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Potential for Development of Seaweed Cultivation Business Post Covid-19 Post in the Marine Area, Serangan City, Denpasar - Bali

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A R T I C L E I N F O

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A B S T R A C T

The aim of this research was to outline the possibilities for seaweed farming in Serangan Denpasar, Bali's maritime waters. study based on Aqua Modis satellite photography findings. The results of satellite photography for water depth are used, together with SST (Sea Surface Temperature) distribution photos taken between January and June 2019 and January and June 2023. Based on observations, the attack sea's waters contain an area of 70.61 Ha that could be used for seaweed production in 2019. 71.82 Ha could be used for seaweed farming in 2023

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INTRODUCTION

1. Overview of the Research (Heading 2)

According to Zarmawis (2009), Indonesia's marine potential, which includes coastal areas, is derived from marine biological economic resources that can be recovered. These resources include seaweed, pearl oysters, reef fish (cultivated or raised in marine environments other than ponds), capture fisheries, and the marine biotechnology industry, which has a total estimated value of US$ 71,935,651,400 annually.

2. Goal of the Research (Heading 2)

In order to ascertain the possibility of seaweed production in the sea waters of the Denpasar-Bali assault, this study attempts to measure and characterize the distribution of sea surface temperatures both before and after the Covid-19

LITERATURE REVIEW

With a total area of 8,300,000 km2, comprising 6,400,000 km2 (77.11%) of sea waters and 1,900,000 km2 (22.89%) of land, Indonesia boasts a coastline that stretches 110,000 km (BIG 2017 in PERPRES, 2019). The food development plan of Indonesia should be distinct from that of the United States and Australia, two nations with greater landmasses but smaller marine areas.

Indonesia should concentrate on managing the potential of its waterways to promote national food security and contribution to global markets, as the country's sea area accounts for about two thirds of its total area. The majority of the food that comes from waterways comes from sources of fibrous animal protein. Less than 1% of Indonesians consume fibrous foods made from seaweed, which is far less than the 20% of people in other nations like Japan that utilize seaweed as their primary source of fibrous foods. (PERPRES, 2019).

Seaweed farming is another kind of aquaculture in the fisheries industry that has potential for development in Indonesia, according to Aslan (1998). The production of seaweed is crucial to efforts to boost fisheries output in order to meet demands for food and nutrition, as well as those of the domestic and international markets. It also helps to create jobs, improve the welfare and income of fish farmers and fishermen, and preserve aquatic biological resources.

PERPRES, the year 2019 In addition to providing a food source, seaweed, particularly in Indonesia's coastal regions, helps to alleviate poverty among communities. With 261.9 million people living there as of 2017, Indonesia needs a lot of protein, carbs, and fiber. This explains the great desire for seaweed to be extensively cultivated in order to use it as a lever for the economic development of coastal areas, which are home to about 60% of Indonesia's total population.

METHODOLOGY

1. The Heading 2 MODIS (Moderate Resolution Imaging Spectroradiometer)

MODIS is one of the primary instruments carried by the spacecraft Terra (previously known as EOS AM-1) and Aqua (formerly known as EOS PM-1)., or Moderate Resolution Imaging Spectroradiometer. Terra crosses the equator from north to south in the morning due to the timing of its orbit, whereas Aqua crosses it from south to north in the afternoon.

In order to monitor the whole Earth's surface, Terra MODIS and Aqua MODIS collect data in 36 spectral bands, or sets of wavelengths, every one to two days (see to MODIS Technical Specifications). These data will improve our understanding of the global dynamics and processes occurring in the lower atmosphere, on land, and in the oceans. MODIS has significantly contributed to the development of validated global interactive Earth system models that can accurately predict global change, assisting decision-makers in protecting our environment.

The MODIS instrument has a high radiometric sensitivity (12 bit) and 36 spectral bands with wavelengths ranging from 0.4 µm to 14.4 µm. The solutions have very little out-of-band reaction and are tailored to the particular requirements of the user base. 29 bands are taken at 1 km, and five bands are taken every 500 m., and two bands at a notional resolution of 250 m at the nadir. Using a 2,330-kilometer swath and a ±55-degree scanning pattern at the 705-kilometer EOS orbit, global coverage is achieved every day or every two.

The Scan Mirror Assembly is powered by a motor encoder that is designed to run at 100% duty cycle for the duration of the instrument's six-year design life. It scans ±55 degrees employing a continually rotating, double-sided scan mirror. The optical system focuses light onto four refractive objective assemblies using an off-axis afocal telescope with two mirrors. These assemblies are one for the VIS, NIR, SWIR/MWIR, and LWIR spectral areas, and collectively they cover a 0.4 to 14.4 µm spectral range.

Two HgCdTe Focal Plane Assemblies (FPAs) have their 20 infrared spectral bands reduced to 83K by a high-performance passive radiative cooler. A unique photodiode-silicon readout technique offers exceptional quantum efficiency, low noise, and excellent dynamic range for the visible and near infrared. The two specialized electronics modules, The modules Space-viewing Analog (SAM) and Forward-viewing Analog (FAM), respectively, the analog programmable gain and offset, and the FPA clock and bias circuits, are situated close to the FPAs. The Main Electronics Module (MEM), the third module, is in charge of power, control systems, telemetry and command, electronics calibration, and control systems.

The system includes four on-board calibrators: a v-groove Blackbody (BB), a spectroradiometric calibration assembly (SRCA), a solar diffuser (SD), and a solar diffuser stability monitor (SDSM). It has a glimpse of space as well.

The first MODIS flight instrument, the ProtoFlight Model, or PFM, is installed on the Terra (EOS AM-1) satellite. On December 18, 1999, Terra was successfully introduced. The MODIS flying instrument number two is flying Model 1, or FM1. It is a part of the Aqua (EOS PM-1) spacecraft, which was launched on May 4, 2002, successfully. These MODIS instruments offer a unique window into the phenomenology of the land, atmosphere, and ocean that will be of great service to a broad and varied global user base.

The MODIS instrument has been developed since the middle of 1995, when the Engineering Model (EM) was completed. Since then, two spaceflight units—the Protoflight Model (PFM), housed aboard the Terra satellite, and the Flight Model 1 (FM1), housed aboard the Aqua satellite—have been completed and launched. Terra made its debut on December 18, 1999, and Aqua debuted on May 4, 2002.

The ultimate in aerospace hardware engineering for remote sensing are the MODIS sensors, which Santa Barbara Remote Sensing built in compliance with NASA specifications. The MODIS instruments were designed with the following subsystems and capabilities in mind. Click on the indicated links for more thorough technical explanations of each subsystem.

A single device with the ability to photograph the land, sea, and atmosphere; spectral bands with 1,000, 500, and 250 m resolutions; spectral bands that are adjustable to range from 0.4 to 14.4 µm with minimal out-of-band response; optomechanical apparatus; mainframe

Long-lasting, continuously spinning double-sided scan mirror assembly; passive radiator; and superior sensitivity provided by advanced focal plane assembly (FPA) technology Space-Viewing Door, Solar-Viewing Door, Forward-Viewing Analog Module, Main Electronics Module (MEM), Earth-Viewing Door, Electronics System, Optical Bench Assembly, Optical System Description, Door Assemblies, and On-Board Calibration System

Low ghosting and low scatter optics; on-board solar diffuser and solar diffuser stability monitor (SDSM); on-board full-aperture Blackbody (BB); IR calibration for low 1/f noise and good accuracy on each scan, Spectroradiometric Calibration Assembly (SRCA) mounted on-board.

2. Spesification (2.2)

Orbit: At 10:30 a.m., Terra, a sun-synchronous, near-polar, circular, descending node, is located 705 km away.. or ascending node (Aqua) at 1:30 p.m. 20.3 rpm cross-track sweep scan rate Dimensions: 2330 km (cross track) by 10 km (long track at nadir). Telescope: 17.78 cm in diameter, off-axis, afocal (collimated), with an intermediate field stop Dimensions: 1 x 1.6 x 1 m 228.7 kg in weight Power: 162.5 W (average for a single orbit) Peak daylight data rate is 10.6 Mbps, whereas the orbital average is 6.1 Mbps. Quantization using twelve bits 250 m (bands 1-2), 500 m (bands 3-7), and 1000 m (bands 8-36) are the available spatial resolutions. A six-year design lifecycle

Table 1. Spesification (2.2)

Principal Use	**Band**	**Bandwidth**[1]	**Spectral Radiance**[2]	**Required SNR**[3]
Limits of Air, Cloud, and Land	1	620 through 670	21.8	128
	2	841 through 876	24.7	201
Features of the Terrain/Cloud/Aerosols	3	From 459 to 479	35.3	243
	4	545 through 565	29.0	228
	5	Between 1230 and 1250	5.4	74
	6	1628 through 1652	7.3	275
	7	2105 through 2155	1.0	110
Ocean Color, Biogeochemistry, and Phytoplankton	8	405 through 420	44.9	880
	9	438 through 448	41.9	838
	10	483 through 493	32.1	802
	11	526 through 536	27.9	754
	12	546 through 556	21.0	750

	13	662 through 672	9.5	910
	14	673 through 683	8.7	1087
	15	743 through 753	10.2	586
	16	862 through 877	6.2	516
Airborne Water Vapor	17	890 through 920	10.0	167
	18	931 through 941	3.6	57
	19	915 through 965	15.0	250
Principal Use	**Ban d**	**First Bandwidth**	**Spectral Radiance2**	**Necessary NE[Δ]T(K) 4**
Weather of the Clouds and Surface	20	3.660 through 3.840	0.45(300K)	0.05
	21	3.929 throug3.989	2.38(335K)	0.20
	22	3.929 throug3.989	0.67(300K)	0.07
	23	4.020 throug4.080	0.79(300K)	0.07
Ambient Temperature	24	4.433 throug4.498	0.17(250K)	0.25
	25	4.482 throug4.549	0.59(275K)	0.25

Cirrus Water Vapor Clouds	26	1.360 - throug1.390	6.00	150(SNR)
	27	6.535 - throug6.895	1.16(240K)	0.25
	28	7.175 throug 7.475	2.18(250K)	0.25
Cloud Characteristics	29	8.400 - throug8.700	9.58(300K)	0.05
Ozone	30	9.580 throug9.880	3.69(250K)	0.25
Surface/Cloud Temperature	31	10.780 throug11.28 0	9.55(300K)	0.05
	32	11.770 throug 12.270	8.94(300K)	0.05
Cloud-Top Elevation	33	13.185 through 13.485,	4.52 (260 K)	0.25
	34	13.485 throug13.78 5	3.76 (two hundred and sixty thousand)	0.25
	35	13.785 throug14.08 5	3.11 (240 KB)	0.25
	36	14.085 throug14.38 5	2.08 (220 k)	0.35
Bands 1 through 19 are measured in nm, while bands 20 to 36 are in µm.Spectral Radiance values are (W/m2 -µm-sr). 3 The signal-to-noise ratio, or SNR 4 NE(Δ)T, is the noise equivalent of the temperature difference. Note: The performance aim exceeds the required level by 30–40%.				

3. Information (Top 2)

The MODIS instrument is utilized by both the Terra and Aqua missions.. Every one to two days, it monitors the whole surface of the Earth with a viewing swath width of 2,330 km. The data is collected at three different spatial resolutions: 250, 500, and 1,000 meters. 36 spectral bands between 0.405 and 14.385 µm are covered by its detectors..

The Tracking and Data Relay Satellite System (TDRSS) is used to send MODIS data, along with all the data from other sensors on board the Terra and Aqua spacecraft, to ground stations in White Sands, New Mexico. The data is then received by the EOS Data and Operations System (EDOS) at the Goddard Space Flight Center.

The Level 1A, Level 1B, geolocation, cloud mask, and Higher-level MODIS land and atmospheric products are produced by the MODIS Adaptive Processing System (MODAPS). After that, these are split up among three DAACs for dissemination. The Ocean Color Data Processing System (OCDPS) generates ocean color products that are made available to the application and scientific communities.

A multitude of data items derived from MODIS observations provide information about land, ocean, and atmospheric aspects that are useful for investigating processes and trends at local, regional, and global scales. As was previously mentioned, MODIS products are offered by a number of vendors. The LAADS website offers MODIS Level 1 and atmospheric products. The U.S. Geological Survey EROS Data Center (EDC) offers Land Products via the Land Processes DAAC.

The National Snow and Ice Data Center (NSIDC) in Boulder, Colorado, provides cryosphere data products (snow and sea ice cover). items on sea surface temperature and ocean color are available at the OCDPS at GSFC, along with information on these items. If users have the required x-band receiving equipment, they can get regional data directly from the spacecraft via the MODIS Direct Broadcast signal.

The information websites listed below have more details regarding getting MODIS data. The following are the URLs for these data sources:

1. http://ladsweb.nascom.nasa.gov provides Cloud mask, geolocation, atmospheric products, and MODIS level 1 data.
2. You can access MODIS land products at lpdaac.usgs.gov.
3. Items available at http://nsidc.org/daac/modis/index.html for the MODIS cryosphere.
4. You can access MODIS products for ocean color and sea surface temperature at http://oceancolor.gsfc.nasa.gov.

4. Analytical Methods

The Ocean Biology Processing Group (OBPG) at NASA's Goddard Space Flight Center provides support for the OceanColor Web. Our responsibilities include gathering, manipulating, confirming, storing, and distributing ocean-related objects from various locations, as well as data on ocean color, Since 1996, the international research community has had access to sea surface salinity and temperature through satellite-based remote sensing programs.

SeaDAS is an all-inclusive software suite designed to handle, display, analyze, and quality-check ocean color data. While SeaDAS is primarily focused on ocean color data, its application can also help many other satellite-based earth science data analysis applications. It was originally created to support the SeaWiFS mission, but it currently supports the majority of US and international ocean color missions.

The NASA SeaDAS Toolbox and the ESA Sentinel-3 Toolbox are application platforms for the SeaDAS 8.x platform, which is an extension of the ESA SNAP platform. The fundamental command line and graphical user interface (GUI) components of NASA SeaDAS science processing are included in the SeaDAS ToolBox. The Sentinel-3 Toolbox contains the ESA processors and NASA satellite mission data file readers for the Sentinel-3 missions.In terms of the internal workings and key components of the GUI, SeaDAS 8.x represents a significant improvement over SeaDAS 7.5.3.
The latest version of SeaDAS, 8.3.0, includes Sentinel-3 Toolbox (version 9.0.3) and SeaDAS Toolbox (version 1.3.0). Furthermore, SeaDAS 8.3.9, which is only compatible with Mac OS, fixes the issue of operating Mac OS 13 Ventura.

RESULT AND DISCUSSION

1. Sea Surface Temperature (SST) Satellite Imagery Results from January to June 2019

The distribution of sea surface temperature, which is connected to sunlight intensity and the process of photosynthesis, has a significant impact on the growth and development of seaweed. It will be feasible to identify the seaweed planting season and the potential area for seaweed agriculture by knowing the distribution of SST.

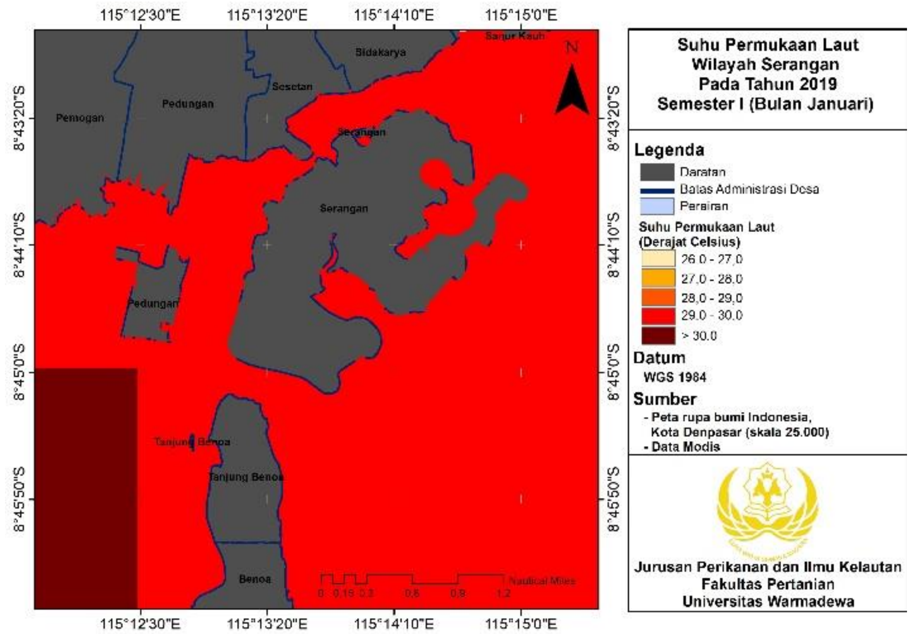

Figure 1. SPL Image for January 2019

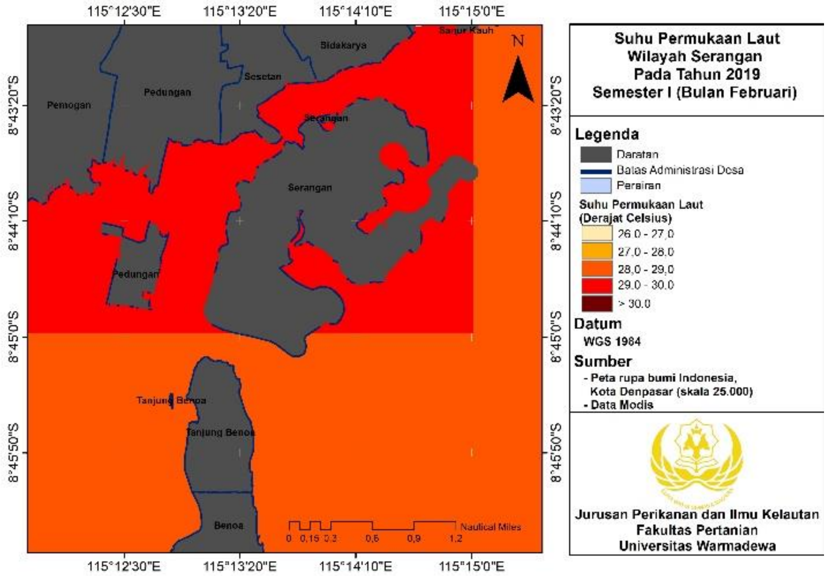

Figure 2. SPL Image For February 2019

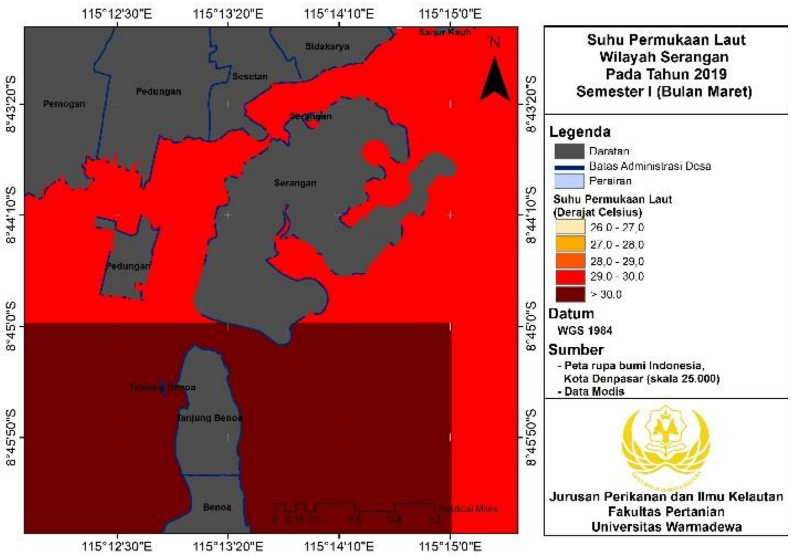

Figure 3. Maret 2019 SPL Image

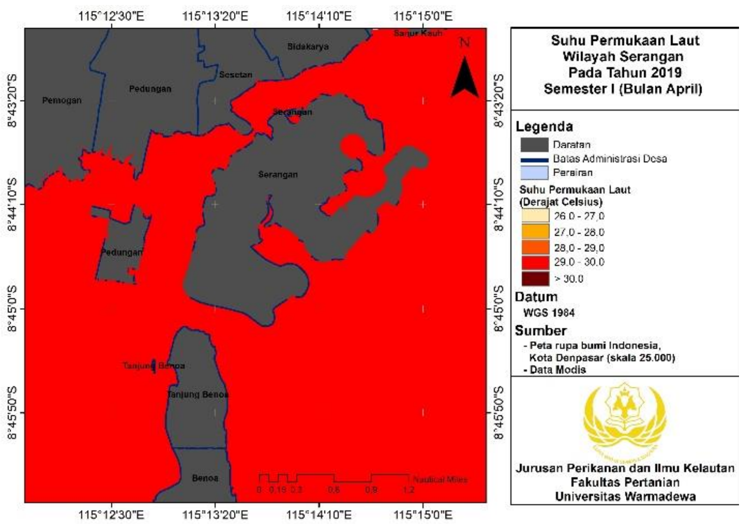

Figure 4. April 2019 SPL Image

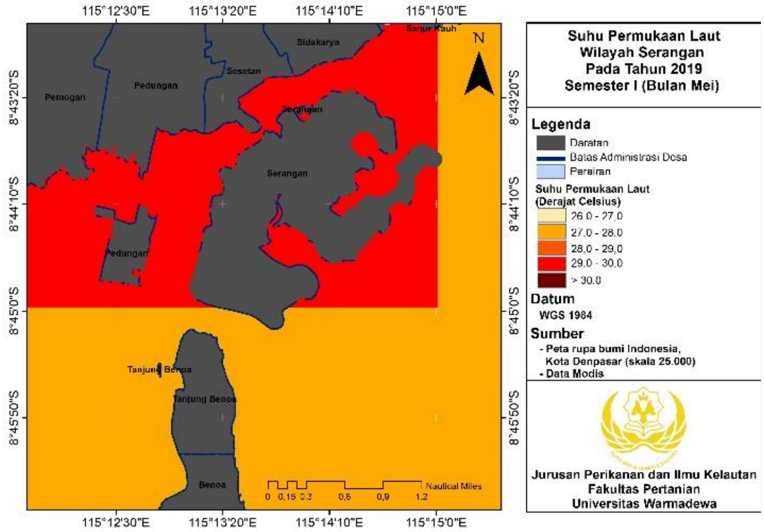

Figure 5. Mei 2019 SPL Image

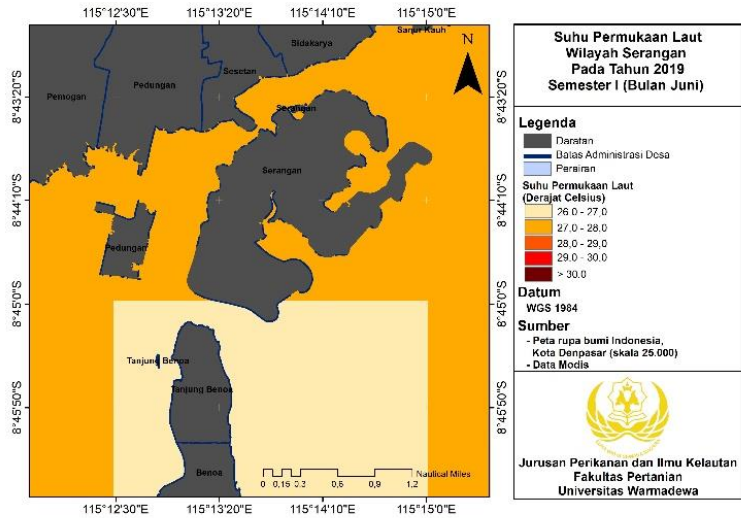

Figure 6. Juni SPL Image 2019

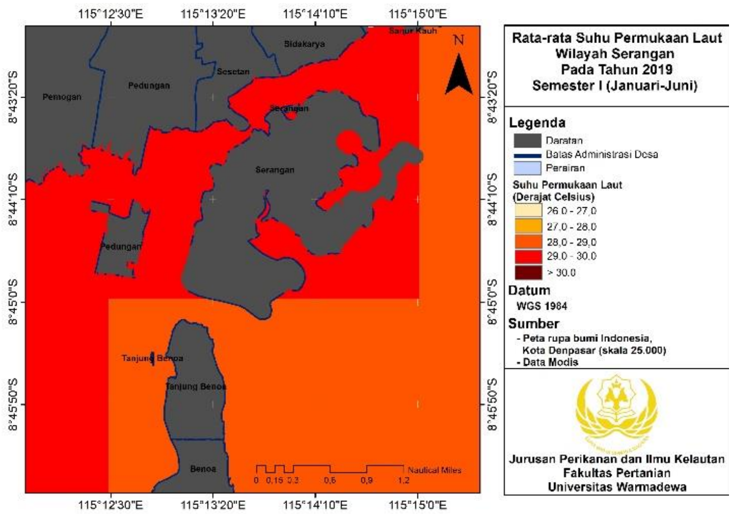

Figure 7. Mean SPL from January to June in 2019

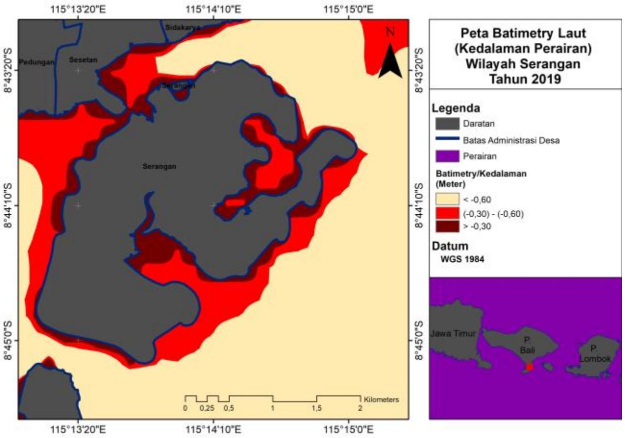

Figure 8. 2019 Average Bathimetry

2. January–June 2023 Surface Temperature Atmospheric (SST) Satellite Imagery Results

The SPL image results for January through June of 2023 are listed here.

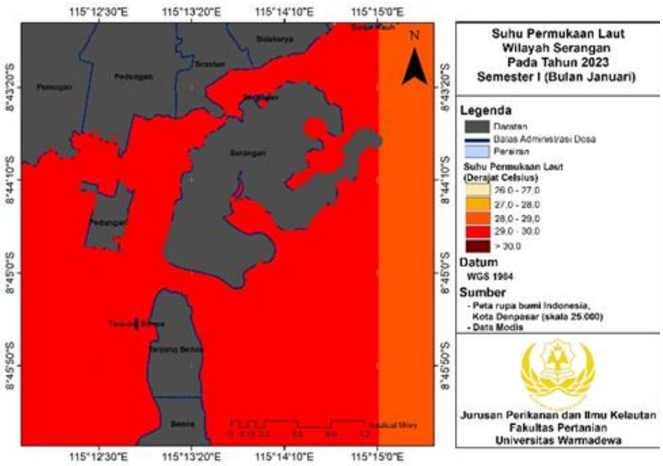

Figure 9. Image SPL Januari 2023

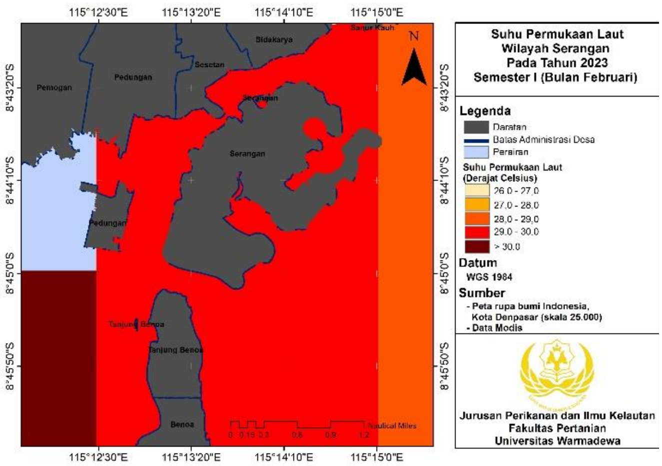

Figure 10. Image SPL Februari 2023

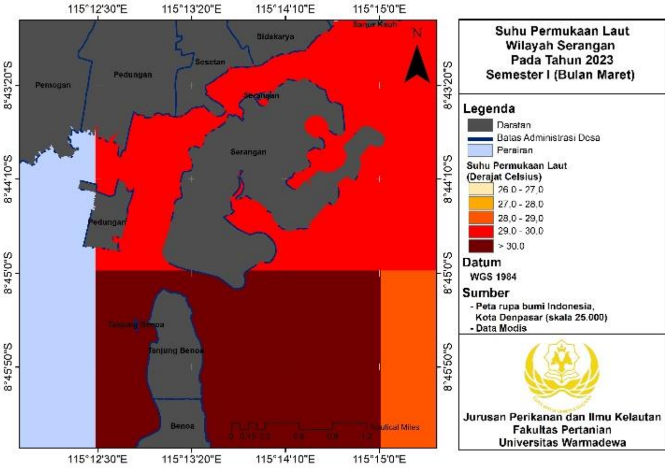

Figure 11. Image SPL Maret 2023

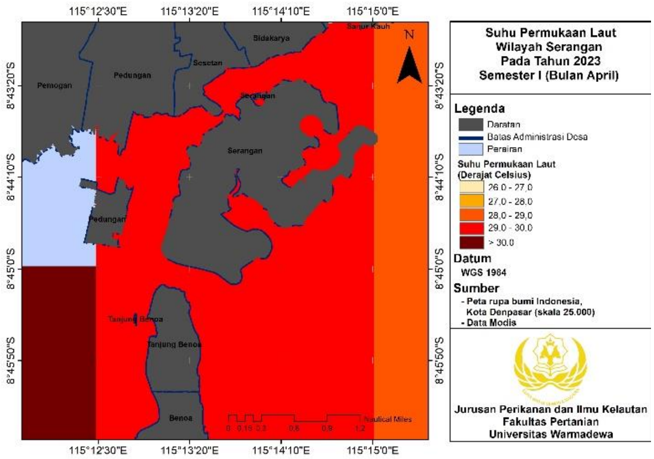

Figure 12. Image SPL April 2023

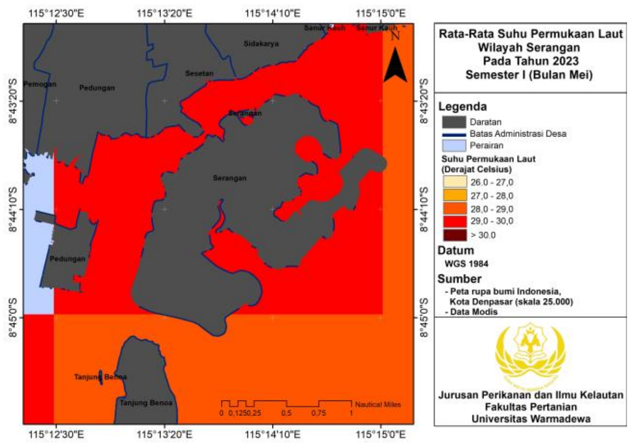

Figure 13. Image SPL Mei 2023

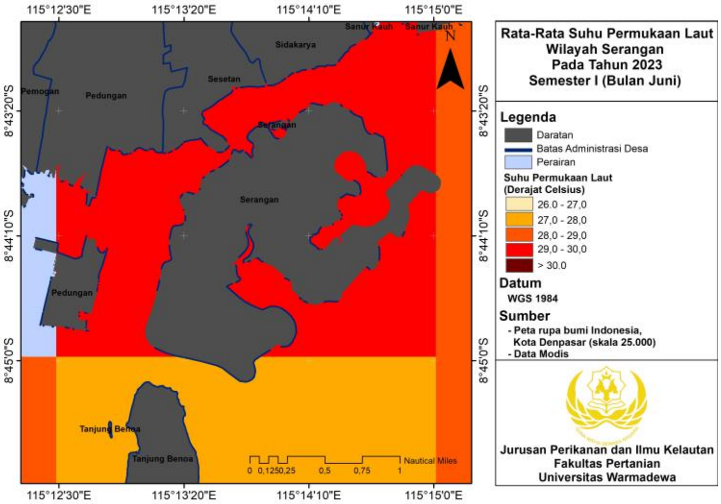

Image 14. Image SPL Juni 2023

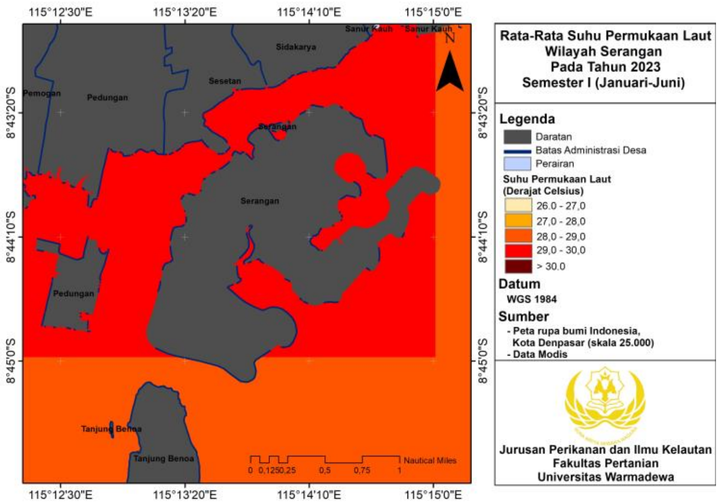

Figure 15. Average SPL Januari - Juni 2023

3. Findings from January to June 2019 and January to June 2023 for Bathymetry Satellite Imaging (Depth)

Fig. 5 displayed the total gas generation for the NaOH pretreatment at three different concentrations (1:2, 1:1, and 2:1) and two control tests.

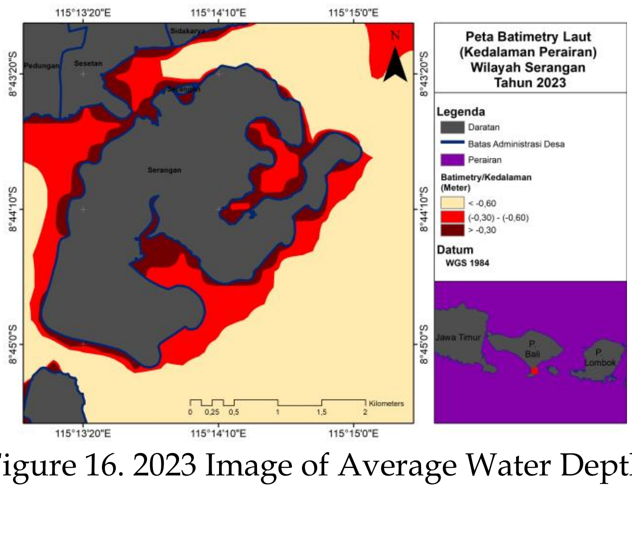

Figure 16. 2023 Image of Average Water Depth

4. Suitability of Area for Growing Seaweed Cultivation

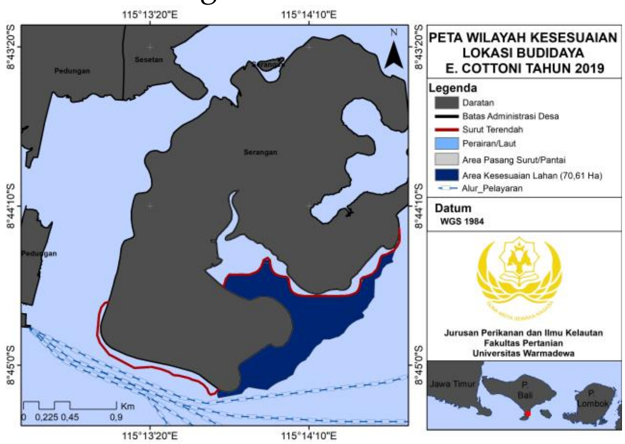

Figure 17. Water Location Where Seaweed Farming Could Take Place in 2019.

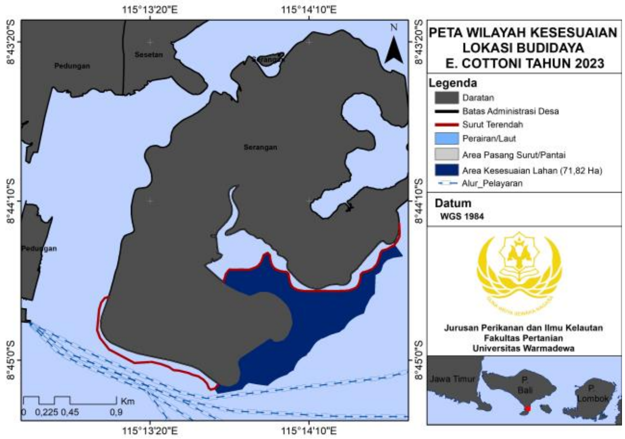

Figure 18. Water Area where Seaweed Farming May be Possible in 2023

CONCLUSIONS AND RECOMMENDATIONS

The following are the conclusions drawn from the satellite imaging data.

A) The average water quality readings range from 26 to 30 ˚C B) The average bathimetri water depth is less than 30 M C C D) The potential seaweed cultivation area in 2019 is 70.61 Ha E) The possible seaweed cultivation area in 2023 is 71.82 Ha.

FURTHER STUDY

This research still has limitations, so it is necessary to carry out further research regarding the Potential for Development of Seaweed Cultivation Business Post Covid-19 Post in the Marine Area in order to perfect this research and increase readers' insight

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