

MARICULTURE

DRAFT POLICY AND REGULATION

NATURAL RESOURCES CONSERVATION AUTHORITY

COASTAL ZONE MANAGEMENT DIVISION

APRIL 1998

EXECUTIVE SUMMARY

It has been well established that overfishing (particularly of the nearshore fishery), has resulted in a significant decline in catch per unit effort.

Uncontrolled harvesting, pollution, and the destruction of mangrove and coastal wetlands have severely depleted shellfish stocks, particularly the mangrove oyster. Finfish harvests are also believed to be at a "stabilised low" as stocks continue to be overfished.

Mariculture - the production of marine organisms for food - represents an opportunity to provide a sustainable supplement or an alternative to the marine capture fishery.

The aim of this national policy is to support and encourage the managed use of the nation's marine resources to raise output of marine food products for domestic consumption and for export, and to generate local employment in communities that have traditionally relied upon the sea. In order to achieve this broad aim government will pursue the following goals:

1. Establish the principles for carrying out sustainable mariculture.
2. End or effectively control potentially damaging practices associated with mariculture.
3. Promote the recognition of mariculture as an option for the sustainable use of coastal resources.

In pursuing these goals, the government will be guided by the following principles:

- The culture of local species is preferred, but under controlled circumstances introduction of species may be allowed.
- Sustainable mariculture can only be achieved through the coordination of functions of the relevant government agencies, and close collaboration with mariculture operatives and their communities.
- Public awareness of the importance of the role of mariculture in preservation of marine species, and the need for good environmental quality must be improved.

Ten policy statements are made in support of achieving the stated goals. Specifically, the policy seeks to:

- Establish designated areas for mariculture;
- Exercise greater control over Mariculture Operations;
- Develop The Economic Potential Of Mariculture And In Particular Oyster Culture;
- Protect mariculture operations From Pollution;
- Protect the environment from the harmful effects Of mariculture by requiring an Environmental Impact assessment for mariculture operations;

- Increase Public Awareness of the benefits of mariculture as an alternative or supplement to the capture fishery, and as a useful tool for species management;
- Draft provisions for inclusion in a lease agreement, as well as some possibilities for expanding mariculture operations are annexed.

OVERVIEW

It has been well established that overfishing (particularly of the nearshore fishery), has resulted in a significant decline in catch per unit effort. This means that an ever increasing amount of fishermen are catching the same amount of fish harvested by as little as half their numbers a decade ago. This has led to the taking of greater number of juveniles, the proliferation of illegal catch methods eg. dynamiting, and spiralling fish prices.

Shellfish -- oysters, conch, lobster -- have been a significant, though shrinking, component of Jamaica's marine resource base. Uncontrolled harvesting, pollution, and the destruction of mangrove and coastal wetlands have severely depleted shellfish stocks, particularly the mangrove oyster. Finfish harvests are also believed to be at a "stabilised low" as stocks continue to be overfished.

Mariculture - the production of marine organisms for food - represents an opportunity to provide a sustainable supplement or an alternative to the marine capture fishery. It is also a means of diversifying the fisheries sector, introducing new skills and technologies into a largely traditional and somewhat static sector of the economy.

Mariculture can increase employment and income in areas with marginal economies as well as advancing coastal zone management objectives through improved marine resources planning and management. Under ideal circumstances, it could lead to the reduction of foreign exchange expenditure for the importation of fish and fish products, as well as provide a source of foreign exchange through product export.

Presently, the relatively low capital input required makes it an opportunity that is accessible to lower socio economic groups.

1. MARICULTURE IN JAMAICA

The development of mariculture in Jamaica had its beginnings in the 1977 Oyster Culture Project which was a joint effort of the Ministry of Agriculture and the UWI Department of Zoology. The chief aim of this project was to study the culturing of mangrove oysters (Crassostrea rhizophorae) in Bowden Bay, St. Thomas. The project subsequently

expanded to include Davis Cove at Green Island in Hanover, East Harbour at Port Antonio in Portland, and Bogue in St. James.

The only commercial mariculture species is the mangrove or cup oyster. It derives its name from its growth on the stilt roots of the red mangrove (Rhizophora mangle). Another indigenous species, (Isognomon alatus)the "flat oyster", which is really a mussel, occurs naturally around the island being abundant at locations such as Oyster Bay near Falmouth, Trelawny, and Port Royal in Kingston.

Apart from the activities stemming from the Oyster Culture Project, there is only one other active mariculture enterprise in Jamaica, a privately owned tilapia farm utilizing sea water. Other options for development in mariculture include, sea moss culture, establishment of a marine shrimp hatchery, and the cage culture of fin fish.

A recently concluded project funded by the National Development Foundation of Jamaica (NDFJ) points to the lack of an adequate marketing strategy and a developed distribution network as the main drawbacks to oyster farmers.

1.1 BOWDEN

The oyster culture site at Bowden is the sole area from which seed for Oyster Culture is obtained. The Fisheries Division operates the Bowden site as a research facility, primarily for the generation of scientific data on oyster culture. Personnel at this site also provide technical assistance to oyster farmers.

Five oyster farmers are based at Bowden, though two are reportedly inactive. Those who are active account for the deployment of about twenty units. Based on an expected yield of approximately 300doz./unit every five months, not less than 144,000 oysters per year should be available from the Bowden site.

There are no significant pollution sources nearby, and water quality at Bowden has been determined to meet local and international standards under normal circumstances. However elevated bacterial counts have been associated with periods of heavy rainfall.

1.2 PORT ANTONIO EAST HARBOUR

The Port Antonio mariculture site at East Harbour is located in close proximity to the densely populated parish capital.

There are presently four oyster farmers operating out of Port Antonio. Based on present expected yield, not less than 36,000 oysters per year should be available from the Port Antonio site.

There are a number of outfalls which enter the harbour, and water quality data collected from this site indicates several instances where unacceptable levels of bacteria have occurred.

1.3 GABRIEL FISHERIES - ANNOTO BAY

Gabriel Fisheries was established in 1989 as a wholly private mariculture operation. It is located at Iteboreal, Annoto Bay in the parish of St. Mary. The prime activity carried out is the farming of tilapia for export. This operation is the only one of its kind in Jamaica.

This unique operation consist of the rearing of tilapia in aerated concrete tanks of approximately 8 sq.m., filled and supplied continuously with sea water. Sea water is delivered by a specially designed salt water pump which abstracts from a canal constructed by Gabriel Fisheries. There are presently twelve tanks but future plans include a doubling of the present capacity.

The initial years were largely dedicated to investigating optimum conditions for tank production of Tilapia. However, some export of produce was achieved by the end of 1991. Production is presently suspended to enable cleaning of the tanks as well as the correction of faults with the pumping system. The estimated production level to ensure recovery of costs is reported to be approximately 11,000 fish per tank per week, though yields as high 40,000 have been reported for similar operations elsewhere. Gabriel fisheries have set themselves a target of 20 - 25,000 per tank per week.

Difficulties experienced by the operators have included the deliberate poisoning of tanks with agricultural chemicals as well as the unavailability of local brood stocks.

1.4 NEGRIL/GREEN ISLAND CASE EXAMPLE

The mariculture site at Green island is located to the northeastern section of the Bay in close proximity to an area which is relatively well developed.

As much as twelve oyster farmers may have received financial assistance through the NDFJ project, but of these, only two are believed to be actively pursuing this activity. These two farmers between them have deployed eight units. Fourteen units held between the other farmers are believed to be empty at the present time. Based on present expected yield, not less than 57,000 oysters per year should be available from the Green Island site.

Water quality data for the Green Island Harbour indicates the occurrence of unacceptably high bacteria levels in some instances.

2. MAJOR ISSUES RELATED TO MARICULTURE

At present mariculture operations are not extensive and so the opportunity exists to address a number of issues which will eventually be of national significance as this sector expands.

The main issues related to mariculture may be classified as socio-cultural, economic, and environmental (Table 1). These issues can only be resolved by the development of a clear policy, and guidelines for mariculture operations. It is not generally expected that mariculture on private lands should have any significant impact on socio-cultural norms. There may nevertheless be environmental concerns.

Socio-cultural/Economic Issues

The main socio-cultural issues pertain to the granting of exclusive license to a special interest group(s) for using sections of the coastal zone. As population pressures increase, and as foreshore and nearshore space becomes more intensively used, the granting of exclusive use of a particular site to a special interests may lead to conflicts. The main economic issue of concerns to oyster farmers is the lack of a dependable market, and a distribution network for their product.

(i) Diminished Access To The Foreshore.

This may be similar to the debate, with respect to the right of all citizens to beach and foreshore access. At the present time, the government is at pains to resolve this issue by mediating between the public, whose right of access to the foreshore is established in the Beach Control Act, and some of the all-inclusive hotels which have been issued licenses providing for exclusive use of the foreshore.

(ii) Diminished Access To The Water Column, And Floor Of The Sea.

The issue with respect to granting exclusive rights for the leasing of the floor of the sea and the water column to mariculture operators involves, primarily two groups of fishermen, namely, those engaged in finfishing, and shellfishing operatives. Though not presently a problem, mariculture operations over time may affect the traditional territorial rights of fishing communities to their customary fishing grounds.

Table 1. Environmental/Sociocultural Factors

Threats	to	Mariculture:
Coastal maricultural operations may be subject to damage from a number of sources including:		
<ul style="list-style-type: none">○ Contamination by substances transported by surface run-off.○ Contamination by oil spills.○ Non-point source pollution by chemicals, fertilizers and other materials used in agriculture and are transported to coastal areas by rivers or under ground seepage.		

<ul style="list-style-type: none"> ○ Deliberate contamination (acts of sabotage) ○ Theft. 			
Threats	Posed	by	Mariculture:
Threats posed by mariculture include:			
<ul style="list-style-type: none"> ○ Conflict of use, given the need to assign oyster farmers with exclusive access to oyster culture sites. ○ The destruction of red mangrove due to the cutting of sticks used in the construction of racks. ○ The release of nutrient-rich waters from private mariculture operations carried out in tanks. ○ The introduction of structures which may limit accessibility to coastal areas and may be aesthetically unpleasing. ○ Localised eutrophication around cage culture operations due to the application of feed. 			

(iii) Need For A Reliable Market And Distribution Network For Oyster Farmers.

Oyster farmers have a limited time in which to harvest mature animals. An inadequate marketing/distribution can thus lead to substantial losses due to spoilage. Presently, marketing of oysters is done mainly by vendors selling fresh products. A significant amount of sales is associated with marine sporting events such as fish tournaments.

Environmental Issues

The main environmental concerns, in respect to mariculture, are related to the release of pollutants to the mariculture site as well as the release of pollutants from the site.

(iv) Mariculture Water Supply Must Be Free From Contaminants.

Coastal mariculture is incompatible with the discharge of pollutants at, or in close proximity to the mariculture site.

In Jamaica, there is relatively little risk of contamination of oysters by heavy metals or other persistent toxins. However, the risk of coastal pollution by sewage is high given the inadequate arrangements for sewage disposal which exist islandwide. Coastal oyster culture sites may also be affected by oil spills, given Jamaica's close proximity to major shipping lanes.

Oysters and other bivalves can be cultured on the seabed or on ropes, trays, floating racks or rafts. They require large amounts of freeflowing waters and tidal exchange to allow them to filter-feed on naturally available phytoplankton, protozoans and other microorganisms including bacteria. As a result these animals are potential vectors for

pathogens and parasites. Surrounding waters must therefore be free of harmful pollutants if the product is to be fit for human consumption.

Where oysters are harvested from contaminated areas, they must be taken to a clean area where they are made to remain for several days in order to allow flushing out of contaminants. This strategy however, significantly adds to the cost of production.

(v) Mariculture Can Affect Water Quality.

Mariculture may result in the release of nutrients directly to coastal waters through the application of artificial food sources and the release of metabolism products by cultured species. In the case of tank mariculture there will also be the periodic discharge of nutrient rich sediment due to cleaning of tanks. There may also be the release of larvae to the environment. This is of special significance where introduced species are being farmed.

No artificial food sources are currently used in oyster production, so there is no significant release of pollutants from this source. However, bivalves are known to produce "psuedofaeces" (biodeposition). The deposition of this organic-rich particulate waste from bivalve culture can stimulate microbial activity resulting in deoxygenation of the substrate and bottom waters thus affecting benthic communities.

(vi) Oyster Farming Can Lead To Mangrove Deforestation.

Ironically, while the production of spat depends upon the preservation of a healthy red mangrove community, the use of mangroves as a source of construction material for racks, is potentially destructive.

3. GOVERNMENT RESPONSE/ INSTITUTIONAL ARRANGEMENTS

The sustainable use of coastal and marine resources for the production of food, and the generation of employment and income is consistent with the development objectives of the Government of Jamaica. Carefully sited and well managed coastal aquaculture and mariculture activities represent a productive use of coastal resources when they are carried out within the framework of an integrated coastal area management plan for Jamaica.

Institutionally, mariculture is under the purview of the Fisheries Division of the Ministry of Agriculture. Operational control of the Oyster Culture Programme is exercised by the Aquaculture Branch of the Fisheries Division.

Three primary laws pertain to mariculture: the Fishing Industry Act, the Natural Resources Conservation Act, and the Beach Control Act. While fisheries management falls under the broad mandate of the Fisheries Division, management of the seabed and foreshore, as mandated by the Beach Control Act and the Natural Resources Conservation Act, is under the jurisdiction of the NRCA.

One other agency having major control over mariculture in Jamaica is the Ministry of Health - Environmental Control Division. This agency by virtue of the Public Health Act has responsibility for ensuring the sanitation of animals destined for human consumption, and the monitoring of water quality in areas where bivalve culture is carried out.

The draft national policy for mariculture is intended to complement the objectives of the National Environmental Action Plan, and other sectoral policies pertaining to coastal zone management such as, coral reefs, coastal wetlands, and protected areas.

4. AIM

The broad aim is to support and encourage the managed use of the nation's marine resources to raise output of marine food products for domestic consumption and for export, and to generate local employment in communities that have traditionally relied upon the sea.

5. GOALS

In order to achieve the above broad aim government will endeavour to achieve the following goals:

1. Establish the principles for carrying out sustainable mariculture.
2. End or effectively control potentially damaging practices associated with mariculture.
3. Promote the recognition of mariculture as an option for the sustainable use of coastal resources.

6. KEY PRINCIPLES

In pursuance of the goals of the National Policy for mariculture, government will be guided by the following principles:

- Mariculture will be carried out mainly using local species, but may under controlled circumstances include the large scale introduction of species, particularly where organisms are cultured for overseas markets.
- Sustainable mariculture can only be achieved through the coordination of functions of the relevant government agencies, and close collaboration with mariculture operatives and their communities.
- Public awareness of the importance of the role of mariculture in preservation of marine species, and the need for good environmental quality must be improved.

These basic principles guide the development of the strategies described below.

7. POLICY STRATEGIES

The following strategies are believed to be of critical importance in the development of sustainable mariculture and relate to the issues presented previously in this document.

7.1 Designation Of Areas For Mariculture

Criteria for site selection must be established in order to avoid or minimise user conflicts or other adverse environmental impacts.

Strategy

1. No area will be designated for mariculture activities if the following is true:
 - The area is subject to injurious levels of pollutants;
 - Conflicts with prior users would arise;
 - The area is needed as a nursery area (eg. for spat production);

Rationale: By using these basic criteria sections of the coastal zone can be reserved for various types of mariculture activity. This information can be included in a coastal resources map indicating which sites are suitable for a specific mariculture activity eg. bivalve production, sea moss culture, cage fin-fish production etc.

7.2 Control Of Mariculture Operations

Control over mariculture operations is necessary to ensure compliance with prescribed regulations particularly those pertaining to encroachment, and species management.

Strategy

1. Mariculture operatives will require a permit or lease from the NRCA or the Fisheries Division specifically to address the following:
 - Extent (Area) of mariculture site;
 - Type of operation to be carried out (species to be cultured and method to be used eg. Grow Out/Off Bottom);
 - Use of the water column, and the floor of the sea;
 - Time frame of the permit or lease;
 - Performance;
 - Fees;

- Termination;

Rationale: Under the Beach Control Act the Natural Resources Conservation Authority will maintain jurisdiction over mariculture permitting/leasing, except within declared Fish Sanctuaries, in which case approval shall also be required from the Ministry of Agriculture.

Lease conditions may vary by site and will be established by the NRCA in collaboration with the Fisheries Division. Administrative procedures, including duration, termination, compliance, and fee schedules will be publicly promulgated so that lease holders and potential lease holders need not be in doubt as to any aspect of permit/lease administration.

7.3 Develop The Economic Potential Of Mariculture And In Particular Oyster Culture

The local market for oysters is presently not largem and the major sales are achieved through road-side peddling. A small amount is supplied to Jamaican Hotels.

Strategy

1. Provide technical and other assistance to those engaged in mariculture particularly with respect to:
 - Product development, and marketing;
 - The provision of low cost loans for purchase of equipment, and rack building materials;

Rationale: A greater demand can be generated through promotion as well as research aimed at providing a wider range of preparations such as sauces, drinks, and canned products.

7.4 Protection Of Mariculture Operations From Pollution

Water quality data indicates occasions of unacceptable levels of bacteria at two prime oyster culture sites namely Green Island and Port Antonio. In addition there is an alleged report of deliberate contamination of water supply for the pond mariculture operation at Iterboreale.

Strategy

i) Enact and enforce regulations to protect the rights of those engaged in mariculture, as well as the consumer specifically to address the following:

- Preventing the release of pollutants to waters used for mariculture.
- Setting up of a process to ensure the settling of compensatory claims as a result of a pollution incidents such as oil spills and the release of other contaminants.
- Monitor aquatic food products, particularly bivalves and other mariculture products, to protect the public from the consumption of contaminated foods;

Rationale: Maintaining good water quality is essential for ensuring the safety of cultured species. This is particularly true for bivalves which are known to concentrate pollutants to levels much higher than the surrounding water.

7.5 Protection Of The environment From Harmful Effects Of Mariculture.

The main environmental threats from mariculture relate to the release of nutrient rich waters and sediments, as well as the release of larvae in return water from tank mariculture. In addition, present oyster culture practice relies on mangrove forests as a source of poles for construction of racks.

Strategies

i) Subject all or certain types of mariculture development proposals to an Environmental Impact Assessment (EIA).

ii) Adopt and enforce standards, and regulations to prevent the adverse impacts of mariculture activities on coastal and marine ecosystems such as mangrove wetlands, coral reefs, and marine nursery areas. This will include but not necessarily limited to specific regulations for:

- Allowable levels of contribution of nitrogen and phosphorous to the water column;
- Allowable level of BOD in sediment;
- Controlling the cutting of mangrove poles;

Rationale: The EIA is a detailed technical document which determines the environmental management measures to be incorporated into the economic development plan. It is an essential environmental management tool in achieving sustainable development.

7.6 Increasing Public Awareness

The degradation of mariculture sites is to some extent due to a lack of public awareness or appreciation for the need to protect keep these sites free from contaminating substances. In addition there is the need for heightened awareness of the importance of mariculture as an alternative or supplement to the capture fishery, and as an effective tool for species conservation.

Strategies:

- i) Develop and implement a public education programme on mariculture and its socio-cultural, economic, and ecological significance.
- ii) Target the programme primarily at communities in close proximity to actual or potential mariculture sites, as well as potential purchasers of produce.
- iii) Ensure wide circulation of specific regulations among fishing communities.
- iv) Develop demonstration projects.

ANNEX 1

DRAFT PROVISIONS FOR INCORPORATION IN MARICULTURE REGULATION

(The material that follows was adapted from a proposed mariculture policy prepared by the Fisheries Division, Oyster Culture Unit in 1986. It has been modified to reflect jurisdictional changes resulting from the creation of NRCA. It is expected that it will be finalised through close collaboration between these two agencies as well as the Environmental Control Division in the Ministry Of Health.)

DESIGNATION OF MARINE AREAS TO BE LEASED:

NRCA jointly with the Inland Fisheries Branch of the Fisheries Division, Ministry of Agriculture, should designate areas to be reserved for leasing to parties engaged in mariculture activities. These area designations will be subject to review and update

periodically. No area will be leased if it is determined that the following conditions, among others, apply:

1. The area is subject to high and/or widely variable levels of potentially injurious pollutants or;
2. The area is needed for public spat production or;
3. Leasing of the area could result in being a source of irreconcilable conflict with prior users.

Leasing of contaminated areas will only be permitted under exceptional conditions. Ministerial approval will be a requirement for these leases. Leasing of contaminated areas will automatically prohibit sale of shellfish products from those areas, except under conditions certified by the Ministry of Health, and after cleansing of the shellfish under conditions specified by public health authorities.

LEASE ADMINISTRATION:

Under the Beach Control Act the Natural Resources Conservation Authority will maintain jurisdiction over mariculture leasing, except within declared Fish Sanctuaries, in which case approval shall also be required from the Ministry of Agriculture.

Lease conditions may vary by site and will be established by the NRCA. Administrative procedures, including duration, termination, compliance, and fee schedules will be publicly promulgated so that lease holders and potential lease holders need not be in doubt as to any aspect of lease administration.

SIZE OF LEASEHOLD:

The maximum size limit on total leased area under the control of an individual, group, company or cooperative will be determined by the type of mariculture to be pursued, and the potential effect on traditional users.

It is suggested that the minimum area required for a viable oyster culture operation is .08 Ha.

Oyster production:

In the case of oyster production the size of the leased area will be limited to that required for the deployment of 32 units (one unit is equal to a rack containing 250 strings of oysters), with provision for larger allocations. Cause need be shown that a lease covering

a larger area is necessary, and/or the area will be adequately used for expanding mariculture activities. The minimum size limit will be 4 units, except in special circumstances. In general, there will be no restrictions on leasing of areas from 4 to 32 units in size and on consolidation under a single lease agreement of existing separate lease held by a lessee.

EXCULSIVE LEASE RIGHTS:

This lease application and license provisions will be specific as to the type of lease sought.

Grow Out/Off Bottom Culture:

Where the water column immediately above the leased bottom is utilised, there is a need for leaseholders to control the use of the water column above their lease. For this reason approval will be given by NRCA for the rights to the water column above the lease.

TENURE OF LEASE (CONDITION OF TENURE):

The lease period will be five (5) years, so long as all performance requirements and lease obligations are met. After the fifth year those leases in good standing will have the option to renegotiate with the lessor for three (3) year renewal periods. The lease will be subject to physical inspection annually to determine that performance requirements are being met. There will be provision that the lessee will be notified at year 4 if the Government does not intend to grant a three (3) year renewal at year 5.

UTILISATION OF LEASES:

Leaseholders will adequately utilize their leased area under possible penalty of forfeiture. Leaseholders will, under penalty of forfeiture, be obliged to commence active working of an approved lease within a six (6) month period from the date of the lease.

Leaseholders shall not enter into an arrangement with any third party with intent to sub-let the leased area without prior approval of the NRCA upon satisfaction that there are extenuating circumstances for this action.

ANNUAL RETURNS:

Leaseholders will be required to submit an annual return indicating the extent of operations. The required form will be provided by the NRCA.

Failure to submit an annual return of operations by a specific date will result in automatic cancellations of the lease.

GENERAL

FEES:

The lease rental fee will be \$----- per ha. per year until such time as the lease is cancelled or transferred.

LEASE SURVEYS AND RE-SURVEYS:

Site surveys will be conducted either by the Survey Department or by a registered public land surveyor.

The prospective lessee may choose to use a public land surveyor if he considers the extra cost justifiable in terms of obtaining a survey at an earlier date than might be possible using the Survey Department personnel.

A survey charge of _____ will be levied for completed surveys carried out by the Survey Department.

No charge will be levied in those cases where a public land surveyor is used. The following procedures will be taken:

1. Applicants will submit applications to the NRCA on forms provided.

Upon receipt by the NRCA applications will be recorded and acknowledged. Within _____ days of receipt of the application, a survey will be carried out by the Survey Department.

2. If the prospective lessee does not wish to wait for the Survey Department to carry out the survey, he can arrange to have it conducted by a public land surveyor. A Ministry of Agriculture representative will be required to inspect the area to be surveyed to determine its availability and suitability for leasing. This will be based on criteria for site selection developed by the NRCA and the Fisheries Division in collaboration with the ECD. Establishment of a survey date suitable to the Ministry of Agriculture personnel will be the responsibility of the prospective lessee.

The Minister may require a survey or surveyor at any time at the lessee's expense if for any reason the Minister considers it necessary. The costs will be borne by the leaseholder under penalty of cancellation of the lease.

PRIORITIES IN LEASING:

The following priorities have been established for granting new leases and for redistribution of cancelled leases:

- a. Existing oyster farmers - desiring to regularise their status and/or requiring additional holdings to make their combined total acreage leased a viable or economic enterprise.
- b. Cooperative farm units.
- c. New entrants.
- d. In a new area, persons trained in aspects of oyster culture and with a viable plan of operation.

RESTRICTIONS OF LEASING:

Leases will be restricted to Jamaican Citizens ordinarily resident in Jamaica and/or Jamaican controlled corporations.

Leases will also be considered for companies having joint venture arrangements involving Jamaican partners.

No one company or individual shall obtain holdings by consolidation or assignment which might in the opinion of the Minister, prove contrary to the Public interest.

GENERAL:

A lessee will be able to cancel his lease any time and with the consent of the Minister, or to surrender portions of his lease. There will be no refund of fees.

Regulations could provide that, on cancellations of a lease, all works, improvements, and marine resources in and upon the leased land and in the water column above, will be the property of the Crown.

Regulations could provide for lease cancellation for the infraction of lease regulations in respect to matters such as navigable waters and pollution control, and for other activities which are injurious to marine species in the area.

Should an objection to a leasing procedure or related grievance arise the appellant will be heard by a special board appointed by the Minister of the environment or Chairperson of the NRCA. This board would be comprised of a fisheries officer, a fisherman and a neutral person from the general public, suitable to both parties. The NRCA could provide the secretariat to such a board. The Oyster Aquaculture Branch - Managers of the Oyster Culture Programme, will also be represented.

At the beginning of each calendar year, each lessee will be sent the following by mail:

- Two copies of Return of Operation form (one for their own record, and one to be returned to the Aquaculture Branch.
- One self-addressed return envelope for lessee to mail the completed Return of Operations form and relevant fee.
- One coloured flyer stating the date the completed return form and fee must be received.

ANNEX 2

POSSIBLE OPTIONS FOR MARICULTURE DEVELOPMENT

In addition to the rearing of oysters and tilapia, there are other areas of mariculture which appear to be less studied but may have potential for development locally. These include cage culture of finfish, and the use of casitas to enhance lobster production. The culture of seamoss though presently carried out on a small scale, appears also to have potential for expansion.

Potential Oyster Culture Sites

A study carried out by the Fisheries Division, has identified sites suitable for oyster farming. These sites have been found to meet the criteria with respect to salinity and food source. It is important to note that all of these sites occur close to stands of mangrove wetlands. These sites are as follows:

- Bowden - St. Thomas.
- Green Island - Hanover.
- Port Antonio - Portland.
- Belmont - Westmoreland.
- Davis Cove - Mitchell Town

To date, oyster farming occurs in only three areas namely, Bowden, Green Island and Port Antonio. One major drawback is the fact that some of the prime sites occur in close proximity to built up areas, thus making them vulnerable to pollution, mainly from sewage.

Cage Culture Of Finfish

A 1993 Study by the FAO examines the possibility of the development of cage culture of finfish in Jamaica. The following seventeen sites have been identified as suitable for this venture:

- Port Esquivel
- Salt River
- Main Bay
- Port Morant
- Port Royal
- Orange Bay

- Green Island

- Davis Cove

- Lucea Harbour

- Mosquito Cove

- Rio Bueno

- Discovery Bay

- Port Maria

- Annotto Bay

- Port Antonio

- Manchioneal

- Happy Grove

Port Morant (Bowden) has been identified as being suitable for the implementation of a pilot project. Despite the obvious advantages associated with cage culture eg. no significant land or fresh water requirements, there are drawbacks. The major draw backs relate to lack of technology which would enable the use of local species, the need to import fish feed, and the foreseeable problems with praedial larceny.

The report recommends investigating the use of Tilapia given its proven adaptability. Given that the capture of juvenile fish is prohibited under the Wildlife Protection Act in its present form, regulatory changes would be required to enable the development of brood stocks from local species.

Seamoss Culture

The harvesting and use of seamoss have been a part of the Jamaican culture for many years. Presently all seamoss used in Jamaica has been harvested from wild stocks, thus creating a risk of depletion due to over harvesting or the use of improper methods

of harvesting. Mariculture has been shown to be an effective way of increasing the supply of seamoss. Though little work has been done locally on the culture of seamoss, other islands in the region have recorded significant progress in this activity.

Information gained from seamoss culture in St. Lucia gives an indication of the features which should be considered for selection of suitable sites (Table 2). Based on these criteria it should be possible to identify several suitable sites around the island.

TABLE 2 SEAMOSS CULTURE GUIDELINES FOR SITE SELECTION

Favourable Features:

- A firm substrate, such as seagrass bed, or sand in some areas.
- Moderate wave action or surface chop.
- Good water exchange, especially if nearby river outflows carry fresh water and sediment into the area after rainfall.
- An offshore reef for protection from heavy wave action.
- A water depth of at least 1.0m at low tide.

Unfavourable features:

- Soft muddy substrates that are easily stirred up
- Still water with no waves and poor tidal exchange.
- Areas where freshwater run-off accumulates, reducing the salinity for prolonged periods and causing high levels of siltation.
- Nearby coral reefs which have large numbers of herbivorous fish that will feed on the cultivated plants.