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Eucheuma culture and practices: The case of Calape Bohol, Philippines

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Abstract

Seaweeds are the most successful fishery product of the Philippines in recent years. It is essentially a small growing industry on the production side thus, providing a livelihood in the generally poor coastal areas. The study was conducted to evaluate the status of seaweeds culture in Calape Bay, Bohol. A mixed method research design was used in the study. Results showed that the majority of the respondents belongs from ages 29 to 57, consisting of seven (7) females and 29 males that were personally interviewed and surveyed. Two species of Eucheuma were identified, *Eucheuma cottoni* and *Eucheuma spinosum*. The *Eucheuma cottonii* were preferably grown and known to adapt to the type of environment found at Calape Bay. The hanging method and floating method were the two common production practices used but the majority of the growers used the hanging method. As reflected in their income, this method provided higher net returns. There is a significant difference between the seaweeds used and the type of production in the culture of Eucheuma. The results of the study implied that the area is a good potential for mass production of both species of Eucheuma.

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Introduction

Eucheuma production from wild crop sources has dwindled to insignificance, and over 95% of the crop is farmed *E. alvarezii* Doty (as cottonii), *E. denticulatum* (Burman) Collins & Hervey (as spinosum) and *E. gelatinae* (Esper) J. Agardh (as gelatinae). Only the latter is predominantly from wild crops. The others are almost all farmed. The taxonomy of the Eucheuma section Cottoniformia, which produces the cottonii of commerce, is most difficult due to the wide range of environmentally induced forms. This was not realized until strain selection commenced in the early 1970's (Doty and Alvarez, 1975) and one kind, *Eucheuma alvarezii* var. tambalang Doty, was found to be consistently different physiologically and to have its own gamut of variation in form. It proved to be so much more easily grown that it has completely replaced the other species, such as *E. striatum* (elkhorn variety), formerly dominating the farming. Likewise, many of the former wild crop components of commercial lots of Eucheuma were either never farmed (such as *E. cottonii*), are no longer farmed (e.g., *E. striatum*), or are not now recognized (e.g., *E. spinosum, E. edule, E. muricatum, E. okamurae and E. serra*) (Doty and Norris, 1985).

Seaweeds or *halamang dagat* is a red to brown grass of the sea that provides nourishment for man. Aside from being consumed as food, seaweed is utilized as raw material in the manufacture of industrial products such as alginate, agar and carrageenan. There are five species of seaweeds in the country namely Eucheuma (usually exported fresh), Caulerpa (exported fresh or in salted form), Sargassum (produced as meal for animal feed manufacture), Gelidiella and Gracilaria (both exported dried and/or alkali-tested). Eucheuma, however, has a number of uses and enjoys the heaviest demand in the market, both here and abroad. In addition, it can be farmed commercially almost anywhere in the country's coastal area (Foscarini and Prakash, 1990). In the processing sector new investors are coming in while established ones imported their services to meet the increasing international demand. The Philippines was able to take hold a significant portion of the market, however, the industry can still stand a lot of improvements and is considered as the world's leading producer of Eucheuma comprising about 80% of the world's supply. Raw Eucheuma is sold according to its quality. Most Eucheuma products however are exported in carrageenan or processed form. Two types of Eucheuma seaweeds are exported in dried form. These are the *Eucheuma cottoni* and *Eucheuma spinosum*. The Philippines already is the world's third largest seaweed producer after China and Indonesia in tonnage terms producing about 1.5 million metric tons (mt) a year worth around US$137 million. For the past seven years the Philippines has been the world's largest supplier of carrageenan (Trono, 1997). The seaweed industry has manifested remarkable performance in the international market. In 1999, the Philippines exported a total of US $ 95.653 million worth of seaweeds in all forms up to US$64.21 million of 1998 or an increase of 49%. As part of efforts to increase marine production and increase incomes in coastal fishing communities, BFAR also is promoting seaweeds production to supply domestic markets as well as for export.

In Central Visayas, Eucheuma is one of the most commercially useful seaweeds. Though some seaweeds can be cultured like red algae that grow on coral reefs and in rocks and sandy bottom marine waters but Eucheuma seaweeds is the species that hold promise of some fish farmers to be cultured. It is very important commodity since it is the source of carrageenan used in many industrial and food application. It is utilized as thickener, stabilizer, gelling agent, gum, binder and food ingredients. It is also used in pharmaceuticals. Latest development shows that seaweeds can be used as fertilizer, and fodder in Agriculture (Aquaculture Production and Management BFAR, 2004). In the economic point of view, seaweeds farmer in Central Visayas always look at the price of the commodity, since they started Eucheuma culture in 1975. In other words, price is the motivating factors that determine whether the farmers will plant seaweeds or not. Financial and technical assistance will play a significant role if the above-mentioned motivation is met by the industries. In the field of medicine, seaweeds are good

therapeutic agents for the prevention of human physiological disorders such as goiter. They provide roughage necessary for the maintenance of the normal functions of the digestive system. They also used as laxative and as treatment for stomach disorders. The demand for seaweeds in the world market is increasing such that development of this commodity is encouraged. It is a welcomed economic venture for the coastal communities as this will ease pressure on the fast depletion of coastal and marine fisheries. It provides better income opportunities and additional source of income to improve the quality of life of fisher folks. Furthermore, development of the seaweed industry will boost export earnings and contribute to the economic stability of the country (Trono *et al*., 1988).

In the town of Calape, a good and potential place for culture because of its tributary islands that has two islands that are inhabited and two uninhabited islets including all its tributaries. It has an aggregate of the total land area of 8,217 hectares with approximately 28 kilometers of rugged shorelines with 114 square kilometers area of municipal sea waters. The bigger percentage of which are the island/islets shorelines with about 16 kilometers. Currently, there were areas in the municipal waters that were devoted to mariculture production by Local Government Unit and other private fish operators. Many of the fisherfolks go on the culture of different economically and valuable fishery products. Seaweeds are one of those economically important fishery resources that were cultured.

In addressing the trends and challenges of seaweeds culture, there is a need to revisits and assess the production practices of the growers in the locality to abreast the recent trends in the field of production hence, this study was conducted.

The study assessed the production practices of seaweeds culture in Calape, Bohol, Philippines. Specifically aims to determine the seaweeds species used, production practices, common problems encountered, and find out the significant difference on the production practices used.

Materials and methods

Mixed method research design was used in the study that includes both qualitative and quantitative study. For quantitative research design, descriptive-survey method was used. Guided questions and personal interview were administered that includes indicator pointing on the kinds of species grown, type of production practices used, income per harvest, expenditures per cropping and problems met. The respondents of the study were the seaweeds growers ages from 29 to 57, comprising of seven females and 29 males which was fifty percent of the approximate total of identified growers in the town of Calape and were randomly selected and personally interviewed during their available time. The study lasted for two (20 months. In qualitative research design, focused group discussion was used in the study. Clarification of the issues and concerns with regards to the production practices used were asked. The focused group discussion comprises of the grower, selected consumer and fish vendor. Thematic analysis (Aranson, 1993) was used to facilitate identification of the ranking of the problems. The Calape bay is an area that was known to be the ideal place where many growers established their own fish farm like mariculture (fish-cages). It was also surrounded with mangroves and other aquatic trees. There were cages established fish-cages from the people organization and Bureau of Fisheries Experimental set-up. The t-test for independent samples was used to test the significance of the study.

Results and discussion

The results of the study showed a remarkable indicator that the area is a good potentil for culture. Partly, it showed that there were two Eucheuma species cultured at Calape Bay *E. cottoni* and *E. spinosum* (Table 1). Among of the two species identified, *E. cottoni* comprised the majority of being cultured. These species were known to adapt easily to the type of environment found in Calape Bay. Seaweed's growers prefer to plant this specie in wider areas because this was also known to have a higher market value.

Table 1. Seaweed's species used by the growers found in Calape Bay

Species planted	Frequency of seaweeds growers	Average area planted (m)	Average gross income per harvest (Php)
E. cottonii	20	26.87	5,000.00
E. spinosum	16	15.93	3,500.00
Total	36		

There were 20 growers who used *Eucheuma cottoni* as planting material with an average covered area of approximately 26.87 m² with the projected average gross income per harvest of Php 5, 000.00 pesos only. On the other hand, 16 growers utilized *Eucheuma spinosum* with an approximate planted area of 15.93 m² and an average income per harvest of Php 3,000.00. Based from the area planted, majority of the growers cultured *Eucheuma cottoni* and preferred to plant in wider areas because of its higher market value. Thus, majority of the growers perceived that this species has high market demands.

Eucheuma spinosum

Eucheuma cottonii

The production practices used by seaweeds growers were hanging and floating method (Table 2). Majority of the seaweed's growers chose hanging method as the best production practice. Both methods could be used all year round. Floating method growers preferred to grow seaweeds from August to September. Some grew seaweeds using hanging method from September to October. More farm inputs were spent for both species using hanging method (8,700) compared to floating method (6,600). The cost of materials for hanging method was expensive but data shows, that its net income was higher compared to the floating method for both species. In general view, majority of the growers wanted to grow *Eucheuma cottoni* using hanging method.

Table 2. Production practices use of seaweeds growers in Calape Bay

Production practices	Frequency of growers	Seasons/Cycle of planting	Farm inputs	Gross income	Net income
E. cottonii					
Floating	7	August-September	1,500	6,600	5,100
Hanging	10	September-October	2,500	8,700	6,200
Floating/Hanging	3	All year round	6,000	13,000	7,000
Total	20				
E. spinosum					
Floating	5	August-September	1,500	4,800	3,300
Hanging	8	September-October	2,200	7,400	5,200
Floating/Hanging	3	All year round	4,800	11,000	6,200
Total	16				

Floating method

Hanging method

Problems encountered by the seaweeds growers

The problems encountered by the seaweeds growers are shown in Table 3. Majority of the seaweeds growers encountered the problem on climate (19) next to diseases such as ice-ice (11). Ice-ice is characterized by whitening of a segment of Eucheuma

which remains for a day or two but when dissolves away separating the two adjacent parts of the thallus. Some of the growers also experienced problem in stealing of their products their cultured seaweeds were lost and taken by other intruders coming from nearby barangays and towns. However, disease problems could be solved by proper management practices.

The most common symptom of malaise, ice-ice, is often spoken of as a disease. Actually, it is only a symptom. No microorganism-caused or contagious disease is known (Uyenco *et al.,* 1981). Infections and infestations are known. In itself the word ice-ice is (Doty and Alvarez, 1975) a malay treatment of the Middle English word, ice, applied to the white segments that appear between branches usually in the more basal parts of the thalli. Ice-ice seems to be related most often to intolerable physio-chemical stresses, such as increased ceil permeability following low growth rates or relatively low counter-movement of photosynthate. The onset is a sharply limited greening of a segment which, the next day, is clearly green and in one or very few more days very pale, then white. The segment may remain there for a day or two but soon dissolves away, separating the two adjacent parts of the thallus, which seem to be otherwise unaffected. In this way ice-ice acts as an agent in vegetative reproduction: the ice-ice does not normally spread to the adjacent segments. The two such thalli resulting continue their normal growth though one is unattached. Of course, the one not attached may become lost to the farm.

In some cases, general decay has been seen to result in the death and disappearance of ail but the very oldest basal, often horizontal but unattached, segments. These may remain alive though reduced to an unbranched cylinder. If the environment becomes favorable again such segments may generate a plethora of vigorous shoots and regenerate a new thallus of normal form.

In one case in Sitangkai (Philippines) a great deal of die-off occurred, with the thalli displaying the above general discoloration symptoms. Similar losses have occurred in the Malay-sian part of the Sulu Archipelago. This general die-off phenomenon has been thought due to pools of fresher water forming off the mouths of the large rivers that drain into the sea along the north shore of Borneo (i.e., in the Malaysian State of Sabah) and, breaking away, drift so as to temporarily cover reef-flat farm areas to the east and south. In some dialects of the region this phenomenon is apparently referred to as HAUS, pronounced as is the English word for a residence (Doty and Norris, 1985).

Table 3. Problems encountered by the seaweed's growers at Calape Bay

Problems encountered	Types of problems meet	Possible solution	Number of growers
Disease	Ice-ice	Proper Management	11
Climate	Typhoon	Proper Management	19
Human Factor	Intruders/Stealing	Proper Management	6
Total			36

Statistical analysis

Data shows that there was a significant different in the production practices used by the seaweed's growers in Calape bay wherein *E. cottonii* in hanging method is significantly higher in the net income compared to the rest of the practices used with same area planted (Table 4). However, *E. cottonii* in floating and E. spinosum in hanging did not differ.

Table 4. Statistical analysis in the production practices used by seaweeds growers.

Seaweeds production practices used	Net income
E. cottonii + floating	5,100.00[b]
E. cottonii + hanging	6,200.00[a]
E. spinosum + floating	3,300.00[c]
E. spinosum + hanging	5,200.00[b]

Conclusion

There were two common species cultured by the seaweed's growers at Calape Bay, the *Eucheuma cottonii* and *Eucheuma spinosum*. In the production practices, growers used hanging and floating method. Other growers utilized the combination of hanging and floating method depending upon the type of seaweeds. There is a significant difference in the production practices used in the culture of Euchema.

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