



**Technical guidelines for integrated agriculture and aquaculture production
in coastal forests**

Technical inputs to support Vietnam's Ministry of Agriculture
and Rural Development



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TECHNICAL GUIDELINES

On some some integrated agricultural and aquatic production methods in coastal forests

Part I

GENERAL PROVISIONS

1. Content and purpose

The Technical Guidelines are intended to guide the implementation of intergrated agriculture and aquaculture productions in coastal forests, in order to improve income and livelihood for the local households associated with the obligations of forest protection and sustainable development of coastal forests, conservation of coastal wetland biodiversity and ecosystems.

2. Scope of application

The technical guidelines applies to organizations and individuals having intergrated agriculture and aquaculture production in coastal forests (this is not applied for strictly reserved areas of special-use forests and very critical protection forests).

3. Interpretation

a) Integrated agriculture and aquaculture production in coastal forests: are the investments in aquaculture (shrimp, crab, fish, mollusk, etc.), agriculture (vegetables, crops, fruit trees, etc.) by ecological production methods within the coastal forests based on the use of forest environments (water and natural food sources) and protective functions (wind-breaking and sand-shielding) of coastal forests.

b) Aquaculture pond: In this Technical Guidelines, aquaculture pond is the terminology applied to canals, marshes, ponds, etc. for aquaculture farming.

Part II

TECHNICAL GUIDELINES FOR INTEGRATED PRODUCTION METHODS IN COASTAL FORESTS

METHOD 1

Intergrated tiger black shrimps, crabs and agriculture production in mangroves

A/ Conditions

1. The ecological production of aquaculture and agricultural production shall use only natural food; chemicals, industrial food, pesticides are not allowed, water and land environment should not be polluted.

2. Forest area should be contracted in the long-term and the obligations to protect forests are fulfilled according to regulations.

3. Households invest their own capital to carry out intergrated production.

B/ Silviculture techniques

1. Natural forests

1.1. Zoning for natural regeneration

a) The forests subject to zoning for natural regeneration are mangroves, which are not sufficiently qualified to be forests, density of halophytes in mangroves is 500 – 1,000 trees per ha, evenly distributed with no or very few empty land plots of 200 m² or more.

b) Techniques:

- Put signs to prohibit the exploitation and fishing of aquatic species in the zoning for natural regeneration;

- Prevent the forest cutting, deforestation and destruction;

- Do not to fill the land or to prevent the flow of water in forests for aquaculture or integrated production;

- Put nets around the zoning for natural regeneration to limit fruits from spreading to other places.

1.2. Zoning for natural regeneration integrated with supplementary plantation

a) The forests subject to zoning for natural regeneration integrated with supplementary plantation are mangroves with density of halophytes in ranges from 300

trees per ha to less than 500 trees per ha, but unevenly distributed with certain empty land plots of 200 m² or more.

b) Techniques:

- Area with relatively evenly distribution: The techniques specified in section 1.1 shall be implemented.

- Area with empty land plots of 200m² and more: shall be subject to supplementary plantation Put into replanting. The afforestation follows the technical guidelines attached to the Decision No. 1205/QD-BNN-TCLN dated April 8, 2016 on the promulgation of technical guidelines on afforestation of six species of mangroves, such as *Kandelia obovata* (Trang), *Aegyceras* (Sú), *Avicennia marina* (Mắm đen), *Bruguiera gymnonrhiza* (Vẹt dù) and *Sonneratia caseolaris* (Bần chua) and the Decision No. 5365/QD-BNN-TCLN dated December 23, 2016 on promulgation of technical guidelines for reforestation of six species of mangroves, such as *Avicennia alba* (Mắm trắng), *Avicennia marina* (Mắm biển), *Rhizophora apiculata* (Đước đôi), *Rhizophora mucronata* (Đung), White Stork *Sonneretia alba* (Bần trắng), *Lumnitzera racemosa* (Cóc trắng).

2. Plantation forests

Plant new trees on no-forest-areas and poor quality forests in order to ensure the minimum 70% area qualified as forest.

Silvicultural techniques applied to specific conditions of the plantation areas and specific plant species shall be implemented in accordance with the technical guidelines issued with Decision No. 1205/QD-BNN-TCLN dated April 8, 2016 on the promulgation of technical guidelines on afforestation of six species of mangroves, such as *Kandelia obovata* (Trang), *Aegyceras* (Sú), *Avicennia marina* (Mắm đen), *Bruguiera gymnonrhiza* (Vẹt dù) and *Sonneratia caseolaris* (Bần chua) and the Decision No. 5365/QD-BNN-TCLN dated December 23, 2016 on promulgation of technical guidelines for reforestation of six species of mangroves, such as *Avicennia alba* (Mắm trắng), *Avicennia marina*

(Mắm biển), *Rhizophora apiculata* (Đước đôi), *Rhizophora mucronata* (Đung), White Stork *Sonneretia alba* (Bần trắng), *Lumnitzera racemosa* (Cóc trắng).

C/ Shrimp and crab production in mangroves

1. Species

- Tiger Black Shrimp: *Penaeus monodon* (Fabricius, 1798)
- Mud Crab: *Scylla serrate* (Forsskal, 1775)

of which, shrimp is the main target species and crab is the supplement.

2. Aquaculture ponds

2.1. Types of mangrove with site suitable for integrated aquaculture farming

a) *Mud form site*: With relatively low terrain, inundation of 15-20 days in a month.

b) *Soft clay and clay form site*: Inundation lasts 6-15 days per month.

c) *Hard clay form site*: With high and unordinarily high tides in the year, it is necessary to renovate and lower the natural ground before planting mangroves integrated with aquaculture farming.

2.2. Ponds design

The techniques vary for different species, however, these following criteria shall be ensured:

- Aquaculture ponds can only be established on the no-forest-area;
- Pond area shall be less than or equal to 30% of the total forest area;
- The width of canals (ponds) shall be 4-5m and the height shall be 0.5m more than the highest water level.
- Ponds must have separate water intakes and drainages. The water intakes and drainages should have a diameter larger than 1 meter (1-1.5m) in order to facilitate water supply and drainage, and avoid impacts in the growth of mangrove.

The current popular single pond system should be replaced by the double pond system with a view to:

+ Make the water surface in the ponds always clear and getting more light, when the canopy of mangroves planted in ponds is completed.

+ Enable aquaculture management and care.

+ Double pond system should be designed and arranged reasonably so that it is possible to create appropriate water flow, change water easily and fully, and conveniently harvest products.

+ Double pond system should have water fully drained when the tide is lowest.

- After harvesting and prior to any new production, sedimentation must be carefully cleaned and harmful species shall be removed in order to clear the ponds and do not pollute the soil and water environment, affect the growth and development of mangroves and ecosystems.

3. Techniques of breeding, stocking, taking care, preventing diseases, harvesting, preserving, etc., shall be implemented in accordance with the technical guidelines promulgated with the following documents:

- Circular No. 26/2013/TT-BNNPTNT dated May 22, 2013 of the Ministry of Agriculture and Rural Development on the management of aquatic species.

- Circular No. 52/2011/TT-BNNPTNT dated July 28, 2011 of the Ministry of Agriculture and Rural Development on regulations on prevention and control of shrimp diseases.

- Circular No. 45/2010/TT-BNNPTNT dated July 22, 2010 of the Ministry of Agriculture and Rural Development regulating the conditions of establishments and areas for intensive farming of black tiger shrimp and white shrimp to ensure hygiene and safety food.

- Ecological shrimp farming process of Ca Mau Department of Agriculture and Rural Development in 2013.

D/ Guidelines for planting agricultural trees in mangroves

a) Possible locations: On the canal bank, on which alum and salinity was already washed away, or on bare land with no forests, but not exceeding 30% of the total forest area.

b) Possible crops: fruit trees, agricultural crops, non-timber forest trees, medicinal herbs or vegetables, depending on specific conditions but not exotic or harmful species.

Suitable species might be:

- Fruit trees: banana, dragon fruit, papaya, guava, apple, coconut, pineapple, and custard.

- Vegetables: onions, melon, herbs, peppers, tomatoes, pumpkin, green mustard, okra.

c) Techniques: Follow to the Technical Guidelines for specific agriculture crops, in line with the “clean agriculture” production method without using fertilizer and chemical pesticides (VietGAP).

METHOD 2

Integrated aquaculture in protection forests on coastal sandy land

A/ Conditions

1. There is a belt of coastal protection forest that prevents waves from overflowing into aquaculture ponds during the rainy season, stopping wind from blowing sand into the aquaculture ponds during windy season and improving the harsh conditions of climate change.
2. Households shall be assigned or contracted to protect forests in the long-term, or they must commit to protect the coastal forests, protect against cutting, destruction and encroachment upon coastal forests.
3. Do not pollute the water or land environment in coastal forests.
4. Households invest their own capital to carry out the integrated production.

B/ Silvicultural techniques

1. Designing wind-breaking and sand-shielding forest belt for shrimp farming on sandy soil

The wind-breaking and sand-shielding protection forests must have at least one main belt of at least 20m wide, planted in rows or stands of multiple rows of trees to have both horizontal and vertical coverage, obstructing or reducing damages caused by wind and sand. Forest belt plantation shall be based on plans and design of forest plantation must be approved by the competent authority.

The wind-breaking and sand-shielding forest belt for aquatic farming on sandy soil is designed following the diagram (Figure 1):

- The primary protection forest belt (usually casuarina belt) is designed perpendicularly or almost perpendicularly to the main wind direction (damaging wind), with a width of 20 - 100m.
- Secondary forest belt, usually acacia, or mixed casuarinas with acacia planted in rows with a width of 10 - 20m, alternatively arranged with the primary belt. The secondary belt is at least 10 meters from the pond.
- The protection forest belts in the middle of aquatic ponds are arranged perpendicularly to the primary and secondary forest belts, forming closed squares in the

form of flagpoles. On the belts, two rows of Casuarina trees (2x3m) are planted alternatively.

2. Silvicultural techniques

It is possible to use wind-breaking and sand-shielding protection forests and forest land for intergrated agro-forestry and fishery production and other activities, but the forest coverage must be at least 70% and distributed evenly throughout the forest area.

2.1. New afforestation

The new afforestation shall be based on the afforestation designs approved by competent authorities. The techniques for each specific species and condition is presented as follows:

1. Casuarina:

To comply with the Technical Regulation on planting of casuarina, issued together with the Decision No. 05/2000 / QD-BNN-KHKT of January 25, 2000 of the Agriculture and Rural Development Ministry and the Industry Standard TCN: 04TCN - 22 - 2000.

2. Acacia auriculiformis:

To comply with the Industry Standard QPN 19-96 and the Interim technical guidelines for planting Acacia auriculiformis forest, issued together with the Decision No. 1410 NN/QD dated August 20, 1996 of the Ministry of Agriculture and Rural Development.

3. Acacia crassicarpa:

To comply with the Interim technical guidelines for planting of Acacia crassicarpa by the Forest Science Institute of Vietnam (2014).

4. Acacia difficilis:

To comply with the Interim Technical Guidelines for planting of Acacia difficilis by the Forest Science Institute of Vietnam (2009).

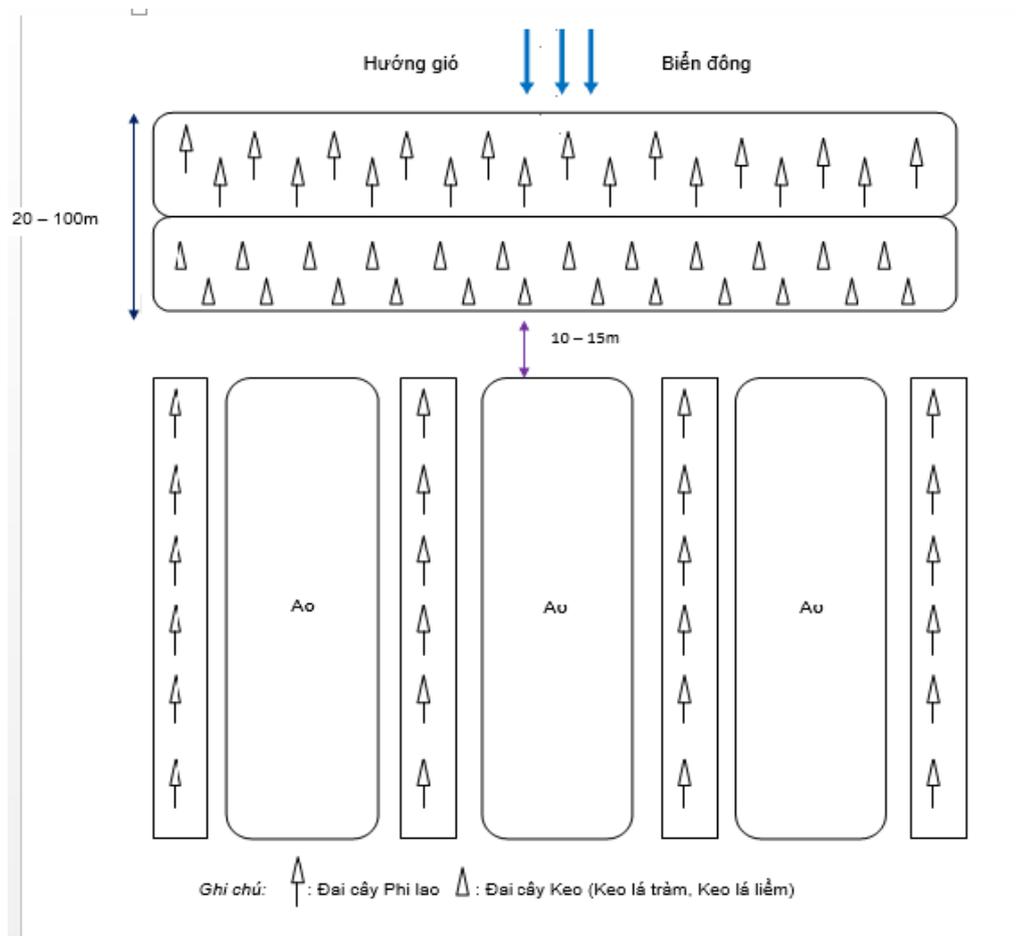


Figure 1. Design of wind-breaking and sand-shielding forest belt for aquatic farming on sandy soil in protection forest.

C/ Aquaculture farming techniques

1. Species

White leg shrimp: *Litopenaeus vanamei* (Boone, 1931) or appropriate aquatic species depending on specific local conditions.

2. Farming ponds

2.1. Location selection

- Located in the area planned for aquaculture in the locality.
- Located behind the coastal protection forest strips.
- Have a stable and suitable source of fresh and brackish water, suitable in quantity and quality, meeting the requirements on physical and chemical indicators and non-pollution.

2.2. Design of farming ponds

- The shape is square, circular or rectangular, with a suitable area of 2,000-5,000 m². The pond bottom is flat, compacted and lined with waterproof materials.
- The best water depth 1.8 - 2.5m or minimum 1.2m of water.

- Pond edge: The edge should be always at least 0.5m above the water level in the aquaculture pond. It is best to have waterproof by nylon canvas. In the pond edges, there should be a fence made by fibro-cement or dense net to prevent pests (crabs, shacks, mice, frogs and clones), wind, sand, disease and security control.

- Water supply and drainage: Each pond has separated water intake and outlets with diameter depending on the water volume in the pond, allowing the pond to be filled in 4 - 6 hours or drained before tide rise. In addition, it is necessary to equip aerators.

2.3. Ponds preparation

- Ponds clearing: ponds need to be thoroughly cleaned before use.

- Edge reinforcement and waterproofing;

- Water preparation for ponds: water inlet must be consistent with the water/physical/chemical criteria, pest larvae shall be killed and pathogens shall be eliminated.

3. Techniques of breeding, stocking, taking care, preventing diseases, harvesting, preserving, etc., shall be implemented in accordance with the technical guidelines promulgated with the following documents:

- Circular No. 26/2013/TT-BNNPTNT dated May 22, 2013 of the Ministry of Agriculture and Rural Development on the management of aquatic species.

- Circular No. 52/2011/TT-BNNPTNT dated July 28, 2011 of the Ministry of Agriculture and Rural Development on regulations on prevention and control of shrimp diseases.

- Circular No. 45/2010/TT-BNNPTNT dated July 22, 2010 of the Ministry of Agriculture and Rural Development regulating the conditions of establishments and areas for intensive farming of black tiger shrimp and white shrimp to ensure hygiene and safety food.

- Technical manual of white leg shrimp (*Penaeus vannamei*) in 2009 by the Agricultural Extension Center, Department of Agriculture and Rural Development, Ho Chi Minh City.

- Technical manual of white leg shrimp farming under VietGap in 2015 of the Thua Thien Hue Department of Fisheries.

D/ Planting agricultural trees in the forest on coastal sandy soil

a) Possible location: It is possible to plant behind the protection forest strips at a distance of two times the height of the forest belt and by square shape in chess boards.

b) Possible crops: fruit trees, agricultural crops, non-timber forest trees, medicinal herbs or vegetables, depending on specific conditions but not exotic or harmful species.

Suitable species might be:

- Fruit trees: orange, lemon, pineapple, jackfruit, longan, litchi, mango, cashew, etc.

- Food crops: rice, maize, cassava, etc.

- Short-day agricultural crops: watermelon, cucumber, onion, etc.

c) Planting technique: Follow to the Technical Guidelines for specific agriculture crops, in line with the “clean agriculture” production method without using fertilizer and chemical pesticides (VietGAP).

Part III

IMPLEMENTATION ARRANGEMENT

1. Provincial People's Committee

- To establish owners of coastal protection forest in accordance with the Decree No. 119/2016/ND-CP dated August 23, 2016 of the Government and Decision No. 17/2015/QĐ-TTg dated June 9, 2015 by the Prime Minister promulgating the Regulations on protection forest management.

- Instruct functional agencies and forest owners to implement long-term contracting with for households in the coastal forest protection in association with the interests of aquaculture and agricultural production for higher income and livelihood. This is one of the important solutions to protect coastal forests.

- Create mechanisms for investment socialization in protecting and developing coastal forests by policies for mobilizing funds from from households, fisheries companies (both state and private), and linking investment, product sale, benefit sharing and co-management among organizations, households and individuals in forest protection, sustainable use of benefits from the coastal forests.

- Direct the Department of Agriculture and Rural Development and the Department of Natural Resources and Environment to implement the management, preservation, protection, integrated and sustainable exploitation of coastal forests and wetlands according to regulations defined in the Law on Marine and Island Resources and Environment.

2. Department of Agriculture and Rural Development

- Instruct forest owners and organizations assigned for forest management, and local households to apply the integrated agro-aquaculture production methods in coastal forests by applying investment socialization and forest protection linked with sustainable exploitation and use of natural resources in coastal forest.

- Make plans for protection and development of coastal protection forests using the integrated management approach of coastal forests and wetland ecosystems in accordance with the Law on Forest Protection and Development and the Law on Marine and Island Resources and Environment.

- Direct forestry, agriculture and fishery extension agencies to provide technical assistance to organizations, households and individuals engaged in integrated production method in the coastal forests.

3. Private enterprises in fisheries and agriculture

- Are encouraged to invest in protection and development of coastal forests.

- Are encouraged to conduct investment linkage with households and forest owners in agro-aquaculture production in coastal forests on the principle of forest protection and sustainable use, equal benefit sharing for the sake of mutual benefits.

ANNEX

(all technical annexes are in Vietnamese)