TCP/MDV/4452
Field document 3

TECHNICAL COOPERATION PROGRAMME

FEASIBILITY STUDY ON FARMING, PROCESSING AND EXPORT OF EUCHEUMA (SEAWEEDS)

LAAMU ATOLL
MALDIVES

BASED ON THE WORK OF

RUBEN T. BARRACA, Sr.
SEAWEED CULTURE SPECIALIST

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

BANGKOK, 1997

TCP/MDV/4452
Field document 3

TECHNICAL COOPERATION PROGRAMME

FEASIBILITY STUDY ON FARMING, PROCESSING AND EXPORT OF EUCHEUMA (SEAWEEDS)

LAAMU ATOLL
MALDIVES

BASED ON THE WORK OF
RUBEN T. BARRACA, Sr.
SEAWEED CULTURE SPECIALIST

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

BANGKOK, 1997

The Food and Agriculture Organization is greatly indebted to the organizations and individuals who assisted in the implementation of the project by providing information, advice and facilities.

TABLE OF CONTENTS

		Page
I.	INTRODUCTION	1
II.	FINDINGS	1
III.	RECOMMENDATIONS	3
IV.	PLAN OF ACTION	4
ANNEX 1	WORKSHOP ON SEAWEEDS PRODUCTION PROPOSED AGENDA OUTLINE	5

I. INTRODUCTION

The Seaweed Consultant was hired by the FAO to assist the Ministry of Fisheries and Agriculture (MOFA) through the Oceanographic Society of Maldives (OSM) in introducing the *Eucheuma* (seaweed) farming technology at Gamu Island, Laamu atoll, Maldives.

Several prior attempts to introduce seaweed fanning in the Maldives had failed, mainly due to the problem of fish grazers. The farming technique used in the Philippines, Malaysia, Indonesia, and Tanzania (monoline system) could not be applied successfully in the Maldives due to the abundance of fish grazers which thrive in the lagoons.

When the consultant arrived in the Maldives in February 1996 for his first one-month technical assistance, he brought a sample of the net-bag propagule holders which he had devised in the Philippines to counter problems such as grazer attacks and losses due to turbulent weather. The floating net-bag technique is described in detail in the project field document No. 2. The new technique eliminated also the tedious process of tying every propagule to the monoline, thereby saving a lot of labour cost. When he visited the test station for the *Eucheuma* at Gamu island, he observed that the plants were almost consumed by the grazers since the propagules were cultured using the monoline system. The remaining plants were untied from the monoline and then brought to another site where the current was good and where the water motion was consistent. The five kilograms of *cottonii* which were salvaged were planted, placing them in 10 net-bags at the rate of 1/2 kilogram/bag. The propagule line containing the 10 net-bags was installed in the water in the selected area. After 15 days, the plants recovered and showed a good growth rate, which was computed to be 3-4% daily.

The seedlings in the net-bags were split continuously every month. Five hundred net-bags were procured to contain the rapidly increasing volume of seedstocks. By September, 1996, OSM reported that the seedling inventory was already 600 kilograms, requiring additional net-bags (35,000 pieces).

At this time the plant growth had increased to about 5-6% daily, which means that the biomass was doubling every 10-15 days.

In March, 1997, the Seaweed Consultant carried out his second one-month mission to evaluate the performance of the seaweed culture and to introduce the post-harvest technology to the project staff and workers.

II. FINDINGS

The project staff established the pilot seaweed farm on the western shore of Gamu island near the village of Thundee. The anchors and anchor lines were well laid out. There were 600 lines or 6,000 net-bags estimated to contain more than 10,000 kilograms of healthy green and brown *cottonii* strains. This volume of seedstocks isalready sufficient to start a commercial farm. Grazer damage to the plants was still observed. However, the seaweeds had already reached the critical mass whereby the grazers could no longer inflict significant damage to the plants. The propagules were still growing fast at the rate of 5% to 6% per day even during the northeast monsoon season.

At the project site, the consultant prepared and imparted a training program for the personnel sent by MOFA and by the Japan Overseas Volunteer Service (JOVS). The JOVS is also introducing seaweed farming in one of the atolls north of Male. The trainees, Messrs. Ibrahim Nadheeh and Yoshimura, went through the different aspects

of seaweed production from farming up to post harvest handling. The training technique "learning by doing"was applied to them as well as to the workers in the pilot farm.

The project staff had already constructed drying tables on the shore near the pilot farm with local materials, such as wood and coconut petioles. The plastic nettings recovered from the sea cucumber activity were used as flooring of the drying tables. The use of drying tables is one method of drying seaweeds. It is simple and inexpensive, but it has some disadvantages. It needs a long canvas (as long as the table itself) to cover the seaweeds in case of rain. The canvass is an expensive material. If a small canvass cover is available, then it is necessary for the workers to move the seaweeds by hand to make a pile towards the centre of the drying table where they can be covered by the small canvass. The re-piling work is time-consuming and critical when rain comes unannounced.

The consultant introduced and taught the staff to make drying racks, an improved method for drying the seaweeds. The drying rack is a rectangular frame, usually measuring 1 x 2 metres, and made of wood or bamboo. The floor is made of wooven bamboo mats or nets which are resistant to degradation by sunlight. When the seaweeds are not yet dried, these frames are portable, hence they can be piled on top of each other. The fresh seaweeds are spread on the drying racks at a density of about 10 kilograms per square metre during night time; the racks are piled on top of each other, about 5 racks per pile, and then covered by a small canvass. The rack system has the advantage of quick recovery or piling, especially during rainy season, and requires only a few small-sized canvass for covering the drying racks. The seaweeds dried on the racks are also easily collected for transport to the warehouse.

About 100 propagule lines were harvested for the drying practice. The fresh seaweeds were spread out on the drying racks and tables at a density of about 10 kilograms per square metre. It took about two days of bright sunshine, or 30 hours of exposure to air and sunlight, to dry the seaweeds to the right dryness of about 35% moisture content. It took 8 kilograms of wet to produce 1 kilogram of dried seaweeds. This wet-to-dry ratio is in the same range as the one of seaweeds produced in other countries.

The workers also practised loading the dried seaweeds into sacks and compacting the content by means of a wooden pestle so that maximum load can be placed in each bag. It was only possible to load about 50 - 60 kilograms per sack, or about 15 metric tonnes per container. Since the buyer or processor of seaweeds requires a minimum load of 20 metric tonnes per container, it is necessary that the seaweeds be baled by means of a baling machine at Laamu before they are shipped to Male where they will be loaded in container vans.

The staff and workers were shown how to pile the dried seaweeds (there are about 1,500 kilograms already stored in the warehouse) on the cement floor so that the product can attain the equilibrium moisture content of about 35%. As long as the seaweeds are well-dried, they will not spoil also if stored for a long time (even more than one year). The dried seaweeds contain about 30% salt which acts as preservative during storage.

III. RECOMMENDATIONS

1 The seaweed project has been successful in its experimental and pilot farm stages, and it is now time to start the commercialization stage. This can be done easily because of the availability of the seedstocks, and the effectiveness of the seaweed

farming technology introduced, and the growth consistency of the seedstocks. The seaweeds are growing fast, almost at the same growth rate year-round.

2 Since the FAO funding of this project will end in June 1997, it is very important that modalities be activated as soon as possible to take over the function of the OSM and the MOFA and work for the development and commercialization of the seaweed industry in Laamu. A local company or corporation seems ready to take over. They should establish a buying station for seaweeds in Thundee village, preferably using the laboratory building that was originally meant for the sea cucumber activity. If they intend to buy wet seaweeds from the farmers, the company should build drying facilities around the laboratory building and also procure the baling machine, to be installed just outside the building. The baling machine should be protected from rain, sunlight, and trespassers by a fence and roof. Additional slabs should also be built around the baling machine. The pricing, frequency of seaweed delivery, and payment modalities should be discussed by the representative of the company during the workshop which will be held in Thundee as soon as possible and before the termination of the TCP project in June 1997.

3 MOFA and/or OSM should continue to provide technical and managerial assistance to the new company. The MOFA personnel (Mr. Ibrahim Nadheeh), who was trained by the consultant from 13 to 24 March 1997, should be assigned permanently to the project site to see to it that the development effort goes forward. The MOFA technician should work closely with the supervisor of the company.

4 There is no doubt that the potential of developing the seaweed industry in Maldives is great considering that the environmental conditions are suitable for the culture of *Eucheuma.* The MOFA should continue to follow up the progress of the seaweed farming project and eventually encourage joint ventures and other entrepreneurs.

5 The MOFA, OSM and the *Company* that will pursue the commercialization stage, should conduct workshops or training programmes for the villagers who are interested in starting their own family farm business. During the workshop, opportunities and problems should be discussed in order to avoid misunderstandings in the future. The villagers who are now working in the pilot farm should be given the first chance to become seaweed farmers because they are already trained in planting and caring for the seaweeds.

6 Procurement of post-harvest processing equipment - such as the drying racks, weighing scales, wheel barrows, drying oven for moisture testing - is essential so that the product can be exported according to required specifications. MOFA has a role in ensuring export of a quality product and might need to secure additional assistance at the beginning of the commercialization phase.

IV PLAN OF ACTION

On March 26, Mr. Jadullah Jamael, Director of MOFA, called a meeting at his office. The meeting was attended by Mr. Hassan Shakeel, Senior Fisheries Resource Officer; Mr. Ahmed Shakeel, Director, OSM; and the consultant. The group discussed ways and means of sustaining the seaweed project after FAO terminates their assistance in June 1997. The MOFA technician, Mr. Mohamed Haleem, is already at the project site to take over the function of the ICEIDA/OSM expert who will be soon ending his assignment. There is a plan to activate a company or corporation "the Tropical Colloids Pte. Ltd." to take over the commercialization stage of the seaweed project. This

company aims at developing only about 3-4 hectares of cottonii farm in Laamu which can produce not less than 20 metric tonnes per month. As soon as they develop the expertise in buying and exporting of the seaweeds, then they will decide an eventual expansion of the operation by looking for a joint venture partner and also by encouraging more farmers to plant seaweeds so that the export volume can be increased.

A buyer (FMC-Corporation, USA) already promised to buy the seaweeds produced in Maldives but the minimum shipment should not be less than one container or 20 metric tonnes per month. The representatives of FMC will come to Maldives during the first week of May 1997 to visit the farm at Laamu as well as to sign a marketing contract with "Tropical Colloids, Pte Ltd".

The MOFA, OSM and "Tropical Colloids" will plan and schedule the workshop for the people who are interested in farming the seaweeds in Laamu as soon as possible. It is important mat representatives of the three entities should be present during the workshop. An outline of topics to be discussed during the workshop is in Annex 1. The workshop should be held as soon as possible before the termination of the project in June 1997.

ANNEX 1

WORKSHOP ON SEAWEEDS PRODUCTION
PROPOSED AGENDA OUTLINE

- How much income the farmer is likely to obtain in terms of fresh harvest per month based on a production of 2,500 kilograms initial weight x 2.5 to 3.0 = 6,250 kilograms to 7,500 kilograms.
- Pricing of the seaweed when sold fresh or dry : the price of wet seaweed should range from Rf 0.40 to Rf 0.50 and the price of dried seaweed range from Rf. 3.20 to Rf. 0.50.
- Location of processing and storage stations stations and potential buyers of the seaweeds.
- Modalities of payment to the farmers (Cash on delivery or accumulated cash per week? per two weeks? or per month?)
- Supply of planting materials (by the buyer? If so, how much will the farmer pay? In how many installments : 12, 24, or 36 months?)
- Farmers' protection from exploitation such as low buying price, irregular payments,etc. (Can the MOFA intervene? Can the farmers organize themselves into cooperatives?)
- Plans for expansion of the seaweed culture : role of farmers and traders and market absorbtion capacity
- Government plan for expansion of culture in other atolls. (MOFA and the Ministry of Atolls)
- What are the possibilities of potential donors to provide assistance for eventual introduction of seaweed farming in other atolls for further development of the industry in Maldives?
- To be competitive with other seaweed-producing countries, the Maldives must be able to export more than 400 MT per month. The Philippines can export 6,000 MT of *cottonii* per month and the Maldives has the potential to reach the same level. Plan for the establishment of about 400 farmers to be able to produce about 400 MT per month.
- Can the women be encouraged to plant seaweed, too?