



CMFRI
Bulletin 48

ARTIFICIAL REEFS AND SEAFARMING TECHNOLOGIES

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE

INDIAN COUNCIL OF AGRICULTURAL RESEARCH
DR. SALIM ALI ROAD, POST BOX No. 1603, TATAPURAM - P. O.,
ERNAKULAM, COCHIN - 682 014, INDIA

CMFRI
Bulletin 48

**ARTIFICIAL REEFS
AND
SEAFARMING TECHNOLOGIES**

DR. K. RENGARAJAN

Editor

January 1996



CENTRAL MARINE FISHERIES RESEARCH INSTITUTE

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

DR. SALIM ALI ROAD, POST BOX No. 1603, TATAPURAM - P. O.,
ERNAKULAM, COCHIN - 682 014, INDIA

Bulletins are issued periodically by the **Central Marine Fisheries Research Institute, Cochin** to interpret current knowledge in various fields of research on marine fisheries and allied subjects in India.

©
Copyright reserved

Published by : **Dr. M. Devaraj**
Director,
Central Marine Fisheries Research Institute,
Cochin - 682 014.

Citation

PARAMESWARAN PILLAI, P. 1996. Artificial reef research in Minicoy, Lakshadweep. *Bull. Cent. Mar. Fish. Res. Inst.*, 48 : 11 & 12.

Cover Layout by : Dr. K. Rengarajan.

Cover Photos by : The authors.

SEAWEEDS AND THEIR IMPORTANCE

V. S. K. CHENNUBHOTLA*

Central Marine Fisheries Research Institute, Cochin 682 014

Introduction

Seaweeds is the name implies to cover the macroscopic plants of the sea except the flowering plants. Most of the seaweeds are attached to rocks and also grow on other plants as epiphytes. Along the coast line of India, seaweeds are abundant where rocky or coral formations occur. This sort of substratum is found in the States of Tamil Nadu and Gujarat and in the vicinity of Bombay, Ratnagiri, Goa, Karwar, Vizhinjam, Varkala, Visakhapatnam and in the Lakshadweep and Andaman-Nicobar Islands. The seaweeds are classified into three important groups namely green, brown and red. Seaweeds contain different vitamins, minerals, trace-elements and proteins. Seaweeds are also a rich source of iodine. As seaweeds are a cheap source of minerals and trace elements, meals prepared from seaweeds can be utilized as supplements to the rations of cattle, poultry and farm animals. From time immemorial seaweeds have been used as manure in the coastal areas. As the minerals and trace elements occur in water soluble form, these chemical constituents are readily absorbed by plants when the manure is applied. Deficiency diseases are also controlled by the minerals and trace elements present in them. There are certain medicinal properties for the seaweeds. Seaweeds rich in iodine such as *Asparagopsis taxiformis* and *Sarconema* sp. can also be used for controlling goitre disease caused by enlargement of thyroid gland. Indian marine algae have all the essential amino acids needed in the human diet which are not available in other vegetable food materials. Seaweeds yield the most important products such as agar-agar and algin. They are colloidal carbohydrates present in the cell walls of these algae. Agar-agar is extracted from seaweeds such as *Gelidiella acerosa*, *Gracilaria edulis*, *G. folifera*, *G. corticata* and *G. verrucosa*. Algin is extracted from species of *Sargassum* and *Turbinaria*.

Seaweed culture

In our country there are several factories manufacturing agar-agar and algin (Madurai, Tiruchirapalli, Ahmedabad, Baroda, Hyderabad, etc.). In recent years, many entrepreneurs are enthusiastic to start these industries, as a result of which there will be a great demand and competition for the raw material and a day may come when an acute shortage of raw material (seaweeds) will be felt, as a consequence of which the whole world may find it difficult to prepare certain life saving vaccines, since agar-agar is used as a culture medium for the bacteria and moulds. In order to meet this, a process to augment the supplies of these seaweeds by culture practices has to be developed.

Since 1972, the Central Marine Fisheries Research Institute has been engaged in the cultivation of several economically important seaweeds and the method of cultivation of *G. edulis* a fast growing species with minimum seed material has been standardized. These culture experiments have been done by introducing the fragments of the seed material in the twists of the coir ropes which are fabricated in the form of 5 x 2 m size nets and these coir nets were tied to wooden poles fixed in the coastal waters for further growth. The plants reach harvestable size after a period of 60 days. The yield from a coir net is approximately 30 kg fresh weight in the coastal waters of peninsular India, while the experiments conducted in Minicoy Lagoon (Lakshadweep) using long line coir ropes gave a maximum production value of 31 fold increase over the initial seed material introduced; thus indicating the Minicoy Lagoon to be more productive than main land waters.

The difference between coir net method and coir rope method is that the former gives a very

* Present address : Visakhapatnam Research Centre, of CMFRI, Visakhapatnam 530 003.



PLATE I. *Gracilaria edulis* on rope: A. after 30 days and B. after 50 days.



PLATE II. *Gracilaria edulis* on rope: A, after 71 days and B, a close up view.

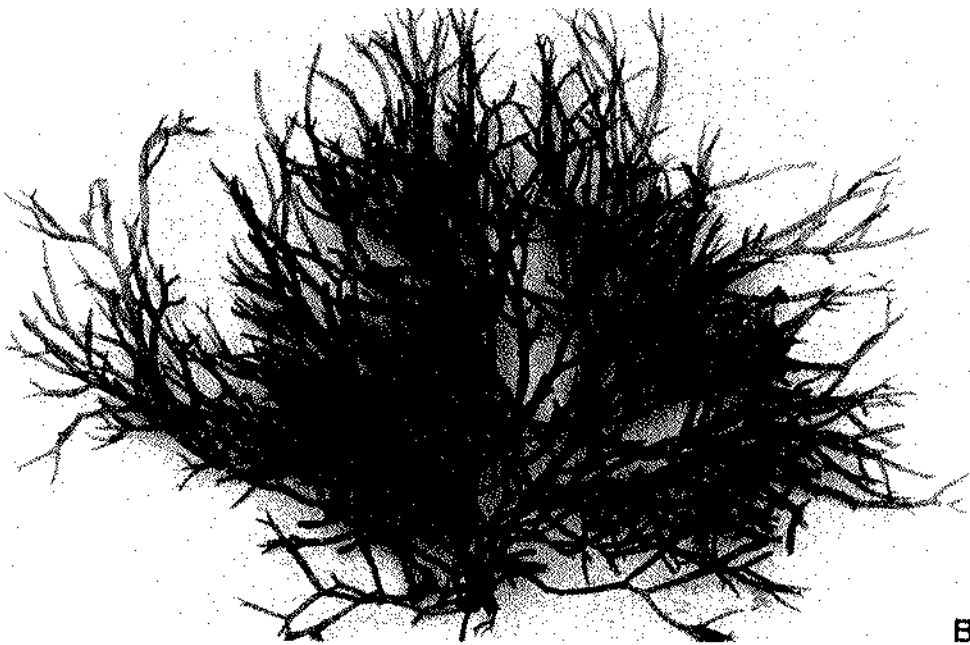


PLATE III. Agar yielding seaweeds: A. *Gelidium acerosa* and B. *Gracilaria edulis*.

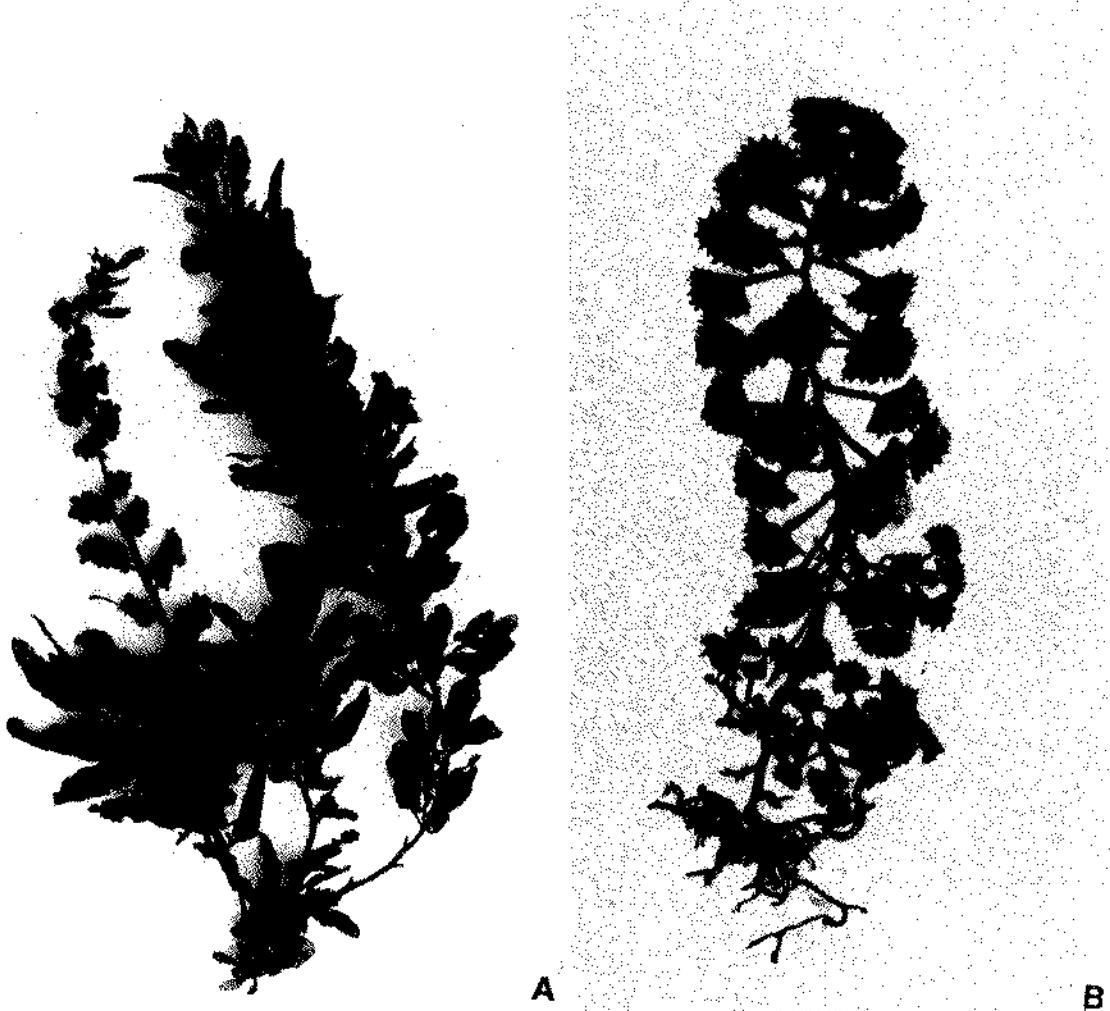


PLATE IV. Algin yielding seaweeds: A. *Sargassum weightii* and B. *Turbinaria conoides*.

good support to the growing plants and it also withstands for 3 harvests, while the latter does not give much support as it is at the mercy of the waves, tides and wind. But the long line rope culture method is suitable for bays and protected areas which has given better results in Minicoy Lagoon than the net method. Further it brings down the operational cost also by this method as the charges for fabrication of the nets and the cost of poles for fixing the nets can be obviated by tying coral stone at either end.

Advantages

1. To augment the supply of seaweeds.
2. A single species of alga can be maintained in a steady crop.
3. The algae will be uniform in quality.
4. If the cultured alga is utilized by the industry, our natural resources can be used as mother material.
5. A continuous supply of alga can be maintained.
6. By introducing improved techniques and by using modern materials, the yield can be increased and cost of the cultivated seaweeds can be brought down considerably.
7. There is a possibility of improving the quality of the seaweed by adopting scientific breeding and other techniques of crop improvement.
8. The other marine algae which do not grow on our coasts could be introduced for cultivation in our waters, thereby augmenting our resources.

Uses of agar-agar and algin

In general, both agar-agar and algin serve as stabilizers, emulsifiers, thickeners, body-producers and gelling agents. Agar-agar is often used where firm gel is needed and algin for soft and viscous products.

In ice-cream industry, both agar and algin are used as stabilizing agents to give smooth body and texture to the ice-cream and also to prevent the formation of large ice-crystals. Similarly, these

two seaweed colloids are employed to prevent adhesion of the sugar coating to the wrappers, in canning industry as coating materials for preserving fish, meat and other products, in the preparation of milk puddings, dental impression materials and agricultural sprays.

There are certain specific uses for each of these two extracts. For instance, agar is used in smoking tobacco and fruit cakes to serve as moisture retaining agent, in confectionery for making gelly candies, in drawing tungsten wires as a lubricant, in hectograph duplicators in photofilms and plates. It is also widely used as microbiological culture medium, therapeutic agent in constipation and as a coating material for capsules.

Algin is used for sizing textiles and paper, thickening textiles paints and for boiler water treatment. This is the most useful colloidal carbohydrate in cosmetic industry for preparing creams, beauty milks, mouth washes, hair pomades, tooth pastes, etc. It is also used in the preparation of tablets and pills as granulating and binding agents, in rubber industry as a creaming agent to separate the rubber, in the manufacture of lignite briquettes, in liquor clarification, in varnishes, paints, adhesive leather polishing materials, etc. Sodium alginate and other salts are used in the manufacture of seaweed rayon. Alginic acid and its salts are used as blood anticoagulants also.

Along the coast of peninsular India, if seaweed farming is taken up in one hectare area, a return of Rs. 9,000/- is assured in an year for an investment of Rs. 36,000/- assuming the production rate to be 3 fold and that two harvests only can be taken in an year. While in Minicoy Lagoon the input requirement (infrastructure) is less and the production rate high (average of 15 fold) and hence the net profit works out to around Rs. 20,000/- for an investment of Rs. 25,000/- in an year with 3 harvests.

Hence from the above it can be inferred that the culture and utilization of seaweeds can contribute to rural development and thus to economy of the country as a whole.