HACCP in AQUAFARMS

A practical handbook

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INTRODUCTION

“If it’s good for me, then it’s good for them”
—Pampanga Shrimp Farmer, March 2009

HACCP\(^1\) has become a basic requirement for international trade, not only for Filipinos wishing to export to most countries, but also for foreign operators wanting to sell their products on the Philippine market.

It is important to understand the roots of the success of HACCP, because it is not just a constraint to be complied with. If well understood, HACCP is an opportunity for Filipino farmers to take the lead in the highly competitive context of the 21st century’s global economy.

With the globalization of trade, the geographical and cultural gaps between food producers and food consumers have never been larger. Filipinos eat imported rice and Europeans eat imported shrimps. But the growing distance between producing and consuming areas is also a factor that breeds misunderstanding and sometimes distrust, whether justified or not. Aside from the mandatory enforcement of food safety, there is another major component of trade: consumer confidence. The “If it’s good for me, then it’s good for them” principle is no longer acceptable for the aquaculture business in 2009. Of course, the product must be safe, but it is not enough as was glaringly apparent during recent food crises: the consumer must also be convinced that his food is and will always be safe. (It is not enough for the producer to know and say that his product is safe, the consumer must be absolutely convinced of its safety, as was apparent in recent food scares.) Being an internationally accepted and recognized method, HACCP is probably the best tool currently available to Filipino farmers to ensure both food safety and consumer confidence.

But starting a HACCP project can be intimidating and overwhelmingly difficult, so that many might be discouraged outright before even trying. This handbook is meant to change this perception by providing—through real Filipino examples—the basic knowledge required to develop a HACCP plan on an aquafarm. It is by no means meant to create the ultimate and perfect risk management plan, as quality management is a never ending process, but it is aimed at convincing Filipino aquafarmers that HACCP is not that difficult and that they can do it.

\(^1\) Hazard Analysis and Critical Control Point
PRESENTATION OF HACCP

The *Hazard Analysis and Critical Control Point* (HACCP) is a method that was developed in the USA in the 1960s as a way to ensure the highest level of food safety that astronauts required during its exploration of the Moon. Since then, it has met huge success and has been standardized by the *Codex alimentarius* (the global food-standard-setting body) in order to facilitate ease of international trade.

A *hazard* is any source of potential damage, harm or adverse health (*e.g.*, the presence of a venomous snake). It should be distinguished from a *risk*, which is the chance, probability or circumstance that the hazard causes the feared damage (*e.g.*, being bitten by the snake). But all hazards have different levels of risk, and the purpose of HACCP is to distinguish among them in order to control them efficiently, using the most appropriate and effective monitoring scheme.

The HACCP is composed of three (sometimes four) independent modules:

- **Risk analysis** is aimed at identifying and ranking hazards. It must be based on sound science and applied using a rigorous system-based approach to the production process. It generally ends by identifying several Critical Control Points (CCPs)—phases in the production process (or sometimes products)—at which control can be applied and are essential to prevent or eliminate a food safety hazard or to reduce it to an acceptable level.

- **Risk control** is aimed at preventing and controlling hazards. It cannot be initiated before risk analysis is finished as it relies on a series of previously established and set procedures, available in writing that can be used to control the critical hazards identified during the risk analysis.

- **Risk management** is the implementation of the risk control scheme.

- **Risk communication** is not always included in the HACCP, but more and more companies take it into account in order to instill confidence in their clients and reduce the risk of having anybody harmed in case of a food crisis.

The HACCP system is built on respecting seven principles:

- Principle 1: Conduct a hazard analysis.
- Principle 2: Determine the CCPs.
- Principle 3: Establish critical limit(s).
- Principle 4: Establish a system to monitor control of the CCPs.
- Principle 5: Establish the corrective action to be taken when monitoring indicates that a particular CCP is not under control.
. Principle 6: Establish procedures for verification to confirm that the HACCP system is working effectively.
. Principle 7: Establish documentation concerning all procedures and records appropriate to these principles and their application.

In order to facilitate its development, the *Codex alimentarius* has identified 12 steps to follow while implementing an HACCP, which are:

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
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<tbody>
<tr>
<td>1.</td>
<td>Assemble a HACCP team</td>
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<td>2.</td>
<td>Describe the product(s)</td>
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<td>3.</td>
<td>Identify intended use(s)</td>
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<td>4.</td>
<td>Construct a flow diagram</td>
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<td>5.</td>
<td>On-site confirmation of the flow diagram</td>
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<tr>
<td>6.</td>
<td>List all potential hazards associated with each step, conduct a hazard analysis, and consider any measures to control identified hazards</td>
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<tr>
<td>7.</td>
<td>Determine Critical Control Points</td>
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<tr>
<td>8.</td>
<td>Establish critical limits for each CCP</td>
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<tr>
<td>9.</td>
<td>Establish a monitoring system for each CCP</td>
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<tr>
<td>10.</td>
<td>Establish corrective actions</td>
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<tr>
<td>11.</td>
<td>Establish verification procedures</td>
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<tr>
<td>12.</td>
<td>Establish documentation and record keeping</td>
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These are the steps that will be followed in this handbook, understanding is enhanced by providing comments and recommendations as well as real-life examples taken on three actual aquafarms in the Philippines.
THE BFAR-CIRAD COOPERATION

The Bureau of Fisheries and Aquatic Resources (BFAR²) is the government agency responsible for the development, improvement, management, and conservation of the country's fisheries and aquatic resources. It was reconstituted as a line bureau by virtue of Republic Act No. 8550 (Philippine Fisheries Code of 1998). The bureau is under the Department of Agriculture. It is the Philippines’ Competent Authority for the food safety of seafood products and was successfully inspected for this by European Food and Veterinary Office’s inspectors in 2006.

The Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD³) is a French agricultural research center working for international development. Most of its research is conducted in partnership. CIRAD has chosen sustainable development as the cornerstone of its operations worldwide. This means taking account of the long-term ecological, economic, and social consequences of change in developing communities and countries. CIRAD contributes to development through research and trials, training, dissemination of information, innovation, and appraisals. Its expertise spans the life sciences, human sciences, and engineering sciences and their application to agriculture and food, natural-resource management, and society.

With the continuous support of the French Embassy to the Philippines⁴, Cirad and BFAR have been cooperating for many years to support the sustainable development of Filipino aquaculture. Past and current research projects include a research on the genetic dynamics of tilapia which leads to, the development of a selected strain of brackishwater tilapia (molobicus) and, since 2005, a project which also compliant with International Food Safety Standards.

² BFAR <http://bfar.da.gov.ph/>
³ CIRAD <http://www.cirad.fr/ or http://aquatrop.cirad.fr/>
THE THREE PRACTICAL CASES

This extensive cooperation and experience with CIRAD inspired the BFAR to initiate activities towards HACCP-compliant aquafarms as part of the farm-registration requirements of trading partners like the EU.

Being HACCP-compliant is a big step towards consumer confidence and global competitiveness, and although it involves effort and attention to detail, it is not beyond the reach of the average aquafarmer.

The seven principles and 12 steps that make up HACCP are general but necessary guidelines that can be applied in a multitude of ways. There is no single, specific way to do HACCP; its application varies.

For that reason, we have decided to illustrate it here with examples taken from three real-life studies conducted on Filipino farms that can be considered the first HACCP-compliant farms in the Philippines:

- Natanauan Aqua Farm
  L. Natanauan St., Aya, Talisay, Batangas
- JLV Prawn Farm
  Tanagan, Calatagan, Batangas
- Yabut Farm
  San Esteban, Macabebe, Pampanga

These farms were selected because they were highly representative of their sectors of aquaculture and because their owners are pioneer supporters of the modernization of Philippine aquaculture. These studies were also used as training experience for two French students and BFAR staff.

These examples are also aimed at helping the reader understand the basic principles of aquaculture. Although full studies are available at farms and the BFAR offices, readers are encouraged to use this handbook to come up with their own HACCP plan, tailor-fit to their specific needs.
PREPARE YOURSELF!

The main challenge with a HACCP is that you should not expect to be told what to do in terms of food safety practices. **YOU** are responsible for defining **WHAT** has to be done, and you will not be evaluated for your compliancy with a series of requirements, but for your capacity in identifying hazards and controlling them. This is a brand-new approach to food safety regulations, and you will need to prepare yourself and probably fundamentally change the way you work.

Be open-minded, fight the clichés, be humble and accept that you cannot know everything. Be transparent as well: if you are honest and work seriously, you have no reason to hide anything when it comes to food safety. Moreover, it is very easy for any skilled inspector or auditor to find out what is hidden, so remember that an admitted non-compliancy is always considered less serious than a hidden one, because people know that if you are transparent, they can trust you. Some exporters have recently been banned on-the-spot from some economically important markets, not for being non-compliant but for not being transparent. So if you are not compliant, just admit it and face an embarrassing delay in accreditation (even the best companies get into this situation) rather than suffer shameful banning.

Listen to others (staff, friends, other farmers, clients, government, etc.) and try to understand their point of view, even if you disagree. Work as a team, and never forget that when it comes to quality, 1+1 is not 2 but more! Encourage your staff, even the shyest, to contribute to HACCP. If you do your HACCP well, you will most likely discover inappropriate practices that you probably didn’t know existed. Do not discourage people from informing you about these by letting them fear that they might be punished for reporting wrong practices. HACCP has nothing to do with discipline but can be used as an educational tool.

Do HACCP seriously and if you cannot, assign someone by giving him all and unlimited authority in developing and implementing the program. Even so, expect to spend at least 6 months of hard work before having a first acceptable version.

Finally, be ready for a lot of paperwork. HACCP is all about “Write what you do, do what you wrote, and give written evidences of it.” But do not worry; it’s not as difficult as it looks, at least once you have gotten used to it!
PART ONE: RISK ANALYSIS

The HACCP team, description of the farm, description and intended use of the product (Steps 1, 2 and 3)

While beginning the HACCP, it is important to introduce yourself and the product that you are considering, so that the scope of your study is clearly defined.

The first step is defining the HACCP team, which is the group who is jointly responsible for creating and implementing the HACCP. Although there should also be one person identified for leading and piloting the study, all people belonging to the HACCP team are required to actively contribute to its achievement. They must take part in regular meetings and sign the attendance sheet for each one. They must be chosen for their skills that must supplement those of the other members. Generally, there should be a representative of the management (someone to validate decisions taken by the group and allocate resources), representatives of the production sectors (those who know the processes and the farm) and any other people who might be helpful and can take part in all meetings (extension service’s representative, client’s representative, consultant, OJT, etc.). The HACCP also requires interviewing all resource persons that can help in the study, but those must not be listed as members of the HACCP team if they do not take part in all commitments assigned to the HACCP team. The HACCP should not be too large, nor too small (approx. five persons).

The second step is to describe the farm. Some companies have several farms and establishments, but a HACCP is site specific, as many hazards are also site specific. For that reason, it is important to present the site within the scope of the HACCP, and if required, to explain its relationship with other components of the group.

The third step is the description of the product. It must be well understood that a product should not be confused with a species. Some hazards are species-related (e.g., Biotoxins in filtering shellfish) while some others are process-related, ingredients-related, or packaging-related (preservatives, etc.). Selling fish products live or dead, for food consumption or ornamental lead to completely different products when it comes to food safety. First, identify the scientific name of all species farmed, and then describe the product sold and its market(s). Do not forget to mention the packaging or storage type, as well as how the product is distributed and stored after distribution (e.g., frozen, refrigerated, on ice, or dry). If applicable, identify whether any special shipping methods, such as mail order, are used.
The fourth step is the intended use. You must identify how the end user or consumer will use the product, by including all reasonable possibilities in case of doubt. Examples: to be heated (but not fully cooked) and served, to be eaten with or without further cooking, to be eaten raw or lightly cooked, to be fully cooked before consumption, to be further processed into a heat-and-serve product. You must also specify if the intended consumer or user of the product may be the general public or a particular segment of the population, such as infants or the elderly. The intended user may also be another processor, who will further process the product.

**EXAMPLE 1: TILAPIA CAGE CULTURE**

1. **The HACCP Team**

The HACCP Team evaluates and monitors the safety of farm operations including practices, workforce, material, feed and fry reception, farm managing, harvesting, and all other activities directly or indirectly related with the overall production operation. It is composed of the following:

1. **XX Farm manager/Owner.** Manages and administers the business affairs of the farm in a specified way. He is the one validating the HACCP plan.

2. **XX Assistant manager.** Oversees and ensures that all routine activities undertaken in the farm, including hatchery and cage operations, are properly implemented. He is the one piloting the HACCP study.

3. **XX Takes charge of the cage operation (stocking, feeding, harvesting) and maintenance.**

4. **XX receives and inspects feeds upon delivery. Takes charge of the preparation of harvesting materials like harvesting boat, plastic basin, scoop nets, and weighing scale. Is in-charge of weighing and transporting tilapia from the farm to the traders.**

5. **XX is an extension officer. Extends technical assistance on feeding management and risk assessment.**

6. **XX is a Fish Health Officer. Extends technical assistance on fish health management.**

2. **Description of the farm**

Tilapia culture in cages has been practiced in Taal Lake for the past two decades. It was in 1984 when the farm started its operation by rearing tilapia using 3 units of floating cages which are made of bamboo, each measuring 10x10x8m. Due to its success in grow-out culture, the farm expanded up to 120 units in other barangays.

3. **Description of the product**

Nile tilapia, scientifically known as *Oreochromis niloticus* and other genetically enhanced species or strains such as GIFT, BFAR 2000, and GET EXCEL are widely used for grow-out because of their notable characteristics such as resilience, rapid growth, and relatively low mortality. In the 1990s it was aptly referred to as “chicken of the sea” because of its palatable taste. On the farm, a combination of strains is used.

Commercial sizes are 5–6 pcs/kg, 3–6 pcs/kg, and 1–6 pcs/kg. The Farm Gate price is PhP70.00 as of August 2008.

4. **Intended use**

Harvested tilapia are either sold live or freshly chilled to traders/fish brokers to local markets in Alabang, Navotas, and Laguna. Traders in turn distribute fish products to wet markets, hotel,
restaurants, and other outlets for consumption.

Method of storage and distribution:
- Transport in plastic containers with aeration and in plastic boxes with ice
- Marketing to direct buyers
- Delivery trucks belonging to traders

EXAMPLE 2: SEMI-INTENSIVE SHRIMP MONOCULTURE

1. The HACCP team
Mr. XX in charge of doing a pilot HACCP on the farm as part of his OJT’s training work.

Mr. XX, a technician from a company supplying the farm, who is testing a new protocol based on the use of probiotics.

Mr. XX, technician responsible for feed quality, harvesting equipment, and production who has been working for several years in the farm. He will be in charge of carrying out the HACCP, following the monitoring system and controlling for new hazards. Other technicians and workers of the farm are also involved in carrying out the HACCP.

Mr. XX, the owner of the farm who validates the HACCP.

2. Farm description
Operations on this farm were began 90 years ago by descendants of Spanish settlers. The current owner bought it in 1985. The total surface of the farm is 100 ha and there are 53 ponds, but only 21 are currently being used for shrimp growing. The total water area is 30 ha, 20 ha of culture, and 10 ha of reservoir, excluding dikes and waterways.

Aerial view of the farm

3. Product description
Black tiger shrimps, (*Penaeus monodon*) are grown in monoculture ponds using commercial feed pellet. Shrimps are delivered live and unsorted to the buyers. For the local market, the commercial size is 10-30 g/piece (100–33 p/kg) and for export, 20–30 g up (50 up to 33 p/kg).

4. Intended use
The production of the farm is intended for local and export market according to demand and prices. Shrimps can be commercialized fresh, frozen, or processed. They are supposed to be cooked but they
can also be consumed as raw dishes especially in Japanese food. Farm production is oriented mostly to the local market especially if prices are higher than the export price. The local market is actually the main outlet of the farm due to its proximity to the Greater Metro Manila area. Another part is exported to Japan, Korea, and the USA. The companies that buy and export shrimps from the farm are: Well Share Export, AA Export, HJR Export, and INTAQ Export.

EXAMPLE 3: EXTENSIVE SHRIMP POLYCulture

1. The HACCP team
The initial HACCP study was headed by XX from May to November 2008 and developed by the following HACCP team:

XX, owner and farm manager. He provided the technical and commercial information, corrected the drafts and he is the one to approve the HACCP study.

XX, Officer-in-charge (OIC). Provided the technical information on the practices and the equipment used on the farm, and validated the drafts.

XX, student from French engineering school. Collected the data by direct observation, interviewed all stakeholders including caretakers, wrote and submitted the draft to HACCP team, and implemented the HACCP scheme.

2. Yabut farm
The farm is located in San Esteban, Macabebe, Pampanga province (Lat: 14°51’21.74”N Long: 120°39’29.29”E), 1 km from the nearest community. It is isolated and can only be reached by boat. It belongs to the Baltazar Lacap Agro Development Corporation which is based in Guagua (Pampanga, 30 minutes by boat). The company also owns three farms and three consignaciones. The manager of the company is Mr. Joselito Baltazar Lacap who lives in Hagonoy, Bulacan. The farm is managed by an officer-in-charge (OIC), Mr. Joe Balthazar who has been working for several years for the company. The farm is registered with the BFAR (under number R3-PAM-003).

The total area is 85 ha divided into 11 ponds. The largest is 14.5 ha and the smallest is 6 ha. The latter is used exclusively for pre-growing shrimp. The culture environment is brackish water and the salinity fluctuates between 10 and 15 ppm. The farm is located on a small canal 8 km from Manila bay (seawater). The farming system used is extensive polyculture in which shrimp is grown at a low density, along with fish (tilapia and milkfish) and crab. This is the dominant farming system in the whole region.
3. Product description

The farm produces seven species in polyculture ponds. Five of them are introduced in the ponds and are considered economically important, as these are the ones that sell most. They are comprised of black tiger shrimp, two species of mudcrab, and two species of fish. Another two species are self-recruiting from the wild and are collected by the workers after harvest. These two are one species of mudcrab, Alimasag *Portunus pelagicus* (Linnaeus, 1758) and one species of fish. The HACCP study only considered the economically important products.

**Black tiger shrimp** *Penaeus monodon* (Fabricius, 1798)

*P. monodon* is a marine crustacean that is widely cultured for food. According to FAO (2007), it is the second most produced shrimp in the world, accounting for 29% of the total production. Unlike *Litopenaeus vannamei* (Boone, 1931), which is the world’s most produced shrimp comprising 57% of the total and was recently introduced to the Philippines, *P. monodon* is a native species. It is the one preferred by consumers and benefits from a higher price, but it is also more susceptible to diseases and has a higher production cost. Following disease outbreak in high-stocking density (SD) or intensive farms in 1995, production in Pampanga has become dominant because shrimp cultured through extensive polyculture is less susceptible to disease. The shrimp is grown at a very low density (<5/m²) without commercial feed and drug treatment. The culture of filter-feeding fish with shrimp is generally thought to improve the shrimps’ health. Shrimp is produced on a 3–4-month basis and is first packed as fresh as possible in ice, sometimes while still alive, into 37–40 kg mixed-sized batches inside iceboxes. All the shrimps are then sold through an auction market belonging to a company in Hagonoy, Bulacan (located 20 to 30 minutes by boat from the farm). The price depends on the size, the season, and the destination of the products (export or local).

Price of the shrimps in consignacion⁵ (Bulacan 2008)

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<thead>
<tr>
<th>Size</th>
<th>Unit per Kilo</th>
<th>Price per Kilo (Php)</th>
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<tbody>
<tr>
<td>Jumbo</td>
<td>&lt; 18</td>
<td>600 to 700</td>
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</table>

⁵ Auction market
Two species of crabs are grown on the farm, the Bulik *Scylla serrata* (Forsskål, 1775) and the Pulahan *Scylla paramamosain* (Estampador, 1949). These species have been introduced recently in the polyculture because of the high national demand and price, as well as the reliability of production. Although the Philippines already has hatcheries producing mudcrab fry, the owner of Yabut farm stocks up with wild catch from the Pacific coast. The growing-out period lasts from 120 to 180 days, which is more than the duration of one shrimp cycle, which requires some transferring of crabs during shrimp harvest. Trash fish spread in pond is used as the primary feed for the mudcrabs.

All crabs are sold in the local market through the company’s consignacion in Orani, Bataan. They are delivered live but hampered, in batches of one hundred unsorted pieces inside large plastic buckets. The price depends on the species, sex, and size of the crabs. The Bulik are more expensive than the Pulahan. The price of the Bulik is around Php100.00 per kilogram.

Fish

The polyculture farm may also include fish species belonging to tilapia *Oreochromis niloticus* (Linnaeus, 1758) and *O.mossambicus* (Peters, 1852), and milkfish *Chanos chanos* (Forsskål, 1775).

Milkfish, commonly called Bangus in the Philippines, is a marine fish that has been farmed for more than a century in Pampanga. Most of the ponds currently used for shrimp farming were actually built many decades ago to grow milkfish. Today it is an important secondary product, rivaling tilapia. Farmers will grow one or the other depending on the market price of tilapia.

Tilapia is an African freshwater fish introduced to the Philippines in 1950. Until recently, the country had become the world leader in the production of this species. In 2003 alone, Pampanga produced 65,000 metric tons of tilapia, earning it the title “tilapia capital of the Philippines.” Freshwater species of tilapia have been introduced in brackish water shrimp ponds because it has been reported that its filter feeding behavior had a beneficial impact on shrimp survival and disease outbreaks. The fish reportedly reduce the expansion of invasive aquatic weeds in the ponds. Milkfish and tilapia are sold jointly through the company’s consignacion in the town of Sasmuan. They are delivered in bulk storage on boat bottom. They are exclusively sold in the local market.

Utilization of the product

Farm animals are mainly intended for human consumption. Several methods of preparation are possible and generally, the seafood is cooked before consumption. All the production on the farm is sold fresh. Animals can also be frozen, smoked, or processed depending on the product. The products are intended for the local market or export depending on the price and the facility they are brought to. Mudcrab and fish are sold exclusively at the local market while shrimps are sold in both.

Local market

Many factors can contribute to an increase of the importance of the local market in shrimp production. Three of the most important and are directly connected with the shrimp consumption are:

- The increase of the standard of living in metropolises like Metro Manila.
- The proximity to the consumers.
- The progress of the selling price.
- These factors give the local market an important place in the competition between the buyers.
Export market

The export market is principally divided into three zones, Asian, European, and American. The difference in selling price between the export and the local market is always in favor of the former according to the zone.

Flow diagram (Steps 4 and 5)

The purpose of the diagram is to provide a clear, simple description of the steps involved in the processing of your fishery product and its associated ingredients as they "flow" from receipt to distribution. The flow diagram is definitely a key and critical step. **Do not underestimate it or you will fail!** Together with the farm map, it is the basic tool that will help you to identify hazards, so it must really be perfect.

The flow diagram aims at representing clearly all the steps that are included in the HACCP. The Receiving and Storage Steps for each of the ingredients, including the non-fishery ingredients, should be included. To make the diagram clearer, it is recommended to standardize it; for example, list steps inside boxes, use arrows to show the life cycle of input and equipment. There are no specifics as to how detailed the flow diagram should be. It must not be too simplistic, but should also fit on one page and must be clear enough to be understood by any reader, even if he has no specialization.

**The main risk in making it is drawing a theoretical but not a real flow diagram.** While being interviewed, it is very common for all us to describe our activities the way we *think* we are doing it, but not the way we *really* do it and this gap might have dramatic consequences in terms of hazards. For that reason, it might be interesting to have an external observer, someone who is not aware of the techniques that should be used, making the flow diagram, as he will describe the reality he sees, not what is supposed to be done.

After drawing the flow diagram, it must be checked and verified on-site for accuracy, jointly with the staff involved, who should comment on and amend it. Discussions on the gaps between theory and reality should be encouraged, in order to understand the gaps and identify the consequences in terms of food safety. All in all, this operation of drawing, verifying, discussing, and validating the flow diagram took about 3 weeks on the three farms exposed in this handbook.
EXAMPLE 1: TILAPIA CAGE CULTURE

Disposal → Cleaning → Site selection

- Check cages / nets repairs
- Installation of hapa nets 10x10x2
- Stocking
- Grow-out
- Replacement of hapa by size 14 nets
- Replacement of hapa by size 10 nets
- Grow-out
- Sorting 5’ filter

5–8 months

- 24 hours storage
- Transfer to client

2 months

- Transfer to client
- Transfer to styrobox
- Icing
- Transfer to client

Used material → Bamboo frames
- Buoys
- Nets
- Ropes
- Steel pipes

Plastic
Dead Fry

Net

- Fingerling Size 14, 17, 20
- Starter
- Anti-fungus treatment
- 14’ net
- Grower
- Anti-fungus treatment
- 10’ net
- Finisher
- Anti-fungus treatment
- 5’ net

For sale as freshly chilled

Feed receiving → Feed storage

Transfer to client

Ice

For sale as live
EXAMPLE 2: SEMI-INTENSIVE SHRIMP MONOCULTURE

Seawater → Pumping → Filtering → Reservoir stocking → Clear 97 to kill wild crustacean

Zymetin + Ascorbic Acid Every feeding day 0 to 60

Pre-starter Up to 7 days
Pre-starter + Starter 7 to 30 days
Starter 1 ABW 2 to 5 g/p
Starter 2 ABW 5 to 8 g/p
Starter 3 ABW 8 to 15 g/p
Starter 3 + Grower ABW 15 to 20 g/p
Grower ABW 20 to 25 g/p
Grower + Finisher ABW 25 to 30 g/p
Finisher ABW > 30 g/p

Pond flushing → Drying → Soil/bottom preparation → Pond filling → Fertilization / water conditioning → Stocking and grow-out + Sampling and monitoring → Disinfection / preparation of equipment → Preparation of fishing teams

Partial harvest
Feeding → Waiting clients → Transport in box/net → Slaughtering → Sorting → Crate draining and weighing → Icebox storage

Ice + pond water → Harvest with cast nets

Ice

Total harvest
Pond draining → Harvest with net → Hand collection of shrimps

ABW: Average Body Weight
EXAMPLE 3: EXTENSIVE SHRIMP POLYCULTURE

1. **Shrimp and crab fry**: Plastics bags, water
2. **Fish fry (tilapia and/or milkfish)** 45 days after stocking shrimps and crabs
3. **Reception at Guagua**: Boat
4. **Transport**: Boat
5. **Storage at the office or other farm**: Motor pump, Plastics bag
6. **Transport to the farm**: Boat
7. **Monitoring harvest**: Green basket
8. **Ice box**: Shrimp and crab fry, Plastics bags, water
9. **Buying and keeping in ice box**: Boat
10. **Temporary storage**: Boat
11. **Boat to the farm**: Green basket (shrimps)
12. **Rinsing**: Green basket, Orange basket
13. **Bulk storage (ice box)**
14. **Storage before transport**: Shovel
15. **Loading**: Boat
16. **Transport**: Shovel (ice)
17. **Delivery to consignacion**: Ice box, orange basket
18. **Inputs**: Mud
19. **Dredging**: Guazon lime
20. **Liming - poisoning**: Tea seed (harvest + 7 days)
21. **½ Pond filling**: Canal water
22. **Organic fertilization**: Aqua-pond
23. **Full pond filling**: Super SPO
24. **Probiotic treatment**: Fry feed
25. **Growing 3 to 4 months**: Saso or gasang harvest in the canal every day until harvest
26. **Pond preparation for harvest**: Super SPO (1-2 times/month)
27. **Trash fish**: Boat, net
28. **Pond draining (low tide)**
29. **Pumping**: Boat
30. **Total harvest**: Motor pump
31. **Partial harvest**: Plastics bag
32. **Sorting**: Net 1, Net 2, Net 3
33. **Fish fry (tilapia and/or milkfish)**: 45 days after stocking shrimps and crabs
34. **Reception at the office (Guagua)**
35. **Transport**: Boat & Net (after 3 to 4 week stocking)
36. **Reception on the farm**: Boat & Net (after 3 to 4 week stocking)
37. **Partial harvest**: in the dry storage area
38. **Total harvest**: in the pond
39. **Rinsing**: Green basket
40. **Bulk storage (ice box)**
41. **Storage before transport**: Shovel
42. **Loading**: Boat
43. **Transport**: Shovel (ice)
44. **Delivery to consignacion**: Ice box, orange basket

---

**Example:**
- **Fish stocking**
- **Reception and control on the farm**
- **Transport**
- **Canal water**
- **Dredging**
- **Liming - poisoning**
- **½ Pond filling**
- **Organic fertilization**
- **Full pond filling**
- **Probiotic treatment**
- **Shrimps & crabs stocking**
- **Growing 3 to 4 months**
- **Pond preparation for harvest**
- **Pond draining (low tide)**
- **Pumping**
- **Total harvest**
- **Partial harvest**
- **Sorting**
- **Rinsing**
- **Bulk storage (ice box)**
- **Storage before transport**
- **Loading**
- **Transport**
- **Delivery to consignacion**
Description of the practices (Steps 4 and 5)

This is to be done jointly with the flow diagram, since this is the description that will give all the details that cannot be listed on the flow diagram. However, be careful: the flow diagram must be explicit enough not to require any legend, so this description must really give additional information and not be a substitute to an ambiguous flow diagram.

Do not hesitate to put beautiful pictures and layout as you may distribute this part to your clients. It is a good way of showing what you are doing and give them reasons to trust you for the quality of your product.

EXAMPLE 1: TILAPIA CAGE CULTURE

Site selection
The cages are installed in cove areas to protect them from strong wave action and the depth ranges from 6 to 10 m. The site is permanent but it can be adjusted depending on the wind direction.

Checking of cages/repairing nets
Material used such as nets, bamboos, buoys, and ropes are properly prepared by checking the nets if they are properly sewn and tied to the bamboo frames.

Installation of hapa nets
Fine mesh hapa nets are installed from the stocking of fry (2.8 cm) rear then up to 2 months until they reach the fingerling stage or 5.5 cm.

Fingerling reception
Tilapia fingerlings have been purchased from several hatcheries in the municipalities of Calauan and Bay, Laguna province for the past years. Presently, the fingerlings used for stocking are being produced from the farmer’s own hatchery in Calauan, Laguna. Fingerling size: 14, 17, and 20.

Stocking of fingerlings
Fingerlings are stocked in hapa nets (size 24) usually in the morning from 7 to 9 am with an SD of 250 pcs/M3. Plastic bags with fingerlings are allowed to float in the water (acclimatization) for 15 minutes before the contents are poured. One module consists of 4 units measuring 10 x 10 m. Each module has a distance of 3 m to allow for good water flow.

Grow-out
A grow-out cycle lasts between 4 and 8 months depending on the size and weight of the fish and market demand. The feeding of stock is done with different feeds of various sizes depending on the Average Body Weight (ABW) of the fish and days of culture (DOCu). From Days of Culture (DOC) 0 to 120 days, tilapia are fed three times per day and then four times per day until harvest.
Feeding

Tilapia Feeding Guide

<table>
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<tr>
<th>Feed Type</th>
<th>ABW (g)</th>
<th>Potion %</th>
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<tbody>
<tr>
<td>Starter crumble</td>
<td>5.0–10.00</td>
<td>12–8</td>
</tr>
<tr>
<td>Starter pellet</td>
<td>20.00–30.00</td>
<td>6–5</td>
</tr>
<tr>
<td>Grower</td>
<td>50.00–75.00</td>
<td>5–4</td>
</tr>
<tr>
<td>Finisher</td>
<td>150.00–200.00</td>
<td>3–2.5</td>
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</tbody>
</table>

Replacement of hapa by size-14 and size-10 nets

Replacement of B-Nets/hapa nets (fine mesh nets) to size-14 nets is done after 1 month of stocking or for the month of culture period; the nets are replaced with size-10 nets to ensure good water flow in and out of the cages. The dirty nets are dried, washed, and stored for re-use during the next operation.
Sorting
Sorting of stocks is done after 5 to 6 months of culture, using size-5 mesh nets. Tilapias that have reached the marketable size of 3 to 6 pcs/kilo are sorted out and separated for harvest. Smaller sized tilapias will be cultured for another 2 weeks.

Harvesting
Average-sized tilapias weighing 250 g are harvested for the market. Before harvesting, water from the lake is allowed to flow into the harvesting boat. Materials needed such as scoop net, weighing scale, and perforated plastic basins are prepared. Harvesting starts at 9 am by scooping the fish from the cage and transferring them to the basin. The fish are then weighed. Thirty kilograms of tilapia are weighed using a 30-kilogram capacity holding net, locally known as “siyo” and are then soaked in the lake water to keep them alive. Dead tilapias are separated from live ones and are chilled in ice. After harvesting, they are transported to the fish port for delivery to clients. Freshly chilled tilapias are packed in plastic boxes lined with styrofoam with salt and ice before delivery to clients.
Example 2: Semi-intensive shrimp monoculture

Fry reception
The company buys fry from several hatcheries in the islands of Luzon, Negros, Panay, Samar, Bohol, and Cebu (Dennis Saw hatchery, Jamandre hatchery, Jun Tabares hatchery, Tenederos hatchery, Dobe Export hatchery, and Tanchan hatchery). The fry are then delivered by plane to Manila and transported by truck to the farm.

After receiving the fry, they have to be acclimatized before being introduced to the ponds. Fry are adapted to the pond’s salinity, water pH level, and temperature by progressively adding water from the pond into tanks. These steps have to be done in less than 1 hour to avoid stress and mortality.

Pond preparation
The preparation of ponds before stocking is a long process in the cycle of production (30 to 60 days). It includes many steps:
- Flushing: the pond is filled up to the 30 cm level to suspend organic matter so it can be easily flushed out. This step can be done 3 to 4 times.
- The bottom is dried until the soil cracks. This step can last over 1 month depending on the weather.
- Black soil layer (organic matter) is scraped and removed.
- Plowing is done to bring organic matter to the surface in order for flushing. Plowing can be done up to four times depending on the quantity of organic matter to be removed.
- The pond is filled with water (30 cm level) just over the bottom to be washed.
- Mineral soil from the farm is added to replace the soil that was removed.
- Soil fertilizer is applied: nitrogen, phosphorus, and potassium.
- The pond bottom is leveled with a roller.
- The soil is dried until it hardens.
- The soil is compacted with a roller.

Pond filling, water conditioning
The step of pond filling is done with seawater. The water is first filtered and stored in a reservoir, then pumped to the ponds.

Tea seeds are applied to kill wild fish considered as predators and competitors. Clear 97 (trichloroform) is also applied to kill crabs, considered carriers of the White Spot Syndrome Virus (WSSV).

Fry in its first steps of growing will feed almost exclusively on plankton so it is essential to grow phytoplankton and zooplankton. The water is first fertilized before the fry are introduced. The fertilizers used are:
- D-ammonium phosphate to stimulate plankton growth.
- A cooked mixture of rice bran and fresh fish to stimulate microbial loop.
- pH FIXER: Bacillus sp. that helps restores stable beneficial microbial culture.

Stocking/shrimp growing
A grow-out cycle lasts from 90 to 120 days depending on the size and weight of the shrimps and market demand.
Ponds are aerated with paddle wheels day and night depending on the level of DO (dissolved oxygen). The high density of growing requires an aeration of the water to facilitate gas exchange between the water and the atmosphere. Otherwise, the shrimp would suffer from asphyxia. Batangas Electric Cooperative, Inc. provides the electricity for the farm and aerators. However, as power failures are frequent, four standby diesel generators have been installed to in the farm.

**Paddle wheels**

Aerators are also used for water circulation to create a stream that would bring organic matter and sediment to the middle of the pond and keep clean the bottom of the pond in feeding areas, which are situated on the borders of the ponds (green area in the picture).

The feeding areas of ponds are dredged everyday to remove the organic matter on the soil and prevent anaerobic soil conditions as well as the production of H₂S. This operation is done manually by workers dragging chains across the pond. Low-salinity water from the reservoir is also introduced to compensate for water evaporation.

Shrimp feeding is done with different feeds of various sizes depending on the ABW of the shrimps and DOCu. From DOC 0 to 60, shrimps are fed three times per day and then five times per day till harvest.

![Feeding (left) and feed mixed with Zymetin (right)](image)

From DOC 0 to 60 the feed is mixed with:

- **Zymetin:** *Streptococcus faecalis*, *Bacillus mesentericus*, *Clostridium butyricum*, protease, lipase, and yeast of beer.
- Ascorbic acid.

The bulk of feeds are stored in a warehouse located at the main house of the farm. Feeds good for three days’ consumption are also stored in a warehouse near the ponds.

The control of biological, chemical, and physical aspects of the water is essential in shrimp farming. It involves the checking of parameters everyday and up to 5 times per day; pH, temperature, water transparency, DO level. To improve the development of plankton, probiotics are used:

- **SUPER BIOTIC:** luminescent bacteria inhibitory special: *Bacillus sp.*
- **pH FIXER:** *Bacillus sp.* that helps to restore stable beneficial microbial culture.
- **SUPER NB:** Digest organic substances found in the pond bottom sludge, including shrimp fecal discharge, uneaten feed and dead algae: *Bacillus sp.*, *Pseudomonas sp.*, *Nitrosomonas sp.*, *Nitrobacter sp.*, *Aerobacter sp.*
- **SUPER PS:** Digest the unused organic substances proteins, carbohydrates, and lipids. Utilizes and decreases H₂S in the water column and soil: *Rhodobacter sp.*, *Rhodococcus sp.*
The only regulated chemical (for EU regulations) used is TOLIN, an herbicide in which the active molecule is trifluraline (alpha, alpha, alpha-Trifluoro-2,6-dinitro-N,N-dipropyl-p-toluidine). The treatment is only used if there is a pathogenic development of algae and protozoa in the shell of the shrimp.

*Preparation and activation of probiotics*

**Checks/monitoring**

Checking is done every day in each pond:

- Monitoring of shrimp and feed consumption in the feeding trays 5 times a day.
- Checking for salinity and alkalinity by taking water samples from every pond.
- *In situ* checks of pH, temperature, transparency and ammonium concentration.
- Sampling of shrimp to know the ABW is done twice a week using cast nets.

*Monitoring of feed consumption on feeding tray (left) and ammonium analysis (right)*

Other analyses are done to prevent hazards to consumer safety, for example:

- Antibiotics residues in the shrimps
- Antibiotics residues in the fry
- Antibiotics and mycotoxins in the feed
- Chemical, pesticides, and heavy metal for water used in the ponds

*Harvest*

Before the exporter-buyer arrives, equipment (sorting tables, light, slaughtering tanks, nets, boxes) are first cleaned and disinfected and then set out. A footbath is installed next to the sorting tables in order to decontaminate the shoes of workers and harvesting teams. A basin of clean water is placed next to sorting tables to clean shrimps that may have been in contact with soil.

*Slaughtering*

A pond may not necessarily completely harvested, it depends on the quantities ordered by the buyer. There are two kinds of harvest; partial harvest and complete harvest. The harvest begins when a client arrives. Slaughtering tanks are filled with water from the pond and ice brought by the clients. During a partial harvest the shrimps are lured to one side of pond area with feeds and caught with cast nets. The nets are then emptied into styrofoam boxes and transported to the slaughtering tanks. The slaughtering tank is also able to chill the shrimp to prevent post-mortem microbiological development.

During a complete harvest, the pond is drained and the shrimp are harvested in the monk area (water
way to drain pond) with a net and then transported to the slaughtering tanks.

Shrimps remaining in the bottom of the pond are collected by hand by the workers. Usually a sampling is done during harvest in order to determine a price between the buyer and farmer. Sampling is done by fishing shrimps with cast nets; they are then counted and weighed to determine ABW.

Workers sort out shrimps on tables in order to segregate the sizes of shrimp and remove crabs, fish, and unwanted shrimp (dead, sick, broken). Depending on size, shrimps are put on different crates.

Then crates of shrimps are drained of the remaining water and weighed. The final step is to put the shrimps into boxes under ice.
Example 3: Extensive shrimp polyculture

The farm has three annual shrimp production cycles, a production cycle being composed of four stages. The first is the preparation of the pond. The second is the receiving and the stocking of the fry. The third is the growing of shrimps, crabs, and fish, and the last stage is the harvest. After the harvest, a new cycle begins.

**Preparation of the pond**

The preparation of the pond lasts from 15 days to 1 month, depending on the weather and the management.

**Drying**

After harvest, the pond is not filled up immediately so that the bottom can be dried in order to eliminate parasites and mineralize the organic matter. The bottom is dried until the soil cracks, which takes 7 to 10 days depending on the weather.

**Dredging**

When the quantity of organic matter is too high to be completely eliminated by drying, dredging must be performed manually using a small quantity of soft mud (e.g., around the monk) or mechanically when the equipment are available.

**Liming and poisoning**

Agricultural lime is applied during drying to reduce soil acidity and to improve organic matter mineralization. The quantity used is 400 to 500 kg/hectare and is applied manually. Poison is applied to kill all prejudicial organisms that could carry diseases or compete with the farmed species. Sodium cyanide is used in the region but it is prohibited by Philippine regulation. An authorized poison that is being used is tea seed. Poison is applied in water puddles 7 days after the harvest. The quantity used is around 8 kg/hectare of tea seed.

**Pond Liming**

**Filling, organic fertilization, and probiotic treatment**

After drying and dredging the pond is half filled using canal water during high tide. The organic fertilization is spread in the water using a commercial fertilizer, *Aqua-pond*, at 1500 kg/hectare.


- Rehabilitates soil.
- Provides stable organic matter.
- Provides much-needed humus.
- Creates favorable soil conditions for the growth of microflora.
- Creates a stable environment for plankton bloom.
- Provides all the essential macro and micro nutrients that the soil needs to sustain a healthy pond ecosystem.
**Aqua-pond composition:** Total Nitrogen (3.95%), Total Phosphorous (3.55%), pH (8.5), Total Potassium (2.26%), Organic Matter (40.00%), Moisture Content (20.00%), Calcium, Iron, Sulfur, Boron, Cobalt, Zinc, Copper, Magnesium, Molybdenum, Humic Acid, Buffer Mineral, Plant growth hormones, formulated biochemical component for enhancing and stabilizing growth of phytoplankton and zooplankton

After organic fertilization, the pond is filled completely. Probiotic treatment is then applied using *Super SPO*. The probiotic is a mixture of bacterial strains aimed at improving pond ecology and water quality in a way that is beneficial to the farmed animals. Dosage level depends on the number of DOCu, the SD, and the salinity.

- Removal of H₂S, NH₃, and NO₂.
- Breakdown of organic and fecal waste.
- Increases nutrient availability for plankton growth.
- Reduction of bottom sludge.
- Stimulation of growth rates of prawn.
- Prevention of diseases.
- Increases survival rate.
- Minimizes pond bottom acidity.
- Prevention of D.O. depletion.
- Maintenance of good water quality.
- Prevents drastic biochemical and nutritional changes that upset the metabolism of prawns.
- Increases ABW, improves FCR.
- Controls suspended solids due to high organic loading.
- Decreases power consumption due to less water change.

**Reception and stocking**

The shrimp fry comes from hatcheries located in Cavite and Zambales provinces. Shrimps and crabs can be stocked at the same time if available but fish (milkfish and/or tilapia) are only introduced after 45 days. Fry are carried in plastic bags inflated with oxygen. It is delivered by truck to the office at Guagua and then transported by boat to the farm.

**Fry reception on the farm, control, and stocking**

The bags are immediately placed into the pond upon arrival to equalize the temperature inside the plastic bags with the temperature of the pond water. This reduces the stress and mortality during stocking. At the same time, a random check is done to verify the quantity of fry per bag (three bags per delivery). After the control phase, the fry is then stocked at an average density of 50,000 fry/hectare.

**Growing**

The standard duration of a shrimp cycle is 120 days (Final Body Weight, FBW = 50–80 g) to 150 days (FBW > 60 g) and is never shorter than 90 days (FBW = 30–40 g). For mud crab, the minimum growing period is 120 days and the standard one is 180 days. For fish, the cycle is based on shrimp-growing duration minus 45 days due to delayed stocking. Shrimp growth is monitored by regular control harvest. Shrimp are hand-captured along a transect in the pond and approximately 10–30 individuals are weighed before being released back to the pond.

**Feeding**
No commercial feed is used in growing the species but some natural feed are added to boost production and survival. During the first month a mixture of wild fry shrimp and fish, harvested in the canal and called Alamang is delivered daily in plastic bags by a supplier from San Esteban, Macabebe, Pampanga. The quantity of Alamang used daily in each pond is 5–7 kg. After 3 to 4 weeks, the Alamang is replaced by a mixture of wild bivalves and mollusks generally collected in the rivers and called susó or gasang. It is harvested in the canal every day by contractual workers until the harvest. The quantity of susó spread daily in each pond is 200 kg.

**Probiotic treatments**

The probiotic used during the growing out is Super SPO from Nutri-Systems Inc., which was already used during pond preparation. The frequency of spreading is once to twice a month depending on the shrimp’s growing performances and water quality. The quantity is based on the manufacturer’s recommended dosage.

**Water management**

Water renewal can only be performed 5 to 8 days every month, when tides have a high coefficient. For that reason, it can only be done once to twice a month. The pond is emptied by lowering the water level during low tide, while the filling up with new water is done during high tide. Usually the water exchange rate is 10–20% of the total quantity, which avoids an excessive loss of nutriments, flora, and fauna in the pond. In the case of problems requiring immediate water renewal during tide with an insufficient coefficient, a motor pump is used. A buffer zone located between the ponds and the canal permits independent draining.

**Harvest**

*Harvest preparation*

Iceboxes and plastic bags are stored in Guagua and must be transferred to the farm before the beginning of the harvest. The OIC is responsible for ensuring that all equipment required are delivered the day before. Ice is bought from a local supplier in Guagua and is delivered the same day by boat which will later also carry the harvest to the market. To complete the harvest, additional workers must be contracted. The OIC contacts a team leader who will be responsible for the daily workers.

*Partial harvest*

Partial harvest can be done in small quantities after 3 months of growing. It is conducted at night during low tide, when the water level difference between the pond and the canal permits gravity drainage. A net is covered over the pond exit which is then opened. Shrimp, fish, and crabs are swept along with the water and collected in the net. During the operation, the net is regularly emptied and the animals are transferred to the sorting area.
**Total harvest**

The day before, a net is put on the pond exit in the buffer zone and pond emptying begins. If gravity drainage is not possible the motor pump is used. In the early morning (2–5 am) the harvest begins in the net of the buffer zone. When the pond is completely drained except at its sides, a new harvesting method begins. A team of hand collectors enters the pond and harvests animals trapped in dry areas. Another two teams use a tool called the *gayad* to push the remaining water in the sides toward the pond exit. The *gayad* consists of a net filled with weeds shaped into a tube that is pulled along the pond bottom. Areas over which it has been pulled are drained and can be searched by hand collectors.

![Total harvest with gayad net](image)

During the harvest, shrimp, crabs, and fish are carried to the sorting area. Harvest generally ends at 10 to 11 am.

**Sorting**

Sorting consists of separating shrimp, crab, and fish which are put in different types of plastic buckets before rinsing in the canal. It is performed at the same time as the harvest or immediately after. In a partial harvest, sorting is performed in a specific area of the caretaker house. In a complete harvest, sorting is performed in net cages put up in a pond near the harvest area. The sorting is done directly in the water.

**Rinsing and storage**

The shrimp are rinsed directly in the canal, generally near the boat landing area. After rinsing, the shrimp are stored in bulk in blue iceboxes with ice (1 volume ice for 6 volumes of shrimp). The ice is handled with a shovel and the full box weighs 37–40 kg. Fish are placed directly at the boat bottom and are kept in bulk. Crabs are stored in orange buckets until delivery.

![Shrimp bulk storage in icebox (left) and rinsing area in the canal (right)](image)

**Box storage, loading, transport, and delivery**
Boxes are stored near the boat to make the handling easier. Immediately after the harvest, they are loaded in the boat for delivery to the consignacion in Hagonoy, Bulacan. The fish are delivered simultaneously by another boat to Sasmuan, Pampanga. The crabs are delivered to Orani, Bataan later by the boat returning from Hagonoy after delivering the shrimp.

![Storage before delivery](image)

**Equipment management**

The iceboxes, buckets, and plastics bags are transferred to the office in Guagua where they are rinsed with water and stored. Nets are rinsed in the canal and are stored on the farm.

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**Risk and hazard assessment (Step 6)**

The risk and hazard assessment shall be based on the available scientific evidence and undertaken in an independent, objective, and transparent manner. It cannot be done without extensively consulting technical documents related to the hazards and risks applicable to the operation. **In particular, checking the compliancy of the establishment/farm with applicable laws and regulations is an absolute pre-requisite.** A non-exhaustive list of documents, websites, and regulations is given at the end of this handbook.

The food safety hazards can be classified into three categories, namely:

- **Biological Hazards** such as bacterial, viral, and other biological agent-related hazards.
- **Chemical Hazards** such as prohibited antibiotics, toxic substance residues, etc. Hazards resulting from the presence of substances such as biotoxins (e.g., red tide) or mycotoxins are generally classified as chemical hazards, but they can also be included in the biological hazards as they are produced by the activity of biological organisms.
- **Physical Hazards** such as glass, metal, wood/bamboo, etc. Pieces that could harm customer if remained undetected.

They must be identified:

- **by consulting existing databases on farmed species-related hazards,** for example by consulting the FDA-Food Development Authority of the United States of America seafood hazard tables on the Internet.
- **on the map of the farm,** because some hazards are related to location (e.g., dangerous product storage near ponds, oil leakage from mechanical...
equipment, microbial contamination from nearby sewer drains or networks, etc.). These must be clearly identified on the map.
- on the flow diagram, for all process-related and input-related hazards.

The FishBone Diagram is a helpful tool when applied to the identification of hazards, as it is generally accepted that hazards have five main sources: the environment (e.g., water quality, contaminated surfaces, pests, etc.), the equipment used (e.g., contaminated crates, oil leakage, etc.), the humans (staff, clients, visitors), the products (main product, but also input) and the process and methods used (inappropriate methods or disrespect of good practices).

The FishBone Diagram should be applied to all places in the map and to all steps of the flow diagram. Identified hazards must be reported in the Hazard Analysis Worksheet.
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<thead>
<tr>
<th>Step</th>
<th>Hazard Analysis Worksheet</th>
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# EXAMPLE OF FILLED IN HAZARD ANALYSIS WORKSHEET

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<th>Severity</th>
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<th>Parameters that can permit to say that there is a problem</th>
<th>Warning level (Critical Limit)</th>
<th>How to measure this parameter?</th>
<th>Record</th>
<th>What to monitor to be sure there is no problem?</th>
<th>What to do if a problem is detected? (Corrective action)</th>
<th>What to do to prevent problem? (Preventive action)</th>
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<td>7:</td>
<td>Input (D-SOIL, D-ammonium phosphate, Calcium carbonate) are contaminated</td>
<td>U</td>
<td>B</td>
<td>1</td>
<td>Problems occurred during process, storage or transport</td>
<td>Composition of product.</td>
<td>No unsafe component in the product.</td>
<td>Alert by supplier</td>
<td>Composition of product.</td>
<td>Do not use it, until the problem of contamination has been solved and the product replaced by a safe one. If necessary remove the soil contaminated. Follow instructions by suppliers authorities. Stop using poison. If applicable respect a withdrawal period. Follow instruction from manufacturer to reduce environment impact. Do not put shrimps fry as long as pond is not safe.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9:</td>
<td>Fish poison is unsafe</td>
<td>U</td>
<td>C</td>
<td>2</td>
<td>Product for killing wild fish may be unsafe.</td>
<td>Active principle of poison used.</td>
<td>No unsafe poison for human used</td>
<td>Visual inspection</td>
<td>Poison label.</td>
<td>Verify that product is safe.</td>
<td>Always use safe pesticides such as tea seeds.</td>
<td></td>
</tr>
<tr>
<td>12:</td>
<td>Fish poison is unsafe</td>
<td>U</td>
<td>C</td>
<td>2</td>
<td>Product for killing wild fish may be unsafe.</td>
<td>Active principle of poison used.</td>
<td>No unsafe poison for human used</td>
<td>Visual inspection</td>
<td>Poison label.</td>
<td>Verify that product is safe.</td>
<td>Always use safe pesticides such as tea seeds.</td>
<td></td>
</tr>
<tr>
<td>12:</td>
<td>Pesticides residues</td>
<td>U</td>
<td>C</td>
<td>1</td>
<td>Near the farm there is market gardening or cash crops (sugar cane, maize etc…) pesticides used for their cultures can contaminate water.</td>
<td>Farmers use banned pesticides or inappropriate</td>
<td>Regulation (EC 396/2005)</td>
<td>No utilization of banned or inappropriate pesticides.</td>
<td>Non-conformance report (NCR)</td>
<td>Waiting a few days for pumping until the sea or reservoir contains no more dangerous pesticides. Inform farmers.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:</td>
<td>Water contamination</td>
<td>U</td>
<td>C</td>
<td>3</td>
<td>Water is stored in open air reservoir and can be exposed to many contaminations: sewage, oil, detritus…</td>
<td>Cleanness of surroundings of the reservoir</td>
<td>No pollution.</td>
<td>Surroundings of reservoir must be clean</td>
<td>Non-conformance report (NCR)</td>
<td>Clean surrounds of the reservoir. Do not use water until it is suspected to be unsafe. Identify source of pollution. Inform farmers.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

33
Identification of Critical Control Points (Step 7)

The method recommended by the *Codex alimentarius* for identifying CCP is based on a decision tree shown below. For each step, four questions have to be answered, and depending on the final result, a decision is made whether the step is a CCP or not. See HACCP decision tree on the next page.

However, another method can also be used with more flexibility. It consists of ranking hazards by using the following grading system. Each hazard is assigned a code taking into account its:

- **Control** (U if the hazard is already controlled, nothing otherwise).
- **Severity** (C if the hazard could potentially lead to death; B if the hazard could potentially lead to a severe harm that requires hospitalization for some people; A for other hazards less severe).
- **Frequency** (1 for unlikely hazards, occurring yearly or less; 2 for hazards occurring monthly or less; 3 for other frequent hazards).

With this system, the most critical hazards are the ones graded C3 (they are very frequent, are not controlled, and are potentially lethal), whereas the less critical is UA1 (hazard is controlled, unlikely, and not severe). It is consequently possible to establish a scale, ranking the hazards that must be taken into account most urgently.

C3 > C2 > C1 > B3 > B2 > B1 > A3 > A2 > A1 > UC3 > UC2 > UC1 > UB3 > UB2 > UB1 > UA3 > UA2 > UA1

Depending on the experience of the farm, the boundary between critical hazards can change, in a way that always become stricter and safer. For example, in the first year, hazards C1, C2, and C3 only can be considered as critical and thoroughly monitored, whereas in the second year, B3, B2, and B1 are added to the list.

It should be noted that these latter methods will identify critical hazards and risks, whereas the *Codex alimentarius*’ decision tree will directly identify CCPs.
**Decision tree for the identification of CCPs**

*(In the questions, “acceptable” and “unacceptable” levels need to be determined within the overall objectives in identifying the CCPs of the HACCP plan; “Stop” should be interpreted as “Proceed to the next identified hazard in the described process”)*

1. **Do preventive control measures exist?**
   - Yes
   - No
   - Modify step, process or product

2. **Is control at this step necessary for safety?**
   - Yes
   - No
   - Not a CCP
   - Stop

3. **Is the step specifically designed to eliminate or reduce the likely occurrence of a hazard to an acceptable level?**
   - Yes
   - No
   - Not a CCP
   - Stop

4. **Could contamination with identified hazard(s) occur in excess of acceptable level(s) or could these increase to unacceptable levels?**
   - Yes
   - No
   - Not a CCP
   - Stop

5. **Will a subsequent step eliminate identified hazard(s) or reduce likely occurrence to acceptable level(s)?**
   - Yes
   - No
   - Not a CCP
   - Stop

- **CCP**
- **Not a CCP**
- **Stop**
Example 1: Tilapia cage culture
Thirty-one hazards have been identified in all the steps/procedures of grow-out operation, using ranking system. Among them, seven have been found to be critical:

1. Water quality at site
2. Staff does not respect Good Sanitary Practices (GSPs)
3. Presence of antibiotics or mycotoxins in the feeds delivered
4. Inappropriate feed storage
5. Pest control
6. Quality of the ice used
7. Cleanliness of iceboxes, tools, and containers

It should be noted that these are critical hazards. The corresponding CCP should be “Site selection” (1), “Quality control at reception of inputs” (3,6), “Feed storage” (3,4), “Cleaning and disinfection” (7), “Pest control” (5) “GSP” (2).

Example 2: Semi-intensive shrimp monoculture
Using the ranking system, 25 hazards have been identified in all the steps of production, out of which nine are critical.

1. The hatchery uses banned antibiotics
2. The feed contains mycotoxins
3. The feed contains antibiotics
4. The equipment used during the harvest were not cleaned/disinfected properly and contaminated the shrimp
5. The workers contaminated the product/do not follow GSPs
6. The ice used is contaminated
7. The water used for slaughtering is contaminated
8. Post-mortem microbiological development in the shrimp
9. Post-mortem contamination of the shrimp

It should be noted that these are critical hazards. The corresponding CCP should be “Quality control at reception of inputs” (1,2,3,6), “Feed storage” (2), “Cleaning and disinfection” (4), “Harvest” (5,7), “Post-mortem handling” (4,5,9) and “Post-mortem storage” (8).
Example 3: Extensive shrimp polyculture

Using the decision tree, 72 hazards have been identified; most of them exist at several steps. The number of distinct hazards is only 17, out of which seven have been found to be critical.

1. Input contain forbidden or regulated substances
2. The fry were treated with banned drugs before delivery
3. The natural feed is contaminated
4. The water used for rinsing is contaminated
5. Human contamination of the shrimp during the harvest
6. The ice used is contaminated
7. Post-mortem microbiological development, due to excessive duration of storage or temperature

It should be noted that these are critical hazard. The corresponding CCP should be “Quality control at reception of inputs” (1,2,3), “Harvest” (4,5,6) and “Post-mortem storage” (7)
PART TWO: RISK CONTROL

Defining actions to be taken to prevent critical hazards, to correct deficiencies, and to control risks (Steps 8, 9, and 10)

Once the critical hazards and CCPs have been identified, it is required to develop a monitoring system that will ensure that they are always under control. For each CCP, it is necessary:

- to specify the indicators that will be used to monitor the hazard occurrence. Sometimes, the hazard can be directly measured (e.g., chloramphenicol residues in meat), but most of the time, indirect indicators will be used to monitor the hazard (e.g., equipment dirtiness used as an indicator of contamination). Indicators can be qualitative (e.g., the presence of a quality certificate) or quantitative (temperature, duration of a process)

- to set the critical limits for the corresponding indicators. If the indicator reaches the critical limit, an NCR must be issued and an action plan automatically launched. Depending on the indicator, the critical limit are also qualitative (e.g., the presence of a quality certificate is mandatory for every delivery) or quantitative (e.g., the *post-mortem* shrimp storage temperature must always be below 3°C)

- to set a monitoring scheme with procedures and records.
  
  o A *procedure* is a written document that explains, for a specified problem (e.g., receiving of deliveries), who (e.g., OIC) does what (e.g., check presence of quality certificate) and how (e.g., by visual inspection and inclusion of the certificate in farm’s record book). It also specifies when (e.g., for all deliveries) and why (e.g., because some suppliers use prohibited or regulated substances that could affect the quality of farm’s products). Although not mandatory, a recommended structure for writing a procedure is Justification and Objectives, Scope, Equipment and documents required by the procedure, References structuring the procedure, Definition of technical terms used, Detailed description of the procedure, and Annexes.

  o The monitoring can be:
    
    ▪ Systematic (e.g., the presence of a quality certificate is always checked, for deliveries; a reusable temperature-recording device is put in all iceboxes to monitor temperature).
- On regular intervals (e.g., the temperature of the shrimp under ice is monitored every hour; the duration of storage is checked every 10th icebox).

- Random (e.g., bacterial flora on workers’ hands is randomly checked, with 10 samples taken every month) or Risk-oriented (e.g., new workers are inspected on their practices).

  o A record is a written document that will give evidence that the monitoring scheme has really been implemented as planned. As long as it is gives undisputable evidence, it can be in any form. It can be a government issued document (original or copy), a laboratory analysis, a supplier-made document, or a farm-made document, which is the most frequent case. For farm-made documents, empty templates must be provided in the HACCP book for every record. Filled-in records must be kept in an easily accessible and organized manner, since authorities will inspect them.

- to establish corrective and preventive action procedures

  o A preventive action is an action taken routinely to ensure that the critical limit is never reached for the selected indicator.

  o A corrective action is an action taken when the critical limit is reached or over-passed for the selected indicator. Not all non-conformances will result in acute risk to the customer, but all corrective actions must be taken with the overall immediate goal of avoiding any harm to the customer. Most of the time, it involves withdrawing suspicious products, and in some cases, it can lead to alerting the competent authority and recalling suspicious products. It is possible to distinguish two categories of corrective actions:

    ▪ Immediate corrective action: e.g., withdraw the suspicious product, label it in a non-ambiguous way, so that it cannot be mixed up with standard product, store it in a separate way, etc.

    ▪ Delayed corrective actions: e.g., inspect the product for harmlessness, destroy the product, investigate reason for non-conformance, etc.
### Example 1: Tilapia cage culture

#### CCP No. 3 – Antibiotics or mycotoxins in the feeds delivered

<table>
<thead>
<tr>
<th>Step Concerned Responsibility</th>
<th>Safety Hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grow-out</td>
<td>Mr. XX is responsible for the control of feed quality</td>
</tr>
<tr>
<td></td>
<td>To prevent diseases of fish and boost production, some feed operators add antibiotics that are banned by regulation. During harvest, fish retain residues of these harmful antibiotics, which can cause human health hazards. On the other hand, regulated antibiotics are allowed provided a withdrawal period is respected. Farmers must be informed if the feed contains antibiotics.</td>
</tr>
<tr>
<td></td>
<td>Feeds can also contain mycotoxins if stored in a humid and unventilated area. Molds can develop in the feed and produce <em>Ochratoxin A</em> and <em>aflatoxin</em>, mycotoxins that possess carcinogenic immunotoxic and possibly neurotic properties. Molds can also appear in feeds and produce toxins if the packaging was damaged during storage or transport.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Critical Limit</th>
<th>Feed must not contain any banned antibiotics or mycotoxins</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Packaging must not be damaged</td>
</tr>
<tr>
<td></td>
<td>Shelf life must not be expired</td>
</tr>
<tr>
<td></td>
<td>The presence of regulated antibiotics must be indicated</td>
</tr>
<tr>
<td></td>
<td>Maximum residue limit of mycotoxins in feed</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Immediate Corrective Action</th>
<th>Return feed if its composition includes banned antibiotic or if supplier refuses to give copy of feed analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Return feed if bags are damaged or shelf life expired</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Corrective Action</th>
<th>Maintain a check plan by submitting samples for analysis and inform BFAR 4A-Regional Fish Health Coordinator in case of a positive result, XX at cellphone number 09XX-</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Respect withdrawal period if feed contains regulated antibiotics</td>
</tr>
<tr>
<td></td>
<td>Fill in an NCR</td>
</tr>
<tr>
<td></td>
<td>Keep invoices of supplier</td>
</tr>
<tr>
<td></td>
<td>Record book of lab analysis</td>
</tr>
<tr>
<td></td>
<td>Feed reception form</td>
</tr>
<tr>
<td></td>
<td>NCR</td>
</tr>
</tbody>
</table>

**Records**

- Keep invoices of supplier
- Record book of lab analysis
- Feed reception form
- NCR
## Example 2: Semi-intensive shrimp monoculture

CCP No. 4 – Equipment not cleaned/disinfected properly

<table>
<thead>
<tr>
<th>Step Concerned</th>
<th>Cleaning and disinfection of equipment</th>
</tr>
</thead>
</table>
| **Responsibility** | Mr XX, responsible for harvest equipment  
Tel: 09XX XXXXXXX |
| **Safety Hazards** | During harvest, shrimps are in contact with equipment (slaughtering tanks, tables, boxes, nets). Equipment can be a source of contamination for shrimp if workers do not rinse, clean, and disinfect them properly before and after every harvest. Shrimp can be contaminated and it represents a safety hazard for the final consumer. |
| **Critical Limits** | - No records of cleaning and disinfection  
- Dirty or not disinfected equipment |
| **Preventive action** | Method:  
- Visual control of cleanliness of equipment  
- Lecture of the record of cleaning/disinfection  
- Plan of cleaning and disinfection |
| **Frequency** | - Every time before and after using equipment.  
- Clean and disinfect again if necessary |
| **Corrective Action** | - Inform the technician responsible, Mr XX, that cleaning/disinfection has not been accomplished properly. Find the origin of the problem in order to take appropriate measure to monitor it.  
- Fill in an NCR  
- Record of cleaning/disinfection  
- Form of storage/cleaning/disinfection of the harvest equipment  
- Form of verification of storage/cleaning/disinfection of the harvest equipment  
- NCR |
| **Records** |  
- NCR |
Example 3: Extensive shrimp polyculture

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Control Critical Point No. 4</th>
<th>CCP.4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Water used for rinsing is contaminated</td>
<td>V.1</td>
</tr>
</tbody>
</table>

Steps
- Preparation of the harvest.
- Rinsing.

Hazards
After harvest, the risk that contamination reaches the consumer is high. Shrimp are rinsed before delivery, and the quality of water used is consequently critical. In the case of the farm, water from the canal must not be used, as it can be contaminated by chemical (oil and petrol spills, pesticides, etc.) or biological (coliforms, salmonellas, etc.) contaminants. Pond water is considered clean, since the shrimp was grown in it, and because tropical water has elevated self-cleaning processes due to high plankton activity. As a consequence, only water from the pond can be used for cleaning shrimp and other harvested animals.

Persons responsible
- Mr.XX, farm owner.
- Mr. XX, OIC.

Critical limit
For rinsing, the critical limit is using contaminated water: no canal water must be used for rinsing shrimp on the farm.

Monitoring and control
Before the beginning of the harvest, the OIC must make sure that no canal water is used during the rinsing. For that, strict monitoring and control must be maintained at two points: before and during the harvest.

Method
The day before the harvest, the OIC organizes and identifies the harvest area in the central pond and the rinsing area is in the pond in front of harvest area according to the plan of harvest area organization (P.9.1).
Before the beginning of the harvest, the OIC checks if the daily workers are on the list of trained workers (F.10.1).
During the harvest, the OIC checks that the rinsing is being done correctly in the pond with the form of control (F.9.1).

Frequency
The harvest area has to be organized before each harvest and the workers have to be trained at least once before being allowed to harvest.

Corrective action
If the canal water is being used in rinsing the shrimps, remove the rinsing area from the canal to the pond and rinse the shrimp a second time in the pond. After
the modification of the rinsing area, an NCR is filled in. If a worker is not on the list, provide him with a basic hygienic brochure (B.10.1) and make sure that he reads it or someone reads it to him. After that, list his name.

**Records and documentation**

- Plan of organization of the working areas (P.9.1).
- List of trained workers (F.10.1).
- Form of control during the harvest (F.9.1).
- Brochure of sanitary practice (B.10.1).
- NCR.

Beside these, some prerequisite documents must also be written, since they contribute to the control of hazard and are mandatory in many regulations. These include:

- Traceability procedure
- Alert, recall, and withdrawal procedures
- Pest control plan
- Disease control plan
- Hygiene, cleaning, and disinfection
- Staff training plan

Some examples of procedures, taken from the three case studies, are given below.
Example 1: Tilapia cage culture

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Traceability procedure</th>
<th>P.1</th>
<th>V.1</th>
<th>04/01/09</th>
</tr>
</thead>
</table>

**Justification and objectives**

The objectives of the procedure is to describe how the farm can sell without delaying the delivery of its products and identify the origin of all the input it used during the production process, so that in case of contamination, the origin can be identified without difficulty.

**Scope**

The procedure applies to all input (fry, feed, etc.) and sold products (live, dead).

**Related documents**

- Log book (R.2.1).
- Book of suppliers (R.2.2).
- Book of delivery (R.2.3).

**References**

This procedure is based on:
- EC regulation 178/2002
- EC Regulation 852/2004
- BFAR Memorandum 28 March 2006.

**Definitions**

*Identification and traceability:* The ability to establish and maintain the identity of agricultural products through the supply chain, in order to permit traceability in the event of a food safety or plant animal health emergency. This includes the capability to follow the path of a specified unit of a product through the supply chain as it moves between organizations, and the capability to identify the origin of a particular unit and/or batch of product located within the supply chain by reference to records held upstream in the supply chain.

**Content**

All staff are informed and trained on registering all deliveries on the farm, all input used in a pond, and all batches of shipments. This belongs to the basic training described previously in “procedure 10”. The traceability of food, food-producing animals, and all substances incorporated into foodstuffs must be established at all processes. The OIC and the caretakers are required to apply appropriate systems such as keeping records of the utilization of fertilizer, probiotic, feed, and other input in a log book, keep invoices of suppliers, keep a record of sales, and deliver sales invoices to buyers.
Sales invoices may mention:
  - Name of company and their complete address.
  - Date of transaction.
  - Nature of product.

Log book where the technician records utilization of any input (fertilizer, probiotic, feed) may mention:
  - Name of the input.
  - Quantity/dilution.
  - Date of utilization.
  - Withdrawal period to observe if necessary.

Book of suppliers where all the inputs are recorded (fertilizer, fry, feed, probiotic) may mention:
  - Name of the supplier and their complete address.
  - Date of transaction.
  - Nature and name of the product.
  - Quantity.

Book of delivery where all of the shipments are recorded may mention:
  - Name of the client.
  - Date of transaction.
  - Nature of the product.
  - Quantity delivered.
  - Origin of the product (number of the pond).

**Annexes**

Log book (R.2.1).

Book of suppliers (R.2.2).
Example 2: Semi-intensive shrimp monoculture

According to Regulation (EC) No 852/2004, at all stages of the food production chain, business operators must ensure that equipment with which food comes into contact are to be effectively cleaned and, where necessary, disinfected. Cleaning and disinfection are to take place at a frequency sufficient to avoid any risk of contamination (Annex II, Chapter V). Keep clean and, where necessary after cleaning, to disinfect, in an appropriate manner, equipment, containers and crates. (Annex I, Part A).

Origin of the hazard
Equipment such as tables, tanks, crates, and nets are directly in contact with shrimps during the harvest. If they have not been cleaned carefully, they can be a source of contamination for shrimp and the final consumer. All equipment used during the harvest must have been handled compliant with the instructions on storage/cleaning and disinfection.

Preventive measures
1. The person responsible for HACCP, Mr XX, will give the workers in charge of the harvest equipment Instructions on storage/cleaning/disinfection (I2). This will be registered with a form of reception of documents (F8).

2. Plan of storage/cleaning/disinfection of equipment (Plan 2).
   The plan indicates:
   - Equipment.
   - The frequency of storage/cleaning/disinfection.

Critical limit
The equipment has not been cleaned properly, with the contaminants remaining on the equipment.

Monitoring of critical limits
The technician responsible, Mr. XX, will make a visual control of the cleaning/disinfection/storage and will fill in the form of verification of cleaning/disinfection/storage of the equipment (F3).

Corrective action
In case of non-conformance, the equipment will have to be cleaned and
disinfected again and an NCR will be filled in (F9).

**Record**
Plan of storage/cleaning/disinfection (Plan 2).
Instructions on storage/cleaning/disinfection of harvest equipment (I2).
Form of verification of cleaning and storage of harvest equipment (F3).
Form of receipt of document (F8).
NCR (F9).

Procedure written by: XX
Procedure validated by: XX
Procedure approved by: XX

---

**Example 2: Semi-intensive shrimp monoculture**

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Instruction of storage/cleaning/disinfection of the harvest equipment</th>
<th>I2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>V.1.0</td>
<td>07/07/06</td>
</tr>
</tbody>
</table>

Before, during, and after every harvest, the persons in charge of the equipment used in the harvest will have to follow these instructions:

**Before and after harvest**

Instructions of cleaning/ disinfection and storage of equipment

**Slaughtering tank, table, crates**
1. Rinse with water
2. Use a brush and soap to wash
3. Wash until all traces of dirt are eliminated
4. Rinse with water
5. If equipment is still dirty, clean again following instructions from Step 1
6. Wash the equipment with chlorine (dilution …ppm)
7. Rinse with water
8. Let it dry
9. Keep the tanks upside down suspended over 10 cm from the soil
10. Sign the form of storage/cleaning/disinfection

**Nets**
1. Rinse with clean water
2. Let the net hang-dry
3. Hang the net
4. Sign the form of storage/cleaning/disinfection

**During the harvest**
Sorting tables must be cleaned with clean water in order to remove dirt and mud. It must be done as often as necessary to keep the sorting table clean.

**Instruction of control**
Those responsible for the equipment: Mr. XX and Mr. XX will check the cleanliness and storage of the equipment with the form of verification. In case of non-conformance, the equipment will have to be cleaned and disinfected again and an NCR filled in.

Instruction written by: XX
Instruction validated by: YY
Instruction approved by: ZZ

**Example 2: Semi-intensive shrimp monoculture**

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Form of verification of cleaning/disinfection and storage of harvest equipment</th>
<th>F3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>V.1.0 07/07/06</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Checking point</th>
<th>C (Conform)</th>
<th>NC (Nonconform)</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tanks cleaned, disinfected, reversed, and stored over the soil</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tables cleaned and disinfected</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crates cleaned and disinfected</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nets rinsed and hanged</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date:</td>
<td>Signature:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Example 2: Semi-intensive shrimp monoculture**

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Equipment/place</th>
<th>Arrangement/Cleaning/Disinfection Plan</th>
<th>Frequency</th>
<th>Complete cleaning</th>
<th>Plan 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Warehouse</td>
<td>Storage</td>
<td>Cleaning</td>
<td>Disinfection</td>
<td>1/month</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Every afternoon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment Type</td>
<td>Before/After Harvest</td>
<td>Before/After Harvest</td>
<td>Before/After Harvest</td>
<td>Before/After Harvest</td>
<td>Before/After Harvest</td>
</tr>
<tr>
<td>----------------------</td>
<td>----------------------</td>
<td>----------------------</td>
<td>----------------------</td>
<td>----------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>Slaughtering tank</td>
<td>After harvest</td>
<td>Before and after harvest</td>
<td>Before and after harvest</td>
<td>After harvest</td>
<td>Form of cleaning equipment of the harvest equipment</td>
</tr>
<tr>
<td>Tables</td>
<td>After harvest</td>
<td>Before and after harvest</td>
<td>Before and after harvest</td>
<td>After harvest</td>
<td></td>
</tr>
<tr>
<td>Crates of the farm</td>
<td>After harvest</td>
<td>Before and after harvest</td>
<td>Before and after harvest</td>
<td>After harvest</td>
<td>Book of verification of cleaning/disinfection/storage of harvest equipment</td>
</tr>
<tr>
<td>Nets</td>
<td>After harvest</td>
<td>After harvest</td>
<td>After harvest</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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**Example 3: Extensive shrimp polyculture**

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Alert</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P.1</td>
</tr>
<tr>
<td></td>
<td>V.1</td>
</tr>
<tr>
<td></td>
<td>04/01/09</td>
</tr>
</tbody>
</table>

**Justification and objectives**

If a problem has been detected or suspected of with any products within the responsibility of the farm, it must be controlled before causing any harm, injury, or damage to the consumer. It is unacceptable to hide it or cause any delay if the safety of the consumer is at stake; therefore, an alert procedure must be maintained.

**Scope**

This procedure applies to all staff. If there is any suspicion of food safety hazard with any of our products the OIC must be immediately informed so that s/he can report it without delay to the farm owner or deputized person (Phone number 09XX XXXXXXX). The farm owner or deputized person will be the one to launch the alert.

**Related documents**

- NCRs R.12.1
- Updated list of emergency contacts R.1.1.

**Reference**

EC Regulation 178/2002
EC Regulation 852/2003

**Definition**

**Content**

The staff are informed and trained on reporting food safety problems to the management, as this belongs to the basic training described in procedure 10 (*P.10. Procedure of workers’ training of Good Hygiene Practices*).

If the farm owner or deputized person has reason to consider that any of the products that have been produced and/or distributed is harmful to human health, s/he will inform immediately the concerned *consignacion*, exporters, and competent authorities to withdraw or recall the product.
An updated list of all emergency contacts of all potentially concerned actors is kept in record R.1.1. This list must be checked and updated at least twice a year, by contacting all agents and adding new ones, according to the record of the document R.7.2.

**Annexes and related documents**

- Procedure of workers’ training of Good Hygiene Practices (P.10).

### Company Name  |   **Emergency contacts**   |   R.1.1 V.1   |   04/01/09
---|---|---|---
**Consignaciones** | | |
XX | Hagonoy/ Bulacan | Ph: (044) XXXXX | Ms. XX
XX | Sasmuan/ Pampanga | Ph: (045) XXXXX | Mr. XX
XX | Orani/Bataan | |
**Exporters** | | |
XX | Manila | Ph: (02) XXXXX | Mr. XX
**Bureau of Fisheries and Aquatic Resources** | | |
BFAR Region 3 | San Fernando/ Pampanga | Ph: (045) XXXXX | Ms. XX
BFAR Central office | Quezon City | Ph: (02) XXXXX | Ms. XX
<table>
<thead>
<tr>
<th>Company Name</th>
<th>Non-conformance report</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>R.12.1</td>
</tr>
<tr>
<td></td>
<td>V.1 04/01/09</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Farm:</th>
<th>Pond:</th>
<th>Step:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Problem, discrepancy, or non-conformance</th>
<th>Explanation, solution, and corrective actions</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Name:</th>
<th>Date:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Observations</th>
<th>Further action to be taken</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Case closed by:</th>
<th>On date:</th>
</tr>
</thead>
</table>
PART THREE: RISK MANAGEMENT

This chapter will be the shortest, since there are not much examples and illustrations to give, but it is the most important since the efficiency of your HACCP plan, as well as your compliancy with requirements, will depend on it. The HACCP studies were just the beginning, now you have to implement your findings!

Never forget that your HACCP contains a series of commitments YOU took. You committed yourself to monitoring hazards and to collecting records. That is what you must do now, and you will be inspected for this.

Among the things you must consider doing:

- Establish a record keeping system. This is how you will be able to demonstrate that you are truly controlling hazards. Consider buying a cabinet just for storing your records, and organize it rigorously. Do the work properly and you should soon have a large quantity of records that you should maintain efficiently. Draw a list of them and organize them.

- Establish verification procedures. You should always know that you are doing what you committed to, and for that, you should have a verification systems with own checks. For example, if you committed to inspect the cleanliness of the storage every week, assign to someone the responsibility of checking every month that inspection forms for that task have been properly filled in and stored. Do the same for all other tasks, and very soon, you will have a monitoring plan, that is to say, a table listing all own checks as well as their frequency. You can consider establishing an electronic or printed calendar with all your tasks for the day, the week, or the month; so that you are sure you will not forget any.

- Establish an internal audit system. Once or twice a year, an internal audit team should “audit” the whole system. Some people well aware of HACCP and trained on how to inspect it, should come and inspect everything as if it were an official control… except that it is not! This way, you will be able to find non-compliances and discrepancies with what you propose to monitor, and you will be given the opportunity to correct them rapidly.

- Hold regular reviews of your HACCP system. Once a year, the management should conduct an assessment study on the achievement of the HACCP plan. This assessment should gather data listing the number of non-compliances, their severity, how they have been controlled, corrected, and the action taken to prevent them from recurring. Based on this data, the HACCP team should decide to improve the HACCP, either
by focusing on major sources of non-conformances if there are any, or by increasing the scope of hazards included in the HACCP plan.

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Annual Monitoring Plan</th>
<th>P.14.1</th>
<th>V.1</th>
<th>04/01/09</th>
</tr>
</thead>
<tbody>
<tr>
<td>Own check and corresponding technical instruction describing the inspection process</td>
<td>Frequency</td>
<td>Responsibility</td>
<td>Next monitoring(s)</td>
<td>Record</td>
</tr>
<tr>
<td>Feed reception (TI.14.1)</td>
<td>Monthly</td>
<td>XX</td>
<td>01/02, 02/01, 03/01, 04/01, 05/01, 06/01, 07/01, 08/01, 09/01, 10/01, 11/01, 12/01.</td>
<td>R.14.1</td>
</tr>
<tr>
<td>Traceability (TI.14.2)</td>
<td>Monthly</td>
<td>XX</td>
<td>01/02, 02/01, 03/01, 04/01, 05/01, 06/01, 07/01, 08/01, 09/01, 10/01, 11/01, 12/01.</td>
<td>R.14.2</td>
</tr>
<tr>
<td>Storage room hygiene (TI)</td>
<td>Weekly</td>
<td>YY</td>
<td>04/03, 04/10, 04/17, 04/24</td>
<td>R.14.3</td>
</tr>
<tr>
<td>Documentary system (TI)</td>
<td>Semi-annually</td>
<td>ZZ</td>
<td>04/15</td>
<td>R.14.4</td>
</tr>
<tr>
<td>etc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Example of electronic calendar corresponding to the monitoring plan
LAST ADVICE

HACCP has been developed for food safety purposes but the methods can be applied to many other risks, such as:

- **Cost efficiency**: using the HACCP method and flow diagram, it is possible to rigorously consider all undue cost wastes during the production process and subsequently, to control them.

- **Work accident**: in some countries such as France, employers are required by law to conduct a hazard and risk analysis to prevent accidents at work. It proved that many work accidents can be prevented by simply considering hazards in writing.

- **Customer satisfaction**: by conducting a good study on what your customer’s expectations are, you can use the HACCP method to identify the steps that could affect your clients’ satisfaction. However, be careful to be sure to know what your clients *really* want, because the studies conducted by BFAR and Cirad showed that many times, what the Filipino farmers think is completely disconnected from the reality of what their customers want (particularly for the export market, due to the distance, this is not so true for local market). In that situation, it would be a complete waste of time and resources to develop such a study based on wrong assumptions.

Finally, if you decide to use risk analysis for other purposes than ensuring food safety, take a lot of care not to mix it with food safety. Food safety is not just mandatory by law, it potentially affects human health and for that reason should always be and remain your top priority.
OTHER INTERESTING RESOURCES

French OJT’s diplomas
LEVY P., in press.

GAP

Codex alimentarius website
http://www.codexalimentarius.net

FDA’s Seafood HACCP
http://www.cfsan.fda.gov/~comm/haccpsea.html

BFAR website
http://www.bfar.da.gov.ph/

Cirad’s Aquatrop website
http://aquatrop.cirad.fr/