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Influence of Ecological Factors in the Biomass Production of Farmed Seaweed in Barangay Magsaysay Lavezares, Northern Samar

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ABSTRACT
The study determined the ecological conditions of the seaweed farming site in terms of salinity, light penetration, temperature, substrate, water depth, water current and biotic factors; measured the biomass production in control and experimental; determined the significant difference in the biomass production between the control and experimental groups; and determined the significant relationship between the biotic factors and biomass production.

The independent variable of the study was the ecological factors; the moderator variables were the control and experimental groups and the dependent variables were the biomass production. It employed the experimental research methodology.

The physical parameters were monitored weekly while the biotic factors were monitored daily up to 30 days. It was conducted in barangay Magsaysay, Lavezares, Northern Samar.

Findings of the study revealed that the ecological conditions of both the control and environmental group were favorable to the seaweed far in terms salinity, light penetration, temperature, substrate, water depth and water current. However, the results of the study revealed that among the ecological factors considered, the biotic factors had influenced most on the cultured seaweeds particularly on the experimental group with harmful effects.

In terms if biomass, data showed that the control group exhibited production while the experimental group had non because of the effects of biotic factors.

There was a significant difference in the biomass production of the control and experimental groups because comparatively, only the control group registered biomass production and significant relationship between the biotic factors and biomass production of the seaweeds. The more grazers in the seaweed farm, the lesser the biomass produced.

The conclusion arrived to was that cultured seaweeds in farm sites should not be "caged" because by so doing the cage serves as a sanctuary for grazers particularly siganids and enable some algae and epiphytes to grow that trap the nutrients brought about by the water current. Furthermore, when these events occur, eventually "ice-ice" disease will attack the seaweed.

Keywords: *Seaweeds, Kappaphycus, Monolines*

1. INTRODUCTION

Seaweed farming has been another kind of livelihood of fisher folks in developing tropical countries like the Philippines. In fact, seaweed farming started many years back because some fishers have engaged in illegal fishing practices which resulted to the scarcity of marine resources. Hence, the promotion of sanctuary and marine protected areas. It is assumed that poverty is the bottom line why they are involved in these practices resulting to the overexploitation of marine resources. Fishers consider seaweed farming as one good alternative livelihood which could improve their living condition. Seaweed farming also requires less capital than any other aquaculture species, not-labor-intensive and does not need input that are potentially harmful to the environment. *Kappaphycus* and Eucheuma are the most common seaweeds farmed in the Philippines. Seaweed farming is an export-oriented livelihood because they supply carrageenan for export to other rich countries like United States, Australia and Europe. Products of seaweeds are main ingredients in food, dairy, cosmetics and even pharmaceutical products.'

Large population increases have led to over exploitation and depletion of finite marine resources

in many areas. Likewise, the lack of resources management and "open areas" to the resources led to the highly intensive competition among the resource's users. Thus, the need for resources management is clearly required.

In the same direction, the Bureau of Fisheries and Aquatic Resources (BFAR), Northern Samar Provincial Office in the late 1990s initiated and developed seaweed farming project in Barangay Magsaysay, Lavezares, Northern Samar. However, according to researcher like Gavino C. Trono, development of seaweed farming is affected by biological/ecological, socio-economic and cultural factors. To date, no research has been conducted yet even by BFAR and the Fisheries Department of the College of Agriculture in the University of Eastern Philippines on the influence of ecological factors that variably affect the biomass production of seaweeds in the above-mentioned areas. In furtherance, there is a dearth of information on some potential sites that could be developed for productive seaweed farming. It is along this pressing need that this study is conceptually and theoretically premised.

2. OBJECTIVES OF THE STUDY

1. It determined the ecological conditions of the seaweed farming site in Barangay Magsaysay, Lavezares, Northern Samar in terms of:

A. Salinity
B. Light Penetration
C. Temperature
D. Substrate
E. Water Depth
F. Water Current
G. Biotic Factors

2. It measured the biomass production of seaweeds in the experimental and control groups.
3. It determined if there is significant difference in the biomass production of seaweeds between the control and experimental groups.
4. It determined if there is a significant relationship between the biotic factors and biomass production of cultured seaweeds.

3. METHODOLOGY

Locale of the Study

The municipality of Lavezares is geographically located at the northwestern part of the province of Northern Samar. There are 24 barangays that comprise the municipality of Lavezares, 15 of which are along the coastal areas. Barangay Magsaysay is located in the island of Bani Island and situated at 120° 33′ 5″ N latitude and 124° 22′ 16″ E longitude.

Barangay Magsaysay is located along the coast of Samar Sea lying at the hillside and swamp area of the mountain of Barangay Bani. It can be reached by riding a boat and it has a distance estimated from water more or less 10 kilometers. The farming site is surrounded by mangroves between the islands of Bani Island and the island of San Juan. The substrate is rocky-sandy and it has a clear water with moderate wave current.

Barangay Magsaysay, Lavezares, Northern Samar was chosen as the study site because of its accessibility and seaweed farming is already existing.

Research Design

This study used the experimental design. As defined, experimental design is a problem-solving approach that the study is described in the future on what will be when certain variables are carefully controlled or manipulated.

The experimental set-up has 100 square meters area. The frame of the cage was made up of bamboo enclosed by a net except the top surface of the cage. It was adjacent to the control group.

Preparation of the Farm Site materials, accessibility to transportation and the chosen study site has availability of labor, communication as well. The study site was surveyed if the area where the seaweeds were planted was between the low tide and reef edge or an area which does not dry up during lowest low tides. The area was 250 meters away from the barangay Magsaysay where the caretaker or farmer resides so the monitoring of the seaweeds was easy and accessible. Permission was asked from the Brgy. Captain to allow the researcher to conduct this study in the farm site.

Construction of the Monolines

The size of the study area was 100 square meters for both experimental and control groups. The researcher used the monoline method for seaweed culture. The seedlings planted at 1 ft interval on the monoline with 1.5 m distance between the monolines. The six monolines were established in the experimental group and another six in the control group with the same amount of planting material. However, these two groups differed from each other by the enclosure with a net of the experimental group. The seaweeds were hung in a nylon no. 200 using sift tie straw which was suspended by floaters. The main rope which served as

the mother line is 10-15 millimeters in diameter tied to floaters at both ends and floaters were tied along the monolines with 2 meters interval between floaters. The both ends of the monolines were anchored in the sea bottom using the compressor.

Preparation and Planting of Seedlings

The seedlings were bought from Brgy. Sawang, Capul, Northern Samar. It was acclimatized before planting. The seedling was 200 grams and tied at the strongest point where they were well-balanced for free movement and to have enough allowance for growth.

The seedlings in the experimental and control groups were planted at the same time and these two set-ups were adjacent to each other.

Monitoring of the Farm Site

The farmer used a boat to visit the farm for monitoring and cleaning the seaweeds. The condition of the cage and the monolines outside the net was checked like repair of broken lines, destroyed stakes, tightening any loose nets, etc. The environmental parameters such as salinity, light penetration, temperature, substrate, water depth, water currents were monitored weekly while the biotic factors such as the grazers (sea urchins, siganids, sea turtle, epiphytes) and occurrence of ice-ice disease were observed and recorded daily from day 1 up to 30 days.

4. RESULTS AND DISCUSSION

This study investigated and determined the influence of ecological factors on biomass production of farmed seaweeds in Barangay Magsaysay, Lavezares, Northern Samar. It employed the experimental research methodology to gather the necessary data pertinent to the study.

The findings revealed that the ecological conditions of both the control and experimental groups were favorable to the seaweed farms in terms of salinity, light penetration, temperature, substrate, water depth and water current.

However, among the ecological factors considered, it was observed that the biotic factors had influenced most on the cultured seaweeds particularly on the experimental group (caged seaweeds) with deleterious effects.

Findings also showed that the biotic factors were not present during the first week of the study period and there were no algae present. However, from November 11-13, 2008, *Stolephorus sp* (Bolinao) with an estimated number of 500-1,000 individuals did appear but were not grazers because they do not have teeth; Muray-buray with estimated size of 2 cm with an estimated number of 15 individuals were already found in the area and *Chaetomorpha sp*. (filamentous algae) started to grow in the bamboo of the cage. During the first week, *Kappaphycus* seedlings were in good condition.

During the second week, again *Stelophorus sp*. and *Abudefduf sp*. (Muray-buray) with the same estimated size and number in the first week were still present in the area. However, Siganids fry with an estimated size of 20 cm and estimated number of 200-500 individuals were present. In the algal species particularly, *Padina sp., Sargassum sp*. and *Acanthophora sp*. were observed to have accumulated in the cage net especially on the experimental group. While the siganids fry continuously grazed the soft parts of the *Kappaphycus* plants.

Also during the third week, again *Abudefduf sp*. (muray-buray) with size of 2.0 cm and estimated number of 15-30 individuals including siganids fry with size ranging from 1.0 to 2.5 cm. and estimated number of 200-500 individuals were already present in the area.

Notable observations also were the growth of *Padina sp*. (brown algae) and *Acanthophora sp*. (red algae) on the net. Moreover, the water current in the experimental group became slower because the algae that grew on the net slowed down the water movement. And because of the wounds inflicted by the active grazers on the cultured seaweeds, the seaweeds developed "ice-ice disease" which made them unhealthy and unproductive.

During the fourth week, *Stolephorus sp.* (Bolinao) were still inside the net cage, together with *Abudefduf sp*. (muray-buray) having 15- 30 individuals including siganids fry with an estimate number of 200-500 individuals. The algal species *Padina sp*. and *Acanthophora sp*. still continued to grow, absorbed the nutrients and regulated the water current in the experimental group and the "ice-ice disease" had spread to the other seaweeds in the monolines and the grazers continued to feed on the seaweeds and because of these factors, most *Kappaphycus* plants died.

Data gathered showed that the biomass production of the control group, from initial weight of 4,000 grams each from Line 1 up to Line 6 using the Monoline

Method, it revealed a total biomass production of 1,824.99 grams in one month period. While the experimental group, from initial weight of 4,000 grams each from Line 1 up to Line 6 Monoline Method, it revealed a negative harvest of -366.67 grams in the same period.

Findings also showed that the ecological factors both in the control and experimental groups particularly in terms of salinity, light penetration, temperature, substrate, water depth and water current had the same physical characteristics with very slight variation in water current. It is important to note that the ecological factors of the study area conformed to the standard condition suitable for seaweed farming as recommended by BFAR. These ecological factors were very instrumental to the growth of seaweeds in the control group and even during the first week growth for the experimental group.

Also to be noted well is the "ice-ice disease" that attacked the seaweed culture which resulted in the death and washed out most of the seaweeds in the experimental group. Thus, it can be ascertained that the biotic factors influenced most the biomass production of seaweeds particularly in the experimental group.

There was a significant difference between the biomass production in the control and experimental groups, because the seaweeds in the experimental group did not grow and had a negative biomass production compared to the control group.

In terms of the relationship between the biomass production and biotic factors, findings indicated that using Regression Analysis, results showed that the control group with R-Ratio of 7.42 which is greater than the significant F of .05 which means that there is a significant relationship between the control group and biotic factors.

Likewise, the experimental group shows an F-Ratio of 99.13 is greater than F of .00 which also showed there is indeed a significant relationship between the experimental group and the biomass production.

Henceforth, the coefficient of determination of 96.12% indicates how much the biotic factors (grazers) had influenced on the biomass production of seaweeds. It means that the biotic factors such as the grazers, the algal species that grew on the net had 96.12% influenced on the biomass production in the experimental group.

5. CONCLUSIONS

Based on the findings of the study, the following conclusions have been derived;

1. The ecological condition of the farming site in Brgy. Magsaysay, Lavezares, Northern Samar of both control and experimental groups in terms of salinity, light penetration, temperature, substrate, water depth and water current conformed the standards set by BFAR for farming sites, consequently contributory to growth of seaweeds in the control group.
2. There was a biomass produced in the control group and none in the experimental group because of ecological factors that had affected the seaweeds.
3. Among the ecological factors considered, the biotic factors particularly the "grazers" had influenced most of the cultured seaweeds particularly on the experimental group but with minimal effects on the control group.
4. There is a significant difference in the biomass production of the control and experimental groups because the experimental group showed a negative biomass production compared to the control group.
5. There is a significant relationship between the biotic factors and biomass production of the seaweeds because the more grazers present in the study site, the lesser is the biomass produced.

6. RECOMMENDATIONS

1. A similar study be conducted on other seaweed farming sites initiated by BFAR, Northern Samar Provincial Office now managed by NGOs particularly in Sawang, Capul, Northern Samar and in Sto. Niño, Biri, Northern Samar, in order to have a comparative assessment of the seaweed production in Northern Samar.
2. A similar study be conducted to some potential sites for seaweed farming in District II of Northern Samar particularly in Barangay Paninirongan in Pambujan, Batag Island in Laoang, Binay Island in Palapag, and in other coastal barangays in Mapanas, Gamay and Lapinig, Northern Samar.
3. That studies on seaweed farming and their ecological role in the marine environment as well as the farming processes associated with them should be conducted also in all existing seaweed farming sites initiated by BFAR Northern Samar.

4. That more studies be conducted on predators of commercially-important seaweed like *Kappaphycus* and Eucheuma in all seaweed farming sites in Northern Samar.
5. Production of *Kappaphycus* be advocated by Northern Samar Provincial Seaweed Council in all potential seaweed farming sites with the active participation of UEP College of Science and Fisheries Department of the UEP College of Agriculture.
6. Further study for ecological factors affecting biomass production of *Kappaphycus*, harvesting weekly to monitor its growth.
7. Another study for the *Kappaphycus* be done in laboratory where environmental factors can be controlled.
8. Further study be conducted in different areas to determine variation in salinity, light penetration, temperature, substrate, water depth, water current and biotic factors.
9. That study should be done in dry and in wet season to compare the biomass production of seaweeds vis a vis influence of ecological factors.
10. Conduct information and education campaign among the residents of Brgy. Magsaysay on the results/findings of the study through the cooperation of LGU Lavezares, Barangay Officials, BFAR and the Northern Samar Seaweed Council on the economic importance of Kappaphycus seaweed farming.

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