that the project is economically desirable.

Benefit-Cost Ratio (BCR):

Another common economic indicator is the Benefit-Cost Ratio (BCR), calculated as:

$$\text{BCR} = \text{Total Returns} / \text{Total Costs}$$

A BCR greater than 1 indicates a profitable enterprise.

Example:

Consider a small carp farmer investing in improved management practices in Andhra Pradesh.

A study found that adopting composite fish culture (CFC) practices increased gross profit from Rs. 1,25,500 to Rs. 2,62,233 per hectare, resulting in a net profit of Rs. 1,44,067 per hectare and a BCR of 2.21, highlighting the profitability of such interventions.

Analyzing the costs and potential earnings through methods like cost analysis and CBA is essential for successful carp farming. Implementing best management practices can help farmers reduce costs, increase profitability, and contribute to the sustainable development of the aquaculture sector.

3.2.2 Cost and earnings of aquaculture systems - shrimp farming systems

Shrimp farming is a thriving aquaculture business with significant export potential and profitability, particularly in countries like India. It involves raising shrimp, primarily the white leg shrimp (*Litopenaeus vannamei*), in controlled environments like ponds or tanks.

1. Cost Components in Shrimp Farming:

Seed (Post Larvae): Initial investment in stocking the pond with shrimp larvae.

Feed: Shrimp feed, especially formulated commercial feed, is often the single largest cost component, accounting for a substantial portion of total expenses.

Electricity and Fuel: Used for water pumping, aeration, and other farm operations.

Labour: Hiring labour for pond preparation, feeding, monitoring, harvesting, and processing.

Medicines and Chemicals: Used for disease prevention, water quality management, and sanitation.

Pond Preparation and Maintenance: Includes expenses for pond digging, lining, and regular upkeep.

Other Costs: May include costs related to marketing, processing, and transportation.

2. Potential Revenue Streams in Shrimp Farming:

Sale of Harvested Shrimp: The primary source of income, with prices varying based on shrimp size and quality.

Value-Added Products: Processing shrimp into products like frozen or ready-to-cook items can enhance income.

Shrimp By-products: Income can be generated from utilizing shrimp shells, waste, and meal in the production of chitosan, animal feed, or organic fertilizers.

Example: Cost and Earnings Breakdown (per acre)

1-acre shrimp farm can potentially yield a significant profit margin with proper management. Below is a simplified example of costs and earnings (based on average estimates):

Expense Category :	Estimated Cost	(Per Acre)
Seed (Post Larvae)	₹30,000	– ₹40,000
Feed	₹1,20,000	– ₹1,40,000
Medicine & Probiotics	₹15,000	– ₹20,000
Labor & Maintenance	₹25,000	– ₹30,000
Total Cost	₹1.9 Lakhs	– ₹2.3 Lakhs
Revenue Category:		
Item		Value (Per Acre)
Selling Price (per kg)	₹350	– ₹450
Gross Revenue	₹ 5.5 Lakhs	– ₹ 7.5 Lakhs
Estimated Net Profit	₹3.6 Lakh	– ₹ 5.2 Lakhs

Adopting scientific farming techniques and proper biosecurity measures can help minimize risks and improve income.

3.2.3 Cost and earnings of aquaculture systems- hatcheries

Aquaculture hatcheries are essential components of the aquaculture value chain, providing the necessary seed (fry, fingerlings, or post-larvae) for grow-out operations. The economic viability of a hatchery depends on careful cost management and efficient production of high-quality seed.

Cost Components in Hatcheries:

1. **Fixed Costs:** These are costs that do not change with the level of production in the short run.

Land and Buildings: The cost of the land where the hatchery is located and the construction of the hatchery facility itself.

Equipment: Investment in tanks, pumps, filtration systems, aerators, incubators, and other specialized hatchery equipment.

Broodstock: The initial investment in the parent fish or shellfish used for breeding.

Depreciation: The cost associated with the wear and tear of buildings and equipment over time.

2. **Variable Costs:** These costs fluctuate with the level of production.

Feed (Live and Artificial): Includes specialized feeds for broodstock, larvae, and fry, such as live food like rotifers and microalgae, as well as formulated artificial diets.

Chemicals and Medicines: Used for water quality management, disease prevention, and treatment.

Water Management: Costs related to water sourcing, pumping, filtration, and heating/cooling to maintain optimal conditions for breeding and larval rearing.

Labor: Wages paid to skilled personnel for managing broodstock, larval rearing, water quality, and other hatchery operations.

Electricity and Fuel: Energy costs for pumps, aerators, and other equipment.

3. Potential Revenue Streams in Hatcheries:

Sale of Fish/Shrimp Seed: The primary source of revenue is the sale of high-quality fry, fingerlings, or post-larvae to grow-out farmers.

Genetic Improvement Programs: Some hatcheries may engage in selective breeding and genetic improvement programs to develop disease-resistant or fast-growing strains, fetching higher prices for their seed.

Technical Services and Training: Offering training programs or consulting services to farmers on hatchery management or seed quality can generate additional income.

Cost-Benefit Analysis for a Small-Scale Hatchery

A basic cost-benefit analysis can illustrate the economic viability of a hatchery. Consider a small-scale carp hatchery in India. Farmers paid Rs. 100-150 per 1,000 fish seed, while ResearchGate notes that a KVK-supported hatchery in Khordha district produced 6.2 crores spawn (62 million) annually. Assuming a slightly smaller hatchery producing 10 million fish seed (fry) per year:

Expense Category	Estimated Cost (INR/Year)
Fixed Costs (Buildings, Equipment, etc.)	₹50,000 – ₹100,000
Broodstock	₹10,000 – ₹20,000
Variable Costs (Feed, Labor, Power, etc.)	₹2,50,000 – ₹3.50,000
Total Cost	₹3.1 Lakhs – ₹4.7 Lakhs
Revenue Category	Estimated Revenue (INR/Year)
Sale of Fish Seed (10 million @ ₹75/1000)	₹7.5 Lakhs
Total Revenue	₹7.5 Lakhs

Estimated Net Profit: ₹4.4 Lakhs – INR 2.8 ₹ Lakhs.

4. Important Considerations for Hatchery Economics:

Seed Demand: Ensuring a steady market for the produced seed is crucial. Collaborations with Key local farmers or participation in government schemes can facilitate seed sales.

Technology Adoption: Utilizing modern hatchery technologies for broodstock management, larval rearing, and water quality control can improve efficiency and reduce risks.

Disease Management: Implementing strict biosecurity measures and adopting disease prevention strategies are vital to minimize losses and ensure the health of the seed.

Cost Control: Efficient management of feed costs (often a major component), labour, and energy consumption is essential for maximizing profitability.

Carefully managing costs, ensuring the quality of seed, and responding to market demands can make aquaculture hatcheries profitable and play a crucial role in supporting the growth of the aquaculture industry.

3.2.4 Cost and earnings of fishing units and freezing plants

Both fishing units and freezing plants are vital components of the seafood value chain, each with unique cost structures and revenue generation mechanisms influencing their economic viability.

3.2.4.1. Fishing units (e.g., Trawlers, Gillnetters)

Fishing units, from traditional non-motorized boats to modern trawlers, incur a range of costs and generate revenue through the sale of their catch.

Cost components

1. Fixed Costs:

Vessel and Gear: The initial capital outlay for the fishing boat and associated gear like nets, lines, etc.

Depreciation: Accounting for the wear and tear of the vessel and equipment over time.

Maintenance: Regular upkeep and repairs to ensure the vessel's seaworthiness and operational efficiency.

Insurance: Protecting against unforeseen events like accidents or damage.

Interest on Capital: The cost of borrowing funds to finance the vessel and equipment.

2. Variable Costs (per trip):

Fuel: A significant operational expense, especially for motorized and mechanized vessels.

Labour (Crew Wages): Payments to the crew, often including a share of the catch.

Ice: Essential for preserving the freshness of the catch onboard.

Food and Supplies: Provisions for the crew during fishing expeditions.

Bait: Used to attract fish, depending on the fishing method employed.

3. Potential earnings

Sale of Fish Catch: The primary source of income, heavily influenced by the volume and market value of the fish harvested.

Profitability drivers

Catch Efficiency: Maximizing the quantity of fish caught per unit of effort is crucial.

Fish Prices: Fluctuations in market prices for different species directly impact revenue.

Fuel Management: Optimizing fuel consumption and exploring alternative energy sources helps control operational costs.

Economic Efficiency of Fishing Method: Different fishing operations exhibit varying levels of profitability, as indicated by efficiency studies.

Policy and Regulation: Government policies related to quotas, fishing periods, and subsidies can significantly influence the economic performance of fishing units.

3.2.4.2. Freezing plants (seafood processing)

Seafood freezing plants process raw fish and shrimp into frozen products for domestic and international markets, generating revenue through sales while incurring processing and operational expenses.

Cost components**1.Fixed Costs:**

Land and Buildings: The cost of the processing facility and associated infrastructure.

Machinery and Equipment: Investment in processing lines, freezing units, refrigeration systems, and other machinery.

Depreciation: Accounting for the wear and tear of the plant, buildings, and equipment over time.

2.Variable Costs:

Raw Material (Fish/Shrimp): A major cost component, influenced by market prices and seasonal availability.

Labour: Costs associated with the workforce involved in sorting, cleaning, processing, packaging, and cold storage operations.

Energy: Electricity consumption for refrigeration, machinery operation, and lighting.

Packaging Materials: Costs for boxes, bags, and other packaging required for the finished products.

Water and Chemicals: Expenses for cleaning, sanitation, and water treatment.

Transportation: Costs related to transporting raw materials to the plant and distributing finished products to markets.

3. Potential earnings

Sale of Frozen Seafood Products: Generating revenue through the sale of various frozen fish and shrimp products.

Value-Added Products: Producing higher-margin products such as ready-to-cook items, fish fillets, or marinated shrimp.

By-products: Potential for income from the utilization of seafood by-products in other industries.

4. Profitability drivers

Raw Material Sourcing: Effective sourcing strategies and price negotiations for raw materials can significantly impact profitability.

Processing Efficiency: Optimizing processing steps, embracing automation, and minimizing waste reduce labour and energy costs.

Market Demand: Strong demand for specific frozen seafood products drives sales volume and revenue growth.

Value Addition: Creating higher-value products can increase profit margins and expand market reach.

Energy Management: Efficient use of energy, particularly for refrigeration and processing, is critical for cost control.

Quality and Safety: Meeting stringent food safety and quality standards is paramount for accessing export markets and building consumer trust.

3-3 Socio-economic conditions of fishermen in Andhra Pradesh, Role of Matsya fed

Socio-economic conditions of fishermen in Andhra Pradesh (AP) present a complex picture. While the state boasts a thriving fisheries sector with significant contributions to the state's economy and employment generation, supporting around 1.45 million people either directly or indirectly, the living conditions of many fishermen remain challenging.

1. Socio-economic conditions

Income and Poverty: Many fishermen in AP, particularly those involved in traditional fishing, struggle with low incomes and often fall below the poverty line.

Education and Health: Low levels of literacy are prevalent among fishing communities, impacting their awareness of hygiene and overall health. This can lead to increased incidences of health hazards and difficulty in accessing proper healthcare. Children in these communities reportedly suffer from various diseases like malaria, typhoid, and malnutrition.

Infrastructure and Facilities: Many fishing communities face inadequate infrastructure, including poor road connectivity, limited access to modern fishing equipment, and a lack of cold storage facilities. This restricts their ability to fetch fair prices for their catch and explore alternative income opportunities.

Challenges and Vulnerabilities: Environmental factors, such as the impact of climate change, natural calamities like floods and tsunamis, and overfishing, further exacerbate the challenges faced by fishermen. During fishing ban periods, they often face exploitative work environments and lack social security measures.

Livelihood Diversification: While fishing remains the primary occupation, there's a need to explore alternative livelihoods and integrate other activities like fish and prawn farming to improve the economic conditions of the community.

2. Role of Matsyafed

Matsyafed, the Andhra Pradesh State Co-operative Federation of Fishermen Societies, plays a crucial role in improving the socio-economic conditions of fishermen in the state. Its primary objective is to promote the production, procurement, processing, and marketing of fish and fishery products, with a focus on the holistic development of the fishing community.

Initiatives and activities of Matsyafed:**Financial Assistance and Credit Facilities:**

- Providing financial aid and subsidized loans to fishermen for procuring fishing implements like boats, outboard engines, and nets.
- Implementing schemes with assistance from the National Cooperative Development Corporation (NCDC) and other financial corporations.
- Organizing credit facilities at lower interest rates, including interest-free loans for fish vendors, which helps combat the high interest rates charged by private moneylenders.

Marketing Support:

- Organizing beach-level auctions to ensure fair prices for fish, especially benefiting the traditional sector.
- Establishing smart fish marts and value-added product facilities to improve income generation for fishermen and fisherwomen.

- Renovating fish markets and establishing ice plants to improve post-harvest handling and reduce losses.

Welfare Schemes:

- Operating a Production Bonus Scheme that encourages savings among fisherfolk by providing additional financial incentives.
- Implementing the Matsyafed Input Security Scheme (MISS) to provide assistance against damage or loss of fishing implements due to accidents or natural calamities.
- Participating in and supporting various government welfare schemes like the "Fishermen Welfare Scheme", which provides financial aid during fishing bans and other support, the "Deep Sea Fishing Policy", and housing and accident compensation schemes.

Capacity Building and Training:

- Providing training programs for fishermen on various aspects of fishery management, modern techniques, and sustainable practices.
- Empowering fisherwomen through training in post-harvest technology and value addition, which has led to increased income and improved socio-economic status.

Infrastructure Development:

- Supporting the development of infrastructure like fish landing centers, cold storage facilities, and processing units through government schemes and initiatives.

Matsyafed's efforts contribute significantly to improving the livelihood opportunities, financial security, and overall well-being of the fishing community in Andhra Pradesh. These interventions are crucial for addressing the challenges faced by the community and promoting a sustainable and prosperous future for the state's fisheries sector.

3-4 Contribution of fisheries to the national economy

Fisheries sector in India plays a vital role in the national economy, contributing significantly to food security, employment generation, exports, and rural development.

Key contributions:

1. Economic Growth and Contribution to GDP:

Significant GVA Contribution: The sector contributes approximately 1.09% to India's total Gross Value Added (GVA) at constant prices, demonstrating its substantial impact on the nation's economic output.

Boost to Agricultural GDP: Fisheries contribute around 6.72% of the total agricultural GVA, highlighting its importance within the broader agricultural sector.

Foreign Exchange Earnings: India is a leading seafood exporter, with shrimp being the largest export item. In 2023-24, India shipped 17,81,602 metric tonnes of seafood worth US\$7.38 billion, contributing significantly to foreign exchange reserves.

2. Employment Generation and Livelihoods:

Vast Employment Opportunities: The fisheries sector provides livelihoods to a significant number of people, including fishers, fish farmers, and those involved in processing, marketing, and allied industries. It supports around 1.45 million people directly or indirectly in Andhra Pradesh alone, and nationally the sector provides livelihood to about 25 million fishers and fish farmers at the primary level and twice the number along the value chain.

Supporting Coastal and Rural Communities: Fishing is a vital source of income and food security for millions in coastal and rural areas, particularly in remote regions where it may be the primary source of livelihood.

Empowering Women: Women play a central role in fish processing and marketing, gaining financial independence and skills through their involvement in the sector.

3. Food Security and Nutrition:

Affordable Protein Source: Fish is a cost-effective and nutrient-rich source of animal protein, playing a crucial role in mitigating hunger and addressing nutrient deficiencies in the population.

Meeting Growing Demand: As India's population continues to grow, the fisheries sector's ability to provide a sustainable food source becomes increasingly important.

4. Rural Development:

Economic Stability: Fisheries provide economic stability to rural areas, particularly those with limited agricultural options.

Supporting Allied Industries: The sector boosts industries such as aquaculture feed, fishing gear, and processing equipment, driving industrial growth and creating further economic opportunities.

5. Sustainable Development:

Focus on Responsible Practices: India's fisheries sector is increasingly prioritizing sustainable fishing practices and environmentally sound management programs to ensure the long-term health of fish stocks and marine ecosystems.

Government Initiatives: Schemes like the Pradhan Mantri Matsya Sampada Yojana (PMMSY) aim to boost fish production, infrastructure, and livelihoods while promoting sustainable practices and addressing challenges like climate change and overfishing.

Fisheries sector's multifaceted contributions are crucial for India's economic growth, food security, and sustainable development. Continued policy and financial support, combined with technological advancements and a focus on sustainability, can further unlock the sector's immense potential.

UNIT-IV FISHERIES EXTENSION

4-1 Fisheries extension scope and objectives, principles and features of fisheries extension education

Fisheries extension is a vital non-formal education system aimed at empowering fishers and fish farmers with the knowledge, skills, and resources necessary to enhance their livelihoods, improve production efficiency, and ensure the sustainable development of the fisheries sector. It plays a crucial role in bridging the gap between research institutions and the end-users of fisheries technologies.

1. Scope of Fisheries Extension

The scope of fisheries extension is broad and encompasses various areas, including: Technology Transfer: Disseminating information on improved farming practices, species selection, water quality management, disease control, and post-harvest handling techniques.

Capacity Building: Providing training and educational programs to enhance the skills and knowledge of fishers and fish farmers in various aspects of fisheries and aquaculture.

Sustainable Practices: Promoting environmentally friendly techniques like conservation management, reducing by-catch, and adapting to climate change impacts.

Entrepreneurship Development: Fostering entrepreneurial skills and promoting fisheries as a viable business model.

Community Mobilization: Facilitating community-level participation in fisheries management and conservation efforts.

Addressing Socio-Economic Issues: Working with fishing communities to address issues related to food security, poverty reduction, and women's empowerment.

2. Objectives of Fisheries Extension

Improve Socio-Economic Conditions: To empower fishers and fish farmers to improve their socioeconomic condition and quality of life by adopting better practices, resulting in increased fish production and income.

Knowledge and Skill Enhancement: To bring about desirable changes in human behaviour, encompassing changes in knowledge, skills, and attitudes towards modern fisheries practices.

Technology Adoption: To facilitate the transfer and adoption of useful and practical information and technologies from research institutions to the grass-root level.

Problem Solving: To provide appropriate solutions to the problems faced by fishers and fish farmers, drawing upon scientific knowledge and local experiences.

Promoting Participation: To facilitate community-level participation in the planning, development, and implementation of fisheries projects.

3. Principles of Fisheries Extension Education

Fisheries extension education is guided by the following core principles,

Grassroots Approach: Extension programs should originate from local needs and conditions, involving community members in identifying problems and finding solutions.

Cooperation and Participation: Encouraging active participation and cooperation among fishers, extension workers, researchers, and other stakeholders.

Voluntary Education: Extension is a non-formal, voluntary process where learners choose to participate and adopt new practices based on their perceived benefits.

Learning by Doing: Emphasizing hands-on demonstrations and practical exercises to facilitate learning and skill development.

Felt Needs: Focusing on the felt needs and interests of the target audience as the starting point for extension programs.

Cultural Sensitivity: Adapting extension methods and approaches to suit the local culture, traditions, and customs of fishing communities.

4. Features of Fisheries Extension Education

Non-Formal Education: It's an organized, systematic educational activity outside the formal education system, targeting specific sub-groups like fishers and fish farmers.

Knowledge and Skill Transfer: It involves transferring knowledge and skills from Institutions to the grass-root level through various communication methods.

Focus on Behaviour Change: Extension aims to bring about desirable changes in the knowledge, skills, attitudes, and behaviours of learners.

Two-Way Communication: Effective extension involves a two-way flow of information between extension workers, researchers, and the fishing community.

Adaptability and Flexibility: Extension programs and methods need to be flexible and adaptable to suit local conditions and evolving needs.

Participatory Approach: Involving fishers and fish farmers in the planning, implementation, and evaluation of extension activities promotes ownership and ensures relevance.

By adopting these principles and features, fisheries extension education can play a pivotal role in empowering fishing communities, boosting fish production, and ensuring the sustainable development of the fisheries sector

4.2 Fisheries extension methods and rural development

Fisheries extension services employ various methods to empower fishing communities and contribute to rural development. These methods can be broadly categorized based on the nature of contact with the target audience.

1. Individual contact methods

- **Farm and Home Visits:** Extension workers directly engage with fishers and fish farmers at their farms or homes to provide tailored advice and guidance on issues like pond management, disease control, or species selection.
- **Office Visits:** Fishers and fish farmers can visit extension offices to seek information, advice, or assistance on specific problems.
- **Personal Letters and Telephone Calls:** These methods facilitate communication when face-to-face interaction is not feasible, allowing extension workers to provide information or answer queries remotely.
- **Informal Discussions:** Building rapport and trust through informal interactions allows extension workers to understand the needs and concerns of fishers and farmers in a more relaxed setting.

2. Group contact methods

Demonstrations: Field demonstrations showcase improved technologies or practices in a practical setting, allowing fishers and farmers to observe and learn by doing.

Training and Workshops: Organized training programs and workshops provide in-depth knowledge and skills on specific aspects of fisheries and aquaculture.

Group Discussions and Meetings: These forums facilitate knowledge sharing, problem-solving, and collective decision-making among fishers and farmers, fostering a sense of community ownership.

Study Tours and Exposure Visits: Organizing visits to successful fish farms or processing units allows fishers and farmers to witness best practices firsthand and learn from the experiences of their peers.

3. Mass contact methods

Radio and Television: Utilizing mass media like radio and television to disseminate information to a large and diverse audience.

Publications and Newsletters: Providing printed materials like brochures, newsletters, and farm publications to convey information to a wider audience.

Campaigns and Exhibitions: Organizing campaigns and exhibitions to create awareness about specific issues or technologies among a large number of people.

4. 2.1 Role of fisheries extension in rural development

Fisheries extension plays a crucial role in rural development by addressing various challenges and empowering fishing communities.

Improved Livelihoods and Income: By promoting better farming practices and technologies, extension services help fishers and fish farmers increase their production and income, leading to improved living standards.

Poverty Reduction: The enhanced income from improved fisheries practices contributes to poverty reduction in rural fishing communities.

Food Security and Nutrition: Fisheries extension promotes the production of nutritious fish, a valuable and affordable source of protein, thus addressing food security and nutritional needs, especially in rural areas.

Employment Generation: The growth in fisheries and aquaculture, fuelled by extension efforts, creates additional employment opportunities within the sector and related industries.

Technology Adoption and Innovation: Extension services facilitate the transfer of knowledge and technology from research institutions to the field, enabling fishers and farmers to adopt modern practices like bio floc systems and recirculating aquaculture systems (RAS).

Sustainable Practices and Resource Management: Extension promotes responsible fishing and aquaculture practices, such as bycatch reduction devices (BRDs), to ensure the long-term sustainability of the fisheries sector and conserve aquatic ecosystems.

Community Mobilization and Empowerment: Fisheries extension encourages the formation of self-help groups (SHGs) and cooperatives, promoting collective action and empowering communities to participate in decision-making and resource management.

Entrepreneurship Development: Extension fosters entrepreneurial skills and promotes fisheries as a viable business model, encouraging individuals to start and manage fish farms or related enterprises.

By adopting these extension methods and focusing on the aforementioned objectives, fisheries extension significantly contributes to the overall development of rural areas by improving the lives of fishing communities and promoting a sustainable and thriving fisheries sector.

4-3 Adoption and diffusion of innovations

Adoption

Adoption is the decision by an individual or a group (e.g., fishing community, cooperative) to fully and regularly utilize an innovation as the preferred course of action.

Diffusion

Diffusion is the process by which an innovation spreads over time through various communication channels among members of a social system (e.g., fishing community, farmer groups).

Elements of diffusion are:

- **The Innovation:** The new idea or practice itself.
- **Communication Channels:** The means through which information about the innovation is transmitted, such as extension activities (training, demonstrations,

workshops), word-of-mouth among fishers, mass media, publications, digital platforms, and private sector initiatives.

Stages of innovation adoption

Fish farmers and fishers typically go through a series of mental stages before adopting an innovation:

1. **Awareness/Knowledge:** Becoming aware of the innovation but lacking detailed information.
2. **Interest/Persuasion:** Developing interest and actively seeking more information about the innovation.
3. **Evaluation/Decision:** Mentally evaluating the innovation's potential benefits and risks in their specific context and deciding whether to try it.
4. **Trial/Implementation:** Testing the innovation on a smaller scale to gauge its effectiveness and suitability for their situation.
5. **Adoption/Confirmation:** Deciding to implement the innovation on a full scale and use it consistently as the best available option.

4.3.1 Adopter categories

Individuals adopt innovations at varying rates. Based on their innovativeness, they can be categorized as:

1. **Innovators:** Venturesome and eager to try new ideas, often risk-takers and connected to sources of information.
2. **Early Adopters:** Opinion leaders who adopt after innovators and are influential within their communities, serving as role models for others.
3. **Early Majority:** Deliberate individuals who adopt new ideas just before the average member of the social system.
4. **Late Majority:** Individuals who adopt only after the majority have tried the innovation, often due to increasing benefits or social pressure.
5. **Laggards:** Traditional and resistant to change, often the last to adopt an innovation, and typically more reliant on traditional sources of information.

4.3.2. Role of fisheries extension in innovation diffusion

Fisheries extension services are crucial in promoting the adoption and diffusion of innovations.

They include:

- **Knowledge Dissemination:** Educating fishers and fish farmers about sustainable practices, advanced technologies (e.g., bio floc systems, RAS), and improved management techniques.
- **Capacity Building:** Providing training programs to enhance skills in areas such as seed production, feeding techniques, disease management, and sustainable fishing methods.
- **Facilitating Access to Resources:** Connecting fishers to input suppliers, credit facilities, market information, and other support services that enable them to adopt innovations.
- **Demonstrating Benefits:** Establishing demonstration centres or conducting field trials to showcase the practical application and benefits of new technologies and practices.
- **Fostering Collaboration:** Encouraging collaborations among various stakeholders, including government agencies, NGOs, private sector, research institutions, and local communities, to promote technology transfer and adoption.

Factors influencing adoption and diffusion

- **Characteristics of the Innovation:** The perceived benefits (relative advantage), ease of use (complexity), compatibility with existing practices, trialability, and observability of the innovation significantly impact its adoption.
- **Socio-economic Factors:** Education level, income, farm size, access to information, and financial resources play a vital role in fish farmers' and fishers' ability to adopt new technologies.
- **Extension Programs:** The effectiveness of extension services, frequency of extension contacts, and use of various communication channels influence adoption rates.
- **Cultural and Social Norms:** Traditional beliefs, community structures, and social networks can influence the acceptance or rejection of innovations.
- **Infrastructure and Market Access:** The availability of infrastructure like roads, electricity, and cold storage facilities, as well as access to markets, can either facilitate or hinder the adoption of innovations.
- **Policy and Regulatory Frameworks:** Government policies, subsidies, and regulations can significantly influence the adoption of new technologies and practices.

UNIT-V TRANSFER OF TECHNOLOGY

5-1 ICAR programs salient features of ORP, NDS, LLP, IRDP, ITDA, KVK, FFDA, FCS, FTI, TRYSEM

Salient features of the ICAR programs and other relevant schemes, specifically in the context of their application and relevance to the fisheries sector:

1. Operational Research Project (ORP):

Focus in Fisheries: Testing and demonstrating new aquaculture and fisheries technologies in actual fishing communities or areas. Examples include demonstrating new fish farming methods, disease control techniques, or post-harvest technologies at the community level.

Community Action: Encourages the formation of groups and cooperatives among fishers to collectively adopt and implement these technologies.

Problem Identification: Identifies constraints faced by fishing communities in adopting new technologies and provides feedback to researchers and extension agencies.

2. National Demonstrations Scheme (NDS):

Frontline Demonstrations: Conducts demonstrations of new and improved fisheries technologies on the fields or farms of fishers to showcase their effectiveness.

Technology Validation: Helps validate the production potential and economic viability of new fisheries technologies in real-world conditions.

Integration with KVKs: Now integrated with KVKs, enhancing their role in disseminating new technologies in the fisheries sector.

3. Lab to Land Programme (LLP):

Targeting Small-Scale Fishers: Focuses on transferring technologies to small and marginal farmers, including landless labourers involved in fisheries, particularly from Scheduled Castes and Tribes.

Direct Scientist Involvement: Scientists from ICAR institutes and agricultural universities directly engage in the program, providing technical guidance and support.

Income Diversification: Promotes the adoption of integrated farming practices, such as combining fish culture with livestock or poultry, to diversify income sources.

Integration with KVKs: Like NDS and ORP, LLP is now integrated with KVKs to strengthen technology transfer efforts.

4. Integrated Rural Development Programme (IRDP):

Poverty Alleviation in Rural Fisheries: Aims to improve the living conditions of rural households, including fishing communities, by providing self-employment opportunities and skill development programs.

Financial Support: Offers financial assistance, subsidies, and credit to rural entrepreneurs in the fisheries sector.

Multi-sectoral Approach: Addresses broader aspects of rural development, such as access to healthcare, education, and infrastructure, which can benefit fishing communities.

5. Integrated Tribal Development Agency (ITDA):

Tribal Fisheries Development: Facilitates the socio-economic development of tribal communities in scheduled areas, often focusing on fisheries and aquaculture as key livelihood activities.

Resource Management: Promotes sustainable management of natural resources, including water bodies, and supports initiatives for improving fisheries productivity in tribal areas.

Skill Development and Training: Offers vocational training and skill upgradation programs for tribal youth in fisheries-related trades.

6. Krishi Vigyan Kendra (KVK):

District-Level Extension Hub: Acts as a district-level institution for technology assessment, refinement, and demonstration in fisheries and other allied sectors.

On-Farm Testing and Demonstrations: Conducts on-farm trials (OFTs) and frontline demonstrations (FLDs) to validate and showcase new fisheries technologies.

Training and Capacity Building: Organizes training programs for fish farmers, extension functionaries, and rural youth on various aspects of fisheries and aquaculture.

Role in Aquaculture Development: Plays a key role in developing and popularizing small-scale aquaculture technologies suitable for local conditions, including ornamental fish culture and integrated farming systems.

7. Fish Farmers Development Agency (FFDA):

Freshwater Aquaculture Promotion: Specifically focused on promoting freshwater aquaculture development by providing technical, financial, and extension support to fish farmers.

Financial and Input Support: Offers subsidies/grants for pond construction/renovation and input supplies (fish seed, feed, fertilizer).

Training Programs: Organizes training programs for fish farmers to disseminate improved fish farming practices.

Impact on Production and Income: FFDA programs have contributed significantly to increasing fish production and improving the income of fish farmers.

8. Fisheries Cooperative Societies (FCS):

Empowering Fishermen: Facilitates collective action among fishers, enabling them to reduce costs, access credit and subsidies, and improve their marketing capabilities.

Value Chain Integration: Involves in various aspects of the fisheries value chain, from capture and culture to processing and marketing.

Modernization and Skill Development: Helps fishers adopt modern techniques and technologies, improve their skills, and enhance their overall livelihoods.

Strengthening Cooperative Movement: Government initiatives like the plan for strengthening the cooperative movement support the establishment of new primary fisheries cooperative societies to deepen their reach at the grassroots level.

9. Fisheries Training Institute (FTI):

Specialized Fisheries Training: Provides training and educational programs specifically for the fisheries sector, covering areas like fisheries technology, biology, fishing vessel engineering, and more.

Capacity Building for Fisherfolk: Offers short-term courses and extension training programs for fishermen, fish farmers, and other stakeholders.

Manpower Development: Contributes to human resource development in the fisheries sector by providing specialized training and education.

10. Training of Rural Youth for Self-Employment (TRYSEM):

Skill Development for Rural Youth: Aims to provide technical and entrepreneurial skills to rural youth from below-poverty-line families, enabling them to take up self-employment or wage employment.

Opportunities in Allied Sectors: Offers training in various trades related to agriculture and allied sectors, including fisheries, creating opportunities for rural youth in the sector.

Integration with IRDP: A sub-scheme of IRDP, aiming to improve the economic conditions of rural youth through skill development and self-employment initiatives.

5-2 Training meaning, training vs. education and teaching

In the realm of fisheries development and extension, the terms "training," "education," and "teaching" are interconnected yet distinct concepts, each playing a crucial role in enhancing the capacity of individuals and communities involved in the sector.

Training in Fisheries

Training in fisheries refers to the structured process of acquiring specific skills and knowledge to improve performance in fisheries-related tasks and activities. It is focused and designed to provide individuals with the practical abilities required to excel in specific jobs or roles within the fisheries value chain.

Learning how to operate a specific type of fishing gear effectively.

Mastering techniques for fish handling and preservation to ensure quality and safety.

Developing skills in aquaculture pond management, including water quality monitoring and disease prevention.

Acquiring expertise in fish processing and value addition techniques.

Training vs. Education vs. and Teaching in Fisheries

Feature	Training	Education	Teaching
Focus	Specific skills and job performance	General understanding and knowledge base	The act of imparting knowledge and skills

Duration	Usually shorter, designed for specific needs	Generally longer-term, building a broad foundation	A process that can occur within both training and education
Outcome	Improved performance and productivity in specific tasks	Development of reasoning, judgment, and critical thinking skills	Transfer of knowledge and skills from teacher to learner
Example in Fisheries	Learning how to use a fish finding sonar	Understanding the principles of fisheries biology and management	An extension worker showing fishers how to construct a fish pond

Training is akin to learning how to effectively perform specific tasks or roles within the fisheries sector, such as operating fishing gear or managing a fish farm.

Education in fisheries provides a broader understanding of the principles of fisheries science, management, and conservation, enabling individuals to make informed decisions and adapt to changing conditions.

Teaching is the act of imparting knowledge and skills related to fisheries, whether in a formal educational setting or through hands-on training sessions.

Relationship:

These three concepts are not mutually exclusive and often complement each other. A well-rounded fisheries professional requires a combination of all three. For example, a fisheries extension program might involve:

Teaching the theoretical principles of fish farming to farmers.

Providing training on specific techniques like pond preparation or feeding management.

Offering education on broader topics such as sustainable fishing practices or market trends to empower them to make informed decisions for their businesses.

By understanding the distinct roles of training, education, and teaching in fisheries, extension programs and educational institutions can effectively equip individuals with the necessary knowledge, skills, and broader understanding to contribute to a sustainable and thriving fisheries sector.

5-3 DAATT centres and their role in tot programs, video conferencing, education of farmers through print and electronic media

DAATT Centres and their role in TOT programs, video conferencing, and educating farmers through print and electronic media, with respect to fisheries in India

District Agricultural Advisory and Transfer of Technology Centres (DAATTCs) are district-level units, established in all district headquarters in Andhra Pradesh, to facilitate the transfer of agricultural technologies from research institutions to farmers. While primarily focused on agriculture, their role extends to allied sectors like fisheries, playing a crucial part in the Transfer of Technology (TOT) programs and farmer education.

Role of DAATTCs in TOT programs (fisheries)

Assessment and Refinement: DAATTCs assess and refine fisheries technologies developed by research institutions, evaluating their suitability for local conditions and farming situations.

Capacity Building: They organize training programs and demonstrations to equip fish farmers and extension personnel with the necessary knowledge and skills in fisheries and aquaculture.

Expertise: DAATTCs provide scientific expertise to line departments involved in fisheries, assisting them in conducting training programs for officials, farmers, and input agencies.

Field Diagnostic Visits: They conduct field diagnostic visits to identify problems faced by fish farmers and provide scientific solutions.

Linkages: DAATTCs establish linkages with fisheries research institutes and other district units to facilitate the flow of information and technology transfer.

5.3.2 DAATTCs and video conferencing (fisheries extension)

Considering the increasing use of Information and Communication Technologies (ICTs) in agriculture extension, it's reasonable to infer that DAATTCs, as technology transfer centers, would likely leverage video conferencing for:

Training of Trainers (TOT) Programs: Facilitating remote training for fisheries extension personnel and resource persons.

Farmer Advisory Services: Connecting fish farmers with subject matter specialists for remote consultations and problem-solving.

Knowledge Sharing: Organizing online workshops or webinars for fish farmers on various fisheries topics.

Research-Extension Linkages: Connecting with fisheries research institutions for collaborative discussions and technology updates.

5.3.3 Education of farmers through print and electronic media (fisheries)

DAATTCs play a role in utilizing both traditional and modern media for farmer education in fisheries.

Print media

Publications: Developing and distributing brochures, leaflets, and other print materials with information on improved fisheries practices, suitable species for local conditions, pond management, disease control, and post-harvest techniques.

Newspapers and Magazines: Publishing articles and success stories related to fisheries in local newspapers and magazines to reach a wider audience.

Electronic media

Radio and Television: Collaborating with radio and television channels, including DD Kisan and regional Kendras, to produce and broadcast programs on fisheries-related topics. PIB highlights the use of these platforms to educate farmers on improved agricultural technologies.

Mobile Apps and Digital Platforms: Utilizing mobile apps and digital platforms like Kisan Sarathi to provide real-time information, advisories, and connect fish farmers with experts.

Social media: Using platforms like YouTube and Facebook for disseminating fisheries information, tutorials, and success stories.

Video Marketing: Creating and sharing videos on topics like fish processing, preservation, and value-added products, potentially using platforms like YouTube, which is the second largest search engine.

Conclusion: DAATTCs play a crucial role in fisheries extension by facilitating the transfer of technology, building the capacity of fish farmers and extension workers, and leveraging various communication channels, including print and electronic media, to disseminate information and educate the fishing community.

While specific details on video conferencing use in fisheries are limited, their involvement in TOT programs and the broader trend towards digital tools suggest they are likely to utilize this technology to enhance their outreach and impact.

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