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Module IV-H — Farming in Water

**Problem Area:** Processing the Crop

**Estimated Time:** 2-4 hours

**Purpose/Goal:** This problem develops a basic understanding of the role of processing in aquacrop production. Emphasis will be on the basics of processing and how the producer can cooperate to ensure a quality product results.

**Learning Objectives:** Upon completing the problem area, students will be able to:
- Describe the role of processing;
- Explain basic processing procedures;
- Describe forms of preparation;
- Define dressing percentage and explain its importance;
- Describe the farmers’ role in processing;
- Explain quality control regulations.

**Instructional Resources:**

The following instructional resources are needed to complete this problem area:

**Essential:**
- Transparencies made from the masters attached to this teaching plan.
- The following bulletins:
  - *Processing Channel Catfish,* by Ammerman.
  - *Product Forms, Packaging, Yields and Product Mix,* by McGilberry, Culver, Brooks, Hood, Dean and LaBruyere.
  - *Processed Catfish,* by McGilberry, Culver, Brooks, Hood, Dean and LaBruyere.

**Additional:** The following books:

- *Aquaculture: The Farming and Husbandry of Freshwater and Marine Organisms,* by Bardach, Ryther and McLarney.
- *Seafod Processing: A Factory Visit,* by Skelton.
CONTENT AND PROCEDURES

Preparation
(Interest Approach):

The interest approach prepares students for learning the fundamentals of processing aquacrops.

The procedure establishes an analogy between timber and paper and involves the following steps:

1. Ask students to name the raw materials used in making paper. Examples will include: wood (or trees), cotton, kenaf, clay and other ingredients. List these on the chalkboard.

2. Select wood as the major ingredient to discuss. Ask students to describe the properties of trees. Examples: tall, large, roots in the earth, and have leaves.

3. Ask them to explain the steps involved in getting wood processed into paper. Examples include: cut the tree, haul the wood, chip the wood, mix with chemicals, dry the pulp, and roll or cut the finished product into the desired size.

4. Explain that individuals do not take wood and convert it to paper for their use as paper. They obtain paper from a retail store that bought it from a wholesaler who, in turn, bought it from the paper manufacturer. The manufacturer buys from many tree farms or may have its own farms, has an expensive manufacturing plant, and has a marketing system in place.

5. Ask students to compare providing aquafoods in the supermarket to providing paper. The comparison should involve harvesting the crop, hauling, grading, preparing the crop, keeping the processed product in good condition and distributing it to stores and restaurants.

6. Conclude by explaining how “no one who needs paper wants a tree” is similar to a person who wants to eat an aquafood but doesn’t want to process the raw product.

7. Lead into a listing of the problem area objectives.
Presentation

Key Questions/Summary of Content  Teaching Techniques

This teaching plan develops a basic understanding of the importance of aquacrop processing.

Present the objectives by using T IV-H-1 or by writing them on the chalkboard.

I. What is the role of processing?

A. Processing prepares an aquacrop for consumption.
   1. It includes preparing the crop for sale to a restaurant, supermarket or other outlet.
   2. Processing includes preserving the food to prevent or avoid spoilage. (This keeps the food wholesome and safe for human consumption.)
   3. Processing may involve steps to make the food easy to prepare for consumption.

A. Use T IV-H-2 or the chalkboard to present the meaning of processing.

B. Aquacrops are processed in various ways depending on the nature of the crop.
   1. Fish crops may be "dressed," which means that the internal organs, skin or scales and other parts may be removed, depending on the species and amount of preparation desired.
      • The products may be cut into portions of specific sizes.
      • The products may be pre-seasoned, pre-cooked or otherwise prepared for ease in preparation.

3. Ask students to name examples of processed aquaculture foods. Have them describe the forms with which they are familiar.

• Determine if any students have had pre-seasoned aquaculture foods. Ask them to describe how it was prepared.
2. Some animal aquacrops (oysters, crawfish, and live lobsters) may be marketed with very little preparation.

- (Regardless of the processing, the aquacrop must be kept in quality condition. Steps must be in place to ensure the crops are handled properly. Individuals involved with specific crops should become thoroughly familiar with the procedures involved in processing.)

3. Plant aquacrops may have very little preparation and marketed in fresh form (such as water cress) or be preserved by canning (such as water chestnuts, which is also marketed in uncooked form). (For example, water cress is hand cut into small bundles that may be washed and put into crates for shipping. Refrigeration is important to preserve the quality. Fresh water cress will begin deteriorating in about a week even when stored properly.)

II. What procedures are followed in processing fish?

A. Large processing plants are mechanized and tend to follow the same general procedures. (Processing procedures vary considerably among species and consumer preferences.)

1. With aquacrops, the farmer has an important role in ensuring that the crop delivered to the plant is in good condition.
   - Fish should be free of bruises and other damage.
   - Fish should have the desired flavor when delivered.

2. Procedures used in processing wild fish are similar to processing cultured fish.

B. The steps typically performed at an automated processing plant are:

- Tour a processing plant. Discuss safety precautions and what to look for while on the tour. Have students give oral or written reports on various areas of their observations.

- Use T IV-H-3 or the chalkboard to list the steps typically found in an automated processing plant. (These should be observed on the field trip suggested above.)
1. Sampling — Aquacrops are typically sampled to determine the quality of the product and readiness for harvesting.
   - Some species may have an undesirable flavor.
   - Aquacrops are typically sampled for off-flavor two weeks before harvesting, the day before harvesting and the day of harvesting.
   - Aquacrops that do not meet the standards should not be harvested or delivered to the processing plant.
   - Sampling may also be used to determine the size of the fish. (Harvesting should be delayed if the fish are too small. Large fish may be discounted in price by the processor.)

2. Receiving — This involves those activities associated with unloading, weighing and holding live fish until they go into the processing plant.
   - Aquacrops may be inspected as a part of the receiving process before unloading.
   - Samples may be quickly cooked to check for off-flavors prior to unloading the aquacrop.
   - Some states have specific laws on weighing fish crops to ensure fair treatment of the grower and processor.
   - Holding at the processing plant is usually only for a few hours. Fish are held in aerated vats to keep them alive.
   - Careful records are kept on all fish received so the farmer can be accurately paid for the amount delivered.

3. Grading — Aquacrops may be graded to ensure that all in a batch being processed are of uniform size and species.
   - Equipment is often adjusted to handle fish and other crops that are within a certain size range.
   - Fish over a certain size may require more hand processing.

   - While on the field trip, have a quality control person demonstrate how off-flavor testing is done.

2. On a field trip, have students observe the receiving area of a processing plant. They should carefully observe the weighing of the aquacrop and how information is recorded.

3. Interview a processing plant manager about how aquacrops are graded. In some cases, farmers may do the grading and could be interviewed.
4. Stunning — After holding, the fish are moved in metal crates or other devices which make it easy to stun with electrical current.
   - Stunning dazes a fish but does not kill it.
   - Stunning allows fish to continue living but makes them lifeless.
   - Stunning makes fish easier for workers in the processing plant to handle.
   - Dead fish deteriorate very quickly, particularly if the weather is warm and the fish are not chilled.

5. Beheading — This involves removing the head of the fish and is often referred to in the aquaculture industry as “deheading.”
   - Deheading may involve pushing fish across the stage of a bandsaw to cut off the head. (An individual skilled in using a bandsaw can dehead 40 to 50 fish a minute.)
   - Automated processing plants use deheading machines.

6. Eviscerating — This involves removing the internal organs from the body cavity.
   - In a typical plant, the body cavity is cut open by hand with a knife.
   - A vacuum process may be used to pull the viscera out of the body cavity.
   - Once removed, the viscera are carried away by a conveyor belt for disposal, such as processing into a byproduct.
   - The fish carcass is carried by another conveyor belt to the next step in processing.

7. Skinning (or scaling) — Automated or hand methods may be used to remove the skin.
   - Mechanical skinners can handle 15-25 fish per minute.
   - Without mechanical skinners, considerable hand labor is required at this stage of processing.

4. Have students observe stunning at the processing plant. Ask the manager to explain the process and why it is important.

5. While touring a processing plant, determine if deheading is by hand, with a bandsaw or fishhead saw or if it is automated.
   - If fish are deheaded by hand, observe the saw operator for one minute and count the number of fish the person deheads. Multiply this by 60 (minutes) to determine the number done in an hour.

6. Observe the eviscerating procedures while touring the processing plant. Determine if it is by hand or if a vacuum system is used.

7. Determine how the outer covering of the fish is removed. Students will need to know if the covering for the species involves scales or skin.
8. Washing — After deheading, eviscerating and skinning, the fish is washed with a spray of water.
   • The washed fish may undergo an inspection.
   • After washing, the steps vary depending on the size of the fish and the product being made.

9. Chilling — This typically involves immersing the fish in a tank containing a mix of ice and water.
   • Cooling below 40° F is essential to slow the growth of organisms that could cause the fish to spoil.
   • Sometimes up to 20 ppm of chlorine is added to the water in the chill tank.

10. Sizing — This involves sorting fish carcasses on the basis of size.
    • Smaller fish may be left whole.
    • Larger fish are made into various cuts of high value.

11. Cutting — This involves forming the fish into the desired cuts, such as steaks or fillets.
    • Some automation is available for making these cuts when the fish are of uniform size.
    • Large fish often require hand labor.

12. Convenience preparation — This involves seasoning, breading or otherwise preparing fish or fish portions for easy preparation.
    • Convenience preparation adds to the value of processed fish products.
    • Seasoning (such as lemon pepper, cajun or mesquite) may be used to provide a variety of fish products.
    • Breading puts a flour or corn-meal coating on the product so that the person who cooks it will not need to perform this step.

13. Preserving — This is to prevent spoilage of the product.
    • Fish may be sold fresh without any preservation other than refrigeration.

8. On the tour, have students observe how the fish are washed.

9. Observe the chilling procedures in the processing plant. Have the manager explain how the process works. Determine the temperatures involved and the length of time required to chill the fish.

10. On the tour, determine if an automated sizing system is used. Observe the system in operation and have the manager explain how it works.

11. Determine the forms of preparation being used in the processing plant. Note how the cuts are made and the amount of hand labor involved. Note the movement of the cutters and how they are clothed to protect themselves from cuts and noise.

12. Determine the forms of convenience preparation used in the processing plant. If possible, arrange to eat samples of some of the forms.
    • Have students visit a local supermarket and determine the pre-seasoned fish products available.

13. Determine the ways fish are preserved in the processing plant. Observe how the methods are used.
Many fish products are quick frozen and stored at a temperature of approximately 0° F.

Some fish products are canned, pickled, frozen or preserved in other ways.

14. Packaging — This is to protect the fish product and make it attractive to the consumer.

Packaging protects fish from contamination.

Packaging may involve convenient forms that can be easily cooked, such as in a microwave oven.

Packaging materials include paper, plastic, cans, glass jars and other materials.

Labels providing important information about the product are placed on the package.

14. Students can observe packaging in a local supermarket as well as while on a tour of the processing plant.

15. Storing — All fish products must be stored for a short period of time.

Frozen products must be kept frozen at a temperature of 0° F or below.

Refrigerated fish products must be kept at 30°-38° F but not allowed to freeze.

(Refrigerated products should be shipped from the warehouse within 48 hours.)

16. Hauling — Properly equipped trucks should be used to haul fish. (Refrigeration units must be capable of maintaining the right temperature.)

15. Observe how processed aquacrops are stored during the tour of the processing plant.

16. Arrange to examine a truck while on the tour of the processing plant or when a truck makes a delivery to a supermarket. Determine the temperature in the truck, how the merchandise is positioned for hauling, how the driver handles it and the kind of packaging used.

III. What are the forms of preparation?

A. Traditions often influence how fish are fabricated into portions or cuts (sometimes referred to as forms).

1. The processor must know the market and the forms that are most desired in the market.

2. New forms can be introduced on a trial basis.

If successful, a full-scale marketing effort may be made.

Economy of production influences price and consumer patronage.

A. Have students describe what is meant by “tradition.” Ask them if they have traditions in their home about how they prepare fish or other aquacrops.

2. Ask if any students have sampled foods in a supermarket. If so, have them explain. Determine if a new aquaculture food was being promoted. Ask students how this sample trial in the store is related to getting people to try new products.
(Some forms may be very desirable but not profitable to produce unless a premium price can be charged.)

B. Some of the common forms of fish preparation are:

1. Whole with no dressing — This involves removing the fish from the growing environment, chilling (often to 34°F internal body temperature) and packaging into containers (usually plastic-lined cardboard boxes) for shipment.
   - The grower has an important role in withholding feed for a minimum of 24 hours before harvesting. (This allows food to move through the digestive tract before harvesting so that excrement and partially-digested food don’t foul the fish.)
   - Fish processed in this manner typically go to niche markets.
   - Examples of fish marketed whole with no dressing include tilapia and hybrid striped bass.

2. Whole drawn — This form involves removing the viscera, but leaving the head and skin or scales.
   - With some species, the eyes must remain. Example: Trout.
   - This form is used primarily with fish that will be consumed in a few days.

3. Whole dressed — This form typically involves removing the viscera, skin, some of the fins and the head. (This form of preparation is also known as pan dressed.)
   - Fish prepared in this way are usually cooked whole.
   - Live weight of whole dressed fish varies but is typically 1 to 1 1/2 pounds live weight.

4. Steaks — This involves cutting crosswise slices from a whole dressed fish.
   - The slices are typically 3/4 to 1 inch thick.
   - A cross section of skeletal bones remains in the steak.

B. Have students tour a supermarket and determine the forms of fish that are sold fresh and/or frozen.
1. Use T IV-H-4 or the chalkboard to illustrate forms of fish preparation.

2. Demonstrate the hand process of preparing a drawn fish. Continue the demonstration through the remaining forms.

- Have students practice dressing fish.
  Caution: Be sure to stress safety.

3. Ask students to describe the form of fish preparation they prefer.
• Steaks are typically made from fish with live weights of 3 to 5 pounds.
• These products may be sold fresh, frozen or breaded.

5. Fillets — This is typically a boneless cut made by cutting a side section from a whole dressed fish carcass.
• Fillets are typically 3 to 7 ounces in weight. (One fillet is one portion or serving of the product when it is cooked.)
• Fillets may be trimmed to make premium quality products.
• Fillets are sold at higher prices because there is no waste to the consumer.
• Fillets may be sold fresh, frozen, breaded and/or seasoned.

6. Fillet strips — These are made by cutting fillets into strips about 1 inch wide.
• Fillet strips demand a premium price.
• The strips may be sold fresh, frozen, seasoned and/or breaded.
• Strips are frequently used in fancy dishes, as finger-foods or as hors d’oeuvres.

7. Nuggets (belly flaps) — This form is typically made from less desirable parts of the carcass. (With catfish, it is made from the ventral side of the carcass that holds the internal organs.)
• Nuggets typically do not contain bones.
• Nuggets may be sold fresh, frozen, breaded or seasoned.

8. Formed products — Fish and other aquacrops may be formed into various products.
• These are most often made from less desirable wild fish.
• These typically undergo considerable processing to prepare the product and make consumer preparation easy.
• The products are in portion-size pieces. (Portion-size means that no cutting is needed for preparation to eat the product.)

5. While touring a supermarket, have students collect information on the price of fish. Pay particular attention to comparing the same species in different forms. (The fillet should cost more per pound than the drawn or whole fish.)

6. Determine the species of fish used for fillet strips in the local supermarket.

8. Study the label of a container of imitation crab to determine the nature of the product.
• Surimi is an example of a product that undergoes considerable processing and is made by converting fish into a paste-type substance that is shaped, colored and flavored to resemble crab, lobster or other more expensive products.

9. By-products — These are made from the offal (viscera and other inedible parts) of the fish and is not used for human food.
• Fish meal and fish oil are two common by-products and are used in animal feed manufacturing.
• Fish feed often contains fish oil or meal.
• Some by-products are used in canned pet food.

9. Have students study the label of a fish feed container to determine the percentage of meal or fish oil in the feed.

IV. What is the importance of dressing percentage?

A. Dressing percentage is the percentage of the processed product received from the raw, unprocessed aquacrop.

1. Dressing percentage is calculated by dividing the weight of the processed product by the weight of the unprocessed product. For example, if the dressed weight of a 1 pound fish was 10 ounces, the dressing percentage would be 62.5% (10 divided by 16 = .625).

2. Premium cuts of fish result in a lower dressing percentage.
• The more of the raw product used, the higher the dressing percentage. Fillets may be no more than 30 percent of the live weight.
• Whole dressed fish often dress out at 55 to 60% of live weight.
• Using the offal in by-products increases the proportion of the aquacrop that provides return to the processor.

B. Dressing percentage is important in establishing price levels and determining profitability.

A. Use T IV-H-5 or the chalkboard to present the definition of dressing percentage.

1. Have students calculate the dressing percentage for the following: 1 lb., 8 oz. live fish weighed 15 oz. after processing (dressing percentage = 62.5%)
31 oz. live fish weighed 1 pound after processing (dressing percentage — 51.6%)
1. Since there is less waste with products that have a higher dressing percentage, there is a higher percentage of the aquacrop that can be sold to the consumer.

- Farmers can be paid higher prices for products that have higher dressing percentages.
- Consumers may pay lower prices for food items with higher dressing percentages. Example: whole fish sell for less per pound than fillets.
- Processors have less waste when an aquacrop dresses at a higher percent.

2. Profit for processors may be related to dressing percentage.

- Workers need to be skilled in cutting fish to ensure maximum dressing percentage. Example: an unskilled worker who leaves one ounce of fillet on the bones of the fish carcass would waste a pound of fillet for every 16 fish. The cost of this waste could be calculated by multiplying the number of fish processed in a day by 1 (ounces lost per fish), dividing by 16 (ounces in a pound) and multiplying by the per pound price received by the processor.
- The knives used by workers need to be of the most efficient size and shape and kept sharp.

3. In automated processing plants, machinery needs to be properly adjusted and maintained to minimize loss.

4. Equipment needs to be arranged for efficiency of operation.

- Inadequate holding bins that allow fish to fall on the floor need to be replaced. (Processed fish that fall to the floor should be discarded or placed with the offal.)
- Conveyors need to be operated at a speed for maximum product productivity.

1. Ask students to explain why fillets cost more per pound than whole fish and why shrimp that have been deheaded cost more per pound than those with the heads on.

2. While touring a processing plant, have students observe how the fish are cut. Ask them if the workers appeared to be wasting the product. Ask them what they would do to improve the situation.

4. Upon completion of a processing plant tour, have students prepare a sketch of the floor plan showing locations of equipment. Have them show the modifications they would make to increase efficiency.
V. What is the farmer's role in processing?

A. The farmer must produce a product that the consumer will buy once it is processed.

B. Processors have certain standards for aquacrops to ensure the processed product meets consumer expectations.

1. Flavor — Farmers must produce a product that has the desired flavor.
   - Processors check fish for off-flavor before they are processed
   - Farmers should deliver to the processing plant only those aquacrops that are not off-flavor.

2. Health — Disease-free aquacrops should be produced and delivered to the processing plant. (Only live aquacrops should be delivered.)

3. Damage — Aquacrops delivered to the processing plant should be free of bruises, cuts and broken parts.

4. Size — Aquacrops may need to be sorted according to size prior to delivery to the processor.

5. Species — Aquacrops of uniform species should be delivered.
   - Turtles, snakes and trash fish should be removed at the farm.
   - Weeds and trash should be removed before delivery.

6. Timely delivery — Processing plants need to receive delivery on schedule to keep the plant in operation and to prevent an oversupply of aquacrop at any one time.

7. Contamination — Aquacrops should be free of contamination from pesticides and other residues that might be harmful.

B. Use IV-H-6 or the chalkboard to list the major areas farmers must consider in producing a product that processes well.

2. While on a tour at a processing plant, have students investigate the procedures followed if a fish appears to be diseased.

3. Have students interview a processing plant manager to determine the damage most common in fish. Ask what steps can be taken to prevent the problem.
VI. What quality control regulations apply in processing?

A. Quality control regulations are intended to ensure that only wholesome aquafoods reach the consumer.
   1. Officials within the processing industry want to provide quality products.
      • Poor quality products give the product and the processor a bad name.
      • Consumers will avoid buying products on the basis of past experiences if they have had a bad product.
      • Food products must be produced in clean, sanitary plants.
   2. Quality regulations are established by processors, aquaculture associations, large distributors or retailers of the products and government regulations.

B. Quality control involves several general inspections and permits.
   1. Local health officials are often involved in inspections and issuing permits.
   2. The U. S. Food and Drug Administration makes announced and unannounced inspections to ensure good manufacturing standards are being met.
   3. Inspections may be provided by the National Marine Fisheries Service to observe the products and the procedures followed to produce them.
   4. Inspections may also be provided by other agencies of the state and federal governments.

C. Aquacrops are not subject to the same regulations as other food products, such as beef and chicken.
   1. Efforts are underway to make inspection more uniform in aquaculture processing facilities.
   2. Many of the standards have been self-imposed by the aquaculture industry to ensure a quality product.

A. Ask students to explain what they feel "quality control" means. Have them describe examples of poor quality and quality control.

B. Use T IV-H-7 or the chalkboard to list agencies with regulations designed to ensure a wholesome food supply.

   • Discuss quality control regulations with a processing plant manager.
D. Regulations related to the employment of processing plant workers and the conditions under which they work must be followed.

1. Worker safety is a function of the provisions of the Occupational Safety and Health Administration (OSHA).
   • Wage and hour rates must be met.
   • Child labor provisions must be observed.
3. Legal provisions on taxes, Social Security, employment compensation and other areas of local, state and federal agencies must be met.

E. Several general quality control procedures should be followed.

1. All surfaces that contact fish during processing should be clean.
2. Check aquacrops for disease, chemical residues and other substances before processing.
3. Keep holding tanks for live fish aerated and filled with quality water.
4. Offal should be promptly removed from the processing area.
5. Chilling and freezing should be prompt and in accordance with approved practices.
6. Bacteria counts should be kept low in the processing area.
7. Product dropped on the floor should be properly washed or placed in the by-product.

1. Invite the manager of a processing plant to serve as a resource person in class and discuss safety practices and regulations.

E. Use T IV-H-8 or the chalkboard to list practices ensuring quality in processing.
AQUACULTURE

Review

Review by having the students report in class on the content of each objective. Use T VI-H-1 to show the objectives and call on members of the class to explain the content related to each. This is a good way to reinforce the content that has been learned as well as to strengthen those areas where the students may be deficient in their knowledge. Some of the application activities also provide a good review.

Application

Application can involve several approaches. A few examples are listed here:

- Using hand methods, have the students dress several fish. In each case, have them weigh the fish before any processing is done and after several stages, including drawn, dressed, fillet, and carcass remaining after filleting (record the information). Calculate dressing percentages at each stage of processing. Assess if the processing wasted any product that could have been put to a more valuable use, such as fillet left on the carcass.
- Arrange for the students to tour a processing plant and follow the live product at the point of receiving through the entire processing procedure. Have them give reports in class on their observations.
- Have students visit a supermarket and prepare a list of the different species of aquacrops, the forms in which they are marketed and how they have been preserved.
- Students may be involved in supervised experience programs where they can apply the content of this problem area.

Evaluation

Evaluation should focus on the extent to which the students have achieved the problem area objectives. Here are a few examples.

- Use the review activities to determine the level of mastery of the objectives.
- Observe the performance of students in their supervised experience programs.
- Observe the performance of students in the school laboratory.
- Have students prepare a written report that traces a particular aquafood from farm to the consumer. Students may also give oral reports on their findings.
- Give a written test. (See attached example.)
Farming in Water

Problem Area: Processing the Crop

Instructions: Answer the following questions. Be sure to spell correctly and provide the most complete information you can.

Name ____________________________

1. Why is processing important with aquacrops? ________________________________________________________________

2. Briefly explain the meaning of the following steps in processing fish:
   a. sampling  ________________________________________________________________
   b. receiving  ________________________________________________________________
   c. grading  ________________________________________________________________
   d. stunning  ________________________________________________________________
   e. beheading (deheading)  __________________________________________________________
   f. eviscerating  ________________________________________________________________
   g. skinning  ________________________________________________________________
   h. chilling  ________________________________________________________________
   i. sizing  ________________________________________________________________
   j. cutting  ________________________________________________________________
   k. convenience preparation  __________________________________________________________
   l. preserving  ________________________________________________________________
   m. packaging  ________________________________________________________________

3. Briefly explain the following forms of fish preparation:
   a. whole with no dressing  ________________________________________________________________
   b. drawn  ________________________________________________________________
   c. whole dressed  ________________________________________________________________
   d. steak  ________________________________________________________________
   e. fillet  ________________________________________________________________
4. What is dressing percentage? Why is it important?

5. What is the dressing percentage of a fish that weighs 1 pound, 4 ounces when the whole dressed fish weighs 13 ounces?

6. If the fish in question 5 was made into two 4-ounce fillets, what would be the dressing percentage of the live fish in fillets?

7. What is the farmer’s role in processing?

8. What is quality control? Why is it important?

9. List the general quality control procedures that should be followed in a processing plant.
   a. 
   b. 
   c. 
   d. 
   e. 
   f. 
   g. 
1. It involves preserving the food as well as preparing the crop for sale.

2. a. sampling — Determined the quality of the product and readiness for harvesting.
   b. receiving — Activities associated with unloading, weighing and holding live fish.
   c. grading — Ensures that all in a batch are of uniform size and species.
   d. stunning — Using an electrical current to make a fish lifeless for processing.
   e. beheading (deheading) — Removing the head of the fish.
   f. eviscerating — Removing the internal organs from the body cavity.
   g. skinning (or scaling) — Automated or hand methods may be used to remove skin.
   h. chilling — Immersing the fish in a tank containing a mix of ice and water.
   i. sizing — Sorting fish carcasses on the basis of size.
   j. cutting — Forming the fish into the desired cuts, such as steak or fillet.
   k. convenience preparation — Seasoning, breading, etc., for preparation ease.
   l. preserving — To prevent spoilage of the product.
   m. packaging — Protects the fish product as well as making it attractive.

3. a. whole with no dressing — Removing fish from environment, chilling and packaging.
   b. drawn — Removing the viscera and leaving the head and skin or scales.
   c. whole dressed — Removing the viscera, skin, some fins and the head.
   d. steak — Crosswise slices from a whole dressed fish.
   e. fillet — Usually boneless cut made by cutting a side section from a whole fish.

4. The percentage that the processed product is of the raw, unprocessed aquacrop. It is important in establishing price levels and determining profitability.

5. 65%

6. 40%

7. The farmer must produce a product the consumer will buy once it is processed.
8. Certain standards must be met to ensure the processed product meets consumer expectations. It ensures only wholesome aquafoods reach the consumer.

9. a. All surfaces coming into contact with fish during processing should be clean.

   b. Check for disease, chemical residues and other substances before processing.

   c. Keep holding tanks for live fish aerated and filled with quality water.

   d. Offal should be promptly removed from the processing area.

   e. Chilling and freezing should be prompt in accordance with approved practices.

   f. Bacteria counts should be kept low in the processing area.

   g. Product dropped on the floor should be properly washed or placed in by-product.
Farming in Water:
Processing the Crop

OBJECTIVES
• Describe processing
• Explain processing procedures
• Describe forms of preparation
• Explain dressing percentage
• Describe the farmer's role in processing
• Explain quality control
Processing

DEFINITION:
Preparing an aquacrop for consumption
Steps in Processing

- Sampling
- Receiving
- Grading
- Stunning
- Beheading
- Eviscerating
- Skinning
- Washing
- Chilling
- Sizing
- Cutting
- Convenience Preparation
- Preserving
- Packaging
- Storing
- Hauling
Forms of Preparation

WHOLE FISH

DRESSED

DRAWN

STEAKS

FILLET

NUGGET CUT

STRIP CUT
Dressing Percentage

DEFINITION:
The percentage the processed product is of the unprocessed aquacrop.
Farmer’s Role in Processing

PRODUCE AND DELIVER AQUACROPS THAT ARE:

- Right flavor
- Healthy
- Undamaged
- Right size
- Uniform species
- Delivered on time
- Free of contamination
Agencies in Quality Control

- Local health department
- U.S. Food and Drug Administration
- National Marine Fisheries Service
- Other federal, state and local agencies
Practices to Ensure Quality

- Cleanliness
- Check for contamination
- Good water in holding tanks
- Remove offal
- Chill and/or freeze promptly
- Keep bacteria counts down
- Wash products