COURSE CODE:	FIS401
COURSE TITLE:	Fish Processing, Preservation and Marketing
NUMBER OF UNITS:	2 Units
COURSE DURATION:	Two hours per week

COURSE DETAILS:

Course Coordinator: Dr. (Mrs.) F.O.A. George
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Other Lecturers: Dr. O.J. Olaoye

COURSE CONTENT:

The biodegradation and biodeterioration of fin and shell fish, spoilage indices. Organoleptic assessment of quality of fish, principles and methods of preservation, storage and processing, packaging, product evaluation and quality control, estimation of nutrients in fish flesh.. Product development, evaluation and quality control. Traditional versus modern, preservation and processing techniques. Nigerian fish marketing structures.

COURSE REQUIREMENTS:

This is a compulsory course for all students in Departments of Aquaculture & Fisheries Management and Forestry & Wildlife Management. In view of this, students are expected to participate in all the course activities and have minimum of 75% attendance to be eligible to write the final examination.

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READING LIST:

• Abbot, J.C. and Makeham, J.P. (1980). Agricultural Economics and Marketing in the Tropics, Longman Ltd., Pg. 7, 12, 35.
• Adepegba, O.B. (2007). Improving fish processing and marketing in Nigeria. A paper presented at a National Stakeholder Workshop on inland capture Fisheries Development in Lagos State. Pp. 16-21.
• Ayanda, J.O. (1989). Economics of Fish Marketing and Distribution in Jebba Lake. Annual Report. National Institute of Freshwater Fisheries Research, New Bussa
• Olukosi, J.O. and Isitor, S.U. (1990). Introduction to Agricultural Marketing and Prices: Principles and Applications. Living Book Series, Abuja
• Shaw, S.O. (1990). Marketing a practical guide for fish farmers fishing New Books. Great Britain.

LECTURE NOTES

Biodegradation and bio-deterioration in fish

Spoilage is any change that makes food unfit for consumption, and includes chemical and physical changes, such as bruising and browning; infestation by insects or other pests; or growth of microorganisms, such as bacteria, yeast, and moulds. Spoilage of food products is due to chemical, enzymatic or microbial activities. It is estimated that one-fourth of the world's food supply and 30% of landed fish are lost through microbial activity alone. Proper handling, pretreatment and preservation techniques can ensure good quality of fish and fish products and increase their shelf life. Around 4-5 million tons of trawled and shrimp fish are lost every year due to enzymatic and microbial spoilage because of improper onsite storage.

Forms of Fish Spoilage include:

Microbiological Spoilage

Live fish is normally considered to be sterile, but microorganisms are found on all the outer surfaces (skin and gills) and in the alimentary tract of live and newly caught fish in varying numbers with a normal range of 102-107 cfu/cm2 on the skin and between 103 and 107 cfu/g in the gills and intestine. When fish dies, its entire body resistance mechanisms breakdown, giving way to microorganisms or the enzymes they secrete to invade or diffuse into the flesh where they react with the complex mixture of natural substances present.

Bacteria are able to decompose proteins and other nitrogen containing compounds to ammonia and hydrogen sulphide, which produce an unpleasant and disgusting flavour. Trimethylamine oxide (TMAO), mostly found in marine fish, is broken down to trimethylamine (TMA), dimethylamine (DMA) and ammonia (NH3), which are responsible for off-odours in fish undergoing spoilage.

The general pattern of microbial spoilage of fish preserved by chilling is illustrated in Figure 1.

Figure 1: Changes in total viable count (TVC), specific spoilage organisms (SSO), and chemical spoilage indices during chilled storage of a fish product.

Source: Dalgaard, 1993.

2.5.1.2 Chemical Oxidation

Chemical spoilage processes are changes that take place in the lipid fraction of the fish. Lipids are oxidised to peroxides, aldehydes, ketones and lower aliphatic acids. The hydro-peroxides are tasteless but can cause brown and yellow discolouration of the fish tissue. The degradation of hydro-peroxides gives rise to the formation of aldehydes and ketones that result in rancid offflavours.

All the chemical by-products eventually reach a level where the fish is rejected.

High temperatures are partly responsible for the speed of oxidation processes. In addition, direct sunlight, wind, heat, light (especially UV-light) and several organic and inorganic substances may also accelerate oxidative processes. Living cells in fish have enzymatic protection mechanisms against lipid oxidation by having an enzyme, glutathione peroxidase, which acts by reducing hydro-peroxides in cellular membranes to corresponding hydroxyl-compounds. This

reaction requires a supply of the enzyme in a reduced form and thus the reaction stops when the
fish dies.

2.5.1.3 Autolytic changes (Bio-deterioration)

As fish dies, its enzymatic activity doesn't stop immediately but continues resulting in proteolytic changes that are responsible for early quality loss in fresh fish. The more these enzymes get in contact with the fish's flesh the greater the spoilage. Adenosine triphosphate (ATP) is broken down through a series of products such as adenosine diphosphate (ADP), inosine monophosphate (IMP), inosine and hypoxanthine (HX). IMP and HX may be responsible
for the sweet and mild tastes in the later stages of shelf life and these products accumulate especially when the respective step is rate-limiting. Generally, these changes precede microbiological spoilage and have been seen to contribute very little to spoilage of chilled fish
and fish products.

Factors that influence the rate of Fish spoilage

Time/Temperature

The most crucial factors determining the quality of fishery products are time and temperature. The rate of spoilage is dependent upon the holding temperature and is greatly accelerated at higher temperatures, due to increased bacterial action. The shelf life at different storage temperatures (T°C) has been expressed by the relative rate of spoilage (RRS), defined by the equation:

Relative Rate of Spoilage = Keeping time at 00 C
Keeping time at T0C

Hygiene

Apart from the microorganisms that fish harbours at the time of capture, more is added via unhygienic practices and contaminated equipment such as trawling and storage facilities. The design of a fish hold is of great importance as far as hygiene in the hold is concerned. Hold design should enable the purge (drip loss) to be collected easily. The amount of purge is higher at
5-7ºC compared to 0oC; at which temperature there is greater spoilage, since the purge is a very
good medium for bacterial growth.

Handling

Rough handling usually results in faster spoilage. This is due to the physical damage to the fish,
resulting in easy access for enzymes and spoilage bacteria. Physical mishandling in the net, such
as very large catches, fishermen stepping on fish or throwing boxes, containers and other items
on top of the fish, may cause bruises and rupture of blood vessels. When fish is in rigor mortis,
rough handling can cause gaping.

Bacterial Load and type

The microflora on tropical fish often carries a slight ly higher load of Gram-positive and enteric
bacteria but otherwise is similar to the flora on temperate-water fish. Bacteria populations on temperate fish are predominantly psychrotrophic reflecting water temperatures of about 10oC while fish from the tropics have largely mesophilic bacteria.

Method of Capture

The fishing gear and method employed determines the time taken between capture and death. Fish caught in gillnets struggle much to escape, and in so doing, are bruised by the net which increases exposure to microbial entry and subsequent deterioration. Fish caught by hook and line

methods, on the other hand, die relatively quickly and therefore bruises and stresses are likely to
be minimal. Physical mishandling in the net due to long trawling nets and large catches accelerates spoilage. Large catches in the net are compacted against each other resulting in the
fish getting bruised and crushed (especially small sized fish) by the heavy trawl net.

Mode of Storage

In bulk-storage, the weight of the pile may crush the fish at the bottom, leading to a loss of weight (yield) as well as other physical damage. Crushing of fish by ice or other fish can seriously affect the quality of fish by releasing enzymes from the gut into the fish muscle thereby
accelerating autolytic processes.

Shelf life

The length of time within which seafood remains acceptable and palatable is defined as the shelflife
or storage life of the product. The storage life for fish to remain in good eating quality is about half the total storage life (Archer, 2009). Different fish species have different shelf lives
depending on their type, oil levels, moisture content, intrinsic condition of the seafood and how
they have been handled since capture.

Shelf life is also dependent on time and temperature of storage. Table 2 shows variation in the
shelf-lives of a range of products held at different temperatures and the relative rates of spoilage
(RSS).

Table 2: Shelf life at different storage temperatures and relative rates of spoilage (assuming 0oC as 1)

0oC		5oC		10oC	
Shelf life (days)	RSS	Shelf life (days)	RSS	Shelf life (days)	RSS
Crab claws	10.1	1	5.5	1.8	2.6	3.9
Salmon	11.8	1	8.0	1.5	3.0	3.9
Sea bream	32	1	--	--	8.0	4.0
Packed cod	14	1	6	2.3	2.3	4.7

Source: Archer, 2009.

Assessment of Freshness and Eating Quality of fish

The freshness quality of fish is extremely important as it is a measure of the age of the fish outside water (i. e. Postharvest). Eating quality is however more important to the final consumer
and is usually judged by the odour, flavour and texture of the fish. There are two main ways of
determining the freshness quality of seafood: **Sensory or non-sensory methods**.

Sensory methods rely on the appearance, odour and texture of the seafood, whereas non-sensory
methods typically use analytical, chemical, physical or biochemical indices.

Non-sensory indices for determining the freshness quality of seafood include: total volatile base
nitrogen (TVBN), Total viable counts (TVC) or aerobic plate counts (APC).

NON-SENSORY METHODS

Total Volatile Basic Nitrogen

The main spoilage test of metabolite(s) produced during fish storage or distribution to obtain a quantitative fish quality index is total volatile bases (TVB). It measures the total content of ammonia (produced by the deamination of amino-acids and nucleotide catabolites), dimethylamine (produced by autolytic enzymes during frozen storage), trimethylamine (produced by spoilage bacteria) plus other basic nitrogenous compounds associated with fish spoilage. TVB and TMA values of 30 mgN/100g and 15 mgN/100 g are the rejection spoilage levels respectively.

The fishy odour of TMA when it reacts with lipid is generally detectable when the TMA level reaches 4-6 mg/100 g.

Total Viable Count

Microbiological quality evaluation of fish aims to quantify the hygienic quality of fish, including temperature abuse and the possible presence of pathogenic microorganisms in the fish. Quality levels are based on the plate counts for acceptance or rejection of fishery products for human consumption. Plate counts below 5.5 x 105 are considered of good quality; between 5.5 x 105 and 107 marginally accepted quality and plate counts at or above 107 are considered unacceptable in quality (ICMSF, 1986).

SENSORY METHODS

Sensory Evaluation

Sensory evaluation is defined as the scientific discipline used to evoke, measure, analyze and interpret reactions to characteristics of food as perceived through the senses of sight, smell, taste, touch and hearing. In sensory analysis, appearance, odour, flavour and texture are evaluated using the human senses. Variations among individuals in the response of the same level of stimuli can vary and can contribute to a non-conclusive answer of the test. Thus, it is important to be aware of these differences when selecting and training judges for sensory analysis. Selected respondents are usually trained in interpretation of the stimulus and response in order to receive objective responses which describe features of the fish being evaluated. It is also easy to give an objective answer to a questions e. g. is the fish in rigor (completely stiff)?, but more training is needed if the assessor has to decide whether the fish is *post* or pre-rigor.

Subjective assessment, where the response is based on the assessor's preference for a product, can be applied in the fields like market research and product development where the reaction of the consumer is needed. Assessment in quality control must be objective.

Fish Preservation

Fish preservation refers specifically to the techniques used to keep fish from spoiling and to elongate its shelflife. Preservation is seen as a way of storing excess fishes that are abundantly available at certain times of the year, so that they can be consumed in times when fish is scarce.

Fish preservation traditionally has three goals: the preservation of nutritional characteristics, preservation of appearance, and a prolongation of the time that the fish can be stored.

Traditional methods of preservation usually aim to exclude air, moisture, and microorganisms, or to provide environments in which spoilage organisms cannot survive. The principle of fish preservation thus involves the alteration of certain attributes that support microbial growth such as moisture content, water activity, temperature and pH.

Although consumers prefer fish in the fresh form, fresh fish is only available in the coastal areas. This is due to the unavailability of adequate supplies of ice coupled with poor transportation and distribution facilities to inland areas. Depending upon the variety and locality, fish becomes available during a peak season extending for one to three months and coinciding with the rainy season.

The aim of fish preservation is to prevent undesirable changes in the wholesome quality, nutritive value and/or sensory quality of fish; and to reduce chemical, physical and physiological changes of an undesirable nature and obviate contamination.

With the ever growing world population and the need to store and transport fish from one place to another where it is needed, fish preservation becomes necessary in order to increase its shelf life and maintain its nutritional value, texture and flavour.

Historically salting, drying, smoking, fermentation and canning were the methods used to prevent fish spoilage and extend its shelf life. In response to consumer demand for texture, appearance and taste, new methods were developed including: Cooling, freezing and chemical preservation.

Fish Preservation and Food Security

The Food and Agriculture Organization of the United Nations (FAO, 2000) defines food security as a **"situation that exists when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life".** The process to attain food security must therefore be sustainable coupled with the maintenance of infra- structure and the environment.

Preservation of fish has a beneficial role in food security; as preserved fish has longer shelf life.

In the tropical regions high temperatures and humidity induce accelerated deterioration of fresh fish. This accelerated deterioration is responsible for post harvest loses estimated to be as high as 30%. Preservation of fish could significantly reduce the post harvest loses, consequently reducing the food insecurity.

Fish Preservation and Food Safety

The nutritional quality of fish is high. Therefore, its availability in many developing countries should enable fish to contribute significantly to the provision of a healthy and balanced diet in these countries. It is estimated that around 60 percent of the population in many developing countries derive over 30 percent of their animal protein supplies from fish, while almost 80 percent of the population in most developed countries obtain less than 20 percent of their animal protein supplies from fish.

Preserving fish to extend its shelf-life, while ensuring its safety and quality, is a central

preoccupation of the food industry. When harvested in a clean environment and handled hygienically until consumption, fish is very safe. Unfortunately, unhygienic practices, insufficient refrigeration and sub-standard manufacturing practices can lead to outbreaks of fishborne illnesses and even death.

According to the World Health Organization (WHO), the estimated annual mortality from food and water-borne infectious diseases in developing countries amounts to as high as 2.1 million deaths, mainly of infants and children. In industrial countries, microbiological food borne illnesses affect up to 30 percent of the population. Every year, 20 out of every million inhabitants die from food borne disease. Unwholesome fish and fishery products cause up to 30 percent of the food-borne illnesses.

Around 40 million people in Asia are affected by fish and water borne parasitic diseases, especially trematodes. In addition to the economic losses incurred because of fish spoilage, fishborne illnesses can have costly adverse health effects, the loss of productivity, medical expenses and the adverse publicity to fishing companies. Additional costs in international trade include the cost of rejections, detention of products, recalls and the resulting adverse publicity to the industry and even to the country.

Fish Preservation Methods

Many techniques have been used to preserve fish quality and to increase their shelf life. They are designed to inhibit or reduce the metabolic changes that lead to fish spoilage by controlling specific parameters of the fish and/or its environment. Generally, they encompass a wide array of technologies used to decrease the fish temperature to levels where metabolic activities catalyzed by autolytic or microbial enzymes are reduced or completely stopped.

Preservation methods such as salting have declined in the developed world in preference to newer methods that are machinery based, technologically advanced and sometimes energy intensive. In the tropics however, preserving food based on low energy consumption, simpler machinery and storage at ambient temperatures, appears to be alternatives that are more economical. Methods such as drying, salting, smoking or in combinations like smoking with drying or salting with smoking and drying as well as the use of herbs and spices including fermentation are in common practice in the poorer regions of the world notably sub-Saharan Africa.

Low Temperature methods of preservation

Since mid of 19th century, the low temperature storage method have been used for the preservation of wide varieties of seafood. This method of preservation does not kill the microorganisms but reduces microbial activities responsible for spoilage. It has been observed that freezing and cold storage are efficient methods of fish preservation but they do not improve product quality.

Freezing operation for preservation cannot prevent amino acid losses. However, it surely impedes the physical and biochemical reactions which are responsible for spoilage of food. Survival of spoilage microorganisms during low temperature storage depends on the types of microorganisms and fish species, history of the fish, methods of catch and the handling and storage processes aboard the fishing vessel.

Salting

Salting as a method of fish preservation is an age old custom. Sodium chloride serves both as a chemical preservative and also binds available moisture in fish. This may, however, not affect the halophiles (salt loving microorganisms) which sometime cause discolouration during drying.

The introduction of common salt (NaCl) produces an environment of high osmotic pressure that denies bacteria the aqueous surroundings they require to survive and reproduce. Unlike bacteria, molds can often withstand the effects of high salt or sugar concentrations in foods.

Most food poisoning bacteria cannot live in salty conditions and a concentration of 6-10 per cent salt in the fish tissue will prevent the activity of this class of microorganisms. However, a group of micro-organisms known as **'halophilic bacteria'** are salt-loving and will spoil salted fish even at a concentrations of 6-10 per cent thus further removal of the water by drying is needed to inhibit these bacteria. During salting or brining, two processes take place simultaneously: water moves from the fish into the solution outside and salt moves from the solution outside into the flesh of the fish.

Salting requires minimal equipment, but the method employed is important. Salt can be applied in many ways. **Traditional methods** involve rubbing crude rock salt into the flesh of the fish or making alternate layers of fish and salt (recommended levels of salt usage are 30-40 per cent of the prepared weight of the fish). There is often the problem, however, that the concentration of salt in the flesh is not sufficient to preserve the fish, as it has not been uniformly applied. A better technique is **brining** which involves immersing the fish into a pre-prepared solution of salt (36 per cent salt). The advantage is that the salt concentration can be more easily controlled, and salt penetration is more uniform. Brining is usually used in conjunction with drying. Ultimately the effectiveness of salting for preservation depends upon: uniform salt concentration in the fish flesh, concentration of salt, and time taken for salting and whether or not salting is combined with other preservation methods such as drying.

The salted fish are usually spread in the sun to dry for one to seven days depending on the weather. Platforms are made of sticks, split bamboo or palm branches. When dry, the fish takes on a white appearance due to the presence of salt particles on the surface.

Smoking

The preservative effect of the smoking process is due to drying and the deposition in the fish flesh of the natural chemicals of wood smoke. Smoke from the burning wood contains a number of compounds which inhibit bacteria. Heat from the fire causes drying, and if the temperature is high enough, the flesh becomes cooked. Both of these factors prevent bacterial growth and enzyme activity which may cause spoilage. Smoking is the preferred cheap method of preventing

fish spoilage. This is carried out over smouldering wood, sawdust or other local source of energy using traditional kilns constructed with locally sourced materials. This has the effect of imparting pleasant flavours to the product beside the preservative effect of the smoke itself. Different types of ovens which are completely open at the top to permit the arrangement of fish on the gills are employed. The smoking ovens are predominantly cylindrical or rectangular in shape with one or two openings made at the lower part. These openings serve as doorways for placing fuel into the fireplace which forms the base of the unit. The finished smoke dried fish are dark brown to black, tough and brittle.

Drying

Much of the harvested fish in rural areas of the tropics (especially where ambient temperatures are high and relative humidity low) is preserved by sun drying. While the cost of sun drying is low, there are significant losses due to spoilage, contamination by dust and bacteria, and insect infestation, particularly when the fish are laid close to the ground. Toxins can also develop in such uncontrolled drying set-ups leading to degradation of quality beyond edibility. It is therefore more hygienic for fish to be dried on raised platforms or in solar driers. Solar drying in an enclosed system offers an indirect or direct approach to drying of harvested fishes with added advantages of hygiene, quality control and predictability. The use of simple enclosures that allow heat generation such as the flat plate collectors or other designs of solar heat collectors provide many advantages in the quality of dried products. Solar fish driers are simple and inexpensive and can eliminate much of the spoilage that occurs with traditional drying methods. These driers usually have a wood or bamboo-frame table, covered with plastic or glass to produce an enclosed chamber. The surface of the table can be covered with black plastic or paint to absorb the sun's heat. With openings at the top and bottom of the drier, air will be heated and flow around the fish. Fish exposed to this flow of heated air will rapidly lose moisture, reducing drying time by as much as half over open-air drying. Similar driers have been constructed in Bangladesh, Indonesia, Rwanda, the Philippines, and Papua New Guinea. Solar driers have a number of advantages over traditional drying methods. They exclude rain, insects, animals, and dirt, and can produce temperatures high enough to reduce the possibility of mould or bacteria spoilage. In an increasing hungry world, solar drying offers a cheap and hygienic way of preserving fish.

Drying harvested fish is an energy intensive process, which may be expensive when fossil fuels are used but relatively cheap when the free sun’s heat is exploited.

Irradiation

Irradiation of food is the processing of food with ionizing radiation; either high-energy electrons or X-rays from accelerators, or by gamma rays (emitted from radioactive sources as Cobalt-60 or

Caesium-137). The treatment has a range of effects, including the destruction of bacteria, molds
and insect pests, reducing the ripening and spoiling of fruits, and at higher doses induction of sterility. The technology may be compared to pasteurization; it is sometimes called 'cold pasteurization' as the product is not heated. Irradiation is not effective against viruses or prions,
and is only useful for food of high initial quality. The radiation process is unrelated to nuclear energy, but it may use the radiation emitted from radioactive nuclides produced in nuclear reactors. Ionizing radiation is hazardous to life; for this reason irradiation facilities have a heavily shielded irradiation room where the process takes place. Radiation safety procedures ensure that neither the workers in such facility nor the environment receive any radiation dose from the facility. Irradiated fish does not become radioactive, and national and international expert bodies have declared food irradiation as wholesome.

The irradiation of fish has the advantage of enabling food packaging and preparation in which there is less person-to-food contact, thus decreasing the possibility of contamination and decreasing the need for chemical preservatives, some of which may be harmful. The ionizing radiation that is used to irradiate foods, wherein the foods are exposed to bursts of high-intensity
x rays or streams of electrons, disrupts bacterial DNA. However, the wholesomeness of consuming such food is disputed by some opponents and consumer organizations. National and
international expert bodies have declared food irradiation as 'wholesome'; UN-organizations such
as WHO and FAO have endorsed the use irradiation technology in food preservation.

International legislation on irradiation as a food preservation technique varies worldwide from
'no regulation' to 'full banning'. It is estimated that about 500,000 tonnes of food items are irradiated yearly world-wide in over 40 countries. These are mainly spices and condiments with
an increasing interest in the irradiation of fresh fruits.

Fermentation

Fish fermentation is an ancient technology practised especially in South East Asia, Africa and Latin America. Fermentation is described as the transformation of organic substances into simpler ones by enzymes or microorganisms. The addition of salt during fish fermentation plays
a key role by suppressing the activity of microorganisms, thereby preventing putrefaction.

Fermentation is a naturally occurring chemical reaction by which a natural food is converted into
another form by pathogens. It is a process in which food spoils, but results in the formation of an
edible product. Fish fermentation involves breaking down the protein in the fish by enzymatic action. It is also referred to as **hydrolization**. During fermentation, certain plants may be to fish
in order to speed up the reaction. They release proteolytic enzymes such as Papain (present in leaves of papaya tree), Ficin (obtained from the latex of tropical fig tree) and Bromelin (found in
fruit or stem of pineapple plant). In a normal process, fermentation may take up to 8 months. It
may also take less than a month if pure salt is used and the temperature is increased from 37oC to
45oC.

Meaning and Scope of Fish Marketing

• Fish marketing can be defined from both the micro and macro
view points.
• The micro view point is concerned with the individual

participants in marketing be it the farmer or the business firm.

• From this perspective, fish marketing can be defined as the performance of all business activities which direct the forward flow of goods and services to consumers in order to accomplish the producers' objectives.

The macro view point of marketing on the other hand is a big "picture" view.

It examines the total system of economic activities concerned with the flow of fisheries production from producers to final consumers, the kinds of institutions and the price making mechanisms that guide those flows; the interactions among consumers, agribusiness firms, farmers and even government that determine the levels of expenditures, and the sharing of those expenditures as income to market participant.

Marketing involves all those legal, physical and economic services which are necessary to make

production from the farm available to the consumers

• In the form and amount desired by the consumers
• At the place desired by the consumer
• At the time desired by the consumer
• At the price consumers and middlemen are willing to pay to take possession
• Thus marketing leads to the creation of form, place, time and possession utilities.
• Fish marketing is the performance of all business activities involved in the flow of fish production and services from the point of initial agricultural production until they are in the hands of consumers or users in order to satisfy consumers and accomplish the company's objectives.
• **A market** on the other hand, is generally an area or setting in which price making forces (demand and supply) operate. "It is a place, point or any means of communication whereby the transfer of title or ownership of goods and services can be affected.
• Market is defined as an area for organizing and facilitating business activities and for answering the basic economic suggestions: what to produce, how much to produce, how to produce and how to distribution production.
• A market may be defined by (1) a location (e.g Makun-Omi market) (2) a product (e.g the grain market) (3) a time (e.g the May Soybean market) ; or (4) a level of the market (e.g the retail food market).

Relationship between Marketing and Production

• Unfortunately, many people look upon those who are engaged in the many marketing jobs, such as grading, transporting, storing, arranging for the transfer of title and advancing and collecting credit, as being parasitic on those who really "produce" the goods.
• Farmers often decry the "profits of middlemen" because they think that farmers alone produce the food that people eat.
• Of course, we realize that they produce only the raw materials from which the

consumers' food is finally made e.g fish meal. The contributions of packers, truckers, and processor are needed for fish meal production.

• Economists have defined production as the creation of utility that is the process of making useful good and services.

• The fishers who produce fish meal adds form utility. The processor who carried out the processing also adds form utility. They are the form of raw materials and create something useful. The rail, road or trucker adds place utility by moving the fish from landing site to the packing plant and then after processing moves to wholesalers, retailers and finally to consumers. The product is more useful because of the activities of these agencies in getting the production to where it is most desired.

• The utilities created in the productive processes are further classified into form utility, place utility, time utility and possession utility.

• the processor may freeze some of the fish production for later use. The fish is more useful by being held form periods of relative plenty to periods of relative scarcity. Time utility is added to the production. The cold-room sellers add time to production.

• The people that use their efforts transporting the fish and fish production to those who could better use it, add possession utility

• Most people accept the activities of the farmers and fishers and manufacturers as being productive. They create visible changes in production.

• Marketing creates time, place form and possession which the goods and services produce. It arranges for production and making goods available at the right time, in the right place and form.

• Marketing embraces all the activities relating to the production itself. These activities include the pricing, distribution, promotion, research and sales forecasting.

• Marketing covers all business functions including production in its broadest sense, it covers also all production decision. It constitutes a bridge between production and consumption

ECONOMIC IMPORTANCE OF MARKETING AND MARKETS

• Generation of foreign exchange earnings

• Sustenance of a country's economic growth through the development of an exchange economy at right time and right place

• Provision of incentive to farmers in order to adopt new and improved technologies which will lead to increased agricultural production

• Provision of income and sources of livelihood to the marketing agencies or intermediaries

• Encouraging specialization and expansion of output

• Improvement in standard of living by providing need satisfying quality goods and services

• Employment opportunities

• Fullest utilization of resources: marketing ensures effective and efficient resources utilization in the production of gods and services. This leads to increase in production.

• Creation of demand: marketing consists of all activities involved in assessing and stimulating them for a product

• Lead to healthy competition among firms and this brings about improved quality and price rendition

• Ensures consumer satisfaction in terms of pricing quality and availability of the needed products

• By creating and nourishing the wants, marketing builds more exciting and hopping choices and environments as well as contributes to society's goal of self fulfillment.

DIFFERENCES BETWEEN MARKETING AND SELLING

• Marketing cover the process of distribution of goods and services while

selling is a part of an aspect of marketing
• It creates various types of utilities, e.g possession, time and place while selling creates only possession utility
• Marketing is highly specialized and requires professionalism while selling is simple and can be performed by anybody
• Marketing is the overall process of creating demand and facilitating distribution of goods and services while selling involves the actual exchange of goods and services
• Marketing emphasis is on customers wants while selling emphasis is on the products
• Marketing company first determines what the customer wants and then the firm figures out how to profitably make and deliver a product to satisfy those needs while selling company first makes the product and then figures out how to sell it profitably
• Marketing is external and market oriented while selling is internal and company oriented
• Marketing emphasizes market and buyers needs while selling emphasizes company (sellers) needs

MARKETING RESEARCH

• It is the scientific process of systematic data collection, collation, analysis and the interpretation of findings on marketing problems.
• Marketing research is the study of consumers demand by a firm in order to assist it in expanding its output and marketing of its production.
• It is the systematic and objective search for the analysis of information to guide managers in production and marketing.
• Market planning and problem –solving research provide valuable information for the planning of the marketing mix – product, price, distribution and promotion.
• It can tell which production features are popular, which price ranges are acceptable to buyers etc.
• Marketing research is conducted through the following ways:
• Personal interview
• Telephone
• Questionnaire
• Observation

IMPORTANCE OF MARKETING RESEARCH

• Know the market trends.
• Knows the market potentials
• Knows the market practices in fish industry.
• Assist fish industries to expand its output and marketing of its products.
• Help to make market planning and solve research problems.
• Provide information on marketing mix.
• It can tell which product features are popular, which price ranges are acceptable to buyers.
• It is the systematic and objective search for and the analysis of information to guide managers in fisheries production and marketing.

MARKETING CONCEPT

• It refers to the principle that the consumer is sovereign, i.e. the satisfaction of the consumer’s want is to be emphasized at all stages of product distribution.
• Marketing concept is a philosophy of business which states the customer’s wantsatisfaction is the economic and social justification for a firm’s existence.

• Marketing concept holds that a firm should focus all of its efforts on satisfying its customers at a profit. The philosophy of the concept states that marketing should begin and end with the customer. The planning and operations of the organization must be consumer oriented i.e. consumer sovereignty.
A company adopts marketing concept when all its efforts • are directed towards meeting the needs and aspirations of the consumers.
• Marketing concept involves these **fundamental propositions**:
• Consumer Needs: tastes, expectation Ask the consumer about their needs
• Product Development: Development of production to suit or satisfy the needs, taste and expectations of the consumers
• Planning and Organization: Planning & Organization a marketing programme to bring the production to the customers
• Post Sales Activities: Carry out post sales activities that will ensure that the production are satisfactory in use
• **CONSUMER ORIENTATION:** This is the concept of marketing which begins and ends with the needs and wants of the consumers rather than that of the organization. Consumer satisfaction is the major aim of the concept.
• **CONSUMER SOVERIGNITY:** This concept states that consumers are always right. This is the supremacy the consumers have in determining what a firm has to produce. A firm can only determine the needs and wants of the consumers through research. The determination of what to produce should be in the hands of the consumers and not the government. The notion that all business and marketing activity is directed toward the satisfaction of consumers is called the **DOCTRINE OF CONSUMER SOVERIGNTY.**

CONT'D

There are seven alternative concepts (philosophy) under which organizations conduct their marketing activities. These are:
• Production concept
• Product concept
• Selling concept
• Marketing concept
• Societal marketing concept
• Strategic marketing concept
• Globalization concept

MARKETING DEVELOPMENT

• Food marketing development refers to a wide range of marketing activities designed to enhance the value of food production for consumers. Advertising, quality control, packaging, new production development, personal sales, merchandising, trading stamps, coupons, cents- off and a host of other activities are instruments of market development.
• The **goal** of Marketing development is to increase consumer satisfaction and in the process increase firm or industry profits.

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THE MARKETING MIX

• It is believed to involve the use of elements, factors or activities so that market can thrive and conducive for all the participants. It ensures cost effectiveness and centers on the products as well as the consumers towards effective management of the market. It is generally accepted as the use and specification of the four P's: Products, Price, Promotion and Place.

• The concept of marketing mix was popularized by Neil Borden (1948) and McCarthy Jerone (1960) uses a useful mnemonic: "THE FOUR Ps" to denote the four elements of the mix + p. McCartly however omitted one of the critical keys i.e the people and the doer, process and physical evidence (extended marketing mix). Discuss favourable & unfavouble factors.

• Discuss the various Marketing Mix for Fish & fish Products:

• Place Mix: Channel of Distribution.

• Price Mix: Price & pricing.

• Promotion Mix: Advertising, Personal selling, Below-line programme, Public relations, Sales promotion, Publicity, Product differentiation and branding packaging.

• Product Mix: Consumer & Industrial Products.

• Process Mix: System for efficient services.

• People: Use appropriate staff & people.

• Physical evidence: Service mix.

ASSIGNMENTS

• Market structure for fish: problems and prospect for rural development in Nigeria. Discuss.

• Enumerate the relationship between fish marketing and production.

• The essence of business is marketing, Discuss.

• Marketing add value or utility to a fish and fish products. Explain.

• Middlemen make life difficult for the consumers? Explain this statement, give reasons and examples to support your answers.

• Explain the relationship between longer distribution channel and fish price.

• Explain with diagrams, the channel of distribution of smoked fish in your state/country.