



## **Better Management Practices for Tilapia Aquaculture:**

*A tool to assist with compliance to  
the International Standards for  
Responsible Tilapia Aquaculture*

*Version 1.0*

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## PREFACE

The purpose of this document is to provide better management practices (BMP) to producers to aid in efforts to seek compliance to the International Standards for Responsible Tilapia Aquaculture (ISRTA). It includes BMPs for all standards included in the ISRTA. Adherence to the BMPs in this document does not infer compliance with the ISRTA, rather these BMPs will assist in identifying means that a farmer can use to achieve the standards that are directly under the control of farm management. The BMP manual is to be used in conjunction with the ISRTA Standards Document and the ISRTA Guidance Tool.

The ISRTA are global standards that will help minimize the key negative environmental and social impacts associated with tilapia aquaculture. They are performance-based standards that, with minor exceptions, are measurable. The standards will be amended periodically to reflect changes in science and technology, as well as to encourage innovation and continuous improvement.

The ISRTA are the product of the Tilapia Aquaculture Dialogue (TAD), a group of 200-plus people committed to transforming the tilapia aquaculture industry. The TAD included a broad and diverse group of stakeholders from around the world, among them representatives from the tilapia aquaculture industry, academia, environmental and social non-governmental organizations, and government. From August 2005 to December 2009, they worked together to identify the impacts the standards should address, then develop principles, criteria, indicators and standards that will help minimize those impacts. World Wildlife Fund (WWF) coordinated the process.

These are the first global standards for tilapia aquaculture developed through an open, transparent and multi-stakeholder process that is aligned with the International Social and Environmental Accreditation and Labeling Alliance's renowned guidelines for creating standards. The process was transparent, encouraged input from a diverse group of people, and ensured that their ideas were considered by the full TAD.

The final standards will be given to a new entity that will be responsible for working with independent, third party accreditation bodies to certify farms that are in compliance with the standards created through the TAD and other Aquaculture Dialogues established to develop global standards. The new entity, to be called the Aquaculture Stewardship Council (ASC), is expected to be operational in 2011.

This document was developed by the TAD Steering Committee and published by WWF.

## **PRINCIPLE 1. OBEY THE LAW AND COMPLY WITH ALL NATIONAL AND LOCAL REGULATIONS**

**Criteria 1.1:** Evidence of legal compliance.  
Applicable Standards (1.1.1 – 1.1.4)

**Justification:** Complying with local and national regulations is a core component of maintaining governance over land and water use issues. National and local regulatory bodies attempt to organize and structure usage licenses and permits to better meet the needs of people and the environment, thus there is an inherent dependency on accurate and current information on from all users of resources.



### **Better Management Practices**

1. Contact local regulatory bodies within the farm's legal boundaries or hierarchy to solicit information on what requirements are necessary within the local context.
2. Follow guidance provided by local regulatory body(s) on appropriate leases, deeds or permits required to legally establish and operate a tilapia aquaculture activity in this locale.
3. Inquire with local regulatory bodies which national regulatory bodies also provide governance for land and water use issues.
4. Contact national regulatory bodies or hierarchy to solicit information on what requirements are necessary within the national context.
5. Follow guidance provided by national regulatory body(s) on appropriate leases, deeds or permits required to legally establish and operate a tilapia aquaculture activity in the country.
6. Producers should have available, copies of valid permits, land deed titles, licenses, concessions, etc.
7. Tax payment confirmation certificates are often provided by the national and local authorities that collect these fees. Producers should identify these appropriate authorities and obtain written government confirmation that appropriate taxes have been paid.
8. National labor laws are set by national authorities. It is the responsibility of the producer to comply with national laws. These laws can vary from country to country. Producers shall contact national labor authorities to obtain all laws pertaining to labor rights.
9. Producers shall contact national authorities for any ambiguity or problems in understanding these laws.

## **PRINCIPLE 2: MANAGE THE FARM SITE TO CONSERVE NATURAL HABITAT AND LOCAL BIODIVERSITY**

### **Criteria 2.1: Site Information** Applicable Standards (2.1.1)

**Justification:** The siting of an aquaculture facility will likely be the key contributing factor to the success or failure of a proposed aquaculture activity. Understanding what the potential impacts are of siting/operating a farm in a specific area requires a general understanding of the surrounding environment.



### **Better Management Practices**

1. Document and date the condition of the farm site prior to establishment or at the time the producer begins to operate at a given site.
2. Record the size of farm site and water surface area of production (hectares).
3. Use global positioning system (GPS) to identify key, central points of farm location. A minimum of two separate GPS coordinates is recommended.
4. Develop a schematic of farm with specific locations of all water inlets and outfalls or where cages are situated.
5. Changes to the size of the aquaculture operation should be kept up to date by size of farm area change and production amounts.
6. If available, satellite imagery should be available to confirm farm schematic.
7. Determine the receiving water body type – ocean, estuary, river, stream, lake, reservoir or no receiving water (when no discharge exists at farm site).
8. Contact local and national government offices to obtain, if available, an official national government certification that the tilapia species being cultured was established on or before 1 January 2008. In Africa, in the native range of tilapia species, cultured species and strain must be shown to have been recruited from the same population as that existing in the receiving waters on or before 1 January 2008.
9. When government acknowledgement of species presence in the farm's receiving waters is not available, fish assessments of the receiving waters and/or testimonials from surrounding communities will be necessary to prove existence of the species (strain in Africa) is present in the receiving waters.

10. Studies of major characterization studies (excluding EIAs, see below) conducted pertaining to the receiving waters or specific activities conducted on the receiving watershed, if any (published or non-published) shall be collected and housed at the farm site.
11. Description of the major activities (beyond your operation) impinging on the receiving watershed.
12. Environmental Impact Assessment(s) for initial farm siting and for expansion shall be housed on the farm site, if conducted.
13. Any other pertinent information regarding the receiving waters and any effect of farm activities shall be inventoried and housed at the farm site.
14. Farmers that conduct stewardship activities to protect the receiving watershed from pollution should articulate and document these activities and house descriptions of activities on farm site.

**Criteria 2.2:** Presence of natural or established tilapia species. Applicable standards (2.2.1)

**Justification:** Tilapias are one of the world's most invasive species. Tilapia can disrupt populations of native species when introduced to a novel environment. Thus, it is important to ensure that introductions of exotic tilapia are halted.



### **Better Management Practices**

1. Farmers should provide evidence that the tilapia species cultured is established in the farm's receiving waters. The specific documentation for the affirmation of this establishment may vary by specific locale, but the following forms of evidence will be explored by auditors to determine compliance to the standards.
  - a. Peer-reviewed literature,
  - b. Verifiable Environmental Impact Assessment,
  - c. Government certification,
  - d. Community testimonials, or
  - e. Evidence of multiple size classes of tilapia species in receiving waters captured with cast nets, trapping devices or fishing affirming the existence of species presence in receiving waters on or before 1 January 2008
2. Farms that do not have receiving waters, i.e. there is no farm water discharged into the natural environment, proving compliance with this standard is not necessary. If water is discharged into municipal water systems, and there is a mechanism for the treatment and eradication/elimination of macro-biological organisms such as undesired fish in effluent, the farmer does not need to comply with this standard.

**Criteria 2.2:** Presence of natural or established tilapia species. Applicable standards (2.2.2)

**Justification:** Tilapia species are native in Africa. There are specific regions where specific tilapia species are native. It is important to protect the genetic integrity of native species such that diversity in the natural world is not lost. Thus, in Africa, farmers must present evidence that the specific strain of tilapia that is cultured is the strain that is present in the receiving waters.



### **Better Management Practices**

1. Farmers should provide evidence that the tilapia species and strain cultured is established in the farm's receiving waters. The specific documentation for the affirmation of this establishment may vary by specific locale, but the following forms of evidence will be explored by auditors to determine compliance to the standards.
  - Peer-reviewed literature,
  - Verifiable Environmental Impact Assessment,
  - Government certification,
  - Community testimonials, or
  - Evidence of multiple size classes of tilapia strains in receiving waters captured with cast nets, trapping devices or fishing affirming the existence of strain presence in receiving waters on or before 1 January 2008
2. Farms that do not have receiving waters, i.e. there is no farm water discharged into the natural environment, do not need to show compliance with this standard. If water is discharged into municipal water systems, and there is a mechanism for the treatment and eradication/elimination of macro-biological organisms such as undesired fish in effluent, the farmer does not need to comply with this standard.



**Criteria 2.3:** The effects of eutrophication.  
Applicable Standards (2.3.1)

**Justification:** Dissolved oxygen in farm receiving water can fluctuate with increased rates photosynthesis and respiration. Increases of these natural functions can be a response to nutrient (phosphorus and nitrogen) loading. To protect the receiving waters from excessive nutrient pollution oxygen fluctuations in the receiving water will be limited to a fixed annual average interval from monthly monitoring of early morning and late day measurements of dissolved oxygen.



### **Better Management Practices**

1. Nutrient discharge into receiving waters from farms should be minimized to the greatest extent possible. Feed feeds and fertilizers should be applied sparingly to the culture system to reduce unutilized nutrients in discharge water.
2. Farm management should also interact with the other farmers and industries within the receiving water body watershed to advocate for the reduction of nutrient inputs into the system.
3. Farms will be required to identify 3 receiving water quality monitoring locations where monthly monitoring of water quality of receiving waters will be take place (See International Standards for Responsible Tilapia Aquaculture for instructions for siting of water quality monitoring stations).
4. Dissolved oxygen measurements shall be taken at the Receiving Water Farm-Afar (RWFA) sampling site.
5. Dissolved oxygen measurements shall take place on a monthly basis with two measurements taken within a 24-hour period. One sample will be taken 1 hour prior to sunrise and the second sample taken 2 hours prior to sunset. The difference of these measurements will be compared to the dissolved oxygen concentration at saturation for the conditions at which each sample is taken (temperature, salinity, and barometric pressure). See calculations in Audit Reference for more detail.
6. Farms that do not have receiving waters, i.e. there is no farm water discharged into the natural environment, do not need to show compliance with this standard. If water is discharged into municipal water systems, and there is a mechanism for the treatment and

eradication/elimination of macro-biological organisms such as undesired fish in effluent, the farmer does not need to comply with this standard.

7. It is likely that the farmer seeking certification will not be the sole user of the receiving water body, thus it is critical to attempt to cooperate with other users in an attempt to remedy any excessive nutrient inputs into the system.
8. Cooperative exercises with the surrounding community may already be taking place for the conservation of a particular water body. It is often useful to contact local government or NGOs to determine whether there are currently programs in place to address pollution concerns related to a particular receiving water body.

**Criteria 2.4:** Water quality in oligotrophic receiving waters. Applicable standards (2.4.1-2.4.4).

**Justification:** Most oligotrophic receiving waters will not have considerable fluctuations in dissolved oxygen such that standards could be appropriately implemented. Thus, specific limitations for key water quality variables are necessary in these water bodies that are characterized by having low nutrient concentrations. Secchi disk visibility has been an acceptable estimate the trophic status of water bodies. The ISRTA sought to eliminate the ability for certified farmers to operate in exceptionally pristine water bodies, but also limit the amount of change that a producer can cause in other oligotrophic water bodies.

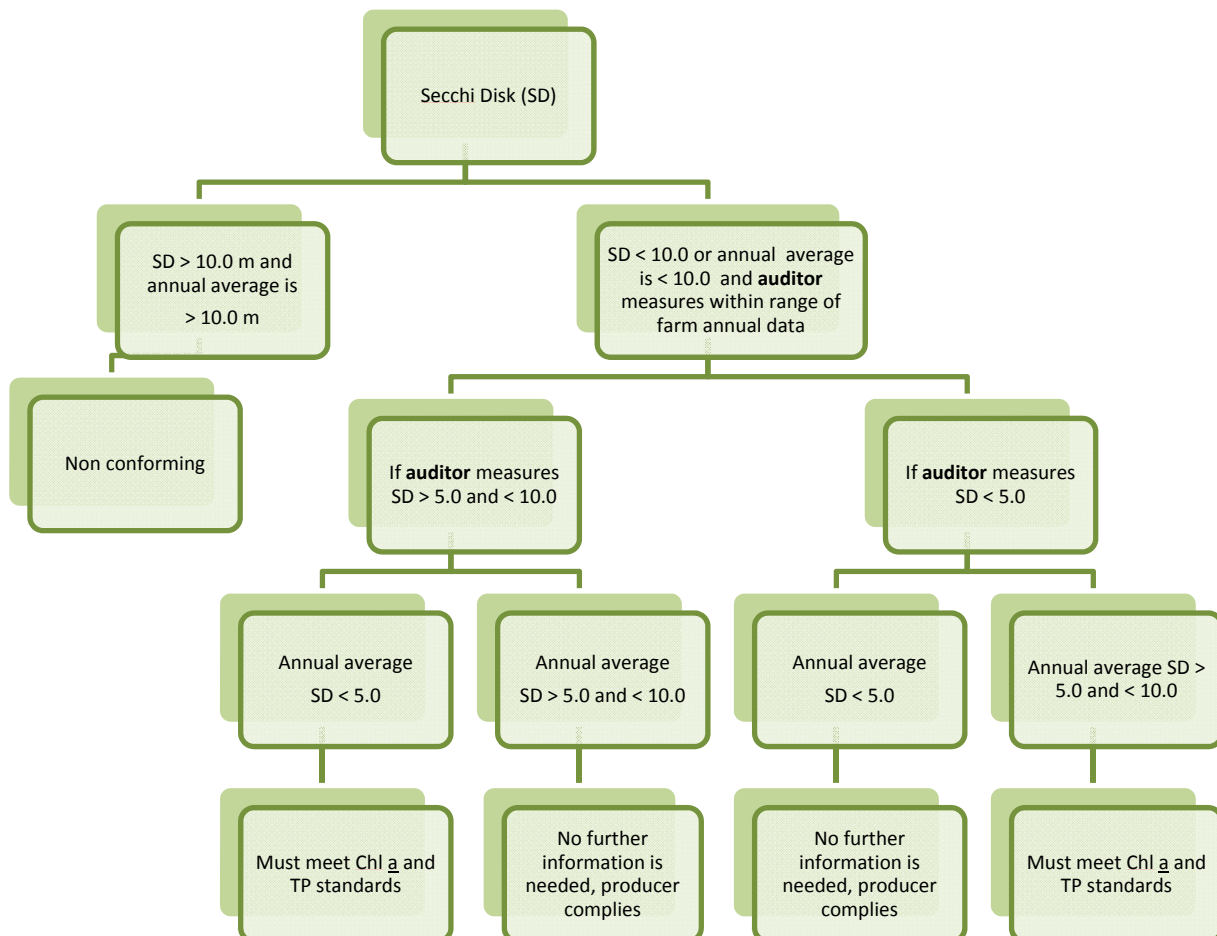


### **Better Management Practices**

1. Nutrient discharge into receiving waters from farms should be minimized to the greatest extent possible. Feed feeds and fertilizers should be applied sparingly to the culture system to reduce unutilized nutrients in discharge water.
2. Farm management should also interact with the other farmers and industries within the receiving water body watershed to advocate for the reduction of nutrient inputs into the system.
3. Farms will be required to identify 3 receiving water quality monitoring locations where monthly monitoring of water quality of receiving waters will be take place (See International Standards for Responsible Tilapia Aquaculture for instructions for siting of water quality monitoring stations).
4. Secchi disk visibility measurements will be required to be monitored at all 3 sampling site locations; however, the only site where the Secchi disk visibility standards will be assessed is at the Receiving Water Farm-Afar (RWFA) location.
5. Secchi disk visibility readings and the restrictions for certified farmers are depicted in Audit Reference 7.
6. Chlorophyll a and total phosphorus concentrations will be measured and limited if farms meet specific criteria associated with Secchi disk visibility (See Audit Reference 7).

Chlorophyll a is required for monitoring at all sampling station, but concentration limits will only be assessed at the Receiving Water Farm-Afar (RWFA) sampling site.

7. Dissolved oxygen measurements shall take place on a monthly basis with two measurements taken within a 24-hour period. One sample will be taken 1 hour prior to sunrise and the second sample taken 2 hours prior to sunset. The difference of these measurements will be compared to the dissolved oxygen concentration at saturation for the conditions at which each sample is taken (temperature, salinity, and barometric pressure). See calculations in Audit Guidance for more detail.
8. Farms that do not have receiving waters, i.e. there is no farm water discharged into the natural environment, do not need to show compliance with this standard. If water is discharged into municipal water systems, and there is a mechanism for the treatment and eradication/elimination of macro-biological organisms such as undesired fish in effluent, the farmer does not need to comply with this standard.
9. It is likely that the farmer seeking certification will not be the sole user of the receiving water body, thus it is critical to attempt to cooperate with other users in an attempt to remedy any excessive nutrient inputs into the system.
10. Cooperative exercises with the surrounding community may already be taking place for the conservation of a particular water body. It is often useful to contact local government or NGOs to determine whether there are currently programs in place to address pollution concerns related to a particular receiving water body.



**Criteria 2.5:** Receiving water monitoring.  
Applicable standards (2.5.1)

**Justification:** Although difficult to attribute a particular farming activity to the condition of the receiving waters, it is important that farmers are aware of the condition of the receiving water. The receiving water monitoring program required by the ISRTA helps producers identify significant changes in key variables of water quality. The monitoring protocol also provides guidance on where sampling stations should be located. These locations are significant in the ISRTA as there is one sampling station (RWFA) where standards are assessed.



**Better Management Practices**

1. Monitoring of receiving waters should be strategically conducted, thus the ISRTA lays out specific sampling stations and their key attributes. The following are the receiving water sampling sites' descriptions.
  - RWRP is a reference or source point that ideally is not influenced by the farming operation, or is least influenced by the farm. Farms discharging in riverine systems, or cages positioned in riverine systems shall identify a point upstream of farm discharge or activity to serve as the reference point. Cage culture operations in lakes and reservoirs will identify a point in the receiving water that is at the maximum distance from the influence from the farming activities. Estuarine-based farms will select a reference point that is characteristic of the furthest point from the effluent but provides a characterization of the estuarine system.
  - RWFO is a point where the farm culture water meets the receiving waters. Because the water inside a cage is a component of the receiving waters, cage operators will sample inside cages. In more point-source pollution oriented operations, this point will be in the mixing zone of farm effluent.
  - RWFA is a point where the farm effluent has an influence in the receiving waters but is not in the immediate outfall/mixing zone. This location would be downstream in a river, or down the prevailing current pattern in a lake, reservoir or estuary. # denotes the number of representative samples for a given category, should more than one sample be collected.
2. To reduce the burden of monitoring of all farm effluents, the TAD developed a “shared” monitoring approach such that many farmers within the same receiving water body can cooperate to develop appropriate monitoring. Famers should pool resources such that

there is a collective agreement to monitor and maintain water quality of the receiving water body.

3. Farmers are encouraged to periodically test accuracy and precisions of methods by sending replicates of samples to laboratories for analysis and compared to on-farm analyses.
4. Farmers are to record data for the multiple sites in a logbook to serve as summary data for inspection. A sample of appropriate logging is provided in Audit Reference 4 of the ISRTA Auditor Guidance Manual.
5. To assist farmers in identifying what monitoring is required, the TAD developed a water quality monitoring quick reference table in Audit Reference 3 of the Auditor Guidance Manual.

**Criteria 2.6: Wetland Conservation.**  
Applicable Standard 2.6.1.

**Justification:** A wetland is defined as lands where saturation with water is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface. Wetlands are critical sinks for nutrients. Their ability to process and assimilate organic matter, nitrogen and phosphorus provide a valuable ecosystem service that all users of the watershed depend on. Moreover, wetlands provide shelter and habitat for numerous species and are rare breeding grounds for a number of terrestrial and aquatic organisms. Because most tilapia farmers discharge waste, it is important that the conservation of wetlands be embodied in a set of standards that seeks to minimize or eliminate impacts of production.



**Better Management Practices**

1. Farmers should seek guidance from local or national governments in determining if wetlands existed on farm property prior to 1999.
2. Wetland delineations surrounding the farm (within 5-km radius of farm boundaries) should also be determined with assistance from local or national authorities.
3. Within the farm schematic (required as part of Pre-Audit), farmers should reference any wetland delineations and whether wetlands were present on the farm property prior to 1999.
4. If possible, farmers should obtain satellite imagery that offers the view of the farm site both pre and post 1999 to assist in proving compliance with the standard.

## PRINCIPLE 3: CONSERVE WATER ESOURCES

**Criteria 3.1:** Nutrient Utilization Efficiency.  
Applicable Standard 3.1.1 to 3.1.4.

**Justification:** Nutrients, primarily nitrogen and phosphorus released as effluent can cause excessive algal growth and increase oxygen fluctuations such that fish and other aquatic organisms can become stressed or die. The amount of nutrients added and released from an aquaculture system should be monitored closely and added sparingly to reduce potential impacts. The primary mechanism to improve efficiency is the reduction of fertilizer and/or feed inputs.



### Better Management Practices

1. Farmers should keep invoices and receipts of all phosphorus and nitrogen containing compounds added to the culture system. These records will detail the exact amount purchased.
2. Farmers should request from feed and fertilizer suppliers the content of phosphorus and nitrogen (as phosphorus and nitrogen) in feeds and fertilizers. The fractions of phosphorus and nitrogen should be determined for all feed types and fertilizers used.
3. Simple requests can be made to obtain data on amounts of nutrients contained in feeds and fertilizers. An example is provided in Audit Reference 9. The format for the request for nutrient content information is not restricted to the format provided, but data will be required on a 12-month basis for these inputs.
4. As tilapia themselves will be a component that accumulates nitrogen and phosphorus, it is important that farmers keep accurate production figures to determine how much nitrogen and phosphorus is removed from the culture system throughout the year. Fish production, as defined by the TAD, is determined for the prior 12-month period as follows:  
$$\text{Fish production} = (\text{Current standing stock of tilapia} + \text{tilapia harvested} - \text{initial standing stock}) - \text{fingerlings stocked from off-site production}$$
5. Fish production can then be used to calculate the amount of nitrogen and phosphorus of fish produced over the prior 12-month period by multiply fish production by the appropriate coefficients of dry ash content in fish. These calculations can be found in Audit Reference 6; however, a simplified method for determining the total amount of nitrogen and phosphorus added and released to and from the culture system is provided in Audit Reference 8 and below.



		Percentile Fraction P	Percentile Fraction N	Total Input (kg) Prior 12 mo	Total P In (kg)	Total N In (kg)
Feed A						
Fertilizer A						
Fertilizer B						
Other						
Grand Total Input (GTI)						
	Production Period	Fish Production Prior 12 mo* (mt)	P Removed at Harvest	N Removed at Harvest	Grand Total Out (GTO) P	Grand Total Out (GTO) N
	MM/YY to MM/YY	[Current standing stock** + fish harvested] – initial standing stock.....	7.5 X Fish Production (mt)	21.2 X Fish Production (mt)	GTI – P removed at harvest	GTI – N removed at harvest
Total in/mt fish/yr					GTI/mt fish produced /yr	GTI/mt fish produced /yr
Total out/mt fish/yr					GTO/mt fish produced /yr	GTO/mt fish produced /yr
*Prior 12 month period – See Audit Reference 6, Equation 8. ** At time of audit						

- The ISRTA call for a limit to the amount of phosphorus that can be added to and released from a culture system per year. The total amount of phosphorus added to a system can be no greater than 27 kg of phosphorus per metric ton of fish produced over the prior 12-month period. Additionally, only 20 kg of phosphorus is allowed to be released from the culture system per metric ton of fish produced over the prior 12-month period. Producers can input these numbers in to the above table and back calculate the rations of phosphorus (i.e. amounts of feed and fertilizer that can be used and still remain in compliance with the ISRTA.
- The ISRTA do not contain a limit for the amount of nitrogen that can be added and released to and from the culture system in the current version of the standards. However, there is a requirement that the total kg of nitrogen added to and released from the culture system per metric ton of fish produced over the prior 12-month period be calculated and justified to auditors. The utilization of the Audit Reference 8 will allow for the complete tabulation of nitrogen and phosphorus added to and released from a culture system to be used to prove compliance with the applicable standards.

**Criteria 3.2:** Groundwater salinization.  
Applicable Standard 3.2.1.

**Justification:** Groundwater is a precious natural resource that provides base flows to natural streams and rivers, but also is a valued resource for humans in areas where potable water resources are unavailable. The salinization of groundwater from fresh to brackish or saline will change the water from potentially potable to unfit for freshwater organisms and human beings for a prolonged period of time. Thus, the protection against the salinization of groundwater is critical.



### **Better Management Practices**

1. The measure used to determine the level of salinization of groundwater is specific conductance. Specific conductance is a measure of the electrical conductivity of water and is directly related to the amount of dissolved minerals in the water. The higher the salinity, the higher the amount of dissolved solids and the higher the specific conductivity.
2. This standard (3.2.1) is only applicable if brackish water is used for the culture of tilapia (if surface water used is less than 1,300  $\mu\text{S}/\text{cm}$  or if initial well water measure is greater than 1,300  $\mu\text{S}/\text{cm}$  – standard is not applicable and no non-conformance issued)
3. When farmers take ownership or lease of land, a groundwater test should be conducted to determine the specific conductance of the water. This testing is important, particularly in arid areas and areas located in proximity of brackish or saline waters. The well-being of the culture species will also be affected by the specific conductance, thus it is good practice to know the characteristics of the water sought to be used in the aquaculture activity.
4. The analysis of specific conductance should also be carried out if wells are drilled by a farmer.
5. Any well drilled or utilized should be depicted on the general farm schematic and referenced accordingly. Corresponding data on specific conductance should be tabulated on at least a bi-annual basis for all wells.

## PRINCIPLE 4: CONSERVE SPECIES DIVERSITY AND WILD POPULATIONS

**Criteria 4.1:** Escapes from aquaculture facilities.  
Applicable Standard 4.1.1 to 4.1.3.

**Justification:** Tilapia escaping from aquaculture facilities may function as vectors of disease in the receiving water environment, or may out-compete native fish species or native tilapia strains. Escapes of stocked tilapia should be done through monitoring and presence of escape barriers.



### Better Management Practices

1. Farmers should construct barriers on the inlets and outlets of tilapia culture enclosures (e.g., tanks, ponds and raceways) such that fish cannot pass through barriers. The barriers on inlets and outlets should be equipped with net mesh or grills/screens, and mesh on all netted confinement units (e.g., cages and impoundments), appropriately sized to retain the stocked fish.
2. Daily inspection of these barriers and cage integrity should be conducted and recorded. Farmers should be able to present a permanent barrier inspection register recording dates, findings and actions taken, including mitigation or fish containment structure repairs.
3. Although it is not possible to get an exact count of the number of fish that escape a farm each year, farmers should periodically sample for escapes by using secondary containment structures around cages or at pond spillways. Fine mesh seine nets can be used to sample escapes in ponds whereas secondary cage nets can be used around a single or group of cages at a cage farming site.
4. Trapping devices should be non-lethal and should be rotated through various sets of enclosures to obtain representative samples from the farm site.
5. The sampling of escapes is meant to show the potential average escapes; however, it is not mandatory to have these trapping devices on all enclosures. A sampling of 5% of the farm enclosures, rotated weekly, is advised.

**Criteria 4.1:** Escapes from aquaculture facilities. Reproduction in cage systems. Applicable Standard 4.1.4.

**Justification:** Although there is protection against the escape of stocked fish by barrier placement and monitoring, there is a far greater chance of magnitudes of more escapes from the reproduction of tilapia within culture enclosures. This can be the case in cage-based culture systems. The intent of the following BMPs is to mitigate the reproduction of tilapia within the culture enclosures.



### **Better Management Practices**

1. Farmers should site cages such that the bottom of cages is greater than 3.0 meters (m) above the bottom of the receiving waters. This practice provides sufficient distance such that eggs cannot be fertilized by sperm. Moreover, tilapia will not be able to construct and maintain spawning beds with sufficient distance from the lake or reservoir bottom.
2. Depth determination of the culture area can be done simply by determination of the depth of cages and subtracting that depth from the total depth from water surface to the bottom sediment of receiving waters. Alternatively, if receiving water depth is great, a calibrated Secchi disk rope that is long enough to take into account the depth of the cage plus 3.0 m can provide sufficient evidence that the cage bottoms are indeed at least 3.0 m from receiving water bottom sediment.
3. If cages are placed in areas where the distance from the bottom of the cage to the bottom sediment is less than 3.0 m, farms will not be in compliance with the standard.

**Criteria 4.1:** Escapes from aquaculture facilities. Reproduction in land-based systems. Applicable Standard 4.1.5.

**Justification:** Although there is protection against the escape of stocked fish by barrier placement and monitoring, there is a far greater chance of magnitudes of more escapes from the reproduction of tilapia within culture enclosures. This can be the case in both land based culture systems. The intent of the following BMPs is to mitigate the reproduction of tilapia within the culture enclosures.



### **Better Management Practices**

1. The primary mechanisms to inhibit tilapia reproduction in land-based systems are to maintain all-male culture stocks. Natural management to reduce the reproduction of tilapia in land-based systems by the stocking of predatory fish to consume fry and fingerlings is possible, but this method has not been considered as effective as the use of sterile or all-male fish populations as culture stock.
2. The most prominent and commonly used mechanism to produce a culture stock that is predominantly male is the administering of a male sex hormone, 17 $\alpha$  methyltestosterone (MT) during the early stages of development. The following are BMPs to obtain a 95% male culture stock:
  - a. When fry reach the swim up stage and are collected, they should be graded to capture fry that are less than 1.5 cm. Fry longer than 1.5 cm are less likely to undergo the female inhibition process. Grading fry can be done with a simple mesh screen with a mesh size less than 0.3 cm.
  - b. MT should be purchased from a trusted supplier such that the effectiveness of the hormone is assured.
  - c. MT should be dissolved in ethanol (> 95% ) in a ratio of approximately 60 milligrams (mg) for every 0.2 liters (L) of ethanol. This ratio is set as it provides ease of calculation since approximately 60 mg of MT is required to be added to every kg of feed to be rationed to fry. Thus, for every 1.0 L of MT/ethanol mixture, 5 kg of MT treated feed can be produced.
  - d. Fry feed can be mixed directly with the MT/ethanol mixture and should be thoroughly mixed in 1.0 kg batches until all of the feed is moist. Mixing can take place in feed drums or buckets.
  - e. When the MT/ethanol mixture is applied to feeds, it should be carried out in a dark (MT degrades in sunlight), dry room. This room should also have adequate ventilation to

assist in the evaporation of the ethanol. Workers applying the MT/ethanol mixture should be wearing rubber gloves, eye protection and ventilation masks. To assist in evaporation, feeds should be spread in 1.0-cm thickness over plastic sheeting or plastic bags.

- f. The feeding of MT-treated feeds takes place over a 3-week period with a ration of 27% of body weight per day for the first week; 20% of body weight for the second week; and 15% of body weight during the final week.
3. The second method used to produce all male culture stocks is the spawning “YY males” or sometimes called “super males” with normal female tilapia to produce Genetically Male Tilapia (GMT®). The YY males sperm are used to fertilize normal female (XX) eggs, thus producing an XY male. Because the process used to create the YY males is patented, the methodology cannot be shared but the majority of farms in the world do not have this technology and YY males will more than likely need to be purchased from a trusted supplier. There are suppliers around the world and searching through the internet or local extension officials can give a better understanding of the availability of these fish in the farmer’s region.
4. Independent of what method is used to develop male culture stock, all farmers will be required to prove that their culture stock is dominated (95%) by male tilapia. Once tilapia reach 200 grams (g), sampling should be conducted by the farmer himself to determine the percentage of males to diminish the escape of fry from the culture system.
5. Dye is often employed to assist in identifying male and female tilapia. The normal dye is indigo, but markers can also be used.
6. To assist farmers in understanding the physical differences between male and female tilapia, the follow photographs are provided:

Male tilapia (left); female tilapia (right)



**Criteria 4.2:** Transporting live tilapia.  
Applicable Standard 4.2.1.

**Justification:** Escapes from transport vessels, post-harvest also pose a risk of escape of fish into the natural environment. To adequately address the potential for escape from transport vessels to the environment, containment of fish while being transported must have no escape path for fish to pass through.



### **Better Management Practices**

1. Once farmers harvest fish from the culture enclosures, whether from pond, tank, raceway or cage, transport containers should have no escape path that fish can pass through. While there is an economic incentive to keep all fish harvested, there are instances when precautionary measures can prevent accidental escape of fish. Farmers should try to identify the points of potential escape of fish throughout the production chain, including the harvesting and transporting of fish off of the farm site.
2. When transporting live fish off the farm site, it is important that farmers cover containment vessels with mesh netting that is secured and has a mesh size that is sufficiently smaller than the size of the tilapia being transported.
3. When fish are transported from cages to loading facilities, nets should also be placed over transport vessels or fish should be held in the hull of the boat with netting or lids that ensure fish cannot jump out or escape from the transport vessel.
4. Trucks that are owned by the farmer and used to transport fish to processing or markets should have vessels securely fastened to the truck or trailer bed so that shifting of these vessels does not occur while the vehicle is in motion.
5. Any transport vessels to be used on vehicles should be equipped with lids that can be locked or latched in place and not opened by vehicle movement in route to the delivery point.

**Criteria 4.3:** Transgenic tilapia. Applicable Standard 4.3.1.

**Justification:** The manipulation or transference of genes from one species to another (transgenics) can produce a more robust and vigorous tilapia strain. However, this vigor may increase the tilapia's ability to out-compete native fish. It is therefore prohibited to use transgenic tilapia under the ISRTA.



### **Better Management Practices**

1. There are no public sources that provide evidence that transgenic tilapia are currently in use within the commercial tilapia industry, but with the rapidly evolving technology surrounding genetics, these fish might be more readily available in certain regions.
2. Farmers sourcing seed from an independent hatchery should request that the hatchery provides written confirmation signed by hatchery management that the seed produced in the hatchery has not been genetically modified. Additionally, farmers should also request that in this written confirmation hatchery management provide the origin of broodstock from which purchased seed originates.
3. This written confirmation should be kept for all stocks of tilapia seed purchased to provide evidence to auditors that fish being cultured have not been genetically modified.



**Criteria 4.4:** Predator control. Applicable Standard 4.4.1 to 4.4.2.

**Justification:** The killing of animals that may prey on cultured tilapia is manipulation of the natural environment that is unnecessary when there are other protective actions and scare tactics that are as effective as specifically targeting wild animals to be killed.



### **Better Management Practices**

1. The killing of birds, reptiles, fish or other species that may cause significant losses of stock is not considered an effective means to mitigate these losses. Farmers should not kill predators of tilapia.
2. A combination of barriers (netting or strings over culture enclosures) to fish and deterrent devices (noise cannons, scarecrows, human movement) has proven to be a more effective means of controlling the predation of tilapia.
3. The highest rate of mortality due to predation occurs when fish are juveniles, thus barriers and deterrents should be strategically employed in and around the juvenile culture areas of a farm.
4. Farmers can purchase many types of barriers for culture enclosures, but these barriers can also be made using relatively inexpensive supplies. Strings of made of a variety of materials can be stretched and secured to anchor points around a pond. These “homemade” barriers are often used on large enclosures such as ponds.
5. Netting, either purchased or constructed on the farm can be lined over the water surface. Netting is often purchased or constructed for cover smaller culture enclosures such as small ponds, raceways, tanks or cages.
6. Deterrent devices such as noise makers can be purchased and should be moved regularly around the areas most prone to predation. Birds, in particular, become desensitized to these noises when they are in the same location.
7. Scarecrows, mannequins, animal statues can also be used to scare away birds, but again, these devices require relocation every 2-3 days so predators do not become adjusted to the presence of such devices.
8. Human movement is also a useful tool employed as a means of deterring predators, particularly if the human movement is coupled with erratic noise and sticks and ropes waved in the air.
9. For non-human predation on tilapia farms, the best results for reducing mortalities are from the employment of a combination of barriers and deterrent devices. This will result in the most uncommon situation that predators will encounter, and thus provide a level of discomfort.

10. In rare instances predators may become trapped or tangled in some of the barrier devices. If this occurs, the farmer should attempt every means to release the animal from these barriers. However, if the predator that has become trapped is severely wounded or would suffer greatly from the continued entrapment, farmers may euthanize these animals.
11. In many locations where tilapia aquaculture takes place, rare and unique fauna exists. Many of the rarest of animals are in endangered or threatened categories. The International Union for the Conservation of Nature (IUCN) maintains a database, the Red List, which identifies these species. Under the ISRTA, there is no tolerance for the killing of any Red Listed species. Farmers should pay special attention to their local fauna and the IUCN Red List, and implement precautionary measures to deter these types of species if they migrate through or inhabit surrounding areas of farms. Precautionary measures may include increased number of deterrent devices around enclosures; secondary impingement protection around water pumped or diverted from natural areas and increased human activity and monitoring. Instructions for using the IUCN Red List database follow:

Instructions:

- a. go to <http://www.iucnredlist.org/>
- b. follow to "other search options"
- c. select "Taxonomy"
- d. select "Animalia"
- e. indicate appropriate "Location", "Systems", "Habitat",
- f. click on "run search" and record species listed and whether they are threatened by the farming activity.

Secondary impingement protection when potential IUCN Red List species, categorized as vulnerable, endangered, critically endangered, extinct in the wild or extinct are known to be in region (including receiving and source waters) of farm

12. Human predation or theft of fish requires a more community-oriented means of establishing trusting relationships. These efforts are described in BMPs addressing social and community concerns in later sections of this tool.

## PRINCIPLE 5: USE RESOURCE RESPONSIBLY

**Criteria 5.1:** Use of wild fish for feed (fish meal and oil).  
Applicable Standard 5.1.1 to 5.1.2.

**Justification:** Wild fish captured from the sea are often used as a protein source in tilapia feeds. The sustainability of ocean fish stocks depends on the prudent and responsible use of natural resources. The utilization of wild fish in tilapia feeds should result in a net production of wet fish product, thus wild fish in the form of fish meal and oil should be used sparingly. Moreover, alternatives should be developed to decrease the tilapia industry's dependency on wild fish. Lastly, farmers should not be using feed that includes fish meal or oil from species that are protected and listed under CITES or on the IUCN Red List.



### Better Management Practices

1. For farmers to achieve the performance level of 0.8 Feed Fish Equivalency Ratio (FFER) required by the ISRTA, the use of 0.8 kg of targeted wild caught fish in feeds should produce at least 1 kg of cultured fish.
2. The FFER is a measure of how much wild fish is used to produce cultured fish. The most useful form of the FFER equation for tilapia farmers is as follows:

$$\text{FFER}_{\text{sum}} = \frac{\sum [(\% \text{ fish meal in feed type}^{**}) \times (\text{mt of feed type used})]}{\text{Fish production}^* (\text{mt}) \times 22.2}$$

Where

\*\* % fish meal in a particular feed type is expressed as a whole number (7% fish meal inclusion is entered into the equation as 7.0);

mt of feed type used is the corresponding amount of feed for a given feed type that has a given fish meal inclusion percentage;

\*Fish production is defined as follows:

Fish production = (Current standing stock of tilapia + tilapia harvested – initial standing stock) - fingerlings stocked from off-site production.

3. Farmers should keep records of all feeds purchased. The records should contain the amount of fish meal in each feed type which can be requested to be provided by the feed supplier; the

total amount of each feed type used; and an invoice that confirms the purchase of the feed. Farmers should be prepared to do a full accounting of the amount of fish produced and the amount of feed used.

4. Depending on the size, type of tilapia produced or production system, the farmer may choose to increase or decrease the amount of fish meal in the feed. It should be noted, however, that increases in the amount of fish meal inclusion will limit the amount of feed that can be allotted to the fish under the ISRTA. Over a 12-month period the FFER should be equal to or less than 0.8, thus farmers must plan and calculate accordingly.
5. The species of fish (if fish used) as fish meal and oil will play a large role in the ability of farmers to conform to the ISRTA. Farmers should request the species of targeted, wild fish use for fish meal and oil in all feed types and should also request for the region this species was harvested from – South China Sea, Gulf of Thailand, Gulf of Mexico, etc. The confirmation of the what species and region harvested should be on the feed manufacturers letter head (feed company's logo) and be signed by an authoritative person representing the feed company.
6. Once species of fish used as fish meal and oil have been determined, the species should be cross-checked with the species list maintained by the Convention on the International Trade of Endangered Species of Wild Fauna and Flora (CITES) and IUCN Red List databases to ensure it is not listed (within the Red List database, the species used should not fall into the following categories: vulnerable, endangered, critically endangered, extinct in the wild or extinct). Instructions on the use of these databases follow:

#### IUCN Red List:

##### Instructions:

- a. go to <http://www.iucnredlist.org/>
- b. follow to "other search options"
- c. select "Taxonomy"
- d. select "Animalia"
- e. indicate appropriate "Location", "Systems", "Habitat",
- f. click on "run search" and record species listed and whether they are threatened by the farming activity.

#### CITES

##### Instructions

- a. go to <http://www.cites.org/eng/resources/species.html>
- b. select option "Species" and click "find it"
- c. determine if the fish species being used is on any CITES list

7. If any of the species used in the feeds fall into the categories listed above the farmer will not be able to comply with the ISRTA using the current feeds. Thus, it is critical that the farmer requests that species that are not on these lists be used as components of the feed. Farmers should seek out feed suppliers and traders that are willing to cooperate to meet the protocols above.

**Criteria 5.1:** Use of wild fish for feed (source of fish meal and oil). Applicable Standard 5.1.3 to 5.1.4.

**Justification:** Wild fish captured from the wild and used as feed ingredients require traceability and proper management to ensure the sustainability of this natural resource. Many fish species are unregulated and illegally caught. Further, if the species origin is unknown, it is not possible for aquaculture producers to know if they are contributing to the degradation of a fishery.



### **Better Management Practices**

1. Farmers should obtain the specific species information and the region from which that species was harvested for all species that are included as feed ingredients in all feed types a farmer uses.
2. The species of fish used in tilapia feeds purchased by farmers will be required to be certified by a sustainable fisheries certification program that is accredited by the International Social and Environmental Accreditation Labeling (ISEAL) Alliance. (see accredited programs at [http://www.isealalliance.org/organisation/full\\_members](http://www.isealalliance.org/organisation/full_members)). This certification must be in place by 19 December 2014. Farmers should develop a letter of commitment that states their intention to purchase feeds with certified fish ingredients, but they should also request that feed suppliers submit a letter of company letterhead that states the feed company's commitment to source fish meal and oil from fish stocks that are certified by 19 December 2014.
3. Prior to the fish species used achieving certification status, all species of fish used as a feed ingredient should be cross-checked with the FishSource database to determine if these species are permissible for use under the ISRTA. Instructions to determine if fish species identified, can be used are as follows:

Instructions:

- a. go to <http://www.fishsource.org/>
- b. select "Species" drop down tab to the left
- c. select the species that is utilized by the farm as a source of fish meal or oil
- d. if the species is not on the FishSource website, and the fish meal or oil is not sourced from by-products (trimmings) of capture fisheries, farms are not in compliance. Contact FishSource via Sustainable Fisheries Partnerships to identify the species as a priority for assessment. [http://www.fishsource.org/site/contact\\_us](http://www.fishsource.org/site/contact_us)

- e. if the species is assessed, select the top tab that reads "Scores"
  - f. average of all scores must be 6.0 or higher and no "N/A" for "Stock Assessment" category (category 4 in FishSource scoring) to be in conformance
4. At first audit farms should have obtained a letter of commitment from feed manufacturer (on letterhead with authoritative signature of feed manufacturer) to provide feed with corresponding fish meal/oil from fisheries complying with FishSource scoring.
  5. Farmer should have been using feed that complies with the FishSource scoring for a minimum of 6 months prior to the second audit.
  6. If feed suppliers do not respond or do not assist in farmers meeting these protocol, the farmer is encouraged to seek out other feed suppliers that will assist in allowing farms to comply with the ISRTA.

**Criteria 5.2:** Preference for better feed manufacturers. Applicable Standard 5.2.1.

**Justification:** Aquaculture entails the utilization of numerous types of primary products and feed to culture tilapia. These products will have impacts on the environment and these impacts will accumulate through the production chain with sufficient burden being placed on producers for using these resources to produce a final product for the consumer. Thus, producers will need the assistance of the many allied businesses in the production chain such that impacts can be minimized both individually and cumulatively. Feed is the one input used by fish farmers that encapsulates many of the accumulated impacts and better feed manufacturers should be used by farmers seeking compliance with the ISRTA.



### **Better Management Practices**

1. Farmers are customers of the feed manufacturers, thus they have every right to make requests and occasional demands from the sellers of the product they purchase. Concern about the health of tilapia and the implications of feed ingredients has caused a movement towards identification of the origin of feed ingredients. This has largely been driven by the desire to have more consistent and healthy feeds; however, the origins of feed ingredients also has dramatic implications for the sustainability of the ingredient – whether the product comes from recently cleared rainforests, over-fished fish stocks or where poor production practices are the norm. It is for this reason that farmers should be discussing and requesting feed manufacturers supply them with a copy of the company’s traceability policy which provides assurances of the origin of feed ingredients. If the company does not have a traceability policy, it should be explained that the feed manufacturers that sell product to farmers seeking compliance with the ISRTA must have a traceability policy in place and shared with the farmers by 19 December 2011.
2. The first step for feed manufacturers to begin to identify better sources of feed ingredients is to identify the product origin, but once traceability is established, feed companies should identify which products have the largest impacts in which regions and why. Shifting towards ingredient sourcing towards specific products and locations that have the least impact on the environment has been of considerable concern for the TAD. Thus, farmers should be discussing and requesting feed manufacturers supply them with a copy of the company’s



sustainability policy which provides the company's strategy to reduce the impact of the products they source. If the company does not have a sustainability policy, it should be explained that the feed manufacturers that sell product to farmers seeking compliance with the ISRTA must have a sustainability policy in place and shared with the farmers by 19 December 2011.

**Criteria 5.3:** Energy use. Applicable Standard 5.3.1.

**Justification:** The generation of greenhouse gases through energy use contributes to climate change and impacts such as sea-level rise, species diversity decline, increased vulnerability to weather events, and other direct and indirect impacts. Not only does the use of energy have impacts, but there can be considerable impacts such as habitat degradation from the production of energy – i.e. dam construction, oil drilling, etc. Farmers that are seeking to comply with standards that project environmental stewardship should contribute to the reduction of and efficient use of energy.



### **Better Management Practices**

1. Although processes that contribute to climate change can be complex, there are simple tools that have been developed to tabulate the amount of energy used for many industries. Farmers seeking to comply with the ISRTA should calculate and record the total amount of energy used annually and be prepared to credibly prove the usage of energy to auditors during certification.
2. Farms should keep a record of energy purchased and the energy source. Energy costs typically are associated with:
  - a. Pumping water
  - b. Air conditioning
  - c. Heating
  - d. On-farm motor vehicles
  - e. Aeration
  - f. Others
3. Energy use is fairly simple to calculate because most energy vendors provide invoices detailing the justification for bills – gas stations will provide the amount of liters of fuel purchased, electric companies provide the kilo-watt hours used in a billing cycle, etc. These receipts and invoices should be maintained to account for the total energy used. The tabulation of the entire amount of energy used should be tabulated by the farmer. These total usages of particular energy sources can be submitted to databases to calculate the total amount of energy used in the form of kilojoules. One site that offers this conversion for free is:

[http://tonto.eia.doe.gov/energyexplained/index.cfm?page=about\\_energy\\_conversion\\_calculator](http://tonto.eia.doe.gov/energyexplained/index.cfm?page=about_energy_conversion_calculator)

4. Farmers do not need to meet a specific level of performance for energy use, but conservation of energy will reduce farm costs and is in the best interest of farmer and the environment. Some common means to reduce energy that are supported by WWF are as follows:

- Check lights. Identify frequently used light fixtures that use incandescent bulbs; order fluorescent replacements bulbs
- Check the settings on equipment in laboratories, canteens, living quarters and in hatcheries. Where the option is available – and is not already selected -- select the energy-saving settings.
- Purchase only energy efficient products. Use a service like TopTen to pick from the most energy-efficient consumer products on the market in a wide range of categories <http://www.toptenusa.org/>. On average, these products use half the energy of a standard model.
- Check your thermostat settings. During the cooling season, set the thermostat higher, especially at night or when rooms are unoccupied. During the heating season, set the temperatures lower.
- Check showerheads and faucets. Determine whether any of your showerheads are models that use more than 2.5 gallons per minute. If so, order low-flow showerheads. Similarly, verify that your bathroom and kitchen water faucets have aerators. Order an aerator for each faucet that does not have one and that can accommodate one. These steps will reduce your use of hot water – and your use of energy to heat that water.
- Turn off appliances that you are not using. Switch off TVs, computers, lights, etc. that are not being used and unplug items on “standby” (that use electricity even when not being used).
- Check vehicle tires for proper inflation. This can improve fuel mileage. The appropriate air pressure typically is listed on the door-pillar on the driver’s side, on the inside of the glove-compartment door or in the vehicle manual.

## **PRINCIPLE 6: MANAGE FISH HEALTH AND WELFARE IN AN ENVIRONMENTALLY RESPONSIBLE MANNER**

**Criteria 6.1:** Stocked tilapia recovery. Applicable Standard 6.1.1.

**Justification:** One of the most telling attributes characterizing a farmer that manages fish health and welfare responsibly is the recovery of stocked fish. The better the management of stress, disease and mortality, the higher the recovery of fish will be.



### **Better Management Practices**

1. Farmers must prove that proportion of fish stocked that were recovered was at or above 65%. Farmers should begin to account for the loss of fish in culture enclosures as soon as they are stocked. However, it is understood that predation on small fish can be excessive and the recovery rate required for compliance to the ISRTA is mandatory after tilapia reach an average size of 100 g.
2. Farmers should calculate their annual recovery of stocked fish in the following manner:  
For prior 12-month period:
  - a. Stage of production where fish attain an average weight of 100 g (estimated) identified
  - b. Estimated loss of fish (#) prior to average size of 100 g being achieved for all production cycles (in ponds, cages, tanks, etc.) for the prior 12-month period
  - c. Standing stock of fish (#) after average size of 100 g achieved
  - d. The number of fish harvested to market for the 12 month period divided by (c.) multiplied by 100 is equal to the percent recovery after 100 g.
3. To achieve a 65% recovery percentage farmers should monitor fish behavior and reduce stress as much as feasible. Some of the specific areas of stress to reduce or eliminate are :
  - a. Over-feeding – feed fish what they will consume and do not feed beyond the rate of what fish will eat.
  - b. Intake water contamination – during wet seasons, the first heavy rain can bring accumulated substances toxic to the fish in the intake water. Water used during this period should be done sparingly.
  - c. Reduce toxic chemicals that accumulate in soils – pond bottoms should be allowed to dry and oxidize for approximately 10 days such that reduced chemicals in the soil will dissipate.

- d. Reduce spread of disease – contain and isolate culture enclosures that appear to be infected by pathogenic organisms.
- e. Treat diseases responsibly – any disease outbreak should be reported to extension offices and/or the farm's health professional for expert advice on how to remedy disease events.
- f. Maintain oxygen concentrations - in culture enclosures, ensure dissolved oxygen concentration in water is above 4 mg/L, especially through the night and early morning. Utilize aeration and water exchange where applicable to improve water quality.
- g. Feed at set times – avoid altering feeding routines and allow fish to anticipate the daily feeding times.
- h. Use trusted feeds – avoid purchasing feeds from companies that do not provide major ingredient labels. Additionally, feeds should have minimal amounts of feed dust and no mold present. If feeds are suboptimal seek extension support to determine where other feed manufacturers are located and how to purchase their feed.
- i. Reduce the amount of stress and predation – use predator barriers and deterrent devices to reduce the stress caused by predation.

**Criteria 6.2:** Chemicals. Applicable Standard 6.2.1 to 6.2.5.

**Justification:** Chemicals usage by some farmers is unnecessary and can cause more problems than intended to solve. Pesticides are banned for use in aquaculture. In many countries there are few therapeutants approved for application for fish to be consumed by humans. Some farmers choose to apply antibiotics in a preventative manner such that disease resistant bacteria can be fostered. Chemicals are to be used sparingly or eliminated completely from production. Most tilapia grow-out farming requires no chemical applications.



**Better Management Practices**

1. Farmers should strive towards to use of no chemicals for the culture of tilapia. It has been proven that chemical additions in grow-out situations are not necessary. Stress reduction, as previously discussed, will have more of an impact on the health and welfare of culture stocks than will any chemical additions.
2. When health-related events occur, farmers should have a specific contact person in the veterinary health profession that is used to assist in remedying health-related events. Farmers may choose to hire a veterinary health professional or they could use a trusted outside source. Some national agencies that handle animal and disease epidemic or aquaculture extension offices provide this service. Copies of farmer's health professionals' accreditations kept at the farm site to prove the capabilities of the persons advising them.
3. Although tilapia aquaculture can be conducted without chemical or antibiotic utilization, it is recognized that in the event of a disease outbreak, it is inhumane to allow the culture species to die from a curable disease by approved means. Farmers should consult with veterinary health professionals to accurately diagnose disease outbreaks, and follow the instructions for remedying the disease. Viral and parasitic outbreaks should be handled in the same manner before the farmer is to apply any treatment involving chemicals.
4. Farmers should inventory all chemicals used on the farm with accurate dates of purchase (receipts or invoices required) and from what source/company the chemicals were purchased.
5. Farmers should update the inventory list to maintain the current chemical amounts on site and when chemicals were used.
6. Farmers should also consult with processing plants to determine the potential destinations where their product will be sold. If this information is subject to high variation, the farm should obtain the locations where the product was shipped over the prior 12-month period.

Included with the list of applicable countries importing the product, farmers should obtain the substances which are banned in those countries and in the country where the farmer produces. The regulatory body governing these chemical substances in the country where the farmer operates should be listed with appropriate contact information.

7. Farmers should maintain another inventory of all prescriptions for antibiotics purchased and corresponding receipts or invoices. The total amount of the antibiotics used should be tabulated per each antibiotic. The fraction of active ingredient in each antibiotic should also be listed.
8. Farmers should maintain a logbook of disease related events including dates and duration. This logbook should correspond directly to prescriptions obtained from health professionals.
9. Farmers should be certain, and able to prove, that the amount of antibiotic purchased minus the current inventory is equal to the amount of antibiotic prescribed by the veterinarian/health professional.
10. For farmers that operate their own hatchery and use MT as a means to produce all-male culture stock, procedures should be followed to ensure the degradation of MT as follows:
  - a. Farmers should not discharge any water that has been used for culture of fish that have been administered MT for a minimum of 48 hours.
  - b. The easiest means of degrading MT is to allow the waters which contain the hormone to be exposed to heat and light. Farmers should construct two settling ponds that can retain the amount of water treated with MT for a minimum of 48 hours.
  - c. Determining the size of the settling basin will depend on the amount of fry produced at the hatchery which corresponds to the length of time fry are treated with MT, the water volume of the culture enclosures and the water exchange of the culture enclosures. Constructing two adjacent ponds will allow the one pond to receive effluent while the other is draining. In general, each pond should be the size of the volume of water in all fry tanks, plus the exchanged water over the time period that the fry are fed the MT-treated feed.
  - d. Farmers should attempt to conserve water in the hatchery to reduce the amount of water exchanged. This will reduce the need for larger settling ponds.

**Criteria 6.3:** Mortalities. Applicable Standard 6.3.1 to 6.3.2.

**Justification:** Mortalities in culture enclosures represent a substrate for the proliferation of bacteria and can foster the transfer of diseases both in the culture system and outside the culture system. The proper disposal of mortalities will reduce the likelihood of disease transmission.



### **Better Management Practices**

1. Farmers will likely experience both small and large scale mortality events for a variety of reasons. When mortalities are observed, farmers should immediately remove these fish.
2. The use of cast nets and floating drift tubing has been used in large enclosures such as ponds where nets are thrown over dead fish and floats can be dragged to push larger numbers of mortalities to shore.
3. Dip nets are more common tools farmers can use in small ponds, cages, raceways and tanks.
4. Mortalities should not be discarded onto the embankments or in the receiving waters because of biosecurity risks and it is pollution.
5. There are a host of options for disposal of mortalities that include but are not limited to the following:
  - a. Burying of fish in compost piles with plastic lined bottoms and no less than 100 m from the receiving waters
  - b. Grinding or chopping fish into small pieces animal feed
  - c. Burning or incinerating
  - d. Utilization as terrestrial fertilizer
6. Farmers should be able to accurately describe the mortality disposal process and prove its existence and use.
7. Daily records of mortalities removed should be maintained. Additionally, the records of mortalities should correspond to records of disposal of mortalities.



**Criteria 6.4:** Fish health management. Applicable Standard 6.4.1.

**Justification:** In order to prevent the introduction, emergence and spread of diseases, and invasive species, within a tilapia farming facility, and to its surrounding environment, biosecurity policies and procedures are required to decrease the likelihood of health-related problems occurring.



### **Better Management Practices**

1. Farmers should work with veterinary health professionals to apply general provisions to identify fish health-related risks as related to their particular farming site. These general provisions should be documented and recorded to serve as the farms health management plan.
2. The health management plan should include attempt to address the general issues that are most applicable to the farm. Some questions are provided that should be addressed in the farm's health management plan:
  - a. What are the potential diseases that could occur?
  - b. How does the farm contain and restrict disease causing organisms from escaping or contaminating fish stocks?
  - c. What type of training is necessary such that all employees and workers are aware of the health management plans, in general, and how to address problems that occur? Are training material for workers available via posters, plackards or manuals?
  - d. Is access to the farm and its facilities by persons other than employees controlled and supervised?
  - e. Are visitors provided with protective clothing as necessary, and instructed regarding the biosecurity and safety rules?
  - f. Is there prohibition of farm animals and/or pets (which act as disease spreading vectors) allowed on the premises?
  - g. Do pest control measures need to be implemented to control other disease vectors? If practical access to the water supply is restricted or fenced.
  - h. Does the water supply, including water bodies for cages, require testing at frequent intervals for quality factors appropriate for the source and related potential hazards?
  - i. Is it necessary to segregate age classes of fish to allow for younger fish to be given the newest water from the intake?
  - j. Is it necessary to adjust the human resources such that adequate care is given to all fish? For example, on farms with limited human resources workers attend to the youngest fish

first in the day, then the older groups in succession; diseased and dead fish are handled last.

- k. Are fish kept from non-production water courses within the farm (channels, settling ponds, etc.)?
- l. Where should feed be kept to keep it cool and dry?
- m. Are the feeds used nutritionally complete for the fish?
- n. Are barriers and deterrents needed to scare or deter predators or other species that can transfer diseases?
- o. Are the stocking densities based on biological principles; e.g., water quality parameters are maintained within acceptable limits under the existing regime.
- p. Is dissolved oxygen monitored in culture vessels at appropriate intervals to avoid stressful conditions?
- q. Is there a mechanism to inform the local, state and/or national authorities having jurisdiction over aquaculture operations in the event of serious episodes related to fish health, escapes and flooding on the farm?
- r. Are vehicles entering the facility and boats and equipmentsubject to a disinfectant spray to their tires, wheel wells and underbodies as a minimum precaution?
- s. Do mechanisms need to be put in place such that culture enclosures are disinfected between production cycles?
- t. Do farms need to be completely fallowed in the event of a severe disease outbreak to diminish re-infection?

## PRINCIPLE 7: BE SOCIALLY RESPONSIBLE

**Criteria 7.1:** Child labor<sup>1</sup>. Applicable Standard 7.1.1.

**Justification:** Children are particularly vulnerable to economic exploitation, due to their inherent age-related limitations in physical development, knowledge and experience. Children need adequate time for education, development and play and, therefore, shall never be exposed to work or working hours that are hazardous to their physical or mental well-being.



### Better Management Practices

1. Farmers should only employ permanent workers that are 15 years old or older. If the legal minimum age allowed in the country is higher than 15, the legal minimum age of the country should be followed. (Note: Employer is accountable for employee age documentation. In most countries, the law states that the general minimum age for employment is 15 years.)
2. Farmers that have workers under the age of 15 are considered child<sup>2</sup> workers and they should only be tasked with light work (According to the ILO convention 138, article 7.1, light work is work that is 1) not likely to be harmful to a child's health or development and 2) not likely to prejudice their attendance at school, participation in vocational orientation or training programs, or diminish their capacity to benefit from instruction received), as long as it does not exceed 2 hours per day on school days or holidays. Also, the total number of hours spent on light work and on school shall not exceed 7 hours/ day. (Note: Per ILO C 138, Article 7.4: Some countries may apply for an exception to the minimum age, thereby defining 12 as the minimum age for light work by children and 14 for the minimum age for young workers; few if any countries still invoke this clause.)
3. Farmers employing person between the ages of 15-18 (young workers) should provide a work environment that does not conflict with schooling and the combined daily transportation time, school time and work time shall not exceed 10 hours. Farmers should also restrict hazardous work (e.g., heavy lifting disproportionate to a person's body size, operating heavy machinery, working night shifts, and exposure to any toxic chemicals) to persons at or above the age of 18.

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<sup>1</sup> "Child labor" is defined as any work by a child younger than the age specified in the definition of a child, except for light work as provided for by ILO Convention 138, article 7.

<sup>2</sup> A "child" is defined as any person less than 15 years of age. A higher age would apply if the minimum age law stipulates a higher age for work or mandatory schooling. If, however, the local minimum age law is set at 14, in accordance with developing country exceptions under ILO Convention 138, the lower age will apply.

**Criteria 7.2:** Forced<sup>3</sup>, bonded<sup>4</sup> or compulsory labor.  
Applicable Standard 7.2.1.

**Justification:** Forced labor—such as slavery, debt bondage and human trafficking - is a serious concern in many industries and regions of the world. Ensuring that contracts are clearly articulated and understood by employees is critical to determining that labor is not forced. The inability of a worker to freely leave the workplace and/ or an employer withholding original identity documents of workers are indicators that employment may not be at-will.



### **Better Management Practices**

1. Farmers should always permit workers to leave the workplace and manage their own time. Farmers should clearly convey the obligations of the work, but not force workers to remain on the job.
2. Farmer should not withhold original worker identity documents in exchange for work.
3. Farmers should develop contracts that are clearly stated and understood by workers and never lead to an employee being indebted through “pay to work” schemes such as the worker paying for job training.
4. Farmers should allow workers to be free to leave the workplace and manage their own time.
5. Farmers should never be permitted to withhold a worker’s original identity documents, especially in the case of migrant or contract work.
6. Farmers should not withhold any part of workers’ salaries, benefits, property or documents in order to oblige them to continue working for employer.
7. Farmers should not oblige workers to stay in their job to repay a debt to the farmer.

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<sup>3</sup> “Forced (compulsory) labor” is defined as all work or service that is extracted from any person under the menace of any penalty for which a person has not offered him/ herself voluntarily or for which such work or service is demanded as a repayment of debt. “Penalty” can imply monetary sanctions, physical punishment, or the loss of rights and privileges or restriction of movement (e.g., withholding of identity documents).

<sup>4</sup> Bonded Labor: When a person is forced by the employer or creditor to work to repay a financial debt to the crediting agency

**Criteria 7.3:** Discrimination<sup>5</sup> in the work environment. Applicable Standard 7.3.1 to 7.3.2.

**Justification:** Unequal treatment of employees based on certain characteristics (such as sex or race), is a violation of a workers' human rights. Additionally, widespread discrimination in the working environment can negatively affect overall poverty and economic development rates. Discrimination occurs in many work environments and takes many forms, thus care should be given to the means and manner farmers treat their workers, but also how workers treat each other.



### Better Management Practices

1. Farmers should develop a written and shared anti-discrimination policy that includes standard working condition protocols for anti-discrimination. Workers should have access to and understand the provisions of this policy. The policy should state that the employer does not engage/support in discrimination in hiring, remuneration, access to training, promotion, termination or retirement based on:
  - a. race,
  - b. caste,
  - c. national origin,
  - d. religion,
  - e. disability,
  - f. gender,
  - g. sexual orientation,
  - h. union membership,
  - i. political affiliation,
  - j. age or
  - k. any other condition that may give rise to discrimination
2. Farmers should take special caution to assist and protect pregnant and lactating mothers
3. Farmers should ensure that workers and management do not discriminate against HIV-infected persons. Much of this policy will entail the training of person on the means to become infected by the disease and how to prevent the spread of the disease.

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<sup>5</sup> Discrimination: Any distinction, exclusion, or preferences, which has the effect of nullifying or impairing equality of opportunity or treatment. Not all distinction, exclusion, or preference constitutes discrimination. For instance, a merit- or performance-based pay increase or bonus is not by itself discriminatory. Positive discrimination in favor of people from certain underrepresented groups may be legal in some countries.

4. Farmers should have a procedure such that workers that are feeling discriminated against can raise these issue with appropriate persons to remedy the problem. The procedures should address how to raise, file and respond to discrimination.
5. Farmers or management staff should develop/receive training on diversity and non-discrimination. All workers should be subsequently trained to receive non-discrimination training.
6. Farmers should recognize that the communities surrounding the farms are the priority and most logical areas to solicit for jobs. It would be indicative of discrimination if the surrounding community diversity and demographics were not characteristic of the workers at the farm.

**Criteria 7.4:** Health and safety of workers. Applicable Standard 7.4.1 to 7.4.3.

**Justification:** A safe and healthy working environment is essential for protecting workers from harm. It is critical for a responsible aquaculture operation to minimize these risks. Some of the key risks to employees include hazards resulting from accidents and injury. Consistent and effective employee training in health and safety practices is an important preventative measure.



### **Better Management Practices**

1. Farmers should minimize or eliminate hazards/risks in the working environment, by developing procedures and policies to prevent workplace hazards and their risks. These policies and procedures should be available to all workers.
2. When an accident, injury or violation occurs, the farmer should record it and take corrective action to identify the root causes of the incident and take steps to prevent future occurrences of similar incidents. This addresses violations and also the long-term health and safety risks meaning, for example, if a worker is handling a substance that may pose risks through prolonged exposure, farmers should use means to protect the worker for the short and long term.
3. When not covered under national law, farmers should prove they are insured to cover 100% of employee costs in a job-related accident or injury. While many national laws require that employers assume responsibility for job-related accidents/ injury, not all countries require this and not all employees (in some cases migrant and other workers) will be covered under such laws.
4. Farmers should train workers in health and safety-related issues and aspects on a regular basis (once a year and immediately for all new workers), including training on potential hazards and risk minimization.
5. Farmers should store potentially dangerous chemicals as prescribed by the manufacturer and take care that chemicals that may react with each other are kept separate.
6. Farmers should provide documentation with regards to occupational health and safety violations and, when necessary, workers are made to undergo subsequent re-training.

**Criteria 7.5:** Wages, overtime and working hours.  
Applicable Standard 7.5.1 to 7.5.2.

**Justification:** Unfairly compensated workers, contractors and employees can be subject to a life of sustained poverty. Revolving labor contract schemes designed to deny long-time workers full access to fair and equitable remuneration and other benefits can restrict workers from the rights they deserve. Better farmers should demonstrate their commitment to fair and equitable wages



### **Better Management Practices**

1. Farmers should have and share a clear and transparent mechanism for wage setting and a labor conflict resolution policy that tracks wage-related complaints and responses, and should ensure the principle of equal pay for equal work.
2. Farmers should make payments in a manner convenient to workers.
3. Farmers should ensure wages paid for a standard working week (no more than 48 hours) always meet, at least, legal/industry minimum standards; cover basic needs of personnel and provide some discretionary income.
4. Farmers should develop a mechanism and protocol such that workers that develop conflicts at the work place can raise and track complaints, but also this protocol should mandate that management respond to these issues.
5. Farmers should ensure the ratio of lowest wage rate to basic needs wage for an individual always exceeds 100%.
6. Farmers should provide proof of their engagement with workers and their representative organizations, and use of cost of living assessments from credible sources to assess basic needs wages.
7. Farmers should not deduct pay as a means of discipline.
8. Farmers should clearly articulate wage and benefits rendered to employees in a convenient manner - e.g. no need to travel to collect benefits, no promissory notes, coupons or merchandise; payment in cash or check.
9. Farmer should not practice labor-only contracting<sup>6</sup> or false apprenticeship schemes<sup>7</sup>, including: revolving/consecutive labor contracts used to deny benefit accrual

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<sup>6</sup> Labor-only contracting arrangement: The practice of hiring workers without establishing a formal employment relationship for the purpose of avoiding payment of regular wages or the provision of legally required benefits, such as health and safety protections



10. Farmers should provide workers with a minimum of one day off in every seven day period.
11. Farmers should pay workers overtime at a premium and should not exceed 12 hours per week without written agreement and collaboration with workers.
12. Farmers should convey to workers and make it standard policy that overtime work is always be voluntary

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<sup>7</sup> False Apprenticeship Scheme: The practice of hiring workers under apprenticeship terms without stipulating terms of the apprenticeship or wages under contract. It is a “false” apprenticeship if its purpose is to underpay people, avoid legal obligations, or employ children

**Criteria 7.6:** Freedom of association and the right to collective bargaining<sup>8</sup>. Applicable Standard 7.6.1.

**Justification:** Having the freedom to associate and bargain collectively is a critical right of workers because it allows workers to have a more balanced power relationship with employers when doing such things as negotiating fair compensation. It is not the case that all workers of a tilapia farm must be in a trade union or similar organization, but workers must not be prohibited from accessing such organizations when they exist.



### **Better Management Practices**

1. Farmers should ensure workers have the freedom to form and join any trade union, free of any form of interference from employers or competing organizations set up or backed by the farmer. ILO specifically prohibits “acts which are designated to promote the establishment of worker organizations or to support worker organizations under the control of employers or employers’ organizations.
2. Farmers should strive to build a strong reputation for fair and open working conditions and prove that the local trade union, or where none exists, a reputable civil-society organization, confirms no outstanding cases against the farmer for violations of workers’ freedom of association and collective bargaining rights.
3. Farmers should ensure that trade union representatives have access to their members in the workplace at reasonable times on the premises.
4. Farmers should make public and aware to all workers the explicit commitment to freedom of association and collective bargaining rights of all.
5. Farmers should allow workers to access/inform all workers directly (posters, pamphlets, visits) if a trade unions exists.

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<sup>8</sup> “Bargain collectively” is defined as a voluntary negotiation between employers and organizations of workers in order to establish the terms and conditions of employment by means of collective (written) agreements.

**Criteria 7.7:** Disciplinary actions. Applicable Standard 7.7.1 to 7.7.2.

**Justification:** The rationale for discipline in the workplace is to correct improper actions and maintain effective levels of employee conduct and performance. However, abusive disciplinary actions can violate workers' human rights. The focus of disciplinary practices shall always be on the improvement of the worker.



### **Better Management Practices**

1. Farmers should never make any use of or support for (e.g. subcontractors using) corporal punishment, mental or physical coercion, or verbal abuse.
2. Farmers should not allow fines or wage deductions as a method for disciplining workers.
3. Farmers should develop procedures for workers such that they understand situations in which disciplinary action is required, and they establish the use of progressive verbal and written warnings. The farmer's aim should always be to improve the worker before letting him/her go.
4. Farmers shall never employ threatening, humiliating or punishing disciplinary practices that negatively impact a worker's physical and mental<sup>9</sup> health or dignity.

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<sup>9</sup> Mental Abuse: Characterized by the intentional use of power, including verbal abuse, isolation, sexual or racial harassment, intimidation, or threat of physical force

**Criteria 7.8:** Action response plans/policies.  
Applicable Standard 7.8.1 to 7.8.3.

**Justification:** Preparedness, whether for disasters, emergencies or unforeseen incidences is indicative of a responsible tilapia farming operation. Corrective action plans assist in farm management to identify and respond to risks and incidences that are unintended. These plans are required to be updated based upon experiences and incidences.



### **Better Management Practices**

1. Farmers should understand that emergencies that occur at tilapia farming operations should be prepared for via an emergency action plan. As emerging issues and incidences occur that require an emergency response, farmers should update and adjust emergency action plans accordingly.
2. Conflicts will occur on farms amongst various individuals within the farm and the farmer should implement, maintain and update a conflict resolution policy to address conflicts that have occurred or may occur at the operation. Rapid action is indicative of a responsible farm and the ISRTA mandate that farmers and managers respond to conflicts raised by workers within three months of the notification of a conflict (first audit requires previous 3-month period).
3. Farmers should also maintain a labor relations corrective action plan for prior 12-month period (first audit requires previous 3-month period) and worker testimonial that these plans have been implemented
4. Farmers should ensure, through training or other means, that workers are aware of the action plans and their intended and realized results.
5. Farmers should develop an emergency (examples include earthquakes, fires, storms, etc.) action plan for prior 12-month period (first audit requires previous 3-month period) and provide workers with the training and support to indicate that these plans have been implemented
6. Farmers should maintain records of complaint cases, related actions and resolution maintained as well as worker evaluation of the resolution. Farmers should ensure that workers feel comfortable with the process for complaint resolution.

**Criteria 7.9:** Living conditions for employees.  
Applicable Standard 7.9.1.

**Justification:** The protection of workers that reside or live on the farm's property is an additional liability and benefit for farm operations. To maintain the health and function of workers, farms will provide clean, sanitary and safe living quarters with access to clean water and nutritious meals.



### **Better Management Practices**

1. Farmers should ensure that potable/safe drinking water is available.
2. Farmers should provide sanitary conditions for disposal of human waste are in practice such as using appropriate facilities for excretory processes.
3. Farmers should not allow human waste to be discharged into the environment.
4. Farmers that provide living and office buildings for workers should ensure that housing is constructed of material to sustain local conditions in the event of storms or other natural events that could endanger lives.
5. Farmers that provide meals for workers, whether paid for or free, should provide adequate dietary requirements, and promote a healthy set of eating habits.

**Criteria 7.10:** Community relations and interaction.  
Applicable Standard 7.10.1 to 7.10.2.

**Justification:** The siting of farms requires appropriate consultation with communities to understand and address concerns that relate to the blocking of access to either natural or physical assets in the environment where the farm is operating. This is an issue for small-scale farms, as well as large-scale farms, particularly when small-scale farms operating in clusters impede access to assets required for community vitality.



### **Better Management Practices**

1. Farmers should work with surrounding community members to ensure that the farm has not blocked access to public property or public natural resources.
2. Farmers should develop a community conflict resolution policy (first audit requires previous 3-month period) and work with the community to ensure there is a shared understanding of procedures for filing complaints and that the desire of the farm is for operation in harmony with the surrounding communities.
3. Farmers should schedule bi-annual meetings with the surrounding communities to allow for an open and transparent discussion of concerns and issues requiring action. This is also an appropriate situation to update members of the community of any progress in resolving conflicts raised.
4. Farmers that have commissioned environmental impact assessments should make these reports available and easily accessible to community.
5. Farmers that have commissioned socio-economic impact assessments should make these reports available and easily accessible to community. Economic impacts of the farm activities should also be reported – at least annually – to the community.