3.2.2 SUB-MODULE 2. CAPTURE FISHERIES

Introduction

The fisheries resources of Kenya are distributed within the inland freshwater bodies and the Exclusive Economic Zone (EEZ) within the Indian Ocean. The marine and inland water fisheries are distinct in geographical scope, operations, and markets.

Inland fisheries are defined and managed based on ecosystems, water bodies, and species, while the classification of marine fisheries is based on fishing gear and their operations, target species, and geographic scope. Kenya's fishing industry contributes about 0.5% of the national GDP and about 2% of the national export earnings. The industry employs over 60,000 fishers directly and an estimated 1.2 million people directly and indirectly within the fishing, production, and supply chain. This income and livelihood are mainly supported by the freshwater Lakes Victoria, Turkana, Naivasha, Baringo, Rivers Tana, Athi-Sabaki, Nzoia, Yala, and man-made dams, as well as the coastal and open sea ecosystems.

The main challenges facing Kenya's fishery sector include environmental change and variability, invasive species, overfishing, declining stocks, and post-harvest loss. Management interventions developed over the years include the introduction of co-management structures mainly the Beach Management Units (BMUs) and the Community Conservation Areas (CBCAs) mandated with the management of fishing operations and conservation of the local environment, and the development and implementation of fisheries management plans at the local level.

Capture fisheries production (metric tons) in Kenya was reported at 129,229 tons in 2020, according to the World Bank collection of development indicators, compiled from officially recognized sources. Kenya - Capture fisheries production (metric tons) - actual values, historical data, forecasts, and projections were sourced from the World Bank in December of 2022.

This sub-module covers seven topics namely;

1. Types of Fish Caught in Kenya
2. Fishing Methods Used in Kenya
3. Fish Processing Practices
4. Fish Preservation Techniques
5. Fish Market and Marketing
6. Importance of the Fishing Industry
7. Challenges facing fishing in Kenya

Topic 1: Types of fish caught in Kenya

Fishing is the extraction of aquatic life. It involves catching fish and other aquatic life like shrimp, lobsters, and crabs, etc. Fishing is carried out in fresh water and marine water bodies. This is both from fresh water and sea. Freshwater bodies include streams, rivers, lakes, ponds, and swamps while Marine fishing is done in salty water grounds like the Indian Ocean and the Mangrove swamps around Zanzibar and Pemba, Mombasa, and Lamu. Thus the type of fish caught in Kenya in the two sources are as follows:

There are those that are found close to the surface (pelagic fish) of the lake or ocean. These include Tilapia, Nile perch, Dagaa, and Haplochromis in freshwater and Mackerel, and Sardines, and Anchovy in marine fisheries.

While those that are found deep in the water (demersal fish) or at the bottom (crustacean fish) e.g. shrimps, crabs, and lobsters in marine fisheries.

Fishing in Kenya

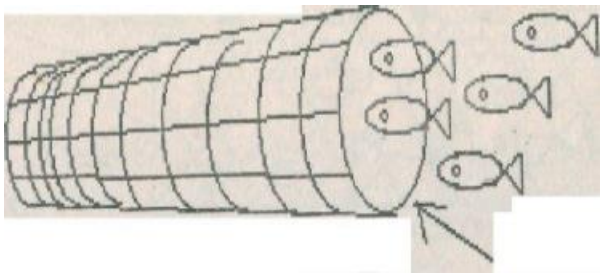
- Freshwater fishing grounds in Kenya include; - Lake Victoria, Lake Baringo, Lake Turkana, River Athi, Tana, and Galana, and fish ponds at Nyanza, in the central, and western provinces at Homa Bay.
- Marine fishing grounds are centered only on the coast. These include the Malindi fisheries, Lamu, Mombasa, and South Coast fisheries. Today, Kenya is the leading exporter of fish products in East Africa. Such products include: - Fresh or Frozen fish, Fish meal, Fish oil, canned fish, and Salted, smoked, and dried fish.
- Some lakes in East Africa are too salty to contain fish. Such Lakes are barren, they include: - Magadi, Elmenteita, and Natron etc.

Table 3.2.1 presents the type of fish captured from both freshwater and marine sources, giving the English and local names.

Topic 2: Fishing methods used in Kenya

These are either traditional or modern methods;

Traditional Methods are mainly used for small-scale fishing mainly for home consumption and a little surplus for sale e.g. Hooks, Basket traps, Spears, and use of arrows.

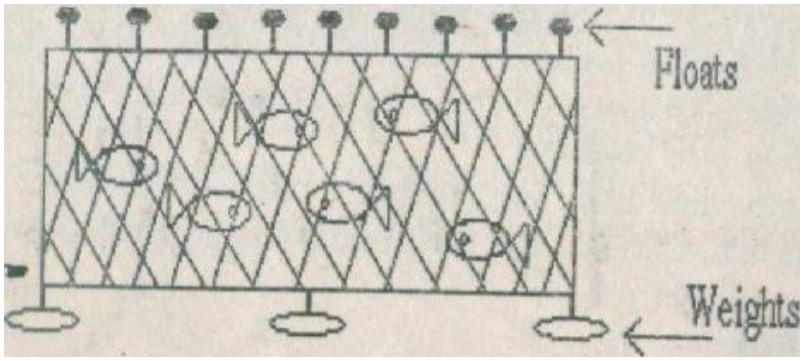


Traditional method

E.g. **use of a basket trap**: A fisherman gets into a boat/canoe that is stationed in the water. He uses a cone-shaped basket that is placed in swiftly moving water e.g. along rivers or a stream. When the fish enters the basket, it is trapped and then scooped out of the water into the boat.

Modern Methods are mainly used for large-scale or commercial fishing.

- **Gill Netting:** This is the most used method for commercial fishing in East Africa. It involves laying a Net vertically in the water. The Net is held vertically by floats on top and weights at the bottom. The nets are left in the water for some time and when the fish try to swim through the net, they are caught by their gills and fins in the net. The Net is then pulled out of the water.

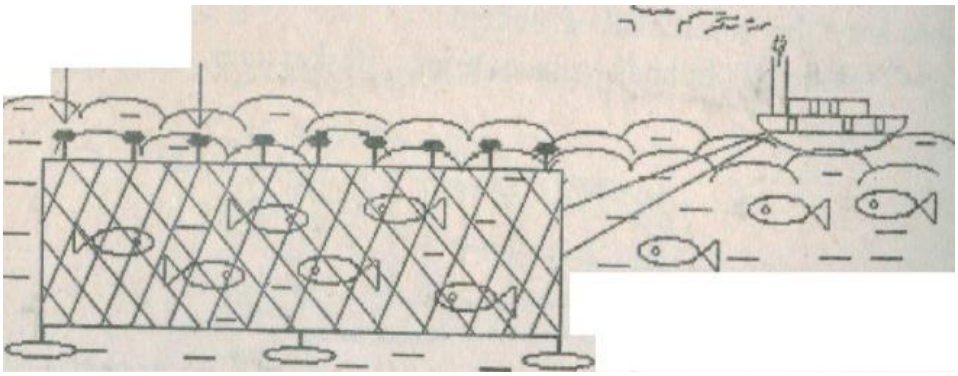


Gill netting

Gill netting is commonly used on Lake Victoria to catch Tilapia. It is divided into two methods which are;

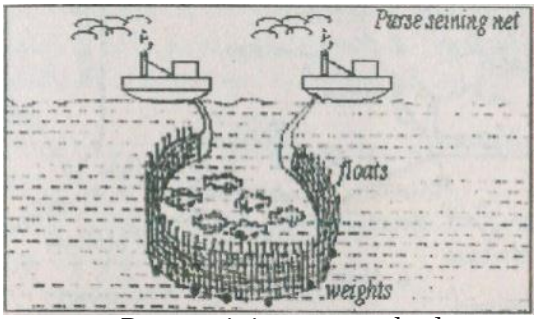
(a) Beach seining: This method involves nets being operated from the shore/ beach. A fisherman in a canoe/ boat stretches the net into the water to encircle a shoal of fish near the shoreline. The nets have weights at the bottom and float on top to keep them vertical in the water. The fishermen pull the net from both sides and the fish catch is poured at the beach. Used to catch tilapia, catfish, and silverfish.

(b) Drift netting: This involves the use of a much bigger net that is connected to a moving boat called a drifter. The net is held vertically in the water by floating on top and weights down. The fish try to swim through the net and are trapped by their gills as a motorboat slowly moves the net. Used to catch anchovy and sardines on the Indian Ocean.



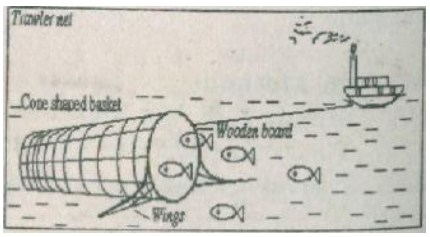
Drift netting

- **Purse seining net method:** This involves two boats called seine boats. The net is laid out in a circle to surround a shoal of fish attracted by an echo sounder. At the bottom of the net, there are rings attached through which the ropes pass. Once the Net has been laid in a circular pattern the ropes are pulled so as to close the bottom of the net to make it bag-shaped to trap all the fish it has surrounded. The Net is then drawn into a boat and the fish is removed. Used to catch sardines, anchovy, mackerel, tilapia and bagrus.



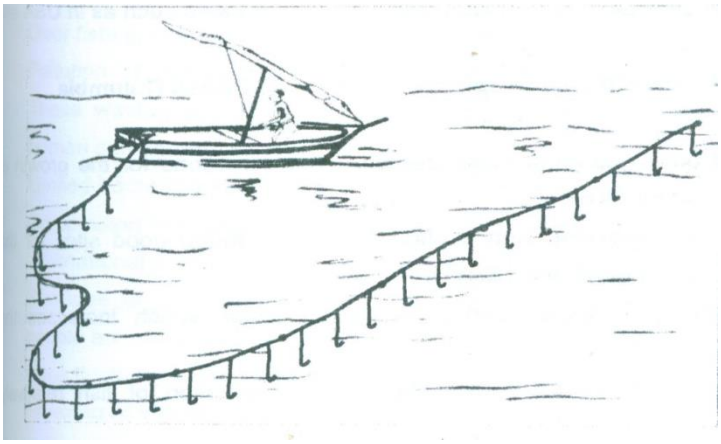
Purse seining net method

- **Trawler method:** this involves the use of a trawl net dragged by a boat called a trawler. The net forms a wide cone-shaped bag whose mouth is kept open by wooden otter boards. The Trawl is pulled along the sea bed by a boat and fish is trapped inside the bag along its way. The net is dragged in water with smooth sea beds. It's used to catch fish such as cod, sardines, mackerel, and anchovy.



Trawler method

- **Long Lining:** In this method, a long rope that has floats and hundreds of baited hooks is set vertically in the water. The rope is pulled by a boat and it's sunk deep in rocky waters where the nets can be damaged. The fish is caught as it struggles to eat the bait on the hook. Fish species caught with this method include Nile perch (freshwater) and cod (marine fisheries).



Long lining

- Lampara method/ lamp attraction method: It is where bright lights (Lamps) are used to attract fish at dark nights and then trapped. The lamp is held over a floating object e.g. a rock. Fish is attracted to the light and a scoop net is used to trap a shoal of fish. This method is used to catch small fish like Dagaa from Lake

Tanganyika, haplochromis from Lake Kyoga, Silverfish from Lake Victoria, and sardines in the Indian Ocean.

- **Lobster trap:** a metallic cage is put in water. Inside the cage, there is the bait that attracts the fish. The fish enters the cage to eat the bait and once it enters the cage, it can't come out. The trapped fish is then removed from the cage by divers. Cages are used in rocky water to trap sea animals near the sea bed e.g. lobsters, oysters, shrimps, and crabs.

Topic 3: Fish processing practices

Fish processing refers to a series of actions applied by the fisher folk and other actors of the value chain to preserve their fish products from the time fish is caught until it reaches the consumer. It is advisable for the fisher folk and other beneficiaries to process their fish products in a proper place with good hygienic conditions. In addition, they should avoid using sharp objects (other than appropriate knives) and poisonous substances. Prior to fish processing, fish are sorted/graded, washed, and cleaned, then heads, tails, scales, fins, and slimes are removed fish are then gutted and cut into steaks/pieces. Equipment and facilities used for processing fish should not get in contact with processed waste products. In addition, any waste products from fish processing areas/centres must be disposed in a friendly way that does not harm the environment either aquatic ecosystem (water) or terrestrial ecosystem (land). Fish waste should be kept and get rid of in a closed place that does not allow flies, rats, and other, pests to breed and be a nuisance. Finished products must be packaged and handled in a careful way to avoid contamination.

Good Fish processing practices

Good fish processing practices refer to appropriate skills and knowledge being used by the (fisher-folk and fish processors) in processing fish products after harvesting. Hence good fish processing ensures a higher quality fish product. The required condition for good fish processing includes the followings:

- Fish that is processed should be fresh and in good condition;
- Fish should be washed in clean water thoroughly to remove blood, slime and scales
- Fish are sorted/graded accordingly, large fish are separated from small fish;
- Fish processing should be done in a proper place where there is no chance for bacteria growth. Equipment and utensils used for fish processing should be kept clean in good condition;
- Waste fish products should be kept in a closed place that does not allow flies, rats and other pests to breed and be a nuisance.
- Any waste products from processing must be disposed of in way which does not harm the environment either the water or land.
- Finished products must be packaged and handled in a careful way to avoid contamination and so they remain safe to eat.
- Finished products are packaged and handled in a careful way

Good hygiene practices and requirements

Personal hygiene practices and hygienic production processes are equally important to ensure that fish products are safe to eat. Fish products should be washed in clean water and remove any chemical or biological hazards that may be present. The concept of hygienic behaviour consists of simple, hygienic actions that individual fishers and people who handle fish products can adopt. These principles apply both to the people who handle the catch and the equipment and surfaces that the fish products come into contact with. The basic hygiene concepts covered include:

Personal hygiene rules for people handling the catch along the supply chain, from capture or harvest to consumption, including personal hygiene and dress codes; Production hygiene, which covers the things that come into contact with fish products. All these objects must be regularly cleaned to avoid contamination of the fish products. Simple steps that can prevent pathogens from contaminating fish products include avoiding fishing in polluted waters, keeping the boat and fishing gear clean, observing good personal hygiene and keeping animals away from the boat. Keeping body clean and wearing clean clothing before starting work or fishing, washing hands with soap and clean water after going to the toilet, being aware of personal appearance and keeping fingernails and hair well-trimmed are all examples of good personal hygiene. The following should not be permitted in areas where fish products are handled: Smoking; · Spitting; · Chewing or eating; · Sneezing or coughing over the product; · Wearing personal effects such as jewelry, watches, pins or other items that, if dislodged, may pose a threat to the safety.

Fishing boats hygiene requirements

Before leaving to the fishing ground, the boats/canoes should meet the following requirement Safety and eficiency of the fishing boat/canoe for operation · Fisher-folk should maintain personal hygiene in the boat/canoe · The boat and equipment should be thoroughly cleaned using clean water and approved detergent, · The boat and equipment should be inspected for damage and necessary maintenance carried out. · Landing site water should not be used for cleaning, as this water will be polluted; · Avoid animals into the fishing boat and using the boat for transport of products other than fish products because it increases the contamination risks; · Fishing boats should be used for fishing only; · Use tap water from the public water supply or clean well/borehole water that has been treated with chlorine to clean boats and equipment; · Do Not use water that may be contaminated with sewage; · Allow the fishing boat and equipment to sun dry.

Icing

Ice is defined as a cooling medium for fish. It has a great role in preserving its flavor. It is important to ice fish throughout the process of preparing fish. During the transport, the best way to store fish is to place it in cool boxes full of ice. The amount of ice required to cool fish depends on the insulation options, types of fish species, ambient temperatures and time of storage. Ice can be produced in different shapes; the most commonly utilized in fish preservation are flakes, plates, tubes and blocks. Ice must be manufactured either from freshwater or drinking quality i.e. potable water. Ice intended for the preservation of fishery products in small-scale fisheries must be manufactured, handled, transported, stored and used in the most hygienic manner possible in order not to expose the ice to any physical, chemical or biological contaminant. Storing fishery products in ice immediately after capture is the best way to maintain their quality and thus keep its value. Ice performs two jobs: · It cools the fishery products to the temperature of melting ice (about 0°C); · It keeps the fishery products cool for long periods. Normally, for efficient cooling, one kg ice is needed for each kg of fish. The longer the storage time, or the larger the catch, the larger the quantity of ice will be required. It is important that some ice remains in contact with the fishery products at the end of the fishing trip. Using ice correctly is simple. Ideally, flake ice should be used, but if only blocks are available then it has to be broken into small pieces. The reason is because large lumps can physically damage fishery products and cool the fish less efficiently than small pieces. It is recommended to use flake ice or mechanically crushed ice obtained from an approved supplier. How to arrange the ice:

Firstly, a thick layer of ice (about 5 cm thick) should be placed at the bottom of the fish box. A single layer of fishery products is placed on the ice. A layer of ice is place on the first layer and the process is repeated until the box is full, finishing with a thick top layer of ice. The fish box should then be closed with a tightly fitting lid.

Benefits of proper icing and chilling of fish

Ice helps to prolong shelf life of the fish product in a relatively simple way. Ice helps to reduce the activity and reaction of enzymes in the guts and tissues that cause breakdown and changes its flavour and aroma. Ice helps to inhibit the growth of bacteria and microbes

causing fish spoilage; Ice helps to keep the surface of fish moist, this prevents fish from dehydration and weight loss. Ice preserves the cold chain till it reaches the consumer.

Chill the catch using ice as quickly as possible. For direct chilling put approximately 5 cm of ice at the bottom and place a layer of fishery products on top. Cover the catch with approximately 5 cm on top and 5 cm on the sides. Repeat for each layer of fish and ice. Make sure the catch, in the case of fin fish, is stored in a straight position and is not bent. Check for ice melt at regular intervals. Replenish ice as necessary to compensate for ice melt and drain melted water as and when required.

Storage

Carefully place the catch in the clean, dedicated container, taking extreme care not to physically damage the catch. It may be possible to use a partitioned container to store both fishery products and ice. Containers used for storing fishery products should have a drainage hole to allow melted water to escape (ensure evacuation of water is controlled, that it doesn't stay stagnant in storage area).

Transport

When returning from the fishing grounds to the landing site, check for ice melt and keep the ice uniformly distributed over the catch. If weather conditions are rough, take measures to prevent the catch from moving inside the container, to avoid damage.

Handling

Treat the fish with utmost respect and care to avoid physical damage to the flesh, as the fishery products may have turned rigid due to the rigor mortis effect. It is recommended to use thermally insulated boxes which are fitted with lids to reduce the heat impact on the catch, and to shield the catch from contact with animals (insects, i.e. flies, rodents, other animals), dust, and other potential contamination hazards. It is important that the inner lining of the box is made of food-grade material.

Fish spoilage

Fish spoilage Fish spoilage is referred to as a change in fish or fish product that renders it less acceptable, unacceptable or unsafe for human consumption. Fish spoilage is caused by the actions of enzymes and bacteria present in the guts of living fish. When fish dies the enzymes help the bacteria in the digestive system to penetrate the belly wall, breaking down the flesh itself. The higher the temperature, the faster the deterioration; bacteria penetrate the fish reducing the quality of fish and the smell dramatically indicates fish deterioration.

Quality of fish product

The quality of the fish product affects the sale price. High quality = High price Poor quality = Poor price Once the quality of the fish product is allowed to deteriorate it can never be regained. This means that everyone involved in the fishing business, from the fisherman at the point of capture, through the processor to the vendor at the point sale, must understand how to maintain quality in order to get the best possible price. There are four basic

requirements for maintaining fish product quality. · Thoroughly chill the fish product and keep it as cool as possible prior to processing or selling; · Do not damage or crush the fish product; · Keep the fish product clean; · Work quickly

Measuring quality of fish products

Quality can be measured by chemical or sensory methods. We are actually doing these ourselves when we look at a fish and decide how much we want to pay for it.

- Chemical Testing: We can use chemical analysis to measure the concentration of chemicals produced during spoilage of fish products.
- Sensory Evaluation: We can quickly check the quality by using (i) our eyes to look at the appearance of the fish product, (ii) our hands to feel the texture of the product, (iii) our noses to smell it and (iv) our tongues to taste it. We simply describe what we see (appearance, colour), feel (texture), and smell.

Fish handling practices

Fish handling after harvest: Maintaining the quality of fish begins with the harvest and transport of the fish products. It is advisable for the fisher-folk to carefully handle their fish products on canoe/boat during transport. This will allow the fisher-folk to maintain high quality of the fish product. There are several factors affecting fish handling on canoe/boat, mostly the biological, chemical and physical factors that cause degradation of fish products. The surfaces of dead fish are ideal growth habitats for bacteria contributing to the spoilage process. Hence, it is important for the fisher-folk to control the temperature of fish. Bacteria growth implicates chemical breakdown due to oxidative and enzymatic reactions leading to off odour; flavour and rancidity.

Good fish handling practices Good fish handling refers to the practices that are used by the fisherfolk after receiving their fish products at the fishing villages/camps and landing sites. The fisherfolk wash their fish product to remove mud, sand, and debris. In addition, the fisher-folk sorted/graded according to species or sizes, prior to fish processing. Hence fish processing will determine the quality of the final fish products.

The recommended good practices of fish handling during processing are as follows:

- Control the temperature of the fish
- Avoid mishandling fish
- Cool the fish as quickly as possible by any convenient methods
- Fish caught at different times, have to be kept apart since they will be at a different stage of spoilage
- Small fishes have to be kept separate from large fishes, as they tend to spoil more rapidly than the latter
- Soft-bellied fishes are to be kept separately, if the guts are being removed or the belly has burst, the body cavity has to be washed to remove any traces of the gut.
- The container used for the transportation of fish should be clean after every use.
- Fish handlers at every processing stage should learn about and adopt good hygiene practices.

Topic 4: Fish preservation techniques

Fish preservation techniques refer to a wide range of actions used by fisherfolk processors to preserve their fish products either through smoking, sun-drying, salting or wet salting. These techniques aim to prevent spoilage, damage or destruction due to enzymes and bacteria action.

Most fish caught is consumed while it is still fresh. However, some preservation methods are employed that include:

- Simple/traditional methods for small-scale like smoking, sun drying (most common), salting, frying and cooking.
- Modern methods for large-scale companies like refrigeration (icing) and fish canning/tinning

Improved techniques of fish smoking

This refers to the smoking techniques where fisherfolk often construct smoking ovens with bricks or stones that can retain heat for continuous smoking of fish products. Improved fish smoking technique reduces firewood consumption since enough heat and smoke is retained. Improved fish smoking practices eliminate nearly 90% of the challenges associated with the traditional fish smoking practices.

Advantage of improved techniques for fish smoking

- Efficient firewood use.
- Improved heat and smoke circulation
- Reduction of smoking time.
- Increase of quantities that can be smoked at once
- Use of trays reducing tediousness of the process.
- The trays form a chimney to trap the smoke and heat.
- Heat and smoke required during the smoking process can be regulated.
- Uniformly smoked products of better quality in terms of colour, shape and taste
- Handling of the fish during the smoking process greatly reduced.
- The product acquires a higher market price.

Improved techniques of sun-drying of fish

This refers to sun-drying techniques where improved drying techniques and solar driers are used to achieve better fish products with high social acceptance. Solar driers are efficient in achieving higher drying temperatures and reduced humidity. They also increase drying rates, producing lower moisture content in the final product and highly improved quality. Other improved sun-drying techniques such as ring tunnel or hanging box tunnel for organic dry fish are not liable to induce contamination with sand and micro-organisms. It does not render the fish prone to attack by pets and other animals such as goats, sheep, pigs and rodents. Improve sun drying to produce high-quality fish products.

Advantage of improved sun-drying of fish

- Low-cost, easy to construct and operate.
- Quick drying technique with a premium quality product
- No dust, insect or bacteria.

- No need to touch fish once hanged inside
- No beetle, mites and blowfly attacks.
- Protects from rainwater if a polythene sheet is placed over during rain
- No pesticides required.
- Protocol improved for drying operation
- High social acceptance found.
- Environment-friendly technology.

Refrigeration

Cooling fish for local markets and also transportation to far markets e.g use of cooler boxes, deep freezers and cold rooms around the fish landing sites

Improved fish transport

Introduction Fish transport refers to a system or means of conveying fish and fishery products from fishing villages/ camps to the landing site and to the fish markets or established fish processing centres/areas. Transport can be done by means of vehicles of all kinds: cars, trucks, boats/canoes, motorcycles, bicycles or by foot etc.

Improved fish transport refers to the appropriate use of equipment and facilities such as cool boxes, refrigerated/ insulated trucks and boats loaded with ice to ensure the preservation of fish during transport to the end consumers. Improved fish transport has several advantages to fisheries stakeholders (fisher-folk and fish transporter). Improvements include:

- Using trucks and boats certified by an authorized officer;
- Testing the temperature of the product before loading to determine whether more ice is needed; careful handling of fish to avoid damages.
- Ensuring the weight of ice is equal to the weight of fish being transported (1:1 ratio)
- Controlling the temperature of fish and protecting fish from contamination. These are the main factors to be controlled during transport.
- Washing trucks and boats used for fish transport with clean water and approved detergents
- Never use dedicated trucks and boats to transport people or other goods.
- Recording the temperature of fresh fish products at the landing site and at the end of transport. Using trucks and boats with a storage compartment.
- Ensuring fish storage compartments are insulated and lined with strong, smooth, and easy to clean materials
- Ensuring that storage is fitted with sealable doors to keep insulation during transport (keep temperature stable).
- Ensuring the cold storage area is independent from the engine.

Topic 5: Fish market and marketing

Fish market is defined as a place where all forms of fish products are exposed for marketing/sale by the fish traders and fish retailers. Fish markets play an important role in the economic development of fisheries stakeholders (fisher-folk, fish processors, fish transporters and distributor, fish traders and retailers). Fishery industry has an important role in food security and livelihoods, Fish are the source of animal protein to the majority of the rural community in the country.

Good fish handling practices in the market

- Fish sellers should clean fish and remove undesirable parts when necessary
- Fresh fish for sale should be arranged on a first in, first out basis.
- Fish sellers should display their fish products on clean tables
- Fish should be arranged with the bellies down to allow melting ice drains away from the fish, hence reducing the chances of spoilage
- Fresh fish should be kept away from non-edible products
- Avoid to sale fresh fish in a room temperature without ice.
- Spoiled fish (soft body, sunken eyes, bad odor) should not be sold;
- Fish sold should be wrapped and packed in appropriate carrying bags;
- Fish sellers should avoid using harmful and prohibited substances for the treatment of fish like formalin;
- Fish sellers should use a storage space that is smooth and made of non-contaminating materials like bio-degradable plastic and stainless steel

Marketing of fish in Kenya

Some fish is consumed locally but some are exported to Asian and European countries e.g. Japan, China, India, Germany, Britain, France, Netherlands and Belgium.

Factors favouring the development of the fishing industry in Kenya

- Availability of large fishing grounds such as Lake Victoria and the Indian Ocean.
- Availability of high value/variety of fish species such as Tilapia and Nile perch with high market demand
- Introduction of better and more effective fishing methods such as the use of gill nets.
- Introduction of better fishing vessels such as motor boats fitted with engines that are used for fishing
- Presence of abundant plankton (food for fish) which has led to fish multiplication in large numbers
- Availability of improved transport networks linking fishing grounds to markets
- Availability of ready market for fish which is both local and international e.g. fish processing industries, local people and neighbouring D.R.C.
- Presence of Indented nature of fishing grounds that are favourable for the development of fish landing sites
- Introduction of fish corporations that teach better the fishermen new and modern fishing skills.
- Political stability especially along Lake Victoria which has attracted foreign investors e.g. Japanese and Indians.
- Presence of improved storage facilities and processing plants such as refrigerated vehicles to preserve fish until it is transported to the processing plants and market centres.
- Availability of adequate capital for investment e.g. buying boats and engines.
- Supportive government policy which encourages investment in fishing activities e.g. through market research and road construction.

Topic 6: Importance of the fishing industry

- Provision of employment opportunities to fishermen hence improving their standards of living
- Source of food rich in proteins to the population leading to better health.
- Source of foreign exchange through fish exports used for infrastructural development e.g. roads.
- Promotes economic diversification to increase income flow and reduce dependence on agriculture
- Facilitates the development of fish processing industries which provides more jobs
- Source of government revenue through the taxation used for the development of schools and hospitals
- Stimulates development of other sectors like poultry through providing feeds e.g. silver fish (Mukene).
- Facilitates the development of infrastructures such as roads, markets and training institutions which leads to the provision of social services.
- Has facilitated the growth of towns leading to regional balance e.g. Dar-es-salaam, Kisumu and Bukoba
- Promotes tourism through game fishing e.g. at Malindi. Earning foreign exchange

Uses of fish

- Provision of food rich in proteins.
- Fish bones can be used for making buttons
- Used for making cosmetics and soap.
- Used for making animal feeds like chicken feeds.
- Fish fats can be used for making edible cooking oil.
- Fish bones and scales can be crushed to make fertilizers
- Used in the making of drugs/medicine.
- Fish skin can be used as a leather material for making shoes, bags

Topic 7: Challenges facing fishing in Kenya

- Limited capital to modernize the fishing industry and also limited research.
- Most of the fishing grounds like Lake Turkana are in remote areas which are inaccessible due to poor roads leading to landing sites.
- Limited market due to low income or cultural norms e.g. among the Turkana and Luos
- Limited fish species of commercial value which reduces international demand.
- Overfishing and indiscriminate fishing through the use of beach seining methods that lead to the catching of young fish.
- Narrow continental shelf limits the growth of a large number of fish plankton (fish food)
- Excessive high temperature creates preservation difficulties.
- Underdeveloped transport network linking to fishing grounds which leads to delays in delivery
- Water hyacinth especially on Lake Victoria chokes fish to death.
- Competition with other fish-producing countries like Norway Japan which leads

to inadequate market

- Inadequate research has greatly limited improvement of fishing methods implements and fish species.
- Insufficient modern fishing equipment due to lack of capital to buy modern boats with refrigeration facilities, boat engines hence ending up using simple and traditional methods.
- Un-desirable fishing methods like fish poisoning that cause health risks to the local people.
- Inter- territory conflict since some of the fishing grounds are found at borders e.g. Lake Victoria
- Reductions of Tilapia due to the presence of Nile perch which eats them away.
- Some fishing grounds are too deep and hence don't favour fish multiplication.
- Water pollution by industries e.g. Nile breweries which causes death of the fish
- Post fishing losses e.g. theft of their nets and fish catch.

Steps that have been taken to solve challenges facing fishing

- Formation of the Ministry of Fisheries to control fishing activities in the country
- Formation of fishing cooperatives for advice, loans and easy marketing.
- Educating the public about the value of fish as a source of proteins and vitamins to increase its market
- International markets have been opened to local fishermen for example to the European Union
- Removal of the water hyacinth by using chemicals to provide enough oxygen for the fish.
- There is construction and rehabilitation of road networks linking to fish grounds to improve fish deliveries
- Treatment of sewage and industrial wastes to reduce water pollution.
- Setting strict laws prohibiting illegal fishing methods like poisoning and indiscriminate nets to protect the young fish.
- Introduction of modern fish preservation methods like freezing and canning by extending power to rural areas.
- Regular police patrols to stop indiscriminate fishing and also to reduce theft on water bodies.
- Introduction of commercial and high-value fish species e.g. Nile Perch which have a large market.
- Increased importation of fishing facilities such as motor boats and motor engines to increase efficiency
- Research work has continued in marine, freshwater fisheries and fish farming to improve fish breeding

Effects of fishing on the environment

- Smoking of fish and construction of boats requires timber which leads to deforestation
- Fishing exposes fishermen to Tsetse flies and Bilharzia disease.
- Smoking of fish leads to atmospheric pollution which spreads human diseases like flu.
- Fishing leads to the growth of towns which leads to high crime rates, unemployment

and poor sanitation

- Wetlands are cleared to construct fish ponds. This has resulted in environmental degradation.
- Increased population in the search for work at landing sites leading to environmental degradation
- Fishermen are exposed to dangerous water animals e.g. crocodiles on Lake Kyoga.
- Some fish that were introduced such as the Nile perch eat away other species like Tilapia leading to a reduction in the diversity of fish species in the lake.
- Opening up feeder roads from landing sites to market centres leads to deforestation
- Clearing of forests to get firewood for smoking of fish leads to deforestation
- Poor fishing methods like the use of poison may lead to health problems for humans.
- Processing industries that are constructed near water bodies have led to pollution due to dumping of wastes in the water bodies.

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