Seaweed Farming in Mauritius and Rodrigues"

Phase II

Hands-on Training workshop on Seaweed Farming for Stakeholders/fisher groups in Mauritius and Rodrigues

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Consultant Report Submitted to Mauritius Research Council (MRC) under MRC Solicited Research Grant Scheme, CONTRACT NO. MRC/RSO/SW009/02, December 2011

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1 INTRODUCTION

The farming of seaweeds especially Eucheumatoids is an important industry worldwide. In Tanzania, like many other countries, two species of Eucheumatoids - *Eucheuma denticulatum* commercially known as Spinosum and *Kappaphycus alvarezii* commercially known as Cottonii are farmed. The industry has become an important one over the years especially in the Zanzibar Islands contributing well above 90% of total marine exports. With a production of 12,500 MT of dry seaweed annually (Msuya 2011a) seaweed farming is also the second most important industry after tourism in bringing foreign money to Zanzibar. It has changed the life of coastal people engaged in seaweed farming especially women who are the majority of farmers (Pettersson-Löfquist 1995, Msuya 2006a, *more information on seaweed farming in Tanzania can be found in the appended bibliography*).

In August this year a project known as "Seaweed Farming in Mauritius and Rodrigues" was initiated under collaboration between the author of this proposal and the Mauritius Research Council. The project stemmed from the fact that there are geographical similarities between the Zanzibar Islands and the Islands of Mauritius and Rodrigues and also because of the expertise of the author in seaweed farming.

The first phase of the project named "Seaweed Farming in Mauritius and Rodrigues: Capacity Building in Seaweed Farming for Technical Personnel of Mauritius and Rodrigues" was run from 10-24 October 2011. In this phase three trainees from Mauritius and Rodrigues were trained in Zanzibar. The trainees learned several aspects of seaweed farming including how to select a site, farming materials required, monitoring of the farm, harvesting process, post-harvest handling including value addition as well as socioeconomic and environmental impacts.

The second phase of the training which is the subject of this report was on "Hands-on Training workshop on Seaweed Farming for Stakeholders/Fisher Groups in Mauritius and Rodrigues" was implemented in Mauritius from 6 – 20 November 2011.

1.1 Aim

The aim of the second phase was to equip the stakeholders and fisher groups in Mauritius and Rodrigues with knowledge in seaweed farming and to set up experimental farms in the two areas.

1.2 Objectives

1. To train the stakeholders and fisher groups in Mauritius and Rodrigues in aspects of selecting a site for farming, starting a seaweed farm, monitoring, harvesting and post harvesting handling.
2. To establish two experimental farms, one in Mauritius and one in Rodrigues.

1.3 Deliverables

Deliverables of the phase II training were as follows:

1. Trained stakeholders and fisher groups: At the end of the training the stakeholders and fisher groups from Mauritius and Rodrigues were expected to have acquired the basic skills in:
    a. Site selection for seaweed farming
    b. Identification of planting material
    c. Setting up of experimental seaweed culture plots including:
        i. mounting of farming structures and
        ii. cultivation process
    d. Monitoring of seaweed plots including pests and disease management
    e. Harvesting process
2. Experimental seaweed culture plots established in Mauritius and Rodrigues
3. A training report to be submitted to the MRC for the hands-on training in Mauritius and Rodrigues.

2 THE TRAINING PROCESS

2.1 TRAINING IN MAURITIUS

2.1.1 Day 0, Sunday 6th October 2011-Scoping to identify sites suitable for seaweed farming

The training programme started by scoping different areas to identify sites that are suitable for the experiments. On arrival to Mauritius, scoping for sites was done on Sunday 6th October 2011. The following are sites that were visited:

2.1.1.1 Mahebourg

Scoping started by driving to the South of the Island, in Mahebourg where the site earmarked for pilot farming was evaluated. At the site, recreational activities were going on and there is a walkway where people usually take walks and have picnics (Fig.1). The area has a number of fishing boats showing that it is an active fishing site. Being active in fishing could need negotiations and informing the fishermen about the presence of the farms. However, the area earmarked for farming is situated at a far distance from the passage way of the boats, and is located beyond the islet with red roofs (Fig. 1).

Fig. 1 Mahebourg – a potential site for farming. Note the walk way and recreational activities in the area

2.1.1.2 Old Grand Port

Site two that was evaluated is the Old Grand Port. It has a shallow water area near a sand bank which could be suitable for off-bottom farming (Fig. 2). No fishing boats could be seen in the vicinity and the area is said to be free from fishing activities. There are fish farms at the far end of the site (Fig. 2) which indicates a high possibility of erecting bamboo rafts and floating lines systems for farming seaweed along the fish cages. It is also a potential site for integrating fish and seaweed farming in floating cages and rafts. The area is said to be a collection site for the seaweeds *Gracilaria* and *Sargassum*.

Fig. 2 Old Grand Port, a site earmarked for seaweed farming. Note the shallow water area near the sand bank (upper photo) and the fish cages (lower photo)

2.1.1.3 Grand Sable

The last site to be visited on this day was Grand Sable. It is about 3-4 km from the Old Grand Port site. The water in the area is turbid (Fig. 3). However, Fishermen have indicated that they would like to use the area for farming seaweed. Therefore, more evaluation including analysing water quality is vital. Fish farms are seen from afar (Fig. 3). The shallow water area is followed by a rocky area and then a deep (2m) site which is suitable for the deep water farming (Fig. 3). There are many fishermen in the area showing that the area is active in fishing, but since the farmers will be fishermen then no problem is expected with this shared resource area. Hotels are seen at the far left side which poses no danger of conflict with seaweed farming. The area is located near a private property, a fishermen's property, but the area near the sea with the tall grasses (Fig. 3) can be used to build a seaweed drying facility if the fishermen will agree to that.

Fig. 3 Grand Sable-a site earmarked for farming seaweed. Note the turbid water and the area that can be used for drying seaweed

On completion of the scoping for sites, a debriefing was done in the evening where the consultant met some officials from MRC. Discussion was held on the programme in general and what the expected achievements are, not only of the training but also the proposed seaweed farming industry in Mauritius.

Following the scoping for sites, the programme sessions involved conducting trainings in Mauritius for one week and in Rodrigues for one week. Theoretical and practical approaches were used.

2.1.2 DAY 1, 7 November 2011- lecture on overview of seaweed farming in Tanzania and visit to the experimental farming site

On the first day of the training in Mauritius, a lecture on overview of seaweed farming in Tanzania was given at the Albion Fisheries Centre conference room. The lecture highlighted the following points:

- Nutritional value of seaweeds
- Historical uses of seaweeds in Tanzania
- Background to farming-Collection from the wild
- Initial studies
- Expansion of the farming
- Species farmed in Tanzania
- Seaweed production in Zanzibar, 1990-2010

- Marketing structure
- Seaweed export structure
- Why Farm Seaweeds?
- Importance and benefits of the Industry-socioeconomic impact, environmental impact, challenges
- Initial problems faced
- Common methods of farming Eucheumatoids
- The farming process
- Harvesting
- Post harvest handling
- Drying facilities used in Tanzania
- Selecting a site for farming
- General challenges faced in farming
- Facts about farming seaweed including the fact that it is an additional activity which is not meant to replace the current activities but to complement them and its low impact to the environment
- Recent events & developments worldwide
- Effect of die-off and price differential
- Production trend since occurrence of die-off
- Efforts to combat *Kappa* die-off in Tanzania
- Innovative farming
- Costing for starting a farm
- Example of environmentally severely impacted area -effect of climate change (Study by Msuya and Porter (2009)
- Additional notes-Advantages of the floating lines technique were given as additional notes because of lack of time.

This was a very interactive day as the participants were very eager to learn and to discuss issues that will make the seaweed industry that is starting in Mauritius to be successful as well as sustainable. Concerns, new ideas, and innovative ideas were discussed and agreed upon. The Research Trainees who were trained in Zanzibar were used as training assistants where they were called upon to give their experiences on some issues learnt in Zanzibar including criteria for selecting a seaweed farming site. Fig. 4 shows some lecture sessions at Albion.

Fig. 4 Participants in a lecture and some discussion sessions at Albion Fisheries Centre

In the afternoon the participants were taken for a site visit to the site earmarked for the experimental farm at Albion. Observations on the characteristics of the site keeping in mind the criteria for site selection discussed during the lecture session were made. Hands on activities such as the nature of the sediment, activities of other users at site e.g. fishing and recreational boats, possible social impact and so on were discussed. It was observed that the site, as a seaweed farming site, could be affected by two potential impacts; nutrient discharge from the tanks at the Albion Research Centre and freshwater input from a nearby river during rainy seasons. It was, however, agreed that the site can be used as an experimental one and the results will be used to select other sites and design experimental farms.
Participants came from a number of institutions (Annex i).

2.1.3 DAY 2, 8 November 2011. Collection of seaweed material and planting of seaweed
This day was used for collection of seaweed material for the experimental farm during morning hours. The material was the seaweed *Gracilaria salicornia* collected from Pointe aux Piment in the north of Mauritius Island (Fig. 5). Other seaweeds of interest such as *Padina*, *Ulva*, and *Hypnea* were also identified. The seaweed material was brought back to Albion Centre.

Fig. 5 Collection of the seaweed *Gracilaria salicornia* material at Pointe aux Piment, north of Mauritius

Because of the collection of the material, it was agreed that the seaweed be planted the same day to avoid possible damage or breaking when stored in tanks filled with salt water. Thus, a PVC raft which will be used for the launching of the experimental farm was constructed (Fig. 6). Participants also learnt how to make different types of knots that are used to tie ropes on PVC raft (Fig. 7). At the same time, wooden pegs that were purchased earlier on were sharpened on one side so they can be driven into the sediment. This was followed by preparing nylon ropes (4mm) and tie ties for planting seaweed by cutting them to 5m long pieces (Fig. 8 a&b). Tying the tie ties on seaweed lines using the knots was also learnt and the participants were shown how to estimate the distance between tie ties by using the palms of their hands (Fig. 9a &b). Seaweed was then sorted and tied to the lines ready for planting (Fig. 10a). Three lines containing seaweed were weighed (Fig. 10b) and initial weights were recorded for monitoring the growth rate of the seaweed. The same lines will be weighed twice per month, at low tides, to monitor the growth of the seaweed. On completion of the preparations, the wooden pegs (Fig. 11a) and the seaweed

lines were taken to the seashore where the seaweed was planted to make an off-bottom farm at the Albion Centre (Fig. 11a&b).

Fig. 6 A constructed PVC raft and participants tying anchor lines on the raft

Fig. 7 Participants learning to make different types of knots

Fig. 8a Preparing nylon ropes

Fig. 8b Preparing tie ties

Fig. 9a Learning how to estimate the distance between tie ties and a participant using his palm to estimate the distance

Fig. 9b Tying tie ties on nylon ropes

Fig. 10a Sorting seaweed material and tying seaweed on nylon ropes

Fig. 10b Weighing some lines of seaweed for monitoring growth rate

Fig. 11a Preparing for an off-bottom farm

Fig. 11b Planting an off-bottom farm

2.1.4 DAY3, 9 November 2011-lecture on other methods of farming & value addition and continued implementation of the experimental farm

On Wednesday, the third day of the training, 9 November 2011, a lecture on other methods of farming seaweed and adding value to seaweeds based on examples from Tanzania was given during morning hours. The day started by a recap of the lecture on the previous day focussing on differences between shallow and deep water farming giving a matrix of criteria for comparison of off-bottom and floating lines methods. Materials needed to construct a 20 × 10 m deep-water floating lines system and a 5 × 5m bamboo raft were discussed. An exercise was conducted where discussions were held on why we should farm seaweed, how to select a seaweed farming site and how to monitor a seaweed farm. The discussion notes are shown in annex ii.

After the recap the lecture covered the following topics:

- Methods of farming leafy seaweeds such as *Ulva* and *Hypnea*
- Value addition -Processing in Tanzania (for value added products) done under the Zanzibar Seaweed Cluster Initiative-ZaSCI (www.secitz.com) showing:
    - Production of seaweed soap
    - Examples of seaweed value added products
    - Existence of shops to sell seaweed value added products in Zanzibar and
    - The Seaweed Centre in Paje-East coast and it Facilities
- Some studies on practical aspects of seaweed farming in Tanzania

- Effects of cultivation duration, seasonality, nutrients on seaweed growth and carrageenan (cg) properties (Msuya and Kyewalyanga 2006),
- Effects of air temperature and rainfall (Msuya and Kyewalyanga 2010)-When should farmers produce more?
- Effects of stocking density, and nutrients on growth cg properties (Msuya and Salum, 2005, 2006)-Which is the best density?
- Effects of (i) air temperature, rainfall, and wind on carrageenan properties (ii) seagrasses on growth and cg properties of the seaweeds in Zanzibar, Tanzania (Msuya and Salum 2006, 2007)-When should farmers produce more?
- Growth rates-floating lines vs. off-bottom (Msuya et al. 2007)-Combat die-off, increased production
- Seasonal calendar of farming cycles (Msuya 2011b)
- Impact of changes in environmental conditions (climate change)-Msuya and Porter (2009)
- Environmental impact (after effect!) study (Msuya et al. 1996)
- Socioeconomic impact study (Shechambo et al. 1996)

The day, just like the first one, was a very interactive day with discussions and comments. The Research trainees were again used as training assistants sharing their experiences while in Zanzibar.

In the afternoon, the session of implementation of the experimental farm continued. Following the discussions, some participants collected seaweed material while the others constructed a second bamboo raft. On the arrival of the seaweed material at the training venue, the participants sorted the material and tied it to the raft. Just like the previous days, each participant took part in the work, some cutting the ropes and tie ties to required lengths, some constructing the raft, and some tying the seaweed. A bamboo raft, 2×2m was constructed and seaweed was planted. Steps used to construct the raft and plant seaweed were as follows:

- Two meter bamboo poles were used for the frame of the raft. The sides of the bamboo raft were tied together by using the 8mm diameter nylon rope
- Shorter and smaller bamboo pieces were tied on the sides to strengthen the rafts using the 4mm ropes (Fig. 12a & b).
- Anchors made of cement blocks were prepared by tying four of them together (Fig. 12c) for use on one side of the raft.
- Anchor lines (12mm rope) were cut to required lengths, in this case 2m.
- Ropes (4mm) were cut to the required lengths, i.e. 2m.
- Seaweed material was sorted and tied to the 2m lines and the lines were then tied on the bamboo raft (Fig. 12d).
- The bamboo raft and the anchors were then taken to the sea for anchorage (Fig. 12 d & e).
- Posters with MRC logo were erected at the experimental site at the beach as markers for the experiments (Fig. 12e).
- Participants then took a group photo with the trainer and MRC officials (Fig. 12e).

Fig. 12a Assembling bamboo poles for construction of a raft

Fig. 12b Construction of bamboo raft. Note also the fixing of side poles to strengthen the raft

Fig. 12c Preparing anchors made of cement blocks

Fig. 12d. Tying seaweed and preparing the raft for anchorage

Fig. 12e Anchoring the bamboo raft, putting buoys & MRC posters to mark the experimental area and participants posing in front of the experimental site with the trainer and research the trainees

2.1.5 DAY 4, 10 November 2011- launching of the experimental farm and planting of more seaweed

This was a day of launching of the experimental farm and planting more seaweed.

a. Launching of the experimental seaweed farm

The launching took place in the morning. The PVC raft which was constructed on day 1 for the launching was used. A thick nylon rope (12mm) was tied on the raft (Fig. 13a) for holding the seaweed lines and the participants learnt how to tie these knots (Fig. 13b). Participants learnt how to tie hooks on the thick rope where the seaweed lines will be attached (Fig. 13c) and the lines were attached to the raft (Fig. 13d). Seaweed was planted as part of the launching activity. Two Ministers; Minister of Tertiary Education, Science, Research and Technology, Dr. Rajeshwar Jeetah and Minister of Rodrigues and Fisheries, Mr. Nicolas Von Mally, launched the experimental farm.

Fig. 13a Tying a thick nylone rope on the PVC pipe

Fig. 13b Participants learning how to tie knots on the thick nylon rope

Fig. 13 c Participants learning how to tie hooks for attaching seaweed lines

Fig. 13c Attaching lines (4mm ropes) on the thick rope

The launching process started with taking the seaweed which was stored in the tanks at Albion followed by sorting the seaweed material, and tying seaweed on nylone ropes (Fig. 14a & b). Anchors made of cement blocks were prepared (Fig.15a) for use in anchoring the raft. The PVC raft with planted seaweed was then taken to the experimental site where the anchors were further prepared (Fig. 15b). Anchors were tied on the raft and the raft was anchored at sea (Fig. 15c & d). The two minsiters participated in the planting and anchorage of the experimental farm (Figs. 15e & f). Some MRC officials were also present (Fig. 15g).

Fig. 14a Collecting the stored seaweed from tanks at Albion

Fig. 14b Sorting and tying seaweed in nylone ropes

Fig. 15a Preparing the anchors made of cement blocks

Fig. 15b Taking the PVC raft to the anchorage site and further preparation of the anchors

Fig. 15c Preparing the PVC raft at sea for anchorage and the anchorage

Fig. 15e Executive Director, MRC participating in the preparation of the PVC raft for the experimental farm

Fig. 15f Ministers participating in the lauching of the experimental farm

Fig. 15g Some pre-launching and launching moments

b. Implementation of experimental seaweed farm

A floating lines system (Fig. 16a) was constructed on the same day of the launching although the seaweed was planted after the launching. The floating system made of nylon ropes only and which measured 2×2m was constructed. Hooks made of the 4mm line were attached on the floating system where seaweed lines will be tied (Fig. 16b). The seaweed was then tied to the lines, the lines tied to the floating system followed by taking the floating system to the beach where floats and anchors were tied to the floating system and the system was anchored at sea (Figs. 16b & c). All the participants took part in the construction of the floating system, tying of seaweed and anchorage of the floating system (Figs. 16a-d).

Fig. 16a Construction of a floating lines system

Fig. 16b Tying hooks and seaweed on the floating lines system

Fig. 16c Taking the floating lines system to sea for anchorage

Fig. 16d Tying floats and anchors on the floating system

2.1.6 DAY 5, 11 November 2011-implementation of experimental farm, evaluation of the experimental farm, summary, discussions, and wrap up

On Friday November 11 2011 the day started by discussions on: what do we need to start a seaweed farm? costing for starting a seaweed farm, and parameters to be measured when

monitoring a seaweed farm. Participants discussed the topics and made a list of what is needed (Fig. 17). These discussion topics are shown in Annex ii.

Fig. 17 Discussion sessions at Albion

This was followed by summarising the training and discussing the “what to do list”, expectations from the farm and who should participate in the monitoring (Annex ii). Many participants expressed their willingness to participate in monitoring the experimental farms. It was agreed that a committee will be formed for the purpose and the list of participants who will be involved in the monitoring will be prepared. It was also agreed that the committee will make a time table where the participants will rotate in the monitoring. A list of parameters to be monitored was made (Annex iii). The participants then took a group photo with the trainer and research trainees (Fig. 18).

Fig. 18 Participants in a group photo with the trainer and research trainees

After the discussion, participants visited the tanks where some seaweed (*Gracilaria*) was kept during the planting sessions (Figs. 19a & b). It was observed that in the tanks that were used for growing seacucumbers there was no aeration. Participants learnt that *Gracilaria* cannot be grown in such tanks without aeration; the seaweed settled at the bottom of the ranks. Other seaweed species of *Hypnea* and *Boergesenia* were seen growing on the walls of the tanks (Fig. 19b). It was discussed that these two are potential seaweed species that can be grown commercially (*Hypnea* had already been identified a potential species by MRC).

Fig. 19a Participants walking to the tanks at Albion

Fig. 19b Visit to the tanks at Albion Centre, *Hypnea* & *Boergesenia* seaweeds that were growing in the tanks

This session was followed by a visit to the experimental site to monitor the experimental farm. On site, the parameters required for monitoring were discussed and the seaweed planted in the bamboo raft was observed to see how it was performing (Fig. 20a). Observations were also made on seaweed planted in the floating lines system and the off-bottom farm. Some participants and research trainees dived to observe the seaweed (Fig. 20b). Thus activity marked the end of the training programme in Mauritius modified to fit the activities in the training (Annex iv). Fig. 21 shows a lunch session at Albion.

Fig. 20a Visit and observation of the experiment at Albion

Fig. 20b A participant and a research trainee dived to observe the planted seaweed

Fig. 21 A lunch session at Albion

2.2 TRAINING IN RODRIGUES

2.2.1 Day 0, Sunday, 13 November 2011, scoping to identify suitable sites for pilot farming

On arrival to Rodrigues, the day 0, Sunday, 13 November 2011 was used for scoping in Rodrigues to identify suitable sites that were already earmarked for pilot farming. The following sites were visited and either evaluated or just discussed from afar.

2.2.1.1 English Bay

This site is mainly for collecting seaweed material. Species like *Gracilaria*, *Hypnea*, *Padina*, *Ulva*, and *Sargassum* were found in this site.

2.2.1.2 Grand Bay

The site has an extended shallow water area as well as deep water area that can be used for both off-bottom and deep water farming. The intertidal is muddy close to the shore to about 100m followed by a sandy area with seagrasses and then the coralline area.

2.2.1.3 Petite Butte

The site has a shallow water area suitable for off-bottom farming and a deep water area suitable for deep water farming. There are two sub-sites that could be used for both farming techniques. However, the water is turbid and intertidal seems to have sediment re-suspension which may not be suitable especially for the off-bottom farming. At the area there is the Fisheries Post where the seaweed material was stored and also the community centre situated at about 150m, the venue of the training.

2.2.1.4 Baladirou

This site is close to Grand Bay and was earmarked earlier on as a potential site for farming. The area was discussed from afar without actual walking along the intertidal. The shallow area is less extensive than Grand Bay and Petite Butte. It is advised here that the area should be scoped with actual walking along the intertidal area to assess the nature of the intertidal.

2.2.1.5 North Bay

It is an area that contains mangroves and has very extended shallow water areas suitable for farming. It has been earmarked for large scale farming. The water seemed to be turbid and thus more evaluation of the site including sampling for water quality should be done. The site was discussed from afar without walking along the intertidal area.

Some of these sites are shown in Fig. 22. It is important that full evaluation of the sites including the nature of the intertidal-whether muddy, has sediment re-suspension etc coupled with evaluation of the water quality be done before the areas are used for farming seaweed.

Fig. 22 Some of the scoped areas for seaweed farming

Owing to the fact that the first day of training was to be used for launching of the workshop, it was decided that the seaweed material be collected on this day for use in the launching. Therefore, the seaweed material was collected from the English Bay and stored at the Fisheries Post in Petite Butte (Fig. 23). The species that was collected was *Gracilaria*.

Fig. 23 Keeping the seaweed material at the sea area of Petit Butte Fisheries Post

Modifications on the training programme

Due to the fact that most participants in Rodrigues were from the fisherfolk (Annex v), more modifications were made on the programme to suite the interest of the participants. Even the materials/topics of the lectures were modified accordingly. Also starting with launching on the first day resulted in changes in the training programme which was changed to suite the activities of the training period. A modified version of the training programme is shown in Annex vi.

2.2.2 DAY 1, 14 November 2011, Launching of the workshop, construction of bamboo raft and planting seaweed

The first day of the training was used for launching the training workshop. The launching process started with briefing at the Community Centre in Petite Butte (Fig. 24). The guest of honour on the launching was the Minister for Fisheries, Mr. N. Von Mally. Also present in the launching were the Departmental Head of the Rodrigues Regional Assembly, the Chief Commissioner of Fisheries in Rodrigues, the Police Officer responsible for Protection of Fisheries Department in Rodrigues, and Dr. Madhvee Madhou from MRC Mauritius office (Fig. 24).

Fig. 24 Launching of the workshop at the Community Centre in Petit Butte, Rodrigues

In consequence of the fact that preparations for the launching were made on the previous day, i.e. collection of the seaweed material, a bamboo raft (5×5m) was constructed for the launching. The raft was made by joining 5m long poles to make a square frame by using the 4mm rope. Smaller, shorter bamboo poles were tied on the sides of the raft to strengthen it (Fig. 25). The 4mm rope for tying seaweed was cut into 5m pieces and some seaweed was tied into the ropes and the tie ties were cut into required lengths (Fig. 25). These preparations were done early in the morning so as to be ready for the launching.

Fig. 25 Construction of a bamboo raft for launching

On arrival of the guest of honour the participants gathered at the Community Centre venue for the briefing. After the briefing, the raft was then taken to the seaside for the launching. This was done by walking from the Community Centre to the seaside (Fig. 26a). At the site, the Minister launched the workshop by participating in tying the seaweed into the lines and then taking the raft with planted seaweed to the anchorage site (Fig. 26b). The raft was kept in the water to avoid drying up of the seaweed by tying it to a boat anchor (Fig 26c) and then the participants prepared the anchors and tied more seaweed.

Fig. 26a Carrying the bamboo raft from the workshop venue to the seashore in Petit Butte, Rodrigues

Fig. 26b Launching of the seaweed farming project in Rodrigues with Minister of Rodrigues & Fisheries and the Commissioner of Fisheries in Rodrigues

Fig. 26c Keeping the bamboo raft with planted seaweed in the water

The afternoon of the launching day was used for tying more seaweed on the raft and anchoring the raft. All the participants worked at the anchorage site, tying ropes on the raft and tying seaweed on the ropes. Anchors made of cement blocks were prepared by attaching the anchor lines (6mm rope) to the anchors. Unlike in Mauritius, the cement blocks had already been paired by attaching two together by using cement as the binding material (Fig. 27). More seaweed was tied to the ropes to fill the bamboo raft and replace some seaweed that dried up during the launching process. When all the lines had been filled with seaweed, the raft and anchors were placed in a boat and taken to the anchorage site where the raft was anchored by tying the anchors to the raft. Anchorage was done by diving where some of the participants, the MRC official in Rodrigues, and the research trainee based in Rodrigues dived to anchor the raft (Fig. 28a). Some participants lead by the trainer worked from the boat by lowering the anchors to the water and giving the lines with seaweed (which had not been tied to the raft yet) to the divers. While some participants anchored the raft, others prepared ropes for planting seaweed the next day by cutting 5m long ropes and tying-in the tie ties (Fig. 28b).When the bamboo raft had been anchored and all the seaweed planted, the team returned to the shore for further discussions and wrap up of the day (Fig. 28c).

Fig. 27 Handling the anchors made of cement blocks and taking a boat to the anchorage point

Fig. 28a Anchorage of the bamboo raft by diving at sea in Petit Butte Fisheries Post seafront

Fig. 28b Preparation of ropes and tie ties for planting seaweed at the Petit Butte Fisheries Post seafront

Fig. 28cA discussion session after anchoring the bamboo raft at the Petit Butte Fisheries Post

2.2.3 DAY 2, 15 November 2011-Lecture on overview of seaweed farming in Tanzania and construction of bamboo raft and floating lines system

On the second day, November 15, 2011, the training started with a recap of the activities of the first day. This was because as shown above, the first day was used for launching of the seaweed farming workshop. The discussion involved the following topics:

- That the participants have seen one method of farming- the bamboo raft method
- That the participants have seen and learnt a bit about how to tie knots

- That the participants have learnt how to tie seaweed seed, and
- That the bamboo raft is one method of farming seaweed and that the participants will learn other methods.

After the recap a lecture on overview of seaweed farming in Tanzania was given (Fig. 29). The main topics of the lecture were:

- What is seaweed?
- Types of seaweeds
- Nutritional value of seaweeds
- Historical uses of seaweeds-traditional uses of seaweeds in Tanzania
- Background to farming-Collection from the wild
- Initial studies
- Expansion of the farming
- Seaweed production in Zanzibar, 1990-2010
- Marketing structure
- Seaweed export structure
- Why Farm Seaweeds?
- Importance and benefits of the Industry
- Initial problems faced
- Methods of farming Eucheumatoids
- The farming process
- Harvesting
- Post harvesting
- Selecting a site for farming
- General challenges in farming
- Facts about farming seaweed e.g. that it is conducted as a part time activity-farmers can do other things and that it has minimal impact to the environment.

EXTRA NOTES

The rest of the lecture material i.e. Recent events & developments, Challenges, Effect of die-off and price differential, Efforts to combat *Kappa* die-off in Tanzania, and an example of impact of effect of climate change, were given as extra notes specifically for the MRC officials in Rodrigues and other interested participants.

In the afternoon, the participants continued with the practical work. A second bamboo raft (also 5×5m in size) was constructed (Fig. 30a). Ropes were then cut into required lengths and attached to the raft (Fig. 30a &b). After the construction of the raft participants walked down to the experimental site at the Fisheries Post for discussion and wrap up (Fig. 30c).

Fig. 29 Lecture session on seaweed farming in Tanzania

Fig. 30a Construction of the second bamboo raft

Fig. 30b Preparation of ropes and tying ropes on the bamboo raft

Fig. 30c Discussion session at the Fisheries Post in Petit Butte

2.2.4 DAY 3, 16 November 2011-Collection of seaweed material and implementation of the experimental farm

The third day of the training, Wednesday 16th November 2011, was used for collection of the seaweed material and planting seaweed in the bamboo raft and the floating lines system constructed the day before. Seaweed material was collected from the English Bay (Fig. 31). Two species, *Gracilaria* and *Hypnea* were collected and brought to Petite Butte, the sorting site.

Fig. 31 Participants preparing to go to the sea to collect seaweed material

At Petit Butte, the seaweed material was sorted for planting (Fig. 32a). The sorted seaweed that was found to be good for planting i.e. with long fronds that could be tied and not bleached was tied on ropes (Fig. 32b) and the ropes were then tied to the bamboo raft and floating lines system. Anchors made of cement blocks were prepared by tying the anchor lines on the blocks. On completion of the preparations, the bamboo raft and the floating lines system were taken to the sea site where tying of seaweed continued (Fig. 32c). The anchors were loaded on a boat and taken to the anchorage site where they were tied to the raft and floating lines system by using the anchor lines. Anchorage was a collaborative work, some participant working from the boat by handing over the required accessories such as buoys to the divers to tie (Fig. 32d). The floating lines system was placed at a slanted position as a way of comparing the performance of the seaweed and the floating lines system itself e.g. resistance to waves and wind and growth rate. This was an idea put forward by the research trainees and it was supported by the trainer and trainees were enlightened on this aspect. The planting was done such that both species were planted in both the devices (the seaweeds were tied on different lines and the lines were tied on both devices i.e. each device contained lines of *Gracilaria* and lines of *Hypnea*.

When conducting the anchorage of the devices, the participants also weighed three lines of *Gracilaria* and three lines of *Hypnea* from each of the two devices to be used for monitoring the growth rate of the seaweeds.

Following the completion of the anchorage session, participants returned to the workshop venue for discussion regarding the work for the next day (Fig. 33). It was agreed that on the next day, participants will be working in three different groups for collecting seaweed, preparing the wooden pegs, and preparing the ropes for planting seaweed.

Fig. 32a Sorting seaweed material at Petit Butte Fisheries Post seafront

Fig. 32b Tying the sorted seaweed into ropes

Fig. 32c Taking the bamboo raft and floating system to the sea and tying more seaweed

Fig. 32 d Anchorage of the bamboo raft and floating lines system

Fig. 33 Discussion and wrap up of the day at the workshop venue

2.2.5 DAY 4, 17 November 2011, Implementation of experimental farm

On day 4 of the training, i.e. Thursday, 17th November 2011, according to the discussions on the previous day, the participants were divided into 3 groups for:

1. Collection of seaweed
2. Preparing ropes
3. Preparing (sharpening) pegs

Thus, some of the participants collected more seaweed material and brought to the Community Centre while some participants prepared the ropes (4mm), tie ties and wooden pegs (Fig. 34a, b, c, d) for planting seaweed to make an off-bottom farm. When the seaweed collecting group was back with the seaweed material (Fig. 34e) and the ropes and pegs were ready, all the prepared items were taken to the Petit Butte experimental site for planting.

Fig. 34a The rope preparation group; preparing ropes

Fig. 34b The rope preparation group; tying tie ties on ropes

Fig. 34c The wooden pegs preparation group; carrying the pegs to the sharpening point

Fig. 34d The wooden pegs preparation group; Sharpening the pegs

Fig. 34e The seaweed collection group bringing seaweed to the workshop venue

The participants carried the items and walked to the experimental site, the Fisheries Post (Fig. 35a). On arrival to the experimental site the seaweed material containing both *Gracilaria* and *Hypnea* was sorted. This was done at the other side of the lagoon (left side of the previous site, Fig. 35a). The sorted seaweeds were then tied to the ropes (5m long, Fig. 35b). Planting to make the off-bottom farm was done on the other side of the lagoon. Trial replication to the same area where the deep water devices were placed failed because the substratum is rocky and the wooden pegs could not be driven into the sediment (Fig. 35c).Sometimes the bottom was hard and a hammer was used to drive the pegs to the sediment (Fig. 35d). ***Note:*** *The water at Petit Butte is very turbid (see Fig. 35d); the seaweed in the off-bottom farm can hardly survive. The research trainees and participants were advised to look for an area further into the deep water and leave few lines only at the off-bottom site for observation.*

Fig. 35a Carrying the pegs, ropes, and seaweed to the Petit Butte experimental site

Fig. 35b Tying seaweed on ropes for off-bottom farm

Fig. 35c Trial planting of seaweed to make an off-bottom farm; the substratum was rocky, off-bottom farm placed on the other side of the bay

Fig. 35d Planting seaweed to make an off-bottom farm, Petit Butte, Rodrigues

2.2.6 DAY 5, 18 November 2011 Lecture on value addition, summary, discussions, and wrap up

2.2.6.1 Lecture on seaweed value addition, summaries, and discussions

The last day of the training, Day 5, November 18, 2011 was used for a lecture on seaweed value addition, summaries, discussions and wrap up of the training programme. The day started by assignments given to the participants on criteria for selecting a farming site, materials needed to make a bamboo raft, a floating lines system, and to start an off-bottom farm. This was a discussion session where all the participants were required to air their views and give ideas on the topics. The exercises were as follows:

- **What do you need to start a seaweed farm?**
- **What are the differences between deep water farming and shallow water (off-bottom) farming?**
- **What problems do you think you can encounter when farming seaweed?**

The answers of the participants were compared with a list prepared earlier on by the trainer and the two lists were discussed in parallel. An example of the discussion listings is shown in Fig. 36.

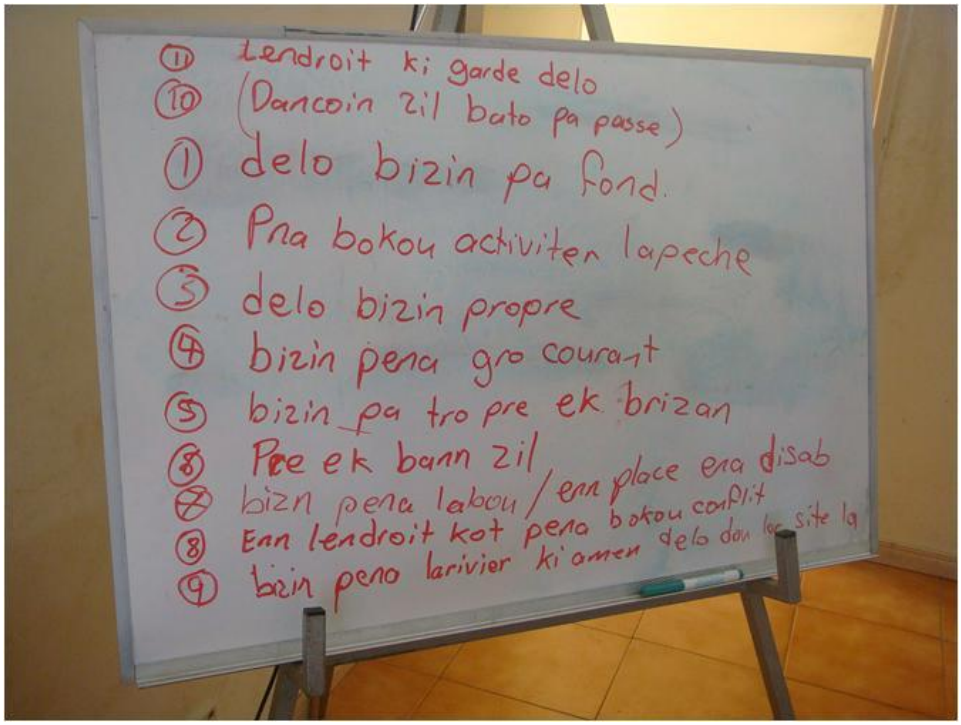

Fig. 36 An example of a list of some discussed issues

Also because the participants were eager to start farming seaweed it was important to let them know that what we planted so far are experiments and that they should start farming after the results. OR if they want to start farming they should collaborate with the MRC officials there in Rodrigues who can lead them on where and how to start farming. Thus the following topics were also discussed:

- That these are experiments and that they will be informed of the results

- The importance of keeping records which will help to know what is happening: On this it was decided that the participants will be trained later on how to keep records-keeping a logbook.
- Monitoring the experiments

The exercise and discussions took the morning hours until tea break.
After the tea break, the lecture on seaweed value addition was given. Topics covered in the lecture were:

- Other methods of farming leafy seaweeds which cannot be tied like *Gracilaria* e.g. *Ulva*
- Processing in Tanzania (for value added products) done under the Zanzibar Seaweed Cluster Initiative-ZaSCI- www.secitz.com
- Production of seaweed soap as the first product to be produced by seaweed farmers in Tanzania through ZaSCI
- What do we need to produce seaweed soap?
- Examples of seaweed value added products
    - Dry seaweed
    - Seaweed powder
    - Seaweed soaps
    - Seaweed Vaseline
    - Seaweed Massage oils
    - Seaweed Food products
        - Seaweed Cake
        - Seaweed Cookies
        - Seaweed Juice
        - Seaweed Jelly
        - Seaweed Jam
        - Seaweed Fruit Pudding
- EXTRA NOTES-The rest of the lecture material e.g.
    - Matrix of criteria for comparison of off-bottom and floating lines methods for the farming of seaweeds,
    - scientific aspect of value addition,
    - shops for selling value-added products,
    - machinery for soap production,
    - the Seaweed Centre, and
    - some studies on practical aspects of seaweed farming in Tanzania

was given as extra notes for the interest of the MRC officials and any other interested party.

On completion of the lecture, the participants were taken to the experimental site to observe the state of seaweeds that were planted the previous day. Some participants took a boat to the anchorage point while others waited at the shore. On the return of the participants who visited the anchorage point, discussions were held on the state of the seaweed and related issues. It was observed that the seaweed was in good conditions although few branches that were probably tied loosely were lost and that there was sediment deposition on the seaweed fronds. Fig. 37a shows the activity of visiting the planted seaweed. Discussions were held at the seafront following the visit (Fig. 37b). Fig. 37c shows a lunch session at the experimental site.

Fig. 37a A visit to the seaweed anchorage point to observe planted seaweed

Fig. 37b Discussions following observation of the planted seaweeds

Fig. 37c A lunch session at the Petit Butte Fisheries Post seashore in Rodrigues

2.2.6.2 Wrap up discussion

Discussions were continued at the workshop venue after the lunch break focussing on any concerns, ideas, and on the lecture on value addition (Fig. 38). Discussion was also held on monitoring of the experiments. Many participants wanted to take part in the monitoring of the experiments, thus, a list of participants who will take part in the monitoring was produced.

Fig. 38 A discussion session on the last day of training workshop

2.2.6.3 Handing over of certificates

After the discussions, a guest of honour, the Commissioner of Fisheries, arrived at the training venue to hand over the certificates to the participants. The handing over of the certificates was officiated by the Departmental Head of Rodrigues Regional Assembly who welcomed the guest of Honour. All the participants received certificates of participation (Fig. 39a). The training was concluded by participants taking a group photo with the guest of honour (Fig. 39b).

Fig. 39a Handing over of certificates to participants in Rodrigues

Fig. 39b Participants in a group photo with the guest of honour, Commissioner of Fisheries in Rodrigues

2.3 Extra day, 20th November 2011-Scoping for sites in Mauritius

On arrival back to Mauritius, the day of 20th November 2011 was used for scoping to evaluate more seaweed farming sites that had previously been earmarked. The following sites were visited:

2.3.1 Poste la Fayette

Poste la Fayette is a recreational site with a number of activities by people at the beach area, picnics etc. However, people are not allowed in the water most probably because there are stones in the shallow water. There is a poster with sign that forbids people from going into the water thus there is no swimming in the area. Evaluation of the site revealed that there is no river around the area which would bring freshwater to the future seaweed farms. No fishing activities e.g. fishermen, fishing boats etc could be seen in the area and it is said that there are no fishing activities in the area. The area is said to have the native seaweed *Eucheuma*; this will be explored further by MRC including getting the samples for identification. There are mangroves and the potential farming site goes around the mangrove stamp (Fig. 40). Only one hotel could be seen at the far left side (Fig. 40). The proposed farming area is located between the stones and the reef (Fig. 40).

Fig. 40 A potential seaweed farming site, Poste la Fayette

2.3.2 Belle Mare

The area Belle Mare which translates as Beautiful Lake or Beautiful Wetland has a lot of the seaweed *Ulva*. Hotels have to remove the seaweed from the beach each time to keep the area clean for their guests. The seaweed is piled at beach which can be used as fertiliser. According to the research trainee, the fertiliser is said to be very good. This site is said to contain the longest beach in Mauritius. Hotels were seen at far left and right. The site is used for collection of shellfish; people were seen collecting the shelled animals for food, fish bait and so on. Some

fishing activity by using hook and line were seen. This indicates that there are no fishermen who fish with nets and is a good sign that there will be minimum resistance/ interference from fishermen. In the area there is also a prayer site for fishermen. The area has many stones (Fig. 41) and the potential site is located after stones towards the open sea. The seaweeds *Ulva* and *Sargassum* were seen and it is said that in seasons also *Cladophora* is found in this site.

The plan to use this area for farming seaweed needs just discussion with hotel owners so that they will know that seaweed is farmed here-no resistance or interference from the hotels is expected as the hotels are far from the potential site (Fig. 41). The potential site has a large and extensive space to be used for farming (Fig. 41).

Fig. 41 A potential seaweed farming site, Belle Mare

2.3.3 Palmar Beach

Palmer Beach is located in Belle Mare area towards the south. There are two gates only through which fishing boats can pass to and from the site (Fig. 42). Stones are found everywhere in intertidal area of the shallow lagoon (Fig. 42). No swimming activities take place in the area. Only one swimmer was seen but it was decided that the swimmer was rather cooling his body because the day was hot than actual swimming for pleasure-he was swimming very near to the beach (Fig. 42). Lots of *Ulva* are present here making the stones slippery. According to the research trainee, this could be the reason why people do not swim here. Some limited fishing activities were seen-few boats, hook and line fishers. The intertidal area has stones and after stones the depth is ~2m and it is the potential area for farming.

Fig. 42 A potential seaweed farming site, Palmar Beach

2.3.4 Recommendation on scoped farming sites

As mentioned several times in the report, the scoping for sites involved looking at sites from afar. In only one site the trainer and research assistants walked along the intertidal but no thorough evaluation was conducted. It is important that full evaluation of the sites including the nature of the intertidal be conducted as most sites have a problem of sediment resuspension which is not good for farming seaweed. The substrate evaluation should be coupled with studies on water quality seaweeds are planted before the areas are used for large scale farming. Alternatively seaweeds could be farmed in deeper waters than the depths where experimental farms are placed.

2.3.5 Debriefing in the evening

In the evening of the same day, Sunday 20 November 2011, there was a debriefing with MRC Senior Staff. Discussions were held on e.g. how the training went in Roddrigues, how the experiment is going on in Mauritius, and future work in the seaweed farming experiments and pilot farms.

3 ACKNOWLEDGEMENT

I would like to thank The Mauritius Research Council for arrangements on all matters related to the consultancy that made the work enjoyable and their cooperation throughout the consultancy period. I would specifically like to mention the names of Dr. Arjoon Suddhoo (the MRC Executive Director), Dr. Madhvee Madhou, Mrs Poonam Veer Ramjeawon, Mr. Diwakar Gangapersad all at the MRC Mauritius office in Mauritius. Likewise The MRC Research Trainees- Ms Chitra Ramphul, Mr. Joseph Jean Maurice Ravina and Mr. Koushul Narrain are thanked for their help in field work and in the training sessions as training assistants. In Rodrigues I would like to mention the name of Mr. Sylvio Perine, an MRC officer. Thanks go to all the participants of the trainings in Mauritius and Rodrigues as listed in Annexes i and v for their cooperation throughout the training programme. My thanks also go to all other people who worked hard in one way or another to make the training programme successful. Finally I would like to thank my employer, the University of Dar es Salaam Tanzania.

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5 ANNEXES

4.1 Annex i, List of participants in the training in Mauritius

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4.2 Annex ii, Discussion topics and outcome

A. What do we need in order to farm Seaweed?

- Property/species
- Market
- Cost of production
- Site for Farming
- Seed Material (Quantity and Quality)
- Policies/Regulations
- Acceptance
    - Willing news - by local community
- EIA – Baseline Data
- Criteria for selection of farmers
- Diversification of industry
- Investment
- Farming Materials
- Security for the farm

SITE SELECTION

POSITIVE	NEGATIVE
Water current/good flushing	Muddy in rainy season
Temperature	Vicinity of hotel/fishing and boat activities
Sandy bottom	River mouth – concerns on salinity
Velocity of water	
Water quality	

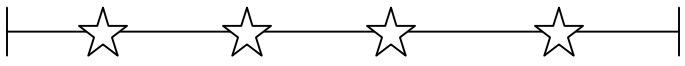
TO DO LIST

Monitor salinity
Monitor water currents
Investigate biodiversity (wild *Ulva* ?)
Chemical parameters and physical parameters

Salinity (monitor more frequently) – pH
Temperature – DO
Growth rate – weigh the lines
Nutrients – NH_4, NO_3 PO_4

Seaweed growth rate

- Monitoring every 2 weeks – at least 2 months
- Compare the techniques



10 branches

- Lost branches!

Observations

- Rain
- Strong winds – cyclone
- Vandalism – ropes stolen, seaweed broken etc……
- Too hot weather
- No water mixing – too clam

ROPE 12mm : MUR 2,300
[220m]

Raffia: Rs 15 x 4

Rope 4mm (100m) = Rs 400 x 2
Rope 8mm (220m) = Rs 950
PVC pipe ¾ inch + fittings = Rs 859
Block (concrete) + transport = Rs 1,500
Bamboo = free?? – can also cost!

↓

Transport Rs 500

Expectations from the Farm

- High prospects
- Upgrade the material used in the farm
- Aim for land-based integrated farming
- Aim for high production
- One Exp farm not enough, need to have in other sites
- Collect all data (temp, salinity etc……)
- Collaborate with other institutions for instrumentation
- Need for replicates in the dame site
- Update on legislation/Regulations to
    I. s/w farming activity
    II. destruction of raft

Additional Players

- Ministry of outer Islands
- Ministry of Business and Cooperatives
- MSB
- Ministry of Agro-Industry

4.3 Annex iii, Parameters to be monitored

Samples

Branches

1. Number (quantity)
2. Weight

Sea Medium

1. Salinity
2. Temperature
3. pH
4. Dissolved oxygen
5. Dissolved Nutrients (NH_4, NO_3, PO_4)
6. Current
7. Turbidity

Meteorological Data (seek data available)

- Meteorological Station
- MSIRI

Time Frame -Observations (Readings to be taken)

- Daily
- Fortnight (seaweed growth)

Environmental factors (e.g. cyclone, bad weather)

1. rain
2. strong winds
3. cyclones
4. too hot weather
5. too calm – no water mixing

Social factors

1. Vandalism
    - Ropes stolen
    - Seaweeds broken …..
2. Disturbance to the public
    - Visual
    - Physical
    - Space
3. Security of the public from the farm
4. Legislation for seaweed farming
5. Ensuring permits/ clearances/ security from Ministry of Housing & Lands, Beach Authority, Fisheries, Police/NCG
6. Empowerment of women – SMEDA & EM

Equipment Required

1. Refractometer (to measure Salinity)
2. Conductivity meter (to measure conductivity)
3. Thermometer
4. pH-meter
5. DO meter
6. Nutrient analysis-spectrophotometry (available at UoM)
7. Assized Spring balance (mechanical)
8. Secchi disc (turbidity)
9. Ice box
10. Aquatic (under water) camera

Experiment

1. Replicates at Albion
2. Replicates at 2 more sites (minimum)
3. Collection of data
4. Maintenance of log book

Statistical analysis to be carried out

- Expertise available at MSIRI (Biometry/IT section)

Regular cleaning of the samples (biodiversity)

- Identification of samples any new seaweed found
- Preservation of samples

Species coming close to the rafts (biodiversity created)

- Fish
- Planktons
- Any other flora and fauna

4.4 Annex iv, The training programme in Mauritius

Date	Activity	Venue	Responsibility
PROGRAMME FOR MAURITIUS			
5 November 2011 Saturday	Arrival and hotel check in Mauritius KENYA AIRWAYS - KQ 1535 at 1755 hours		Dr. Msuya MRC (Admin)
6 November 2011 Sunday	Scoping in Mauritius to identify suitable site for pilot farm (Full day) Briefing session with Senior Staff (evening)		Dr. Msuya MRC
TRAINING PROGRAMME IN MAURITIUS			
DAY 1, 7 November 2011 Monday	**Morning:** Lecture & Discussions: • Overview of seaweed farming in Tanzania- history, development, importance of industry, socioeconomic impact, environmental impact, challenges. • How to select a farming site. Example of environmentally severely impacted area • Farming methods for Eucheumatoids/farming materials/ innovative farming/costing for starting a farm **Afternoon:** Site visit for experimental farm & hands on activities-observing site characteristics	Albion Fisheries Research Centre (AFRC)	Dr. Msuya MRC
DAY 2, 8 November 2011 Tuesday	**Morning:** Collection of Seaweed Material for the experimental farm **Afternoon:** **planting of seaweed**	AFRC	Dr. Msuya MRC
DAY 3, 9 November 2011 Thursday	**Morning:** Lectures on other methods of farming e.g. Ulva, Hypnea and Seaweed innovation-value addition Implementation of **Afternoon:** Implementation of Experimental Seaweed Farm	AFRC	Dr. Msuya MRC
DAY 4, 10 November 2011 Wednesday	**Morning:** Launching of the Experimental Seaweed Farm **Afternoon:** Implementation of Experimental Seaweed Farm	AFRC	Dr. Msuya MRC

DAY 5, 11 November 2011 Friday	Implementation of Experimental Seaweed Farm Summary, discussions, and wrap up	AFRC	Dr. Msuya MRC

4.5 Annex v, List of participants in Rodrigues

S/N	Name
1.	Mr. Joseph Jasmin RAPHAEL SIROUX
2.	Mr. Jean Bernardin MEUNIER
3.	Mr. Christian MOMUS
4.	Mrs. Ancilla CLAIR
5.	Mr. Jean Merlin JAMEER
6.	Mr. Jacques Desiré Laval CLAIRE
7.	Mr. Joseph Aurélio SPEVILLE
8.	Mrs. Dalila HALL
9.	Mrs. Rolana VOLBERT
10.	Mr. Gabriel AGATHE
11.	Mr. Jaquelin LEGOFF
12.	Mr. Laurence MARIANNE
13.	Mr. Sylvio MOMUS
14.	Mr. Jimmy PRUDENCE
15.	Mrs. Arline MOMUS
16.	Mr. Johnson SAMOISY
17.	Mr. Josias LEGENTIL
18.	Johny MALBROOK
19.	Mr. Louis Mariano LEGOFF
20.	Mr. Jacques PRUDENCE
21.	Mr. Jean Claude VOLBERT
22.	Mr. Jean Robert AUGUSTIN
23.	Mr. Pascal PIERRE LOUIS
24.	Mr. Dickson JOLICOEUR
25.	Mr. Jean Noel AGATHE
26.	Mr. Joseph Wilman CASIMIR
27.	Mr. Christian Wilson EMILIEN
28.	Mr. Louis Sylvio BEGUE
29.	Mr. Renaud JOLICOEUR
30.	Mr. Divenson EDOUARD
31.	Mr. Jean Dario BOTTEBELLE
32.	Mr. Marcel BOTTE
33.	Mrs. Clarannese LAROSE
34.	Mr. Joseph Danilo PERRINE
35.	Mr. Josias LEGENTIL
36.	Ms. Richeline RAPHAEL
37.	Ms. Marie Claize EMILIEN
38.	Mr. Jean Marc JOLICOEUR
39.	Ms. Marie Jaimie ERNEST
40.	Ms. Joceline LOUIS
41.	Ms. Joceline POLIMON

42.	Mr. Louiange PRUDENCE
43.	Mrs. Danila POLIMONT ERNEST
44.	Ms. Marie Nicole LEGENTIL
45.	Ms. Bibi Andilena Farida BEGUE
46.	Mr. Yiencidie MARLA
47.	Ms. Mary Jane MALBROOK
48.	Mr. Eric ERNEST
49.	Ms. Marie Danielle POLIMON
50.	Ms. Lina ERNEST
51.	Ms. Brigitte AUGUSTIN
52.	Ms. Henriette BERNADA
53.	Mrs. Charlette LISETTE PERRINE
54.	Mrs. Roselyne MARIANNE
55.	Ms. Marie Veronica ZAMIR
56.	Ms. Vianette MARIANNE
57.	Mrs. Marie Sabrina PERRINE MALBROOK
58.	Mrs. Mariline ADRIEN
59.	Mrs. Marie Lise JOHNY
60.	Ms. Marie Nicette CASIMIR HYPOLITE
61.	Mr. Josias LEGENTIL

4.6 Annex vi, The training programme in Rodrigues

PROGRAMME FOR RODRIGUES			
Saturday 12 November 2011	Departure to Rodrigues		Dr. Msuya, MRC
Sunday 13 November 2011	Scoping in Rodrigues to identify suitable site for pilot farm (Full day)		Dr. Msuya, MRC
TRAINING PROGRAMME IN RODRIGUES			
DAY 1, 14 November 2011 Monday	**Morning:** Launching of the Workshop **Afternoon:** Construction of bamboo raft and planting seaweed		Dr. Msuya MRC
DAY 2, 15 November 2011 Tuesday	**Morning:** Lecture & Discussions: • Overview of seaweed farming in Tanzania- history, development, importance of industry, socioeconomic impact, environmental impact, challenges. • How to select a farming site. Example of environmentally severely impacted area • Farming methods for Eucheumatoids/farming materials/ innovative farming/costing for starting a farm **Afternoon:** Construction of bamboo raft and floating lines system		Dr. Msuya MRC
DAY 3, 16 November 2011 Wednesday	**Morning:** Collection of Seaweed Material for the experimental farm Implementation of experimental farm		Dr. Msuya MRC
DAY 4, 17 November 2011 Thursday	Implementation of experimental farm		Dr. Msuya MRC
DAY 5,	**Morning:**		Dr. Msuya

18 November 2011 Friday	Lectures on other methods of farming e.g. *Ulva*, *Hypnea* and Seaweed innovation-value addition **Afternoon:** Summary, discussions, and wrap up		MRC
19 October 2011 Saturday	Travel Back to Mauritius Debriefing in the evening		Dr. Msuya MRC
20 November 2011 Sunday	Scoping in Mauritius to identify suitable site for pilot farm (full day) Wrap up & debriefing to Senior Staff in the evening		Dr. Msuya, MRC
21 November 2011 Monday	Departure at KENYA AIRWAYS - KQ 6712 at 0820 hours		Dr. Msuya MRC (Admin)