Food and Agriculture Organization of the United Nations

Post–harvest issues in fisheries and aquaculture

Junior Farmer Field and Life School – Facilitator's guide

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Module: Post-harvest issues in fisheries and aquaculture

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
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Module: Post-harvest issues in fisheries and aquaculture

INTRODUCTION

In addition to being a valuable source of protein and nutrients for many people in the world, fish also provides an income for those involved in bringing the fish to the consumer. Many people are involved in the fisheries system and many business opportunities exist. However, care must be taken to use good and sustainable business practices especially when dealing with a highly perishable product.

The harvesting of fish (wild or farmed) starts a whole chain of activities. The supply chain for fish starts in the fishing ground, at sea or in inland waters, or at the aquaculture site, and it ends with the consumer, who can be in the same country or in another country. The supply chain links a network of harvesters, retailers, distributors, transporters, storage facilities and suppliers that all work together to produce, deliver and sell a product to the consumer. A fisheries value chain describes how value is added to the fish as it is moves through the system to the consumer. This can be done, for example, by processing the fish into dried, smoked or any other type of processed product. Fish supply and value chains are affected by many factors: product demand, available processing materials, regulations, access to markets and competition. Climate change and natural disasters can also affect the supply and value chain of fish. It is therefore important to understand the different linkages and to consider how fishers and producers can react and adapt to fluctuations in fish supply and changing marketing environments.

At the end of this module participants will:

1. be aware of different types of fish products
2. better understand quality and safety issues
3. develop a business approach to post-harvest activities
4. appreciate the role of organizations
5. understand the value chain

The purpose of the module is to provide guidance, making available different exercises that facilitators can use as applicable, and adapt as necessary, to the specific socio-economic and cultural contexts and needs of each target group and country in which the module will be used. This Junior Farmer Field and Life School (JFFLS) module is complementary to other JFFLS modules, in particular with Aquaculture and Capture Fisheries, and can be combined with them to enhance economic opportunities.

↘ OPENING ENERGIZER

OBJECTIVE:

Get to know one another, help a group of individuals become a collaborative team, and help them feel comfortable together.

TIME:

About 30 minutes.

MATERIALS:

Ball or some other object that can be thrown, large pieces of paper with different elements of the fisheries system written or drawn on them (see Figure 1 in the facilitators' notes).

STEPS:

1. Ask each participant to pick a piece of paper from the pile.

2. Have all participants stand in a circle and display their piece of paper.

3. Throw the ball/object to one participant and ask him/her to say his/her name and role in the fisheries system.

4. Invite that participant to throw the ball to another participant, who should also give his/her name and role in the fisheries system. Continue until all participants have received the ball.

5. Break the circle and help the participants to reorder themselves depending on their role in the system, from habitat to consumer.

Exercises

ENTERING THE FISHERIES SYSTEM

Fisheries is a system. The capture fisheries system is different from the aquaculture system, but at some point they merge when the fish is brought to the consumer. The system starts with the fish in its habitat and the interactions that occur there. Once the fish is harvested, the aquatic natural system is linked with the human system as the fish moves from the boat or aquaculture farm to the processing centres, markets and eventually to the consumer. A change in one part of the system will have an effect on all parts of the system.

exercise 1

SUPPLY AND VALUE CHAINS

OBJECTIVE:

Introduce the concepts of supply chain and value chain.

TIME:

1 hour.

MATERIALS:

System diagram (see facilitators' notes).

STEPS:

1. Briefly introduce the system diagram with its various elements.

2. Together with the participants choose a local fish species and ask them to identify the different elements of the supply chain for it.

3. Once all the elements have been identified, lead a discussion about:

   - What would happen if one of the elements of the chain disappeared?
   - Who are the different players in the chain? Are they men, women, children, local community members, others?

4. Introduce the difference between supply chain and value chain. Invite students to think about the efforts needed to produce and transform a product at each stage. For example, what do fishers need in order to catch the fish? What do fish farmers need? What types of processing is done and what materials are needed for that? What are main costs that occur? Are they one-time-only costs (such as a boat) or do they occur often (such as fuel)?

facilitators' notes

Supply chain: The supply chain includes all links from the point of production (point of catch or farm site in the case of aquaculture) to the end user or final consumer. The supply chain for fish and fishery products can involve a large number of people between the fisher or fish farmer and the final consumer.

The supply side of fish and fishery products is affected by factors such as: market demand, prices, seasonality, climatic conditions, population dynamics, economic situation, fuel prices, policy and legal environment. The perishable nature of fish requires special attention to handling, grading and packing, and the market price is usually dependent upon the quality of fish (although this is not always true when demand does not match supply). Supply chains are concerned with how long it takes to present the good for

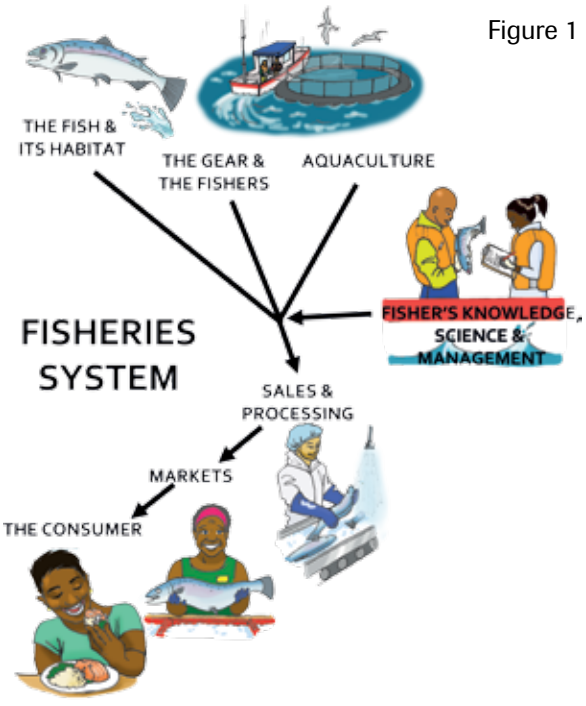
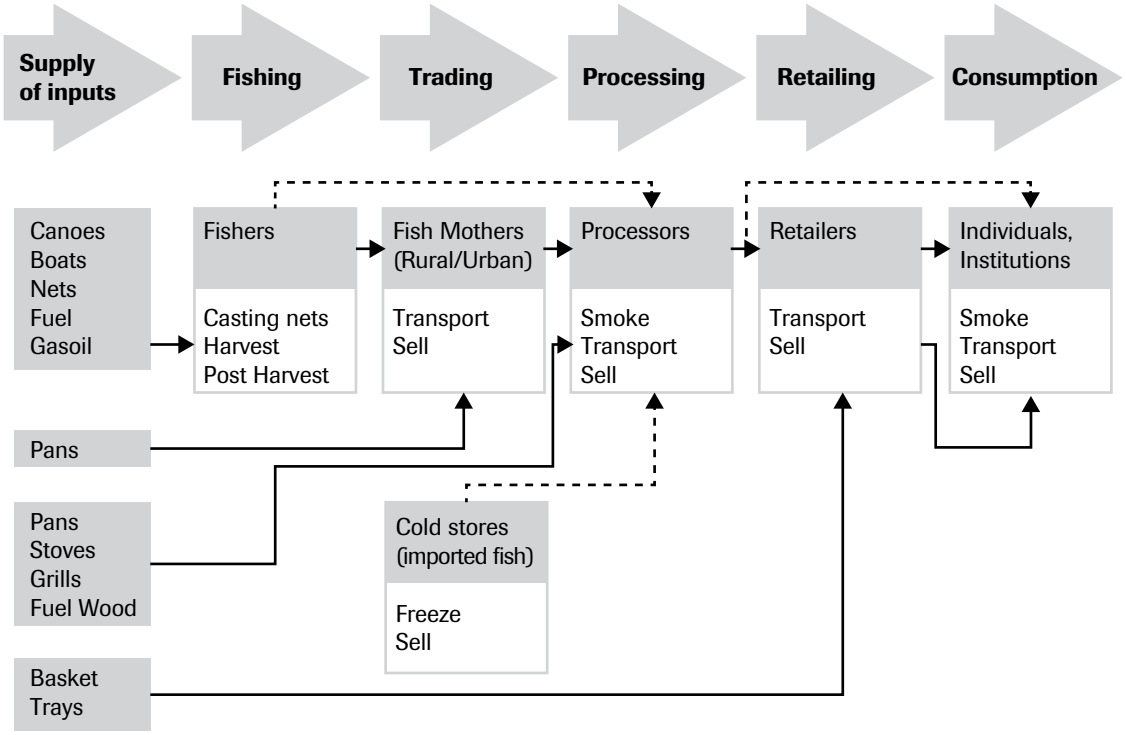


Figure 1

sale. The main objectives of supply chain management are to reduce the number of links and to reduce bottlenecks, costs incurred, time to market, etc. Good supply chain management is essential to develop a value chain

Value chain: A value chain is a supply chain where at every stage value is added as the product moves from production or the landing site to consumption. The product gains value, for example, through processing or packaging. Value chains are concerned with what the market will pay for a good or service offered for sale. Market considerations differ from country to country, region to region and have close connections with food habits and consumption patterns. The main objectives of value chain management are to maximize profit and long-term sustainability.

Example of a supply and value chain for smoked fish in Ghana:



Source: Gordon, Pulis and Owusu-Adjei (2011).

THE VALUE OF ORGANIZATION AND COLLABORATION

There are many types of organizations in fisheries and aquaculture. Some are formed to represent groups of fishers to have a voice in management decisions; some are formed to market their product together; others serve as joint production and distribution centres. The need for an organization will be based on many factors, such as: the type of activity; the power relations along the value chain; the possibility to access production inputs, including capital; the ability to deal with the impact of climate change and disasters; and the availability of transportation and distribution infrastructure as well as of processing equipment and infrastructure.

There are many advantages to working together – being stronger, more visible and having a voice increases bargaining power. If you work together as a group, you can obtain better prices for your inputs, which reduce production costs. You may also obtain better prices as you can produce larger and more stable quantities. As a group, it is also easier to buy larger quantities of inputs at better prices, to optimize transportation to cut operational costs, to obtain access to credit and operate savings scheme, to share ideas, information and experiences and to help one another. As summarized from a popular African proverb: If you want to arrive fast, you go alone, but if you intend to arrive further, go together!

exercise 1

ALONE OR TOGETHER?

OBJECTIVE:

Demonstrate how organizations can help each individual member.

TIME:

1 hour.

MATERIALS:

Hand-made puzzles (e.g. taking a picture from a magazine or hand-drawn picture and cutting it into pieces of various shapes and sizes).

STEPS:

1. Provide each participant with a puzzle and invite all to solve their puzzle. Allow 15 minutes for the activity, depending on the level of difficulty of the puzzle.

2. Ask students if they solved the puzzle. Was it difficult and why? Did they have fun?

3. Redo the exercise with students placed in preferably gender-mixed groups of three people. Ask the same questions. What did they learn about the value of working with one another?

exercise 2

TYPES OF ORGANIZATIONS

OBJECTIVE:

Familiarize students with different types of organizations.

TIME:

At least 3 hours.

MATERIALS:

Fisheries system diagram (Figure 1), case studies linked to the local context (see examples in facilitators' notes).

STEPS:

1. Ask students to examine the fisheries system diagram. Where can organizations help individuals? How can they help solve problems?

2. Have a discussion: Are there already organizations in their community? What are the advantages/disadvantages? Are there any youth groups? Are participants engaged with them? Can youth groups be established in fisheries organizations in the community?

3. Divide participants in smaller ideally gender-balanced groups and provide them with a case study. Ask them to answer the following questions, based on their own personal values and experiences:

    - Is this a good use of the organization?
    - What factors will determine the success of this venture for the individual and for the organization?
    - What factors might cause them to fail?
    - How much and what kind of outside assistance will they need?

4. Ask each of the small groups to prepare a brief representation of a possible scenario for their case study, showing the value of organizations, which they present to the whole group at the end.

facilitators' notes

Below is a list of different types of organizations and their advantages for members.

Management organization:

- Obtain better access to fisheries resources.
- Protect fisheries from overexploitation, for example, through participatory surveillance and monitoring.
- Make it easier to obtain outside support, training courses, extension services, financial assistance, technical assistance, construction of facilities, access to insurance.
- Provide political representation and better social recognition.
- Offer help to group members.

Input supply/producer organizations:

- There is a benefit from purchasing supplies as buying in bulk is usually cheaper than piecemeal.
- Can run a shop for fisher/fish farmers providing essential supplies at reduced costs.
- May be able to provide credit.
- May make it easier to obtain credit from another source.
- Could operate their own facilities such as an ice plant.

Marketing organization:

- Manage fish market facilities or landing centres with good hygiene standards.
- Act as financial intermediary for fisher and trader, improving cash flows.
- Improve fish quality and reduce panic selling of surplus fish by providing storage facilities.
- Develop fish processing facilities such as freezing, smoking, canning.
- Operate a marketing and distribution service, opening up new markets and providing market information (e.g. through mobile phone messages).

↘ SAMPLE CASE STUDIES FOR EXERCISE 2

CASE STUDY 1: TILAPIA AQUACULTURE IN UGANDA

Michael is a small-scale fisher and works from his sail-powered canoe on Lake Victoria. There is a non-governmental organization (NGO) that is promoting cage aquaculture for tilapia. Michael is interested in trying this as catches of tilapia have been decreasing recently. He could continue to fish while his wife and children look after the cages and feed the fish. The Beach Management Unit for his village is talking about setting up a cooperative to have better access to aquaculture inputs such as fingerlings and fish feed; to provide training in record-keeping and technical issues; and to develop a transport system for delivery of the product to the regional buyer. Michael would have to share part of the profit he makes with the cooperative. Should he join the group?

CASE STUDY 2: OYSTER ORGANIZATION IN THE GAMBIA

Fatou is the head of a household in Lamin, a small village in the mangrove community in the Gambia. Her husband has passed away and she has three small children to support. She does not read or write and did not attend school. She is worried about paying school fees for her children and has decided to go into the mangroves to harvest oysters. She will then sell them on the side of the road after she has cooked them. She has been told about an organization called TRY that is helping many of the women in the village. TRY has been able to give the women gloves and boots, made

them uniforms to wear when they sell, set up refrigeration units to store oysters if they are not sold, and TRY even provides classes for the women on sewing and how to handle money. TRY is also facilitating the participation of its members in decision-making about the management of the oyster resource, including, for example, the agreement on closed seasons and minimum sizes. Fatou would have to pay a small annual fee and respect the quality standards developed by TRY members. Should she join them?

CASE STUDY 3: HARVESTING COOPERATIVES IN CHILE

Manuel is a loco abalone fisher in northern Chile. The resource has been overfished and he is trying to find a way to help the resource rebound and still continue to fish. In the next village, there is a Territorial User Rights Fisheries (TURF). The TURF belongs to a group of fishers who formed a cooperative and it provides exclusive rights to the area in front of their village. The resource in the TURF is healthy, and there is even a closed area for spawning and an agreed minimum size for harvesting abalone. The fishers work with the government to determine how much they can harvest and who is allowed to fish. They have developed a relationship with an exporter who will pay a premium price for the bigger products. Manuel would have to pay an entry fee, adhere to stricter regulations than those he has now and work many hours as a volunteer to support the cooperative. Should Manuel join?

Refer to the JFFLS module Entrepreneurship (www.fao-ilo.org/?id=20904) for some of these principles (e.g. planning, marketing, sales, and accounting).

WHAT TYPES OF FISH PRODUCTS EXIST?

Fish can be sold in many forms. The simplest form is a whole fresh fish. However, many ways of processing have developed to either increase the appeal of the product (e.g. fillets) or increase the shelf-life (e.g. drying, salting, smoking, freezing). Some techniques are based on temperature control. These include icing the fish, refrigeration or freezing. Other techniques involve the removal of water from fish. These include drying, salting and smoking. The choice of the processing method depends on the type of fish, the available processing materials and sources of energy (wood, electricity, fuel, sun, etc.), the storage facilities and the costs of each method as well as tradition and market demand. Proper handling and processing is extremely important to ensure that the final product is a safe, nutritious and tasty product to eat.

exercise 1

COMMUNITY SURVEY

OBJECTIVE:

Design and conduct a survey to gather information on different types of processing methods.

TIME:

4 hours.

MATERIALS:

Paper, pencils, a rough hand-drawn map of market area.

PREPARATION:

Make a visit to the market to identify traders and explain to them what you are planning. Also check that the area is safe for the participants and identify a meeting point.

STEPS:

1. Explain to the participants that they will do a survey in the local market to gather information about different types of processing methods and techniques and products produced by the local community.

2. With the group, prepare a map of the area to visit and decide on a route through the market/ processing area for the visit.

3. Form gender-balanced groups of 5–6 people and ask them to identify some questions for their survey. As a minimum, they should:

   - determine the most common fish species in the market;
   - identify different processing methods;
   - learn about the details of each method, and the limitations and advantages of each method;
   - for a particular species/processing type: Who is doing which activity? Role of women? Role of men? Are children involved?

4. In the market, the groups should follow the planned route through the market drawn on the map, but talk to different traders. All members of a team must stay together and meet again at the agreed meeting point after 1.5 hours.

5. When back, ask each group to choose one member to report their experiences to the whole group.

6. At the end, have a discussion with the whole group: What are the advantages of having this survey done? Are there any organizations using these kind of surveys? Can you think of other situations where you would use this survey? Do you think this survey would be useful for future use – and if so, how?

exercise 2

GOING DEEPER INTO FISH PROCESSING

OBJECTIVE:

Provide more in-depth information about processing.

TIME:

3 hours.

MATERIALS:

Paper, pen, fresh fish from local markets, salt.

PREPARATION:

Invite community members involved with different fish processing activities to explain and show to students how they do their work and what types of things can go wrong. Alternatively, discuss whether students can visit them at their place of work.

STEPS:

1. Open the topic by asking participants which current or traditional fish processing methods are used by them, their families, relatives or friends.

2. Invite the fish processors to present themselves and to explain their activity.

3. Open the discussion with the participants and the processors, encouraging participants to ask more details about the steps in the process, to identify vulnerabilities (e.g. impact of pests, heat, hygiene issues, waste, access to clean water, effects of climate change in the form of excess rain or heat, changes in forest production owing to the use of wood for smoking, the use of child labour).

4. Lead the discussion towards improving vulnerabilities in processing (such as a simple hazard analysis and critical control points [HACCP] plan).

5. To conclude, ask students to take the fresh fish and to cover two completely with salt. Put one salted and one normal fresh fish in a shady, protected place and one salted fish and one normal fish in a sunny but protected place. Observe and discuss what happens to the fish over a week.

facilitators' notes

Fish caught from non-polluted water is usually clean and the flesh is safe for consumption. The problem starts when rough or unhygienic handling, or bad control of time/temperature allow for contamination. Fish refrigeration involves either icing (which can be done in containers with ice), chilled sea water or through cool air circulating around the fish. Freezing fish tends to be a very expensive technique that uses a lot of energy. However, it best preserves the nutritional value and extends the storage life of fish.

Dry salting is a technique that allows for the juices of the fish to be extracted. It can be done just about anywhere but the fish should not be spread out on the ground directly but on aired racks to dry. Layers of fish must be separated by layers of salt. This method is inexpensive, requires no energy source, increases the shelf-life and maintains a reasonable nutritional value.

When preserving fish through smoking, the actual process is the withdrawal of moisture or drying. Smoking is one of the oldest preservation methods in combination with other techniques such as salting and drying. Smoking exposes the food to smoke and heat in a controlled environment. A variety of elements are released during smoking. Some of these act as preservatives, some add flavour, while others can be toxic to people and may have health effects. The temperature used for smoking is an important variable, and lower temperatures are better, as long as they are hot enough to preserve the fish before the flesh starts to deteriorate. It is important to be aware that smoking requires large amounts of wood and can contribute to deforestation. Smoking of fish is often done in ovens that are walled in to increase efficiency. However, this makes the working environment difficult and unhealthy for the smokers themselves. Some more modern ovens have been developed, the first among them is called the Chorkor oven.[1] It is fuel-efficient and safe for the smoker. The Chorkor consists of a combustion chamber and a smoking unit with a set of trays. The combustion chamber is rectangular and usually made of mud that has stoke holes for a fuelwood inlet and fire control. A set of 5–15 trays can fit depending on the fish to be smoked and the trays are made of wood with wire mesh.

Fermenting fish is a way of processing and preserving fish by encouraging beneficial bacteria to grow. In this particular method, the development of a distinctive flavour is both the result and principal objective. Fermentation is often combined with salting and/or drying because fermentation often results in the softening and breakdown of the fish muscle. The final product is often used as a condiment or in the preparation of sauces.

Fish canning is a relatively modern technique of processing fish. Fish are sealed in a storage container for long periods – from a few months up to several years. The fish is usually headed, gutted, cleaned and trimmed, and then pre-processed either through salting, brining, drying, smoking, cooking or a combination of these. Vacuum sealing is another method of packaging fish that has already been processed in some other manner. In this method, all the air is removed from the package prior to sealing, thereby extending the shelf-life.

Cooking provides a short-term preservation. There are a variety of methods used to cook fish. Basic methods include boiling or poaching in which the fish is cooked in hot water. Frying fish uses hot oil. Other methods include baking, breading, etc. Generally, cooked fish products should be consumed immediately. However, by utilizing some of the packaging techniques mentioned above, the shelf-life can be extended.

Changing weather patterns affect fish processing, especially fish drying. This is especially true for places where fish is sun dried. Because of changes in climate, it can now rain in months when it never did, and be sunny in months that used to be the rainy months (unpredictable weather patterns). In some areas, there are no longer pronounced rainy or dry seasons. Changing weather patterns can also reduce the amount of fish available for processing.

In many countries, women are in charge of the processing of fish, and in some communities, it is the main economic activity of women. In many instances, they are also responsible for marketing the

1 For more information on the Chorkor oven: http://tcdc2.undp.org/GSSDAcademy/SIE/Docs/Vol5/improved.pdf

fish and are the financiers of the fishers. There are efforts to develop and promote drying systems using renewable energy in order to control the drying operation.

Planning is important to reduce vulnerabilities. A Hazard Analysis and Critical Control Points (HACCP) plan can help to reduce the vulnerability in processing. To conduct a hazard analysis, it is necessary to analyse the food supply chain needs to determine where biological, chemical and physical hazards may occur. Then, critical control points (CCPs) need to be identified as the last controllable points within the chain were those food safety hazard can be prevented. For these points, critical limits need to be established (e.g. max./min. time and temperature) that the CCPs must meet to prevent/reduce hazard. The entire system needs to be monitored with procedures using proper tools that alert you to food safety problems when critical limits are met. If this occurs, predetermined corrective actions need to be taken. All of this should also be documented to provide evidence that food is handled and prepared safely. The plan also needs to be regularly verified to confirm CCPs/ limits are appropriate and monitoring/corrective actions are adequate. The HACCP system is not only for processing sites. Even a fish trader can have a simple HACCP plan, as can a fisher or a fish farmer.

Sometimes, children can be involved in the fish value chain. If the tasks they carry out prevent them from attending school or harm their health and development, this is considered child labour, which is not acceptable. There are international standards developed by the International Labour Organization to protect children and eliminate child labour.

More information can be found in the JFFLS module Child Labour Prevention In Agriculture (available at www.fao.org/docrep/013/i1897e/i1897e.pdf).

PRODUCT QUALITY

In order to ensure the highest quality of fish products for the consumer, care must be taken from the time the fish is caught to the time it reaches the consumer. It is easy to lose the nutritional value of fish as it can spoil rapidly, and there are many points in the supply chain where fish is exposed to hazards.

exercise 1

WHAT'S WRONG WITH THIS PICTURE?

OBJECTIVE:

Increase the ability to identify the risk of post-harvest losses at various points in the supply chain and understand how to reduce these risks.

TIME:

30 minutes.

MATERIALS:

Picture handouts or drawings with post-harvest loss scenarios, paper and pens.

STEPS:

1. Ask the participants to form gender-balanced groups of 5–6 participants.

2. Give each group a handout, paper and pen.

3. Discuss what type of losses can occur during different stages of the fish supply and value chain, e.g. during aquaculture production, fishing, storing fish on board, offloading the catch, fresh fish marketing, processing and packaging or storage.

4. Give each group ten minutes to look at their pictures and to identify where there is post-harvest loss and of what type. After the ten minutes, ask each group to present to the others what they have found.

5. Discuss potential solutions to prevent these losses with the whole group.

Handouts: (can also be replaced by local pictures or drawings)

1. **Aquaculture site**

http://en.wikipedia.org/wiki/Mariculture

http://en.wikipedia.org/wiki/Mariculture

2. **During fishing**

www.fish2fork.com

www.fish2fork.com

3. Storing fish on board

© FAO/Giulio Napolitano

© FAO/Jim Holmes

4. Offloading the catch

© University of Rhode island

© FAO/Pietro Cenini

5. Fresh fish marketing

© FAO/Rosetta Messori

© FAO/J.Micaud

6. Processing and packaging

© Paul Siegel. WWF

© University of Rhode island

7. **Storage**


© FAO/T.Fenyes


© University of Rhode island

8. **Distribution**


© FAO/K. Dunn


© University of Rhode island

facilitators' notes

Post-harvest loss can be physical (e.g. fish that is discarded, eaten by insects or unfit for human consumption) or qualitative (e.g. relatively low price for a product because of quality deterioration). Both relate directly to loss of income and loss of fish as food.

- Time, temperature and handling influence the rate of spoilage of fresh fish.
- Improper processing methods can damage the fish and decrease its value.
- Allowing contamination from insects or predation by animals will decrease the value of the product.
- Packaging, transportation and storage can influence the quality of the product before it reaches the market.

The pictures above illustrate some situations in which losses can occur.

At aquaculture site: The photograph on the left shows how mangrove clearing for the building of aquaculture production sites reduces biodiversity and protection from potential climate change and natural disasters. The photograph on the right refers to high farming density, which can cause physical loss due to higher mortality from disease or lack of oxygen.

During fishing: If nets are not checked and cleared regularly, there is the risk of quality loss due to spoiled or rotten fish. Also, there is a risk of physical loss due to predation from other fish. If not harvested carefully, the flesh of the fish can be damaged (e.g. squeezed, ripped).

Storing fish on board: If fish is kept without ice and not gutted, it will quickly spoil, especially in high temperatures and in improper storage containers. Fish stored at the bottom of the boat can be stepped on.

Offloading the catch: Long bargaining processes and offloading times in high temperatures can spoil the product if it is not properly kept on ice. There is also a risk that fish falls out of the baskets or is stolen in the crowd.

Fresh fish marketing: A lack of ice and proper containers has a negative impact on the quality of the fish. If the fish is exposed on the ground, it risks contamination from dirt and insects.

Processing and packaging: Fish quality will suffer if the processing is done in an inappropriate environment (e.g. on the floor) and without the appropriate hygiene measures (e.g. clean water, no smoking during processing).

Storage: If storage containers are not used correctly (e.g. not properly closed), they will not protect the fish from high temperature, insects and exposure to other sources of contamination.

Distribution: transporting fresh fish in the trunk of a car or on other supports (e.g. donkey, bicycle) without ice and without proper packaging exposes it to high temperature and the risk of contamination with dirt and from insects.

Good practices to prevent losses of fish:

- Keep yourself clean as well as the working tools used and the working environment in order to prevent fish from being contaminated.
- Keep the fish cool, store it adequately, keep it clean, keep it moving (alive if possible), handle it carefully and start preserving it at harvest.

On the boat, the following are among things that can help preserve good fish quality:

- Use proper gear and fishing methods. Adapt to changing weather conditions, seasons, distance from shore (commute time) to prevent fish from becoming spoiled once it is out of the water.
- Handle fish gently.
- Use good sanitary practices. For example, wash hands and use clean gloves.
- Store in clean container with lid and ice.
- Do not let fish sit at the bottom of the boat where it can be stepped on or sloshed in fuel from the outboard motor.
- Remove heads, gills or guts when possible.
- Bleed fish if possible and place in cold brine solution (saltwater with non-contaminated ice).
- Do not store or wash with contaminated water (e.g. shore water).
- If possible, keep fish alive.

At the aquaculture farm:

- Only use approved products for feed and handling, and be careful if using antibiotics and other additives.
- Use good sanitary practices.
- Wash hands and use clean gloves.
- Store harvested animals in clean containers with lid and ice.
- Do not store or wash with contaminated water.
- If possible, keep fish alive until processing starts.

At the landing site:

- Land fish adequately, avoiding spoilage.
- Move quickly from boat to processing or sales area.
- If fish has not been cleaned on board, do so as soon as possible. Wash with clean water and remove gills and guts.
- Keep everything clean. Do not store your boxes near a latrine or other contaminated areas.
- Keep flies and other insects and animals away from fish.
- Ice or refrigerate and store in clean containers.
- Wash hands often and use clean gloves.

At processing or sale site:

- Display on ice or coolers with protection from flies and other insects.
- Put date of capture on the product. If you hold it for several days, make sure it is kept cold.
- Do not let customers or other people handle fish.
- Ensure that all processors pay attention to personal hygiene and health.
- Do not cross-contaminate pretreated/trimmed/processed fish with raw product.
- If you cook, fry, dry or use any other processing technique, make sure all tools and inputs (e.g. pans, oil and utensils) are clean.
- Wrap in clean food-grade packing material for sale.
- Processing inputs such as salt and oil should be clean and good quality.
- If dried and/or salted, make sure it is protected from flies and other insects.
- No fish or fish product should be placed on the ground or floor.
- Drying and salting racks and any other processing facility should be clean and free of debris.
- Smoking facilities should be free of insects and debris.

- Wood used to smoke needs to be safe for human consumption. For example, no painted or treated wood should be used for smoking as the ink and paint pigments and other chemicals may generate toxic smoke.
- Establish and control a “first in, first out” process for storage and pulling out of products.
- An HACCP plan should be developed and applied. If possible, seek assistance from fish inspection and/or extension services. HACCP plans can be simple and can be applied also to small operations: Identify where seafood can be contaminated, and then design and apply a plan to minimize the risk and monitor the result. An HACCP plan should also be applied at the harvesting stage. Good record-keeping is important.

Preparation and cooking techniques at home:

- Plan your purchase and manage it well.
- Buy high-quality fish.
- Fish should be stored in a refrigerator or on ice, or at the very least kept moist in the shade and cooked as soon as possible.
- Keep flies and insects away from fish and any food items.
- Do not cross-contaminate processed and raw product.
- Wash your hands before handling product.
- If there is any doubt about the fish having spoiled, dispose of the fish. Do not eat it!

Any type of fish handling, processing or marketing should not involve children in a way that is harmful to their development or interferes with schooling. Consult the JFFLS module Child Labour Prevention In Agriculture (available at www.fao.org/docrep/013/i1897e/i1897e.pdf) for more information.

THE ECONOMICS OF FISH

Maybe you have a business idea in relation to fish. However, to be successful, you need to assess whether it is worth starting a business. For example, you have to ask if all the necessary inputs are available or accessible to run your business. What will it cost to produce your final product? Setting the price at the right level is very important. Can the price you want to sell it at cover the costs without being too expensive for the final buyer? Is there a final buyer who is interested in your product? Successful businesses will matches the skills and resources of the entrepreneur or producer group with the needs of the customers. Who else produces a similar product and could be a competitor? To work well over a long period, a business will have to learn to deal with risk, including competition and changing circumstances. One way of reducing risk is by linking with others to form a group. When people come together, they bring in different skills and resources and have more options to reduce risks. A group also has a stronger voice in the market.

exercise 1:

WHAT ARE YOU GOOD AT DOING?

OBJECTIVE:

Raise awareness about basic business skills and different business options.

MATERIALS:

Pieces of paper (small and large), pens.

TIME:

1 hour.

STEPS:

1. With the group, talk about the differences between people and what they enjoy doing. Ask them to give examples for themselves (e.g. some people enjoy working with their hands; some enjoy being inside; some like outdoor activities more; some enjoy solving puzzles). Explore with the group if, when they enjoy doing something, they tend to do it better and want to learn more about it.

2. Ask each person to write down on a piece of paper two things they like to do. List all these as skills on a piece of large paper.

3. Discuss with the group: Are there are certain skills that are gender-related?

4. Invite participants to think about what skills are needed to run a business. Ask them to think about someone in their community who runs a successful business. What is the difference between a business person and a sales person?

5. Brainstorm how different skills support running a business. For example, someone who enjoys numbers could enjoy record-keeping; someone who negotiates well might be good at buying and selling fish. Ask the group: what would happen if you tried to do something you were not interested in or not very good at?

facilitators' notes

As a business person, you should see the big picture. A business person is more than just a sales person. A business person must be aware of all aspects of the business, especially the planning. You should be able to identify opportunities, access financing, recruit good workers, and obtain all the necessary information to run a successful business. Consider the following principles when engaging in a business:

- Believe in your own ability to make things happen.
- Make decisions based on careful planning.
- Understand the environment you work in – use Strengths, Weaknesses, Opportunities, Threats (SWOT) analysis.
- Be able to accept failure as part of the learning cycle and make sure you learn from it.
- Work with a vision.
- Manage your time.
- Be realistic.

Useful business skills:

- Appear in public as an organized and focused person.
- Negotiate with skill.
- Communicate clearly.
- Good record-keeping.
- Develop marketing skills.
- Be flexible.

There are exercises below to practise some of these skills and the JFFLS module Entrepreneurship provides more background (www.fao-ilo.org/?id=20904).

exercise 2

PICK A BUSINESS

OBJECTIVE:

Evaluate the feasibility of setting up a new business.

MATERIALS:

Paper, pens.

TIME:

3 hours.

STEPS:

1. Recall that in the community survey (Exercise 1 under What types of fish products exist?) participants were able to observe what is currently sold in the local market. Now their task is to investigate what type of product is missing that people might want to buy.

2. Brainstorm with the larger group: What makes a successful business? (e.g. sell your product, make a profit, save a portion of the income to pay business expenses and reinvest in business, have enough for basic personal needs plus other expenses).

3. Break students into gender-balanced groups of 5–6 people. Ask them to pick a business idea (species, type of product and market) that appears to have a high demand. They should discuss the following questions:

   - What would they sell?
   - Where/who would they obtain it from?
   - Who would they sell to?
   - Where would they sell it?
   - How would they sell it?

4. Have them present their idea to the larger group and pick two ideas (a feasible one and one that seems less likely to work, if possible).

5. For the two cases, with the whole group, work through the following questions:

   - What are the internal strengths of the proposed business?
   - What are the weaknesses internal to the business?
   - What are the opportunities external to the business?
   - What are threats external to the business?
   - Would it make a difference if the business was run by a men or by a women?

6. Capture the results in the following table and compare results:

INTERNAL TO THE BUSINESS			
Strengths	Weaknesses	Opportunities	Threats
EXTERNAL TO THE BUSINESS			
Strengths	Weaknesses	Opportunities	Threats

7. Continue brainstorming with the group:

   - What information are we lacking?
   - Are there more strengths than weaknesses?
   - Are the threats too big to deal with?
   - Is there any gender-based discrimination
   - Is the target market influenced by global changes in markets?
   - Remember to add in climate change in this category!

8. Pick the business idea most likely to work and design a plausible supply and value chain for this business. Conclude by discussing:

   - What are the costs of doing business?
   - What price can you sell the product for?
   - Is it risky? What changes can affect it?

facilitators' notes

Planning is key for the establishment of a successful business. The new business person should understand the environment they are entering with the business. A SWOT analysis is a tool that can be used to develop the business idea, make decisions, solve problems, and develop a marketing strategy.

exercise 3

IS IT FEASIBLE?[2]

OBJECTIVE:

Assess the feasibility of a business idea.

MATERIALS:

Paper, pens.

TIME:

5 hours.

STEPS:

1. Based on the feasible case from the previous exercise, discuss with the group what else needs to be looked at for their particular business idea. The group should now really think in more detail about everything the business will need. Start a discussion by leading the group through a day in the life of the business: It is morning and you are going to the beach, aquaculture site or processing area. Where is the beach, aquaculture site or processing area and how are you going to get there? Once you are there, what will you do first (e.g. checking the fish: is it fresh?)? What do you need to transport your product? Who else will be working with you? etc.

2. The group should list all the things they talk about on a piece of paper.

3. Ask the group further questions to try to make sure nothing has been forgotten. The list of inputs needed for the business should include: raw materials (e.g. fish, salt, wood, ice), labour, skills, equipment (e.g. drying oven/racks, knives), time, buildings (e.g. processing areas), land, transport, licences and legal requirements, public services (e.g. clean water). The following questions can be helpful:

   - Where will the inputs come from? Is everything available locally?
   - Is the supply reliable? Is it reliable throughout the year or just for a part of it?
   - Is the quality of inputs good enough?
   - Who else uses the resources? Will this mean competition for the same inputs?
   - Does the entrepreneur/group have the land or buildings already? How much does it cost to rent them?
   - Are any services already there (water and electricity)? If not what would it cost to provide them?
   - How will inputs be transported? Will they need a storage place?
   - What about equipment? Where will maintenance and repairs be done? By whom?
   - If a licence is needed, where can they obtain it? How much will it cost?
   - How many people will be needed to run the business? Who are they? Is there an existing group with the necessary members or are others needed?
   - Are the necessary skills already available or can they be learned? How, where and when?
   - If designs or other technical information are needed, where will these come from?

4. With the group, estimate what everything will cost. Next to each item on the list, write down estimates of cost. Some of these costs will be fairly easily estimated based on the participant's experiences. Other things will have to be found out by asking others. The figures do not have to be exact, the idea at this stage is just to see whether the business is roughly feasible or not.

2 Adapted from the JFFLS module Entrepreneurship (available at www.fao-ilo.org/?id=20904).

- If skills have to be learned, will it cost anything to learn them?
- If extra labour is needed, what will it cost?
- How about any equipment or tools?
- How much will the day-to-day running costs be for materials, transport, etc?

5. Discuss who will keep the records and do the business accounts for this exercise. Maybe the group has somebody who already has some experience in keeping records. There might be a member who is good at numbers and would be willing to try. Once the group has put a figure next to all the things they need for the business, explain the difference between different types of cost (fixed costs and variable costs).

    - Example: Consider running a bakery. Some costs will not change whether the bakery produces a few loaves or many. Rent, electricity, transport to go to the market to sell the group's product will still be needed regardless of how many loaves have been produced. These costs are called fixed costs. Some other costs will change according to how many loaves the bakery produces. Flour, salt, yeast and other ingredients will vary according to how many loaves are made. These costs are called variable costs.

6. Ask the group to divide their list of costs into the two categories of fixed or variable. This will help the group both to monitor the business and to set the most profitable level of production.

7. Setting the price: Ask the group whether the same or similar products are already available in the area or neighbouring areas. How much do they cost? Discuss with the group how much they themselves would be willing to pay.

    - Note: While the price will depend on what people are prepared to pay for the product, the group will have to check that it at least covers their costs. If the price people are prepared to pay is less than the cost of production, increasing the price is not the answer. This may just mean that nobody will buy the product. Invite the group to look again at the costs, both fixed and variable, to see whether it is possible to reduce some of them. However, cutting costs should not result in a lower quality of the product. If this happens, fewer people will want to buy it.

8. Financing: Where will the money come from to start the business? Until something has been produced and sold, all the money goes out and none comes in. Every business needs money to be put in before any comes back. If the group wants to raise chickens, they will need to pay for the chicks, their feed, and some wire to make a chicken coop to keep them in. All this will have to be paid for before they can start selling the adult chickens. Ideally, this start-up money should come from the business entrepreneur. Let the group discuss options: Is it easier if he/she is part of a group that has its own savings. Will this be enough to cover costs until money starts to be received? If not, where else could money be found? Could the group contribute more? Could money be borrowed from relatives? Are there other sources? Perhaps some things could be borrowed to begin with instead of buying them, or smaller premises could be used.

    - Note: Regardless of how well the group plans the business, things can still go wrong. Input prices can rise unexpectedly or something might break down and need repairing. The group should keep some money aside in a reserve fund to cover these kinds of unexpected expenses. About 5–10 percent of the start-up costs of a business would be a reasonable amount for the reserve fund.
    - If an entrepreneur/group is not sure enough of their business idea to risk their own money first, they should not be thinking of borrowing money. A loan has to be repaid and should

be thought of in the same way as using own funds. Banks and other sources of finance are often not willing to lend to small entrepreneurs or groups unless the group have put some of their own resources or savings into the business.

9. Market research: Once the product has been identified, the group should address the following questions:

   - Who are the people that you hope to sell it to? Are they men, women, children, businesses, households?
   - Where do they live?
   - What do they do?
   - What are they most interested in?
   - How many customers do the group think there could be in the community? Are there enough to keep the business running? Consider also potential demand from local institutions and businesses (e.g. How many fish per week would the nearest hotel require?)
   - Are there more potential customers in nearby villages? How many? Could the product be sold there? Could the group transport the product there? Is anybody selling it there already?

10. Competition: Let the group discuss what product or service they would compete with. This does not only mean whether anyone else makes the product, but what customers would buy in its place if it were not for sale. For example, if the group were to make fresh lemonade, they would not just be competing with other lemonade sellers but with anyone selling soft drinks. Selling kerosene may be competing with selling fuelwood. Discuss this idea with the group and help them to think through who their competitors are. How easy is it to copy the business? If it is very easy, as soon as others see the group starting up the idea, they may copy it. Ask the group the following questions:

    - Are there enough customers for everyone who may want to enter into the business?
    - If not, is there anything the group could do that would give them an advantage over others? Better position in the community, better quality product, faster service, better packaging or labelling?
    - What would the group do if there were not enough customers for both them and their competitors?
    - How easily could they alter their product or service to provide something else to keep the business running?

Note: At this stage, the group should have a clear idea of everything necessary to run the business and will know whether they still want to go ahead. It may be that, although they are willing to start a group enterprise, they decide that the idea chosen is not practical or too ambitious for some reason. If so, it may be worth going back to the original list of suggestions for business ideas to choose something else. Before proceeding to the next chapter, the same feasibility study should then be done for the new idea.

facilitators' notes

Once an idea for an enterprise/business idea has been formed, it is important to assess the actual possibility of producing the particular product or service. Too many people start a new business blinded by the attractiveness of the product or by what seems to be an attractive market but fail after a short time to make a living. This happens because most small-scale entrepreneurs do not plan properly or understand all the costs related to running the business, and they do not do a market study to find out what customers want to buy and at what price.

There are several risks in fisheries production such as changes in abundance, environmental changes, bad weather and theft. Business risks can also be related to poor management of any income (money that comes into the business) and expenditure (money that goes out of the business). Production-related risk could also be due to a breakdown of equipment or damage to products. Market-related risks could be because of a change in what customers want. If there are too many sellers of the same product at one time, prices can fall. Working together with other people through an association can make the group stronger and more resilient to cope with any of these risks.

A feasibility study should show us the best ways to produce, market and sell a product. The result of a feasibility study should point to the best solution to make a profit, given your skills, the resources at hand, and the market opportunities.

exercise 4

CASE STUDIES

OBJECTIVE:

Practically apply the lessons learned from the previous exercises.

MATERIALS:

Two business case studies, one positive and one negative (ideally suitable to the local context, otherwise the samples given below).

TIME:

2 hours.

STEPS:

1. Present case study 1 to the group and together list the steps taken to set up a business.
2. Discuss which factors accounted for the results.
3. Present case study 2 and again identify the steps made to establish the business.
4. Discuss why this one failed.

CASE STUDY 1: ELIZABETH'S DRIED FISH

Elizabeth has space in front of her house near the beach she can use. Both her parents have passed away. She has one younger brother and one younger sister. For the three years since her parents died, she has been working with a local fishmonger helping to clean fish and has not made good profits.

Before she decided what kind of business to establish, she visited the market a number of times to know which types of fish products are popular (in demand) and which ones are sold for a higher price. She even travelled to a market in the next town, because the market in her village is quite small. She found out that dried sole sells at a very high price and that a lot of people want to buy it (it is in high demand), especially in hotels.

Her cousin lives in the next town, and she went to visit him, as she knew he dried sole. She interviewed him thoroughly on how the processing is done. Fortunately, through her cousin, she heard of a training workshop in a nearby village about drying fish as well as other products. Even though she had to arrange for someone to look after her younger brother and sister and to walk a very long distance, she attended the workshop.

The workshop was not like school or anything she had experienced before. It involved demonstrations, and those attending the workshop actually had to do some processing and drying. Elizabeth learned how to select the best fish, clean it, add salt, build racks and keep flies and other pests away from the finished product. She also learned about nice packaging and price setting.

Elizabeth had only 100 (local currency) so she went back to her cousin and requested a loan of 100 (currency) to add to what she already had. Then she went to the market place and looked for traders to buy the fish she was going to produce. She found some stallholders who said they would be willing to sell her fish.

She started to build drying racks on her land. She followed what she had learned from the workshop. She also recorded all the money she spent on buying the fish (production expenses). After three months, she started selling them to her buyers. She wrote down everything she sold, recording her sales. Her total sales amounted to 500 (currency). She made a profit of 200. Out of the profit, she paid back her loan of 100 to her cousin plus a little bit extra (the interest). She reinvested some of the remaining profit into her drying operation by hiring an assistant.

CASE STUDY 2: MARY'S PROJECT

Mary is 17 years old and lives with her two younger brothers. She has been thinking of ways to make some money to ensure her younger brothers can continue to go to school.

She learned from the people who often visit her village that they are looking for fish to eat at home. There are many fish landed in her village and lots of people come to buy. She asked her older sister who used to work in a processing facility how to dry fish.

She organized a loan from her cousin and invested all her savings to start the business. She selected the cheapest fish to buy and dry. For the whole season, she was able to sell only a small quantity of fish. She later learned that there are different prices depending on the quality of the fish product.

She was unable to recover all the money she had spent on the enterprise. Her cousin was becoming increasingly angry with her for not paying him back the money she had borrowed.

SELL YOUR PRODUCT

"What fish does the market want?" is a question all businesses must think about. The "how to market" question requires much thinking. You need to match up your product with the best market approach. For example, a fisher may be returning with high-quality fish. However, marketing this fish can be very competitive, with other fishers offering the same in the local market place. Marketing is about promoting your fish to make it attractive for the customer. How, where and at what price your product is offered is important and, therefore, a marketing plan is very important for your operation. There are many ideas and tools to help you design your marketing strategies, from how to approach buyers to packaging.

exercise 1

SELLING YOUR PRODUCT IN THE MARKET

OBJECTIVE:

Create an effective method to identify and reach your customers through a role play.

TIME:

1 hour.

MATERIALS:

Paper, pencils.

STEPS:

1. Form teams of three people each, considering a gender mix. Explain that they will do a little play (based on the scenarios below or similar ones), and that each of them will have a specific role: one will be the seller, one the buyer, and one an advisor to the seller.

2. Distribute the scenarios.

3. Use the questions below to support the teams in the preparation of their plays:

   - Think about what you are planning to sell and how you will promote it.
   - Plan a strategy:
     - What do you need to know about your competitors?
     - What obstacles do you see?
     - How will you present the information?
     - What questions will you ask?

4. All team members should then discuss together how to best present their roles.

5. Each team will present its scenario to the whole group.

6. Discuss with all the group the different marketing strategies, and brainstorm alternative ideas for closing the deal with the final buyer.

Scenarios

Seller: You are displaying and selling smoked catfish. You are trying to encourage customers to look at what high quality they are and buy them. You are very friendly, happy looking and smile a lot. You are trying to convince a sad-looking person who is walking past to buy some.

Buyer: You are sad because your mother is sick. You are not so interested in buying fish, although a very friendly fish seller is approaching you. Maybe the fish would cheer your mother up? However, you do not have much money.

Seller: You are selling dried fish that you made yourself. You want to show how good they are for preparing lunch. You approach a customer. He/she is worried about the quality of the fish.

Buyer: Someone is trying to sell you dried fish. You are worried that they may not be of good quality and concerned that you may fall sick.

Seller: You have developed a fried fish product, and you are selling it at the market. How can you attract customers to your stall? You must show that it is a good product and the fish is fresh. You want to show how tasty it is.

Buyer: You are hungry. There is a stall with cooked fish for sale. You are not sure whether it fresh fish or not. Also, you are not sure what other ingredients have been used to prepare it. Eventually, you taste it and like it.

Seller: You have live fresh fish for sale (one large one and two smaller ones), and they are wriggling when you lift them out of the water to show to customers. You want to sell the large fish, but the customer seems to want to buy the two smaller fish for very little money.

Buyer: You wish to buy two smaller fish for the same price as the large one. You must bargain with the seller. The seller wants to sell the large fish.

facilitators' notes

Role playing is an effective sales training method that provides a hands-on experience. The key to making it fun and memorable is to add humour and exaggeration to the mix. Students can take turns playing the role of the seller and the role of the customer.

Marketing is about understanding your customers' buying habits and persuading them to buy your products rather than those of a competitor. It involves identifying, anticipating, satisfying and even exceeding your customers' needs. Marketing includes all activities that can contribute to selling a product or service for a better price.

Marketing includes:

- Finding out what customers want.
- Producing a product that meets their needs.
- Pricing the product appropriately.
- Distributing where the customers are located.
- Promoting it through appropriate advertising.

Marketing requires creativity. However, there are marketing approaches that may affect the health and safety of the seller. For example, sometimes women exchange sexual favours in return for fish when they do not have enough money to purchase fish for trading or processing. This behaviour increases their vulnerability and can result in higher transmission rates of HIV/AIDS.

exercise 2

WHEN DO YOU NEED AN INTERMEDIARY?

OBJECTIVES:

Understand the role of an intermediary.

TIME:

1 hour.

MATERIALS:

None.

STEPS:

1. Have an initial discussion on:

   - whether participants think intermediaries and the distribution system are necessary for all products;
   - when and for what products they would be necessary;
   - when and for what products they would not be necessary.

2. Guide the discussion to highlight when intermediaries are useful:

Note: Intermediaries are important when markets are far away or when money is required quickly to meet operating expenses. Intermediaries are less necessary when small quantities are produced and likely to be consumed locally, or also when large quantities are produced and markets are not too far (provided transportation is available to reach the market in time and return at regular intervals). They are also less useful if producers are capable of accessing financial services to face operating expenses.

3. Discuss the characteristics of a good intermediary. For example:

   - a local person of good financial standing;
   - willing to hold stocks of product and equipped to do so;
   - able to create a steady demand for the product;
   - a good communicator (communicating the needs of the market to the producer and helping him/her to produce what the market needs);
   - pay fair prices to the producer and not exploit him/her.

4. Ask for examples of how good intermediaries have helped producers in the local community.

5. Discuss: Is it possible for you to find intermediaries who could help if you wanted to establish your own activity? Or is there scope for you to provide the service of an intermediary in your community?

exercise 3

REFINING YOUR MESSAGE

OBJECTIVES:

Develop simple market research techniques.

TIME:

1 hour.

MATERIALS:

None.

STEPS:

1. Ask the group what they need to know about their customers if they want to set up a business. They should consider the following:

   - Who are the customers?
   - Where are they located?
   - What are their needs?
   - How often do they buy? Are there seasonal patterns?
   - When do they buy?
   - How much are they willing to pay?
   - How will product reach them? Are there seasonal issues with transport?
   - Who are the competitors?

2. Ask them how they can obtain this information (e.g. through customer surveys, information from the media [radio, newspaper, TV] on similar products, observation of competitors, market testing with free samples).

3. Introduce the four “p”s of marketing:

   - Product: High quality, attractive, modern, and diversified.
   - Pricing: Set the right price (to produce a profit but not so high that your customers cannot afford it).
   - Place: You need to be selling at the right location. It should be clean, safe and attractive.
   - Promotion: How do you advertise? Use technology that is readily available. Sometimes word of mouth can be effective; consider the use of information and communication technology (e.g. mobile phones).

4. Value of a brand or a label: Ask students if they would buy a product from a local group rather than from someone they did not know. How could this be used to increase sales? Would their customers prefer locally produced products to imported ones? Would they be more likely to buy fish that was produced sustainably (if this were communicated properly, for example through an ecolabel)? Would they prefer fish from capture fisheries or from aquaculture?

closing activity

DREAM IT!

OBJECTIVES:

Allow students to experience the feeling of a successful business.

TIME:

1 hour.

MATERIALS:

Peaceful music, comfortable setting, pens, paper.

STEPS:

1. Have participants form a circle and sit comfortably on the floor or on comfortable chairs.
2. Tell them to close their eyes and help them visualize their life in 10 years from now – have them envision a successful business outcome.
3. How do they feel? What do they have? What can they see? Hear? Smell?
4. Have them pick a favourite scene and when they open their eyes, they should draw it on a piece of paper.
5. Have them share their vision with others.

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For more information, consult:

- www.kent.ac.uk/careers/interviews/role-play-interviews.htm
- www.salestalentinc.com/sales_situation_interview.php

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