ELABORATION OF AN AQUACULTURE DEVELOPMENT STRATEGY FOR ST. KITTS AND NEVIS

Aquaculture Development Strategy 2013-2023

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Executive summary

Due to high demand for seafood in St. Kitts and Nevis (SKN), leading to substantial imports of seafood as a result of stagnant output from capture fisheries, the Federal Department of Marine Resources of St. Kitts and Nevis (DMR) initiated the 'Elaboration of an Aquaculture Development Strategy for St. Kitts and Nevis' study. This study is designed to (i) reveal the potential for introducing aquaculture to the islands in order to improve food security and nutrition, and to (ii) develop a related implementation strategy.

The aforementioned study, supported by the European Union through the ACP FISH II programme, was performed from July to August 2012, with a validation workshop held at the start of September. The first report produced, initially envisaged to be a brief working document, was expanded to present a detailed appraisal, entitled 'Situation Appraisal for St. Kitts and Nevis – Demand for and Potential of Aquaculture'.

SKN, the smallest federation in the Americas, has limited natural resources, small islands and is situated in the Caribbean hurricane belt. These conditions have led international agencies to officially state that 'in the foreseeable future, aquaculture will not be able to develop on the small islands of the Lesser Antilles' (FAO, *Aquaculture development in the Caribbean*, *Mission to the Caribbean,* 1981), therefore it was felt necessary to document that the islands do have a potential for developing aquaculture.

The present document sets out the 'Aquaculture Development Strategy for St. Kitts and Nevis'. It is recommended that the first working document, 'Situation Appraisal for St. Kitts and Nevis – Demand for and Potential of Aquaculture', be studied beforehand as it contains the analyses that led to the strategies developed and recommended in this document.

The present report elaborates on a strategy for SKN to develop an aquaculture sector that capitalises on its competitive edges, especially its pristine, tropical, oceanic water and the availability of significant amounts of government-owned land resulting from abandoned sugar cane farming. An innovative seasonal farming approach, the 'SKN marine fish farming model', is suggested, which combines the production of juvenile marine fish in land-based facilities during the hurricane season with grow-out farming in the sea in traditional, circular plastic cages during the calm season.

The strategy covers the period from 2013 to 2023. The first phase, covering four years, will be especially intensive and to a certain extent financially demanding, particularly due to the construction of pilot farms and farming infrastructure to be rented to cluster farmers, as well as human resource development (through overseas training).

Due to the limited human resources of the islands' administrations, the strategy suggests the establishment of four aquaculture zones - two land-based and two sea-based, with one of each on each island. These would be developed and matured for the purposes of aquaculture, with all necessary analyses being carried out for these selected areas only.

It is suggested that the zones be managed by Government demonstration farms located in the zones. They should observe that good farming management practises are complied with by the zones' tenants.

It is further suggested that the AZ management organised the farmers into clusters to capitalise on (i) large-volume production advantages or efficiencies of scale in purchases and sales, (ii) technology transfers to the farmers, and (iii) possibly certification schemes.

The purpose of the strategy document is to describe a way forward to achieve the strategic goal of developing an aquaculture sector in SKN, which contributes to the economic growth and food security of the Federation. The strategy outline includes three main axes: Enabling legal and policy framework; Human Resource Development; and Aquaculture production.

List of Acronyms and Abbreviations

AZ	Aqua(culture) Zone
AZC	Aquaculture Zone Companies
CARICOM	Caribbean Community common market
CFBC	Clarence Fitzroy Bryant College
DF	Department of Fisheries, Nevis Administration
DPP	Department of Physical Planning (Nevis)
DMR	(The Federal) Department of Marine Resources (St Kitts and Nevis)
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FTR	Final Technical Report
MSD	Ministry of Sustainable Development
PPP	Public Private Partnership
R&D	Research and development
SKN	Federation of Saint Kitts and Nevis

1. Overall objective of the development strategy

Due to high demand for seafood in St. Kitts and Nevis, leading to substantial imports of seafood as a result of stagnant output from capture fisheries, the Federal Department of Marine Resources of St Kitts and Nevis (DMR) initiated the 'Elaboration of an Aquaculture Development Strategy for St. Kitts and Nevis' study. This study is designed to reveal the potential for introducing aquaculture to the islands to increase the local production of seafood, and to develop a related implementation strategy.

The 'Elaboration of an aquaculture development strategy for St. Kitts and Nevis' study, supported by the European Union through the ACP FISH II programme[1], was performed from July to August 2012, with a validation workshop in early September. The study produced two working documents: firstly, the 'Situation Appraisal for St. Kitts and Nevis – Demand for and Potential of Aquaculture', and secondly, a zoning and mapping report of suitable areas for aquaculture. Finally the present 'Aquaculture Development Strategy for St Kitts and Nevis' was drafted based on the findings of these two documents.

A strategic document produced by the Ministry of Sustainable Development (MSD) of the Government of St. Kitts and Nevis in 2006, *Adaptation Strategy in Response to the New EU Sugar Regime 2006-2013*, already mentioned 'Evaluating the potential for aquaculture and request[ing] technical assistance for the establishment of a demonstration and training unit'.

Domestic seafood production originating from capture fisheries currently stands at approximately 450 tons/year, and has remained stable for several years. A further 850 tons are imported every year, contributing to a large trade balance deficit of USD 3 million per year. Although aquaculture cannot directly replace all these imports, it is clear that there is an unfilled demand for fresh, quality marine fish from the islands' residents.

In addition to improving food security and nutrition, it is envisaged that the development of an aquaculture sector would provide a needed diversification of job and investment opportunities for the islanders, as well as leading to the sustainable use of the Federation's vastest natural resource - the ocean - for food production.

However as SKN is the smallest federation in the Caribbean the natural resources are limited. Hence the development strategy should carefully consider how the Federation and its people can benefit in terms of social development and food security, and how to allow foreign investment companies access to these limited natural resources.

A special **SKN Marine Fish Farming Model** is suggested to capitalise on the natural resources, namely the pristine oceanic water. However, as the Federation is situated inside the hurricane belt, it is suggested to develop a seasonal seawater farming model combining land and sea area resources, i.e. farming in sea cages outside the hurricane season with land-based fish farming pumping seawater into tanks during the hurricane season.

The land-based phase would primarily be used for juvenile production to have large volumes of stocking material to put into the cages in December when the hurricane season is over. Depending on the fish species and marketable size, the production cycle would vary from 6 to 11-12 months from hatching.

[1]The ACP Fish II programme is a four and a half year, EUR 30 million programme funded by the European Union through the EDF. It has been formulated to strengthen fisheries management, improve food security and alleviate poverty in 78 African, Caribbean and Pacific (ACP) states.

The purpose of the strategy document is to describe a way forward to achieve the strategic goal of developing an aquaculture sector in SKN, which contributes to the economic growth and food security of the Federation. The strategy outline includes three main axes (Table 1).

Table 1: Strategy outline

Strategic Goal	The aquaculture sector in SKN contributes to the economic growth and food security of the Federation		
Strategy Axes	**Enabling legal and policy framework**	**Human Resource Development**	**Aquaculture production**
Strategic Objectives	Existence of a robust, enabling and supportive legal and policy framework	Skilled, pro-active and committed government workforce and skilled aquafarmers	Increased contribution of aqua production to national fisheries outputs

2. Development Strategy 2013-2023

2.1 Phase 1 (2013-2016): Preparation and introduction to aquaculture

SKN has very limited experience in aquaculture and none related to marine fish farming, Furthermore being a federation of only 50,000 inhabitants, the limited number of staff in marine resources and fisheries (DMR/DF) must be underlined. The actions of phase 1, the initial development phase of the aquaculture sector should therefore address capacity building of the human resources (primarily of government staff and then potential farmers).

Likewise it is necessary that regulations and procedures are developed over the first years of aquaculture development, in order to protect by law the activities, companies or investments of (at least) farmers and investors. Similarly, rules and regulations pertaining to the application procedures should be set out to facilitate the process and to ensure that it is transparent.

To employ with the best efficiency the available administration staff, it is recommended to focus on the development of a limited number of Aquaculture Zones (AZ's), which shall be selected, on the basis of an in-depth analysis of their technical qualities and environmental carrying capacity.

The advantage of pre-developed Aquaculture Zones for fish farmers 'to be' is that it would simplify and speed up application procedures. Moreover, the AZ's would have been selected for their suitability for fish farming by aquaculture experts. Thus they should provide the best opportunities for new farmers.

A number of priority actions for Phase 1, i.e. the first four years (2013-2016), are set out hereunder for the three main strategic axes.

1.1 Providing a robust, enabling and supportive legal and policy framework for the economic and social development of the aquaculture sector

Table 2: Phase 1 actions related to legal and policy framework

		Responsible bodies
Strategy Axis	1.1 Enabling legal and policy framework	
Strategic Objective	Existence of a robust, enabling and supportive legal and policy framework	
Actions	1.1.1 Review, revise and/or develop legal framework for land and sea based aquaculture	DMR, other relevant SKN agencies
	1.1.1.1 Review legal framework for land and sea based aquaculture	DMR
	1.1.1.2 Revise and/or develop legal framework for land and sea based aquaculture	DMR
	1.1.1.3 Review and confirm legal basis for establishment	DMR, MSP, DPP

	of Aqua Zones	
	1.1.2 Develop directives to streamline and enable application procedures for granting aquaculture farming licenses	
	1.1.2.1 Establish a 'one-stop-shop' entry point for submitting the applications	DMR, MSD, DPP
	1.1.2.2 Make advantageous approval procedures for applications inside AZs	DMR (or AZ board)
	1.1.3 Develop incentives for engaging in aquaculture within SKN	DMR, (MSD?, DPP?)
	1.1.4 Develop regulations/bylaws for Aqua Zones	DMR, AZ board

1.1.1 Review, revise and/or develop legal framework for land and sea based aquaculture

Narrative: A regulatory framework for aquaculture is necessary for two main reasons:

- to encourage and protect investments in the aquaculture sector. Without this no private investments will be done.
- to regulate the farming practises to protect common interests as well as those of other stakeholders from negative impact from the aquaculture activities.

- **1.1.1.1 Review the legal framework for land and sea based aquaculture**

  Narrative: The primary legislation for fisheries (and aquaculture) is The Fisheries Act (1984) described in a revised edition dated on 31st December 2002. In this act, simple provisions are given. For instance: it is possible to lease land, including foreshore or sea-bed for the purpose of aquaculture and public may be denied access to these leased areas. But the provisions are not detailed further.

  Another available regulatory internal document dated on 2011: 'The Draft St. Kitts and Nevis Aquaculture Policy' clearly states that the Government of St. Kitts and Nevis is committed to the development of Sustainable Aquaculture in all forms. It will provide the enabling environment for the economic and social development of this industry and will ensure that the necessary regulatory framework is maintained to encourage and protect investments. A few legal requirements for aqua-farmers are described such as:

  - Obligation to submit fish statistics and other business data;
  - Personal monthly social security contributions;
  - Joining a fisher folk organization;
  - Adhering to the 'rules and regulations' governing aquaculture.

  However the requirements are not developed. Overall, the status of the legal framework is unclear. The status of many acts and regulations of relevance (especially for land use issues) is not known (i.e. already adopted, in process of being adopted or only draft documents). A detailed review of the approved legal framework of relevance for the aquaculture sector is therefore necessary.

  Given the strong linkage between land and sea based aquaculture as described in the suggested SKN marine fish farming model, the legislation related to the sea and the land areas resources should be equally important. For the near shore sea areas, the zoning plan drafted by the Nature Conservancy could have direct impact on aquaculture development as for where cage farming could be allowed. The draft zoning plan is currently under positive consideration by the federal DMR.

DMR has a clear mandate to administrate the use of the sea areas of the whole Federation, but as for the legal framework relevant to land based aqua farming the distinct administration of the two islands is a complication that should be addressed. DMR has only a mandate for land aquaculture on St Kitts. Nevis has its own decision structure (self-governance), guidelines, acts and codes and even does not have the same line agencies taking care of the same issues. These divergences may influence the potential of introduction of especially land based aquaculture on each of the two islands.

Furthermore, due to the history, private land ownership is more common on Nevis than on St. Kitts, where a lot of the abandoned sugar cane farm land is owned by Government development agencies/companies. Public ownership, like on St. Kitts, may show to be an advantage if decision makers decide to actively support aquaculture development by allocating public land areas for the land based Aquaculture Zones.

Responsible body: DMR and other relevant administration agencies of SKN with local consultants

- **1.1.1.2 Revise and/or develop legal framework for land and sea based aquaculture**

Narrative: Some general pre-conditions for granting a farming license should include a clause that the area has to be used according to the implementation schedule (as described in the approved application). If a site lies idle for two production seasons it could be revoked without compensation, unless such a situation had been approved in advance. A farming license is given for a limited period of 15 years, but is renewable if the site is documented to have been used according to its purpose. Farmers or companies could have to pay an administrative (lease) fee according to the size of land or sea area leased.

To ensure the social development of SKN, the Draft St. Kitts and Nevis Aquaculture Policy, 2011, suggests that applicants must reside in the Federation for minimum 10 years prior to application.

It is common practise in many countries not to permit foreign investors to have majority ownership in the primary production sector (agriculture, forestry, fisheries and aquaculture). It is suggested to maintain this clause in the Draft St. Kitts and Nevis Aquaculture Policy, 2011, to discourage foreign investors at a time when SKN is trying to develop the sector itself, (even if foreign investors may sometimes use proxies to bypass such regulations). A number of strategic observations are done regarding foreign investment in the aquaculture sector during Phase 2 (ref 2.5.2) when SKN is in a better position to evaluate its pros and cons.

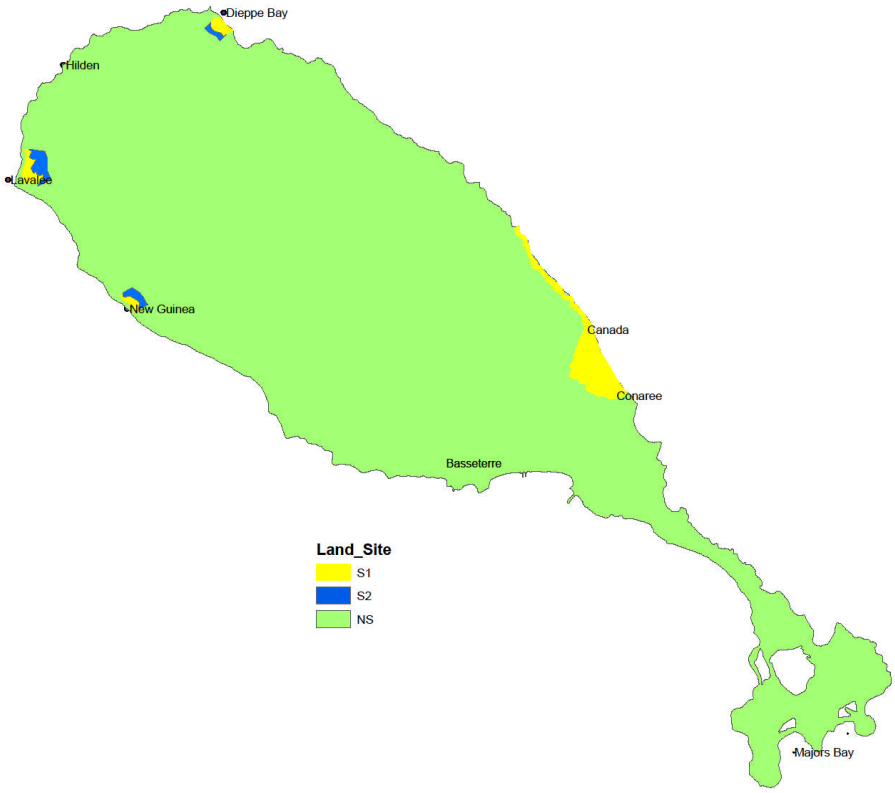
Responsible body: DMR to develop a draft of revised legal framework possibly in consultation with Development Law Service of the Legal Office of FAO, Rome (After completion of the review - Action 1.1.1.2 - and capacity building of fisheries officers through overseas training - ref Action 1.2.3)

- **1.1.1.3 Review and confirm legal basis for establishment of AZ's**

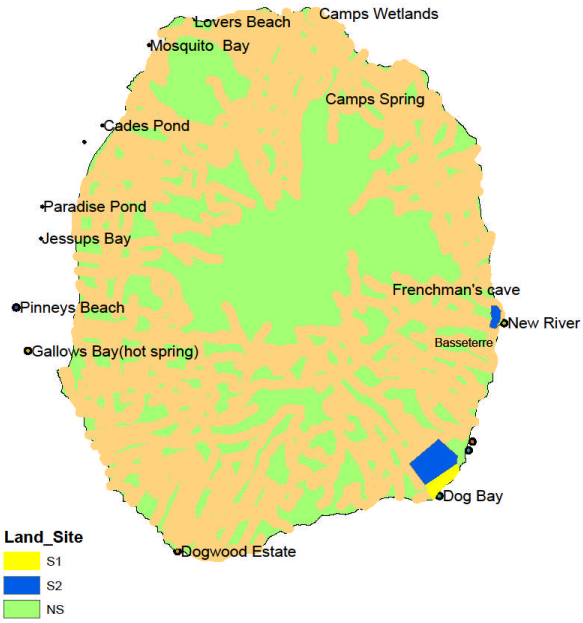
Narrative: Given the limited administrative resources of SKN the advantage of attracting aqua-farmers to establish in pre-approved AZs, is that governance would be much less demanding in terms of human resources. 'Regulations' for farming could be implemented/ enforced or updated by merely amending the bylaws of the zones, which then would have to be followed by its tenants.

An AZ is an area designated for the development of aqua-farming and would already have been cleared or approved by other relevant departments and organisations to be used for aquaculture.

The islands have public land areas lying 'idle', originating from the sugar cane farming which could be very suitable for land based Aquaculture Zones (Map 1 and 2)



Map 1*: Suitable zones for coastal aquaculture in St Kitts



Map 2[2] : Suitable zones for coastal aquaculture in Nevis

<u>Responsible body</u>: DMR and Ministry of Sustainable Development and Department of Physical Planning (DPP) of the Nevis Administration

[2] * Output from the GIS work done under the study detailed in the standalone working document called Annex 10 of the project Final Technical Report (FTR). Suitability for land based aquaculture is assessed. S1 areas are the most suitable, S2 areas are suitable but requiring higher investment costs and No areas are not suitable for aquaculture.

1.1.2 Develop streamlined and enabling application procedures (directives) for granting aquaculture farming licenses.

Narrative: In 'The Draft St. Kitts and Nevis Aquaculture Policy (2011)' a few criteria for engaging in aquaculture within the Federation of St. Kitts and Nevis are suggested such as: The applicant has to submit an application and a business proposal to the DMR; must reside in the Federation for ten (10) years prior to application; and should successfully participate in an Aquaculture Basic Training Course arranged by DMR.

However the application procedure at present is not streamlined. If on St Kitts, the local applicant should apply to Ministry of Sustainable Development, which will arrange a hearing process involving the respective line department such as DMR. However if it is a foreign investor the Ministry of Sustainable Development has provisions for granting approval without consulting any line department. If it is an application on Nevis it should first be given to the Department of Physical Planning of the Nevis Administration for approval including Department of Fisheries after which it would be forwarded to the Federal DMR but only if it involves sea based farming.

- **1.1.2.1 Establish a 'one-stop-shop' entry point for submitting the applications**

  Narrative: Applicants should present their application to only one office, such as the line/resort department (DMR/DF) or as it is now, the respective planning agency. The agency chosen to be responsible for the hearing process should – irrespective of whether local or foreign applicant - be committed to involve all relevant departments and non-administration organisations, and to coordinate all their comments or questions to the applicant. It is important that the aquaculture expertise within the administration has a central role in appraisal of the applications.

  The agency responsible for the hearing process should provide a detailed format of which information should be included in the application in order to make the conditions transparent.

  It is suggested that the applicants should present a brief feasibility study describing the business idea, the technologies to be used, species to be farmed, source of juveniles, implementation schedule (i.e. production volume), maximum quantity of feed or production volume (i.e. an indicator of potential pollution), and finally, information on the economic ability of the applicant. The applicants should also document qualifications (training/education) of management and key staff. If it is a larger project (?500 tons) the application should include an environmental impact assessment (EIA) detailing the production practises and potential impacts on the site, and suggesting mitigation measures.

  The EIA would have to be performed by a DMR/DF-approved agency and at the applicant's cost.

  Should the application involve plans for even larger-volume production (>1.000 tons), or if the farm is planned in a vulnerable biotope (as judged by the DMR), carrying capacity analyses could be requested.

  If the DMR is not in a position to appraise the technical feasibility of an application due to suggestions for either a new technology or new species, provisions should be given in the directives to request that the applicant covers the costs of having an external expert to perform the appraisal for the DMR.

  The reason for requesting all these different studies is not only to preserve 'environment' but also that the applicant has sufficient background knowledge and finances, leading to a better success rate and avoiding damage to the aquaculture sector's image (which is of federal importance).

  Responsible body: DMR and Ministry of Sustainable Development and Department of Physical Planning of the Nevis Administration

- **1.1.2.2 Make advantageous approval procedures for applications inside AZs**

  Narrative: With reference to 1.1.1.3 to have Aquaculture Zones presents several advantages for the administration. However, being in a small area/zone would have pros and cons for the aqua-farmers.

  Firstly the farmers will benefit from getting lease-access to public land, which already has been selected by aquaculture experts; secondly the land has already been through a planning process thus ensuring that the application could be processed very fast as it would only need to be evaluated by the DMR or a designated Aquaculture Zone Board; thirdly the farmers – even if small – may achieve efficiency of scale by being organised as cluster farmers – a modern version of small scale farmers, who will work coordinated (see situation appraisal report/appendix 8).

  The challenge of regrouping many farmers in a restricted area will especially be the management of biosecurity risks. They should be addressed in the bylaws of the AZ's (see action 1.1.4) to avoid creating a disadvantage for the farmers.

  Responsible body: DMR (or AZ board)

1.1.3 Develop incentives for engaging in aquaculture within SKN

Narrative: Incentives is one type of policy support which aims to achieving a desirable development of the sector. It is strongly recommended that incentives are related to production activities and achieved production rather than granting large government supported loans based on 'plans'. Several countries use favourable loan conditions to spur development, but this has proven to be risky as such loans can be used for purposes other than those they were given for, or it can lead to the development of a 'project' rather than to actual production.

Most of the incentives already suggested in the draft Aquaculture Policy document (2011) are of 'production achieved' type. The following has been suggested in the draft:

- Incentives will be the same as those given to fishers and agri-farmers (such as duty-free concessions on boats, engines and truck but no rebate on marine fuel)
- Land and utilities will be allocated to successful applicants at concessionary rates. (Grace periods of 4 years for area leases should be considered)
- All equipment and materials (this includes feeds and chemicals) for the development of aquaculture will be duty free and VAT exempt.
- No sale or profit tax on businesses' earnings
- On-going technical assistance from DMR.

It is recommended to introduce incentives for a limited time span. This would serve a dual purpose: a) it would encourage starting aquaculture 'now', and b) if the sector does not develop according to plan, the extension of the incentive for a further limited period of time could be considered.

Responsible: DMR (and Ministry of Sustainable Development and Department of Physical Planning of the Nevis Administration?)

1.1.4 Develop regulations for Aqua Zones.

Narrative: In 1.1.1.3 and 1.1.2.2 it has already been noted that grouping many farmers in a restricted area creates a biosecurity challenge. Therefore it is necessary to develop bylaws which the aqua-farmers have to comply with.

The AZ management rules/bylaws would be a timesaving alternative to developing a full body of legislation for the whole Federation. In addition to purely administrative issues, the management rules could include regulations on farming practices such as which quality of feed to use, the quality of fish juveniles (health certificates) to stock and other biosecurity measurements to be observed. The bylaws of the AZ's can be updated as deemed appropriate. These embryonic easily adaptive rules can be used by the DMR to gain experience in defining the aquaculture practises that would need to be regulated at a later stage (during Phase 2). They should then constitute the foundations for developing comprehensive/full regulations dedicated to aquaculture management of the Federation.

Responsible body : DMR and Aquaculture Zone Board (with assistance of international consultant/or FAO)

1.2. Human Resource Development

Table 3: Phase 1 actions related to Human Resource Development*

		Responsible bodies
Strategy Axis	1.2 Human Resource Development	
Strategic Objective	Skilled, pro-active and committed government workforce and skilled aquafarmers	
Actions	**1.2.1 Arrange study tour for administration to selected countries**	DMR
	1.2.2 Identify key officers to be trained	DMR/DF
	1.2.3 Overseas Training for key officers	DMR/DF
	1.2.4 Training on development of aquaculture policy guidelines	DMR, other relevant SKN administration
	1.2.5 Establish demonstration marine fish farm	
	1.2.5.1 Develop business plan, investment and operational budget	DMR/DF (int. consultant)
	1.2.5.2 Decide on management structure	DMR/DF
	1.2.5.3 Identify sites for the demonstration farms	DMR/DF, (int. consultant)
	1.2.5.4 Design the demonstration farm	DMR/DF, int. consultant
	1.2.5.5 Construct and commission demonstration farm	DMR/DF, local Construction companies
	1.2.5.6 Recruit and educate demonstration farm staff	DMR/DF
	1.2.6 Establish extension service	
	1.2.6.1 Develop curriculum for basic aquaculture training course	DMR, Demonstration farm
	1.2.6.2 Arrange basic aquaculture training courses	DMR, Demonstration farm
	1.2.6.3 Provide free technical assistance and extension services	Demonstration farm
	1.2.7 Establish aquaculture organisation/technology platform	DMR

1.2.1 Arrange study tour for administration to selected countries

Narrative: Arrange a study tour for permanent secretaries, directors of the DMR/DF and key officers at the DMR/DF with the aim to observe challenges and best practices in relevant (tropical, incl. islands) countries in relation to both family and corporate marine fish farming.

Responsible body: DMR

1.2.2 Identify key officers to be trained

Narrative: It is recommended to nominate at least two staff (preferably four) of the DMR/DF to receive abroad training in aquaculture governance and marine fish farm operational management respectively. The staff receiving farm management training should become the core staff in extension activities (2.4 and 2.5).

Responsible body: DMR/DF

1.2.3 Overseas training for key officers

Narrative: The officer(s) to be trained in aquaculture governance is suggested to be sent for a one-month twinning arrangement in e.g. Europe, while the officer(s) to be trained in marine fish farm operational management should preferable be sent to Asia for an up to two-month period

Responsible body: DMR/DF

1.2.4 Training on development of aquaculture policy guidelines

Narrative: FAO has published many useful technical papers and guidelines for developing aquaculture regulations, management and practises, however it should be appreciated that they in general have been written for countries with greater administrative human resources and, importantly, countries that are already involved in the aquaculture sector. Consequently, many of these recommendations are not relevant to SKN at this pre-development stage and should only be adopted or included in the legislation when the sector has eventually developed and when the specific (FAO) recommendations actually prove to be relevant. It is suggested that a training course is performed for the administration staff of SKN on the topic 'Development of aquaculture policy guidelines'

Responsible: DMR and other relevant administration of SKN assisted by international consultant or FAO legal office

1.2.5 Establish demonstration marine fish farm

Narrative: Since there is no history of marine fish farming in SKN it is suggested to establish two demonstration farms – one on each island – which can demonstrate the SKN Marine Fish Farming Model. Therefore the farms should include both land- and sea-based farming activities.

The demonstration farm will have two equally important functions: Proving the viability of marine fish farming in SKN and serving in extension and in human resource development – of the future farmers (refer to activity 1.2.6).

The extension/human resource development role is likely to become the more important in the long term; hence this action is included under the Human Resource Development Axis of the strategy.

- **1.2.5.1 Develop business plan, investment and operational budget**

  Narrative: A detailed business plan should be elaborated, which includes the functions/services/products and the possible income/budget generation in short, medium and long term as the role of the demonstration farm very likely could change as a result of the sector development.

  Responsible body: DMR/DF assisted by international consultant

- **1.2.5.2 Decide on management structure**

  Narrative: As the demonstration farms will serve mainly the general development of the sector and thus the public interest, it is suggested they are established as public entities. However if a suitable private company is identified, which (maybe as part of a corporate social responsibility plan) finds interest in supporting food security of SKN through investing in the demonstration farms, the possibility of creating a Public Private Partnership should be considered. It shall be clear to the private investor that knowledge and technology will be shared and disseminated to anyone.

  Responsible body: DMR/DF

- **1.2.5.3 Identify sites for the demonstration farms**

  Narrative: The land-based part of the pilot farms should preferably be established inside the AZ to achieve maximum exposure to the main potential stakeholders (see activity 1.3.1)

  Responsible body: DMR/DF assisted by international consultant

- **1.2.5.4 Design the demonstration farm**

  Narrative: The design of the demonstration farm should reflect the findings in the business plan developed. It should likely have a minimum annual production capacity of between 50 and 100 tons of fish – i.e. large enough to demonstrate viability and to simulate real scale production procedures for the training.

  Responsible body: DMR/DF assisted by international consultant

- **1.2.5.5 Construct and commission the demonstration farm**

  Responsible body: DMR/DF with local construction companies

- **1.2.5.6 Recruit and educate demonstration farm staff**

  Narrative: Three persons for each farm: one farm manager, one land-based production manager and one sea-based production manager, all of whom should be assigned to both production and extension work. Those who did not participate in activity 1.2.3 should be sent for relevant abroad training.

  Responsible body: DMR/DF

1.2.6 Establish extension service

Narrative: The extension service will be a very important function of the demonstration farm – and duty of its staff.

- **1.2.6.1 Develop curriculum for basic aquaculture training course**

  Narrative: This course sponsored by the DMR should introduce best management practises including risk reductions through biosecurity measures and SKN's legislative framework for aquaculture.

  Responsible body: DMR, demonstration farm staff and international consultant

- **1.2.6.2 Arrange basic aquaculture training courses**

  Narrative: This course should be compulsory for all applicants, including production management and key staff of corporate investors. Before granting license to investors/farmers, having successfully participated in this course should be a pre condition.

  Responsible body: DMR and demonstration farm staff

- **1.2.6.3 Provide free technical assistance and extension services**

  Narrative: The purpose is to provide stakeholders with any ad hoc advising, assisting in trouble shooting and in introduction of new approaches, findings or equipment as well as on-demand training courses. The demonstration farm should also be open for 'Incubator arrangements', where the operation of some of the facilities of the demonstration farm is allocated to potential newcomers (farmers or small businesses) desirous to acquire supervised, hands-on knowledge before starting out themselves.

  Responsible body: Demonstration farm staff

1.2.7 Establish aquaculture organisation/technology platform

Narrative: Initiate the development of a dedicated aquaculture organisation or aquaculture technology forum/platform to facilitate information exchanges including extension. Membership of this organisation should be compulsory for aquaculture farmers, but open to any interested persons/organisations.

Responsible body: DMR

1.3 Aquaculture production

Table 4: Phase 1 actions related to developing aquaculture production

		Responsible bodies
Strategy Axis	1.3 Aquaculture production	
Strategic Objective	Increased contribution of aqua production to national fisheries outputs	
Actions	**1.3.1 Establish Aquaculture Zones**	DMR/DF, MSD, DPP (int. consultant)
	1.3.1.1 Perform the physical selection process	
	1.3.1.2 Establish management structure of the AZ's	DMR, MSD, DPP
	1.3.1.3 Raise awareness of the AZ - concept and opportunities	DMR (int. Consultant)
	1.3.2 Establish quarantine/import facility for juvenile marine fish	DMR or AZ Board (int.. consultant)
	1.3.3 Establish marine fish hatchery	DMR (int. consultant)
	1.3.4 Establish AZ Companies	
	1.3.4.1 Develop business plan, investment and operational budget - financing	AZ board, DMR/DF, MSD, DPP
	1.3.4.2 Establish management/company structure	AZ, DMR/DF, MSD, DPP

1.3.1 Establish Aquaculture Zones (AZs)

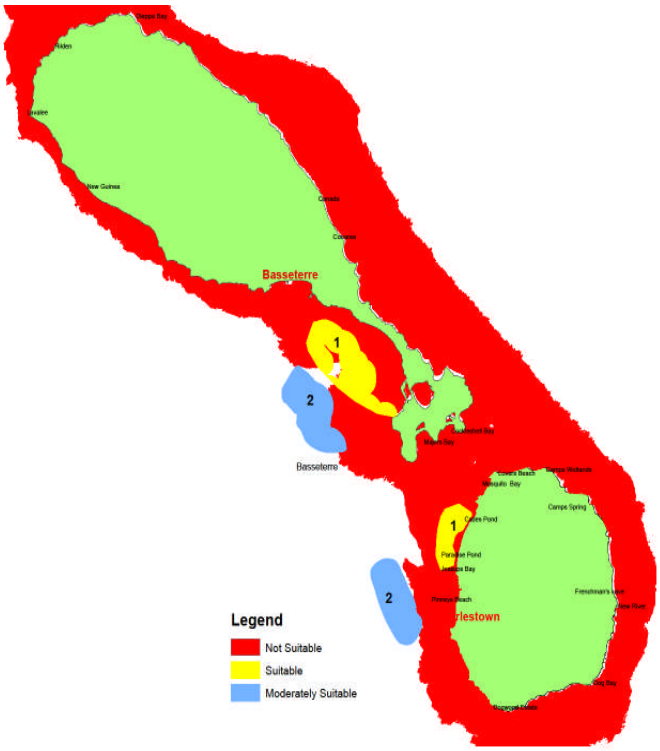
Narrative: AZ's have been already mentioned in Action 1.1.1.3: Review and confirm legal basis for establishment of AZ's; Action 1.1.2.2: Make advantageous approval procedures for applications inside AZs and Action 1.1.4: Develop regulations for Aqua Zones. The present action is therefore related to the process of establishing the AZ's. Two land-based AZs and two sea-based AZs should be selected, one of each type for each island. Suitable sites have been identified in the working documents (Annex 8 and 10 of Final Technical Report) and are shown on below maps 3 to 5.

- **1.3.1.1 Perform the physical selection process**

Narrative: This action needs the close interaction between decision makers and technical experts. The decision makers should define their preferences based on the suitable sites identified in the working documents. They should define different scenarios that they want to get analysed such as: which land and sea areas could be made available. On this basis technical experts could calculate the associated production scenarios. This in turn should be given to the decision makers for their final selection.

The technical analyses of the sea areas would include better detailed oceanographic studies especially including current analyses but also more detailed mapping of the sea floor as for vulnerable habitats. This could lead to more accurate estimates of potential carrying capacity of the areas selected.

In below Map 3 the yellow sea area (1) off St Kitts is about 850 ha while the yellow sea area off Nevis is 309 ha. As mentioned potential carrying capacity studies need to be carried out but if the analysis are in favour of production, the sites could produce at least between 5-10,000 tons fish



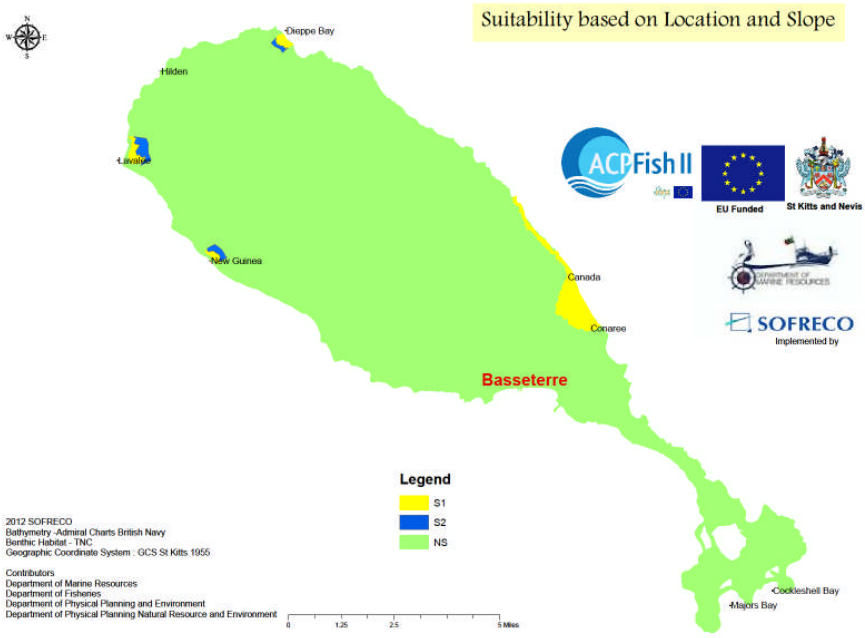
Map 3* Synthesis of Off-shore aquaculture Suitability

The cage farming sites should be in the Caribbean Sea i.e. to the west of the islands, as it is leeward from the trade winds and would be downstream (current) from the land based juvenile production. The transport of juveniles by truck or boat would technically be simple and for a few hours maximum.

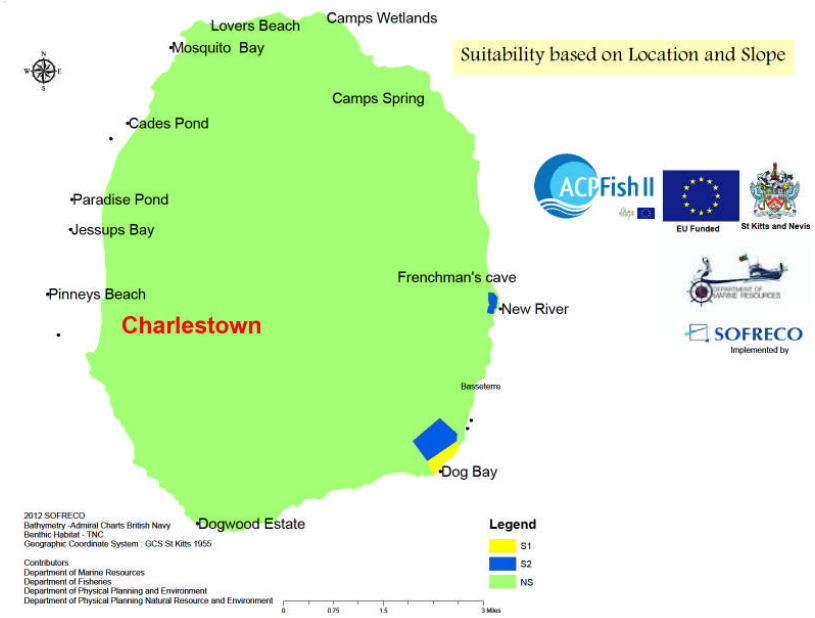
As for the land based sites the technical analyses would describe possible technology scenarios and associated production volumes – based on land area scenarios requested by the decision makers.

The land based AZ's should preferably be established close to fish landing places to be more attractive to fisherfolk. Such a location would also make the demonstration farm (placed in the AZ) achieve the maximum exposure towards the main potential stakeholder.

The suitable land areas are most prominent on St Kitts with about 140ha, while Nevis has about 25ha. The areas are however more than sufficient for a land based production serving as juvenile supply for a large cage farming sector. The land areas could even support a large production (larger than the local market demand) of marketable fish if investors decide to focus on land based production strategy only.



Map 4* Suitable land based sites for AZ's on St Kitts



Map 5* Suitable land based sites for AZ's on Nevis

For biosecurity reasons, the land-based AZs, which will primarily be used for juvenile production, should be situated on the East/Atlantic Coast, as the Caribbean current has a west/northwest direction. This location means that any diseases (or parasites) in the grow-out would not affect the juvenile production by sharing the same water. In addition, the Atlantic Coast is generally less developed in terms of real estate and tourism.

In St Kitts Canada and Conaree have the best potential and are recommended for a land based AZ. On Nevis there are few sites but especially Dog Bay stands out as having the largest potential as a land based AZ.

Responsible body: DMR/DF together with Ministry of Sustainable Development and Department of Physical Planning of the Nevis Administration assisted by international consultant

- **1.3.1.2 Establish management structure of the AZ's**

Narrative: It is suggested to establish an **AZ management board** including at least the director of DMR. The board should decide on development of the regulations/bylaws of the AZ's and supervise the management of the AZ.

The **management of the AZ** itself should be taken care of by the demonstration farm management. Apart from administrative issues, the management is responsible for enforcement of the regulations/bylaws of the AZ. The demonstration farm management is on site and thus has the best opportunity for a meaningful follow-up on the enforcement. It shall be aware to receiving feedbacks from farmers/investors that can feed potential revisions of bylaws.

The management shall assist in organising the AZ tenants, i.e. the modern 'small-scale' farmers, to become cluster farmers.

The term 'cluster farmer' refers to modern 'small-scale' farmers operating privately- and family-owned farming activities as opposed to corporate, investor-owned farms operating mainly through hired-in staff. A 'modern', small-scale farm seeks to achieve 'efficiency of scale' like large-volume, corporate farms by forming clusters. Clusters are different from cooperatives as each cluster farmer owns his/her own farming activity. The advantages of clustering can include: sharing common infrastructure costs, better access to bulk prices for feed, better access to extension services, better market access through consolidated volume and consistency; sharing the costs of certification schemes, etc. (please see the Aquaculture Situation appraisal report (Annex 10 of FTR) for further details).

Responsible body: DMR/DF together with Ministry of Sustainable Development and Department of Physical Planning of the Nevis Administration

- **1.3.1.3 Raise awareness of the AZ – concept and opportunities**

Narrative: Massive media exposure should be launched when the AZ's and bylaws have been established. Eventually when success can be documented the concept should be promoted in other similar island conditions in the region.

Responsible body: DMR (with media and international consultant)

1.3.2 Establish quarantine/import facility for juvenile marine fish

Narrative: The development of the marine fish farming sector will depend strongly on the availability of quality marine fish fry/fingerlings. Presently this supply would have to originate from hatcheries outside SKN – and as with all transboundary movements of live animals this also creates a large risk for introducing alien diseases and parasites. One of the competitive edges of SKN is that it does not have a marine fish farming history and thus has not introduced alien diseases causing problems for aquaculture performance in other countries. This lack of alien disease is very important for the potential of the grow-out production. To keep this disease free status it is strongly recommended being very restrictive on imports of marine fish juveniles so that only one (or few) have the license to import juveniles from approved abroad suppliers. Even with all these precautions, the juveniles are still to be kept in a quarantine facility on SKN to verify their disease-free status before they are released for sale and stocking to cluster farmers.

- 1.3.2.1 **Develop business plan, investment and operational budget**

  Narrative: It is important that imports and quarantining of juveniles take place in a coordinated/controlled way from the start of the farming development. It is therefore recommended to establish it as a government facility as part of one of the demonstration farms and operated by their staff. This would only require minimum extra investments. It is suggested that the juveniles should be sold to the farmers on a 'cost recovery' basis – at least during the pioneering phase. A business plan should then be drafted for this facility..

  Responsible body: DMR or Aquaculture Zone Board with assistance from international consultant

1.3.3 Establish marine fish hatchery

Narrative: The lack of alien fish diseases (ref 1.3.2) is very important for the potential of the grow-out production – but also this can be a competitive advantage for SKN if it eventually develops its own hatcheries. These could supply the whole Caribbean region with documented disease free juveniles. This would bring in the ultimate high value production, with a per kg price many times higher than any fish produced for human consumption.

The Caribbean region only has a few commercial scale marine fish hatcheries and it is recommended as a first step to establish a Southeast Asian-style, extensive, multispecies marine fish hatchery at SKN to produce fish species according to farmers' demands with a yearly capacity of a minimum of 1.25 million fish juveniles. This would be the basis for 500 tons of production. With reference to 1.3.1.1 the hatchery should be situated on the Atlantic Coast for biosecurity reasons, to avoid risk of using the same water as the grow-out facilities/operations (sea cages) that are in the Caribbean Sea, i.e. 'downstream'.

The hatchery could be established inside the AZ's and thanks to its 'extensive style' it is not demanding large investments but needs larger area than a Westerner style, intensive hatchery. Unless there are investors available for such an activity the pioneer hatchery could be public operated (by one of the demonstration farms), a role often seen in most other countries when they try to support the development of the sector.

Responsible body: DMR assisted by international consultant

1.3.4 Establish AZ companies

Narrative: To develop the production facilities of the sector financing sources incl. credit arrangements will need to be developed. If there are pioneering investors ready to enter this new business, the sector development could be corporate driven. However corporate investors often have a long planning phase and are thus slow to implement. The other alternative is enabling investments of small scale farmers (cluster farmers) by providing loan facilities to support their investments. The small-scale farmers are often seen to move very fast – copying each other (or the demonstration farm).

The support to the farmers could be through providing simple banking facilities where the government enters with collaterals/warranties. However, another approach (untraditional) should be considered: providing indirect financial support by providing the necessary 'infrastructure' instead of cash/loans. By doing this, Administration would mitigate the risk that the loans could be used for other purposes than intended or that the technologies invested in by a farmer shows not technically feasible/appropriate. Furthermore there would be savings/synergies in e.g. having shared infrastructure facilities in the AZ's, such as:

- For land-based farms: water inlet, reservoirs, sedimentation tanks, water outlets, etc.
- For sea-based farms: shore base incl. pier, slipway, feed storage, workshop, cage storage area, permanent mooring (anchors) at the sea site, working/guard platform, area marker buoys, etc.

If this option is chosen, providing shared infrastructure would necessitate a company structure of sufficient economic strength and expertise – if this approach is selected, it is suggested to establish so-called Aquaculture Zone Companies (AZC's), one on each island.

- **1.3.4.1 Develop business plan, investment and operational budget - financing**

  Narrative: Detailed business plan would be developed for the AZCs, including their objectives, the financial resources needed, their legal status (part of the DMR, public or PPP), a product portfolio such as renting out facilities (land leasing), selling products to the cluster farmers (juveniles/feed/equipment). The purpose of the AZC's is not to produce fish.

  The business plans should also include an approach for obtaining external financial and technical support, and an implementation schedule.

  Responsible body: Aquaculture Zone Board, DMR/DF together with Ministry of Sustainable Development and Department of Physical Planning of the Nevis Administration

- **1.3.4.2 Establish management/company structure**

  Narrative: The legal status of the AZC's will have to be decided upon based on the findings from the business plan. If the main objective is to rent out facilities to its tenants, the facilities which originally were financed through public (guaranteed) loans, it is often seen that publicly owned companies are used to administrate infrastructure (case studies could be looked into from Japan, the Philippines and Malaysia). In St Kitts and Nevis there could be an entity established by one of the government real estate companies? If the business objective is a little wider than renting out facilities (and land) the AZC's may be better established as public-private partnerships (PPP). However it is recommended that the AZC's focus on renting out infrastructure facilities and let private sector enter as investors in the supply chain, when they see the demand.

  Responsible body: Aquaculture Zone Board, DMR/DF together with Ministry of Sustainable Development and Department of Physical Planning of the Nevis Administration

Table 5: Schedule and indicative budget for actions of Phase 1

Phase 1	Preparation and introduction to aquaculture	Indicative Budget (EUR '000)	Timing			
			2013	2014	2015	2016
Strategic Objective 1	**1.1 Existence of a robust, enabling and supportive legal and policy framework**					
Actions	**1.1.1 Review, revise and/or develop legal framework for land and sea based aquaculture**					
	1.1.1.1 Review the legal framework for land and sea based aquaculture	10	X			
	1.1.1.2 Revise and/or develop legal framework for land and sea based aquaculture	50	X	X	X	
	1.1.1.3 Review and confirm legal basis for establishment of Aqua Zones	5	X			
	1.1.2 Develop directives to streamline and enable application procedures for granting aquaculture farming licenses					
	1.1.2.1 Establish a 'one-stop-shop' entry point for submitting the applications		X	X		
	1.1.2.2 Make advantageous approval		X	X		

	procedures for applications inside AZs					
	1.1.3 Develop incentives for engaging in aquaculture within SKN	15	X	X		
	1.1.4 Develop regulations/bylaws for Aqua Zones		X	X	X	X
Strategic Objective 2	**1.2 Skilled, pro-active and committed government workforce and skilled aquafarmers**					
Actions	**1.2.1 Arrange study tour for administration to selected countries**	42	X			
	1.2.2 Identify key officers to be trained		X			
	1.2.3 Overseas training for key officers	150	X	X		
	1.2.4 Training on development of aquaculture policy guidelines	20		X		
	1.2.5 Establish demonstration marine fish farm					
	1.2.5.1 Develop business plan, investment and operational budget	15	X			
	1.2.5.2 Decide on management structure			X		
	1.2.5.3 Identify sites for the demonstration farms	20	X			
	1.2.5.4 Design the demonstration farm	80	X	X		
	1.2.5.5 Construct and commission demonstration farm	1 000		X	X	
	1.2.5.6 Recruit and educate demonstration farm staff	30		X		
	1.2.6 Establish extension service	10		X		
	1.2.6.1 Develop curriculum for basic aquaculture training course					
	1.2.6.2 Arrange basic aquaculture training courses			X	X	X
	1.2.6.3 Provide free technical assistance and extension services			X	X	X
	1.2.7 Establish aquaculture organisation/technology platform			X	X	
Strategic Objective 3	**1.3 Increased contribution of aqua production to national fisheries outputs**					
Actions	**1.3.1 Establish Aquaculture Zones**					
	1.3.1.1 Perform the physical selection process	50	X	X		
	1.3.1.2 Establish management structure		X			

	of the AZ's					
	1.3.1.3 Raise awareness of the AZ - concept and opportunities	5	X	X	X	X
	1.3.2 Establish quarantine/import facility for juvenile marine fish					
	1.3.2.1 Develop business plan, investment and operational budget	20	X	X		
	1.3.3 Establish marine fish hatchery	500		X	X	
	1.3.4 Establish AZ Companies			X		
	1.3.4.1 Develop business plan, investment and operational budget - financing					
	1.3.4.2 Establish management/company structure			X		

2.2 Phase 2 (2017-2020): Production volume development in the aquaculture zones and the first corporate investors

If Phase 1 is supported in a timely manner with sufficient, appropriate funding, all of the outputs could be achieved by the end of year 4. However, the reality could be different.

Phase 2 of the strategy describes the actions to be undertaken assuming aquaculture production has already been launched, mainly by new cluster farmers using AZCs' common farming infrastructure facilities and the extension services of the demonstration farms.

If Phase 2 is successful, aquaculture development would have taken up and expansion of the facilities would continue in the AZ. During this phase, local corporate investors would be provided with sufficient documentation on the aquaculture business plans and models developed to enter into the sector by capitalising on their competitive edge (finance) for large-volume production.

Sector governance, including monitoring, should be fully developed in this phase, assuming that the sector has developed successfully.

2.1 Providing a robust, enabling and supportive legal and policy framework for the economic and social development of the aquaculture sector

Table 6: Phase 2 actions related to legal and policy framework

		Responsible body
Strategy Axis	2.1 Enabling legal and policy framework	
Strategic Objective	Existence of a robust, enabling and supportive legal and policy framework	
Actions	2.1.1 Develop Federal legal framework for aquaculture including directives 2.1.2 Develop directives for granting aquaculture farming licenses to foreign investors (2.1.3 Continue the provision of some incentives for engaging in aquaculture - continuation of action 1.1.3)	DMR (int. consultant) DMR, (MSD, DPP?) DMR, (MSD, DPP?)

2.1.1 Develop Federal legal framework for aquaculture including directives.

Narrative: When the sector is seen to be developing, the AZ management rules/bylaws along with gained experience in aquaculture practises could constitute the foundations for developing comprehensive/full regulations dedicated to aquaculture management of the Federation. Assistance from the FAO could possibly be requested to formalise the laws and directives according to international best practise.

Responsible body: DMR with assistance from legal office of the FAO (or international consultant).

2.1.2 Develop directives for granting aquaculture farming licenses to foreign investors

Narrative: After having assessed the impact on social and food security by the successful development of the aquaculture sector in SKN decisions should be taken on modalities for foreign investment in the sector.

It is common practise in many countries for no foreign investors to be permitted to have majority ownership in the primary production sector (agriculture, forestry, fisheries and aquaculture), as these sectors are considered to be of national, strategic importance. If foreign investments are authorised, it should be decided whether they are allowed as majority or minority shares only (see explanatory remarks regarding corporate investors in section 2.5.2 below).

There should be two separate approval procedures for foreign investors in SKN: one for granting investment licenses and one for farming licenses. The coordination of farming license applications should be monitored by the line department (DMR).

Responsible body: DMR together with Ministry of Sustainable Development and ?Department of Physical Planning of the Nevis Administration

2.1.3 Continue the provision of some incentives for engaging in aquaculture

Narrative: This is not a new activity - the incentives mentioned for Phase 1 such as those also prevailing for fisheries and agriculture sector should be continued (duty free and VAT exemptions on imported equipment, boats, engines, trucks, juveniles and feed) and no sale or profit tax should be taken on business earnings as they all are supporting production output.

2.2 Human Resource Development

Table 7: Phase 2 actions related to Human Resource Development

		Responsible body
Strategy Axis	2.2 Human Resource Development	
Strategic Objective	Skilled, pro-active and committed government workforce and skilled aquafarmers	
Actions	2.2.1 Identify and send candidates abroad for MSc study in aquaculture	Ross University?, CFBC?,
	2.2.2 Develop course modules on aquaculture sector services	Ross University?, CFBC?,
	2.2.3 Transform the demonstration farms into one aquaculture sector institute	DMR, (MSD?, DPP?)
	2.2.4 Initiate a dedicated Caribbean Aquaculture Counselling Group	DMR
	2.2.5 Empower the SKN aquaculture organisation	DMR

2.2.1 Identify and send candidates abroad for MSc study in aquaculture

Narrative: During phase 2, at least four candidates from SKN of which at least two from government sector should be sent abroad to begin MSc education in aquaculture or related topics

Responsible body: ?the Ross University School of Veterinary Medicine and the Clarence Fitzroy Bryant College (CFBC) of St Kitts.

2.2.2 Develop course modules on aquaculture sector services

Narrative: As the sector has started developing, it is recommended to start develop course modules in the Ross University School of Veterinary Medicine and the Clarence Fitzroy Bryant College (CFBC) of St Kitts. Aquatic health management is of course a very important risk mitigation action, and CFBC has already launched an agribusiness course (with an associated degree), which addresses agriculture management in terms of crops and livestock. This programme could eventually be expanded to include aquaculture. Students graduating from such courses could enter large fish farms at production management levels and as well in government, i.e. the DMR.

Responsible body: the Ross University School of Veterinary Medicine and the Clarence Fitzroy Bryant College (CFBC) of St Kitts.

2.2.3 Transform the demonstration farms into one aquaculture sector institute

Narrative: The demonstration farms developed during Phase 1 will continue to serve the interests of the sector development in the Federation through their role in extension and human resource development (ref to activities listed under Phase 1), but they will increasingly get involved in research and development activities, such as:

- Continued development and fine tuning of the SKN Aquaculture Model for marine fish farming.
- Testing new species, feeds and improved technologies

Therefore they will better benefit by achieving the status of an 'aquaculture sector institute', which would increase SKN ability to participate in regional research networking, including sourcing research and development funding.

Responsible body: DMR together with Ministry of Sustainable Development and ?Department of Physical Planning of the Nevis Administration

2.2.4 Initiate a dedicated Caribbean Aquaculture Counselling Group.

Narrative: A weakness of many Caribbean (or little island) countries is their limited human resources, as many of them are too small to hold key expertise in all relevant fields. By creating a coordinating counselling group, local institutions/centres/projects would be recognised for their individual expertise and become centres of excellence which can assist in supporting the development of the region by sharing knowledge and provide training seminars. This is similar to the role that the NACA (Network of Aquaculture Centres in Asia-Pacific) intergovernmental organisation had before in the early development of the aquaculture sector in Asia-Pacific

Responsible body: DMR

2.2.5 Empower the SKN aquaculture organisation

Narrative: The aquaculture organisation or aquaculture technology forum/platform initiated by the DMR during Phase 1 should be empowered by issuing bylaws to represent SKN aquaculture farmers' interests in local political debates as well as in regional, Caribbean organisations.

Responsible body: DMR

2.3 Aquaculture production

Table 8: Phase 2 actions related to developing aquaculture production

		Responsible body
Strategy Axis	2.3 Aquaculture production	
Strategic Objective	Increased contribution of aqua production to national fisheries outputs	
Actions	2.3.1 Expanding the Aquaculture Zones	DMR/DF with MSD and DPP
	2.3.2 Ensure the continuation of the operate of the quarantine/import facility for juvenile marine fish	DMR and AZ Board
	2.3.3 Upgrade the marine fish hatchery	
	2.3.3.1 Design, construction and four months of onsite training	DMR and Aquaculture Sector Institute
	2.3.4 Expanding or close down the AZ Companies	DMR/AZ Board with MSD and DPP

2.3.1 Expanding the Aquaculture Zones

Narrative: If by this time the production volume has reached the maximum carrying capacity of the AZ's, it should be considered to expand dedicated areas. However the need for expansion should be appraised closely to the market demand assessment for aquaculture products as well as the impact of the entrance of corporate investors in the sector. These may look for establishing their productions on private land instead of inside the AZ's

Responsible body: DMR/DF together with Ministry of Sustainable Development and Department of Physical Planning of the Nevis Administration

2.3.2 Ensure the continuation of the operation of the quarantine/import facility for juvenile marine fish

Narrative: A quarantine facility is needed if SKN is to keep its status as a 'protected (disease free) zone' and as long as imported marine fish juveniles are the main stocking resource. However as the volume of the imported juveniles would have increased substantially in phase 2 this function should be considered to be privatised to a few companies, licensed and monitored by DMR.

Responsible body: DMR and AZ Board

2.3.3 Upgrade the marine fish hatchery

Narrative: The Southeast Asian-style, extensive, multispecies marine fish hatchery operated by one of the demonstration farms should be transformed to include more intensive (western) hatchery production methods, thus improving biosecurity, production planning and increasing output in particular – within the same area resources.

The upgrading is costly and should be carried out by a private investor having identified the market demand. A small experimental scale hatchery should be kept in operation by the aquaculture sector institute (former demonstration farm)

- **2.3.3.1 Design, construction and four months of onsite training**

Responsible body: DMR and Aquaculture Sector Institute alternatively private company

2.3.4 Expanding or closing down the AZ companies.

Narrative: The role of the AZC's during Phase 1 was to provide and administrate infrastructure for the cluster farmers. This 'smart' mean of providing infrastructure investment to the farmers enabled also to make sure at the same time that the chosen solutions were technically well planned and feasible.

The future of the AZC's would depend on how important their role is for the cluster farmers. I.e. if the cluster farmers have been successful they would not need to lease all infrastructure elements but would increasingly develop their own ability to purchase many of the (written down) infrastructure elements apart from the previous mentioned common facilities such as the water inlet and outlet. These latter facilities could be taken care of by one of the cluster farmers or the aquaculture zone management (which became the Aquaculture Sector Institute). If the AZCs are involved with any role in the supply chain (ref Action 1.3.4) they should then be privatised. On the other hand if in fact the economic success of the cluster farmers still depends on whether they can lease infrastructure facilities the AZC's should continue or even be expanded into new AZ areas.

Responsible body: DMR/AZ Board together with Ministry of Sustainable Development and Department of Physical Planning of the Nevis Administration

Table 9: Schedule and indicative budget for actions of Phase 2

Phase 2	Production volume development in the aquaculture zones and the first corporate investors	Indicative Budget (EUR '000)	Timing			
			2017	2018	2019	2020
Strategy Objective 1	2.1 Existence of a robust, enabling and supportive legal and policy framework					
Actions	2.1.1 Develop Federal legal framework for aquaculture including directives	80	X	X		
	2.1.2 Develop directives for granting aquaculture farming licenses to foreign investors			X	X	
	(2.1.3 Continue the provision of some incentives for engaging in aquaculture)					
Strategy Objective 2	2.2 Skilled, pro-active and committed government workforce and skilled aquafarmers					
Actions	2.2.1 Identify and send candidates abroad for MSc study in aquaculture	200	X	X		
	2.2.2 Develop course modules on aquaculture sector services		X	X		
	2.2.3 Transform the demonstration farms into one aquaculture sector institute			X	X	
	2.2.4 Initiate a dedicated Caribbean Aquaculture Counselling Group			X	X	X
	2.2.5 Empower the SKN aquaculture organisation			X	X	

Strategy Objective 3	**2.3 Increased contribution of aqua production to national fisheries outputs**					
Actions	**2.3.1 Expanding the Aquaculture Zones**		X	X		
	2.3.2 Ensure the continuation of the operate of the quarantine/import facility for juvenile marine fish		X	X		
	2.3.3 Upgrade the marine fish hatchery					
	2.3.3.1 Design, construction and four months of onsite training	800		X	X	
	2.3.4 Expanding or close down the AZ Companies			X	X	X

2.3 Phase 3 (2021- 2023+): Consolidation Phase, satiation of local market demand

If SKN is successful in developing the sector, production should exceed 1,000 tons after the initial eight years of development, leading to saturation of the domestic and extended domestic market (the cruise liners).

The third phase, during which there may be an expansion into exports, starts when corporate investors may experience some competitive advantages. The cluster farmers may have also appreciated the market challenges. Going into export means being able to deliver predictable, consistent production, which can be achieved through large-volume farming approaches including vertical integration as a major risk reducing factor. Vertical integration includes control from hatching, farming and processing through to direct marketing to major distributors. Quality assurance and certification schemes also need to be developed and monitored according to US FDA or EU standards, or possibly CARICOM standards which may be developed.

During this phase, the presence of an aquaculture sector institute will become essential as the farming challenges will not always be able to be addressed by good management practices and solid experience, as it was possible during the start-up/initial phases. Some challenges may require research to find solutions, and this is when having transformed the demonstration farms into an Aquaculture Sector Institute may prove to be extremely valuable.

2.4 Financing

If donors appreciate the potential importance of aquaculture to SKN, they could finance many of the activities, as the government itself is not in a strong position to do so.

However, government support or credit lines could be made available by allocating public land, for instance, or possibly by issuing loan guarantees for infrastructure constructions to the AZCs.

The tenants/cluster farmers would have to contribute to repaying such loans (credit facility) through their lease fees to the AZCs.

SKN's public assets, such as natural resources, can already be leased to companies, for resort development in the tourism industry, for example. In return for a concession, foreign investors in particular should be encouraged to support corporate social responsibility projects for the benefit of local society under their operating license requirements. Aquaculture development, including

the development of pilot farms and human resources, could be targeted through inclusion in a prioritised list by the government. This is common practise in many countries where larger investors are given access to public natural resources.

2.5 Role of private sector stakeholders

2.5.1 Local corporate investors

During Phase 2, it is anticipated that some local corporate investors will apply for farming license for large-volume farms, having observed the sector development and seen that the SKN Aquaculture Model works. A potential market of 50,000 people cannot consume the production from one large-volume farm (500-1,000 tons), so such investors would have to focus on production for export.

It is expected that the production efficiency of the cluster farmers, with a good training background and good organisation, could compete with that of large-volume farms, particularly as cluster farmers obtain their whole salary or income directly from selling their production, unlike corporate investors who need to make an income to pay staff salaries and to see a profit on the investment itself. It is expected that the cluster farmers will be more competitive in supplying local demand than the large-volume farms as they will probably produce several species of fish, while the large-volume farms will specialize in single species production to achieve the highest efficiencies of scale. On the export market, the large-volume farmers will probably be the most competitive.

During Phase 1, a handful of small, locally invested 'corporate' farms (50-100 tons) could potentially become established within the AZs, in coexistence with the cluster farmers. They would possibly target slightly larger production volumes than the cluster farmers, and not depend on the infrastructure provided by the AZCs.

2.5.2 Foreign corporate investors

Foreign investors might only be attracted to SKN aquaculture for the purpose of obtaining farm sites in the sea, which is a scarce 'commodity' for project developers.

Neither the size of the domestic market nor the availability of skilled workers are competitive edges for SKN aquaculture sector. However, marine farm sites using 'traditional cage' technology will probably become a constraint for future aquaculture development in the tropical Americas, and this could be a reason to look into SKN sites, once investors have understood the seasonal sea cage farming concept.

It is difficult to anticipate when serious, foreign investors will look towards SKN. However, in the present context, it is assumed that this will not be before 2014.

Several approaches have already been put forward by investors, but they seem not to have shown a serious production purpose as they have not addressed the specific challenges of farming in SKN. This would seem to indicate a high risk that such investment projects are designed by 'developers' for the purpose of attracting venture capital based on unrealistic market projections rather than situation analyses and proposals that can be implemented.

If a foreign investor develops a project proposal which is not located in the identified optimal areas for aquaculture as described in the Situation Appraisal Report, but make use of different submersible cage technology in fully exposed offshore areas, the approach should be welcomed as it would not restrict production or opportunities for local farmers.

SKN should however like in other countries such as Vietnam, welcome foreign investment but request that such investors state exactly how many foreigners and how many locals would be employed in the business application.

SKN should only grant permits for foreign staff if they are to occupy key management positions. Other staff should be from SKN and should be trained by the company. This would ensure local job creation.

2.5.3 The role of fishermen in SKN aquaculture development after 10 years

Before embarking on the development of the aquaculture sector, it must be ensured that it would not damage the livelihood of fishermen.

Firstly, the development of the aquaculture sector is fully open to fishermen and their children. Fishermen have already a competitive edge in terms of their skills and prior investments (boats, etc.). However, fishing is a very traditional occupation or lifestyle, and the average age of fishermen is currently 50 years plus, indicating that fishing is not attractive to the younger generation. Aquaculture however may show business qualities which the next generation may be attracted by.

A higher domestic supply of seafood would obviously create competition. However, it is predicted that the consumption of seafood would increase with a higher quality supply of marine fish, and this could possibly push down prices of freshwater fish fillet imports, which could eventually lead to these fish fillets being more competitive against imported chicken broilers. Whether this will actually materialise or not remains to be seen. Nevertheless, especially freshwater fish is predicted/destined to become a more important (food security) protein source worldwide than currently because it can be produced more cheap than other animal proteins. The question however is rather when the freshwater fish will be sold at the same profit margins as chicken broiler.

With regard to marine fish, demersal trap fishermen supply some 20 species of coral reef fish species. In general, these are small or slow-growing fish, and consequently not adaptable for aquaculture production and consequently they will probably keep a premium in the local market.

2.6 Strategy monitoring

It is suggested that the Department of Marine Resources (St Kitts) (and Department of Fisheries (Nevis)) will be responsible for most of the strategy's implementation.

They will have to provide the impetus by implementing the first steps defined in the strategy, notably by providing an enabling environment for the economic and social development of the aquaculture sector, especially through the creation of the aquaculture zones (and Aquaculture Zone Companies), and a public R&D function.

This strategy provides orientations and actions that will need to be updated on a 2-3 year basis, and the action plan outlined here presents some indicators and constitutes the basis for monitoring. It should be updated and refined during the strategy implementation to develop a suitable monitoring and evaluation process. At this stage of the strategy development it is mainly focused on tangible activities for the first phase.

The monitoring body responsible for the implementation will depend on financing – for instance if there is a large share of self-financing, the Ministry of Sustainable Development would likely have the major responsibility for monitoring.

Annex: Action plan for Phase 1 and 2

	Preparation and introduction to aquaculture	Responsible Body	Indicators	Timing							
				2013	2014	2015	2016	2017	2018	2019	2020
Strategic Objective 1	Existence of a robust, enabling and supportive legal and policy framework										
Actions Phase 1	**1.1.1 Review, revise and/or develop legal framework for land and sea based aquaculture**	DMR, other relevant SKN agencies									
	1.1.1.1 Review the legal framework for land and sea based aquaculture	DMR	Detailed review performed by end 2013	X							
	1.1.1.2 Revise and/or develop legal framework for land and sea based aquaculture	DMR	First legal framework for aquaculture into force by end 2015	X	X	X					
	1.1.1.3 Review and confirm legal basis for establishment of Aqua Zones	DMR, MSP, DPP	Detailed review performed by end 2013	X							
	1.1.2 Develop directives to streamline and enable application procedures for granting aquaculture farming licenses										
	1.1.2.1 Establish a 'one-stop-shop' entry point for submitting the applications	DMR, MSD, DPP	Application procedures streamlined by end 2014	X	X						
	1.1.2.2 Make advantageous approval procedures for applications inside AZs	DMR (or AZ board)		X	X						
	1.1.3 Develop incentives for engaging in aquaculture within SKN	DMR, (MSD?, DPP?)	By end 2014 incentives available for aquaculture farmers	X	X						
	1.1.4 Develop regulations/bylaws for Aqua Zones	DMR, AZ board		X	X	X	X				

	Preparation and introduction to aquaculture	Responsible Body	Indicators	Timing							
				2013	2014	2015	2016	2017	2018	2019	2020
Actions Phase 2	2.1.1 Develop Federal legal framework for aquaculture including directives	DMR (int. consultant)	By end 2018 a comprehensive Federal legal framework for aquaculture developed					X	X		
	2.1.2 Develop directives for granting aquaculture farming licenses to foreign investors	DMR, (MSD, DPP?)							X	X	
	(2.1.3 Continue the provision of some incentives for engaging in aquaculture)	DMR, (MSD, DPP?)	By end 2019 directives done for granting aquaculture license to foreign investors					X	X	X	X
Strategic Objective 2	Skilled, pro-active and committed government workforce and skilled aquafarmers										
Actions Phase 1	1.2.1 Arrange study tour for administration to selected countries	DMR	By end 2013 study tour to marine tropical aquaculture area (at least 2 officials)	X							
	1.2.2 Identify key officers to be trained	DMR/DF		X							
	1.2.3 Overseas training for key officers	DMR/DF	By end 2014 at least 2 officers overseas long term training	X	X						
	1.2.4 Training on development of aquaculture policy guidelines	DMR, other relevant SKN administration	Training course for relevant departments by end 2014		X						
	1.2.5 Establish demonstration marine fish farm										
	1.2.5.1 Develop business plan, investment and operational budget	DMR/DF (int. consultant)	Business plan elaborated by end 2013	X							
	1.2.5.2 Decide on management structure	DMR/DF	Performed latest by end 2014		X						
	1.2.5.3 Identify sites for the demonstration farms	DMR/DF, (int. consultant)	Sites identified and approved by end 2013	X							
	1.2.5.4 Design the demonstration farm	DMR/DF, (int. consultant)		X	X						
	1.2.5.5 Construct and commission demonstration farm		Demonstration farms constructed by end 2015		X	X					

	Preparation and introduction to aquaculture	Responsible Body	Indicators	Timing							
				2013	2014	2015	2016	2017	2018	2019	2020
	1.2.5.6 Recruit and educate demonstration farm staff	DMR/DF, local Const. companies	At least 6+ staff recruited and trained by end 2014		X						
	1.2.6 Establish extension service	DMR/DF			X						
	1.2.6.1 Develop curriculum for basic aquaculture training course	DMR, Demonstration farm	Training courses started by end 2014		X	X	X				
	1.2.6.2 Arrange basic aquaculture training courses	DMR, Demonstration farm			X	X	X				
	1.2.6.3 Provide free technical assistance and extension services	DMR, Demonstration farm			X	X					
	1.2.7 Establish aquaculture organisation/technology platform	DMR, Demonstration farm	Aquaculture organisation established latest by end 2015		X	X					
Actions Phase 2	**2.2.1 Identify and send candidates abroad for MSc study in aquaculture**	Ross University?, CFBC?,	By end 2018 4+ students from SKN of which 2+ from government studying MSc					X	X		
	2.2.2 Develop course modules on aquaculture sector services	Ross University?, CFBC?, DMR, (MSD?, DPP?)	By end 2018 at least one school for higher education offers courses in aquaculture					X	X		
	2.2.3 Transform the demonstration farms into one aquaculture sector institute	DMR	Aquaculture sector institute legally established by end 2019						X	X	
	2.2.4 Initiate a dedicated Caribbean Aquaculture Counselling Group	DMR	From 2018 initiatives are taken to develop Caribbean Aquaculture Counselling group						X	X	X
	2.2.5 Empower the SKN aquaculture organisation								X	X	
Strategic Objective 3	Increased contribution of aqua production to national fisheries outputs		By end 2016 Aquaculture contributes at least 450 tons to the fisheries output (by end 2020, 1000 tons respectively)								

	Preparation and introduction to aquaculture	Responsible Body	Indicators	Timing							
				2013	2014	2015	2016	2017	2018	2019	2020
Actions Phase 1	**1.3.1 Establish Aquaculture Zones**	DMR/DF, MSD, DPP (int. consultant)	AZ's established by end 2014								
	1.3.1.1 Perform the physical selection process			X	X						
	1.3.1.2 Establish management structure of the AZ's	DMR, MSD, DPP		X							
	1.3.1.3 Raise awareness of the AZ - concept and opportunities	DMR (int. Consultant)		X	X	X	X				
	1.3.2 Establish quarantine/import facility for juvenile marine fish	DMR or AZ Board (int.. consultant)	Quarantine facility established latest by end 2014								
	1.3.2.1 Develop business plan, investment and operational budget	DMR (int. consultant)		X	X						
	1.3.3 Establish marine fish hatchery	AZ board, DMR/DF, MSD, DPP	Marine fish hatchery established by end 2015		X	X					
	1.3.4 Establish AZ Companies		AZ companies established by end 2014								
	1.3.4.1 Develop business plan, investment and operational budget - financing	AZ, DMR/DF, MSD, DPP			X						
	1.3.4.2 Establish management/company structure				X						
Actions Phase 2	**2.3.1 Expanding the Aquaculture Zones**	DMR/DF with MSD and DPP	By end 2018 the first AZ's have been fully occupied					X	X		
	2.3.2 Ensure the continuation of the operate of the quarantine/import facility for juvenile marine fish	DMR and AZ Board						X	X		
	2.3.3 Upgrade the marine fish hatchery		By end 2019 the first modern marine fish hatchery has been commissioned								
	2.3.3.1 Design, construction and four months of onsite training	DMR and Aquaculture Sector Institute							X	X	
	2.3.4 Expanding or close down the AZ Companies	DMR/AZ Board with MSD and DPP							X	X	X