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Analysis of the Factors Causing a Decline in Soil Quality and Their Solutions as an Effort to Increase Agricultural Productivity in Dry Areas

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Abstract: West Nusa Tenggara (NTB) is an area that has abundant agricultural resources apart from the tourism sector. Generally, the climate in NTB is a tropical climate which is in the southern part of Lombok, namely in the Central Lombok area. The technique of determining the location and population was carried out using a purposive sampling method, meaning that the population used as a research sample was a population that met certain sample criteria according to the research objectives, and what had to be represented depended on the assessment or considerations of the researcher. Meanwhile, the data analysis used was descriptive data analysis quantitative with multiple linear regression analysis, t-test and F-test, and qualitative descriptive analysis using interview techniques with questionnaires, counseling, and FGD. The stages of the research are surveys, interviews, distribution of respondents, Forum Group Discussion (FGD), counseling, and evaluation. Land conversion, excessive use of pesticides and burning of crop residues was carried out on this basis by the Forum Group Discussion (FGD) which aims to provide solutions to existing problems. From the results of multiple in-ear regression SPSS testing, there is a significant relationship between the variable Y (level of agricultural productivity) in Pujut District and the factors that cause a decrease in soil quality or soil degradation (Variable X) that occurs at the research location with the results of the regression equation, namely Y = 5,398+ 0.97X1+0.125X2+0886X3+0.861X4. The results of the regression equation show a strong relationship between the decline in soil quality and the factors causing the decline in soil quality in the Pujut sub-district.

Keywords: Agricultural Productivity; Dry Area; Soil Quality

Introduction

Indonesia is part of a wet tropical ecosystem which is classified as very vulnerable to degradation if management is not appropriate (Farhan & Lim, 2012; Pratiwi et al., 2021). Wet tropical ecosystems cover an area of about 1.5 billion hectares of land with a human population of around 2 billion, spread over 60 countries, 20% of the area is in Asia. To live and develop vegetation, good soil (living medium) is needed. However, at this time a lot of soil is experiencing degradation which causes decreased plant productivity and is prone to erosion (Ayu et al., 2020; Reswita et al., 2021). In general, soil degradation means a decrease in soil quality, in the sense of the loss of one or more functions in the soil (Johnson et al., 1997). Soil is a natural resource that is very useful for human life (Karlen et al., 2019; Ruwayan et al., 2020). The biggest benefit is water storage and the growth of various plants. The sector that is highly dependent on land is agriculture. The decline in soil quality or soil degradation results in a decrease in the quality, quantity, and status value of the land. Many ways can be done to prevent the decline in soil quality. This must be done immediately if there is soil degradation so as not to interfere in terms of productivity.

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Salim (2013) stated that organic farming and its various production and post-harvest activities stated "That material was rarely used to produce bioethanol as alternative biofuels that were environmentally friendly (Kodirov et al., 2020; Roy et al., 2009). This means that farmers' attention to organic things is less. Integrated or conservation farming systems combine several technological components to achieve goals, namely the sustainability of increasing the productivity of food crops and people's incomes, strengthening resilience to climate change and diversity, and reducing sources of climate change such as greenhouse gas emissions while increasing carbon stocks in the land. The application of conservation and climate-friendly agriculture can improve soil quality where the soil can support plant growth including factors such as tillage depth, aggregation, organic matter content, water holding capacity, infiltration, availability of essential nutrients, infiltration rate, and changes in soil reaction. Land productivity is very important in supporting the cultivation of plants that grow on it. Land parameters that affect the amount of crop yields include nutrients, soil solum, soil texture, slope, and irrigation water conditions (Suriadi et al., 2021; Tomaz et al., 2020).

The scarcity of farmers who are willing to pay attention to organic farming has an effect on environmental quality. Natural factors cause soil degradation between others: areas with steep slopes, easily damaged soil, intensive rainfall, and others (Chalise et al., 2019). Factors of land degradation due to human intervention, both directly and indirectly, dominate more than natural factors, including population changes, population marginalization, population poverty, land tenure problems, political instability and mismanagement, social and economic conditions, health problems, and development improper agriculture.

Soil conservation is the placement of each plot of land in a way of use that is following the ability of the land and treating it according to the requirements needed to prevent land damage (Kheirfam et al., 2020). The physical, chemical properties of the soil and the state of the field topography determine the suitability for a particular use and the treatment required (Mentis, 2020). For land valuation, it is formulated in a land capability classification system aimed at; (1) preventing soil damage by erosion, (2) repairing damaged soil and (3) maintaining and increasing soil productivity so that it can be used sustainably (AbdelRahman, 2023; Sumarniasih & Antara, 2020). One way to control or prevent soil degradation is by rehabilitating the soil structure. Rehabilitation is also useful for repairing, restoring, and improving the condition of damaged land so that it can function optimally both as an element of production, a medium for regulating water management and as an element of nature and environmental protection (Hussain et al., 2022).

West Nusa Tenggara (NTB) is an area that has abundant agricultural resources apart from the tourism sector. Generally, the climate in NTB is a tropical climate, which is around the southern part of Lombok, namely in the Central Lombok area (Radiarta et al., 2016; Suriadi & Nasam, 2017). Based on Schmid and Ferguson's classification, Central Lombok Regency has climate D and climate E, namely tropical rain with a dry dry season, Central Lombok has a paddy field area of 54,287 ha and a dry land area of 33,348 ha. Central Lombok was identified as experiencing degradation caused by various factors causing a decrease in agricultural productivity. On this basis, this research was conducted to determine the extent to which the decline in soil quality affected agricultural production and it is hoped that the results of this study can provide solutions to farmers' problems, so the researchers raised the research theme " Analysis of the Factors Causing a Decline in Soil Quality and Soil Quality Improvement Solutions in Increasing Agricultural Productivity in Dry Areas, Pujut District, Central Lombok Regency, West Nusa Tenggara.

Method

Time and Place of Research

This research was carried out for 8 months starting from November 2022 - June 2023 which was carried out in Pujut District, Central Lombok Regency by focusing on 3 villages namely Tumpak Village, Kuta Village, and Teruwai Village. The location was taken based on the area of land that was classified as the driest in the Pujut sub-district.

Data Type

The types of data used in this research are primary data and secondary data. Primary data is data that comes from interviews and the distribution of questionnaires, counseling, and Forum Group Discussion (FGD). Meanwhile, secondary data comes from villages, Pujut District, the Agriculture and Livestock Service Office of Central Lombok Regency, and the Central Statistics Agency.

Data Collection Techniques

Observation

The observation method can produce more detailed data regarding behavior (subjects), objects, or events (objects) compared to survey methods. The advantages of the observation method compared to the survey method are that the data collected is generally undistorted, more accurate, and free from response bias.

Questionnaire

An interview using a questionnaire is a data collection technique that is carried out by giving a set of questions or written statements to the respondent to answer. Questionnaires are an efficient data collection technique when the researcher knows exactly the variable to be measured and knows what can be expected from the respondent. In addition, the questionnaire is also suitable for use when the number of respondents is quite large and spread over a large area. Questionnaires can be in the form of closed or open questions/statements and can be given to respondents directly or via social media.

Counseling

Counseling is a technique for conveying information and collecting data used by researchers to collect data from those related to research.

Forum Group Discussion

Forum Group Discussion (FGD) is an activity that involves respondents and stakeholders in discussing the issues being studied.

Evaluation

Evaluation of research results is carried out while continuing to collaborate with sub-districts regarding the sustainability of implementing solutions so that the problems of decreasing soil quality and soil degradation can be reduced.

Data analysis

The analysis used in this study is descriptive qualitative and quantitative analysis. Qualitative data were obtained using survey and observation methods by collecting data, namely questionnaires, structured interviews, FGDs, and so on (Sugiyono, 2015). While the analysis of quantitative data used is the analysis of the percentage of factors causing the decline in soil quality by taking the results of the opinions of respondents in the three research locations. And multiple regression analysis because there is more than one dependent variable. Multiple linear regression is a regression model that involves more than one independent variable. Multiple linear regression analysis was carried out to determine the direction and how much influence the independent variables have on the dependent variable. Measuring the effect of variables involving more than one independent variable (X1, X2, X3,…, Xn), multiple linear regression analysis is used, called linear because each estimate of the value is expected to experience an increase or decrease following a straight line. The formula for multiple linear regression analysis is:

$$Y=a+b1X1+b2X2+b3X3+\ldots+bnXn \quad (1)$$

Information :
Y: dependent variable (dependent)
X (1,2,3,…) : independent variable
a: constant value
b (1,2,3,…): regression coefficient value

Statistical constant values are used if the units of variable X (independent) and variable Y (dependent) are not the same. Meanwhile, if variable X (independent) and variable Y (dependent), both simple and multiple linear, have the same units, then the value of the constant is ignored with the assumption that the change in variable Y (dependent) will be proportional to the value of the change in variable X (independent). In determining the value of 'a' and 'b1','b2','b3',.., the multiple linear regression Formula 2.

$$SY=an+b1SX1++b2SX2+b3SX3+\ldots$$
$$SX1Y=aSX1+b1SX1^2+b2SX1X2+\ldots$$
$$3.SX2Y=aSX2+b2SX1X2+b2SX21^2+\ldots \text{ and so on.} \quad (2)$$

To calculate the value of 'a','b1','b2','b3',… in the multiple linear regression equation, it can be formulated =nx-1 where nx = the number of independent variables (X). Parameter Testing a. Parameter accuracy test (test statistic t). The t-statistical test shows how far the influence of one explanatory variable individually explains the variation of the dependent variable (Kuncoro, 2001). Model Accuracy Test 1) F test F statistical test basically shows whether all the independent variables included in the model have a joint effect on the dependent variable (Kuncoro, 2001). The coefficient of determination (R2) The coefficient of determination (R2) is the comparison between the variation of the dependent variable which is explained by the independent variables together compared to the total variation of the dependent variable (Setiaji, 2006).

Flowchart

The research flowchart is as follows Figure 1:

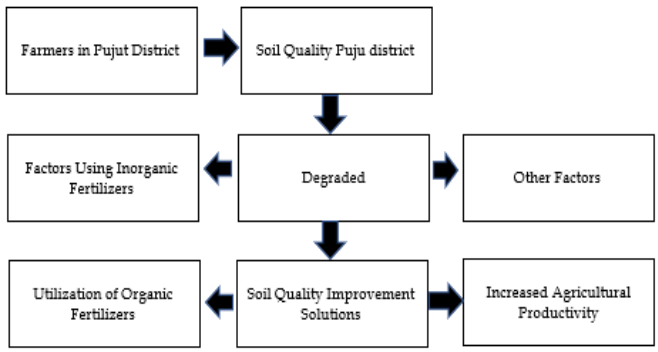

Figure 1. Schema of Research

Result and Discussion

Pujut District and dry land character

Figure 2. Map of the Pujut District Area

Pujut District is a sub-district in Central Lombok Regency with the largest area among the 12 existing sub-districts, which is around 23,355 ha or occupies around 19.33 percent of the total area of Central Lombok Regency. Geographically, Pujut District is in the southern part of Central Lombok Regency and borders the Indonesian Ocean. This is one of the reasons for the emergence of many tourist objects, especially marine tourism which has beautiful beaches and unique waves. To the north, it is bordered by the District Central Praya, bordering East Praya District to the east and West Praya District to the west. Central Praya, borders East Praya District to the east and West Praya District to the west.

Observations were made by observing the condition of the area in Pujut District which is dominated by dry and sandy soil. Pujut District has 16 villages, with most of them having a tropical climate and a rain-fed farming system. The total area of Kec. Pujut is 23,355.

Table 1 shows the area of land in the study locations based on the area with the highest percentage, namely Tumpak Village 3,454 with a percentage of 14.79%, Teruwai 2,965 with a percentage of 12.70%, and Kuta 2,366 with a percentage of 10.13%. These three villages have sandy, dry soil textures. Pujut subdistrict in general has a dry and sandy soil texture with a total paddy field area of 6875 and a dry land area of 8,363 more details are shown in the following table 2:

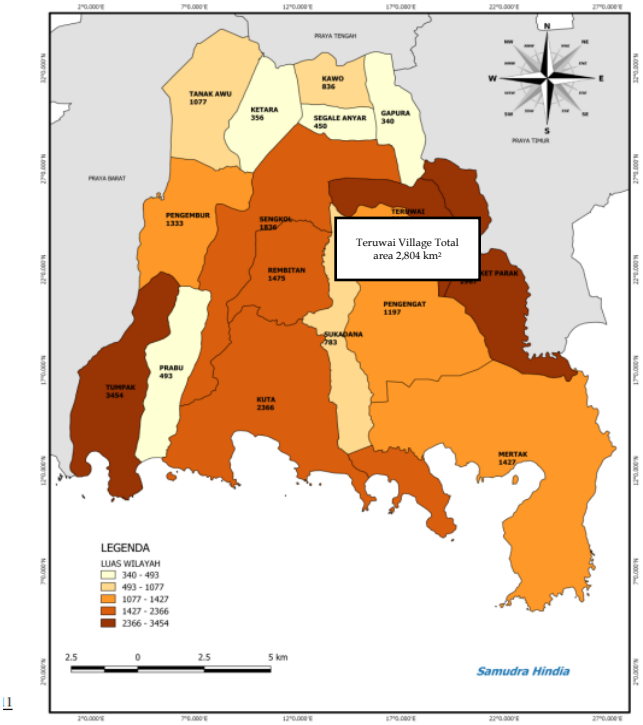

Figure 3. Area by Village in Pujut District

Table 1. The area of the Pujut sub-district is broken down by village

Village	Area (Km²)	Percentage (%)
1. Tumpak	3454	14.79
2. Prabu	493	2.11
3. Kuta	2366	10.13
4. Rembitan	1475	6.32
5. Sukadana	783	3.35
6. Mertak	1427	6.11
7. Pangengat	1197	5.13
8. Teruwai	2965	12.70
9. Gapura	340	1.46
10. Kawo	836	3.58
11. Segala Anyar	450	1.93
12. Sengkol	1836	7.86
13. Pengembur	1333	5.71
14. Ketara	356	1.52
15. Tanak Awu	1077	4.61
16. Bangket Parak	2967	12.70
Total	23355	100.00

Source : Statistical Coordinator of Pujut District

Table 2 shows that Pujut sub-district has higher dry land than paddy fields. The 3 research locations were Tumpak Village with 300 Ha of paddy fields and 2,504 Ha of dry land, Kuta Village with 158 Ha of paddy fields and 1,446 Ha of dry land, while Teruwai Village had 883 Ha of paddy fields and 1,424 Ha of dry land. The soil texture in the three locations is dominated by dry land with a rain-fed farming system, causing farmers in this area to plant once a year. Based on the results of in-depth interviews, farmers in this area inform that they plant

corn or soybeans to fill the void in their land. Dry land is a type of agriculture that is carried out on dry land, namely land that has a low water content, even the extreme is that this dry land is a type of land that tends to be arid, and does not have a definite source of water, such as rivers, lakes or irrigation canals. Dry land expects only from rainfall. Dry land itself belongs to the suboptimal land type which is defined as land that is less able to support food production due to a lack of one or more supporting elements or components. Dry land is usually planted with many crops such as horticultural crops, plantation crops, as well as food crops such as upland rice, corn, cassava/cassava, sweet potatoes, peanuts, and soybeans. Dry land agricultural crops that will be discussed using an expert system are: Breadfruit, Salak, Sapodilla, Mangosteen, and Soursop (Heliza R, et al. 2018).

Table 2. Area of Paddy Field Land and Dry Land in Pujut District.

Village	Wetland	Dryland	Total
1. Tumpak	300	2.504	2.804
2. Prabu	110	283	393
3. Kuta	158	1.446	1.604
4. Rembitan	882	413	1.295
5. Sukadana	196	494	690
6. Mertak	230	286	516
7. Pengengat	318	331	649
8. Teruwai	883	1.424	2.307
9. Gapura	274	4	278
10. Kawo	728	27	755
11. Segala Anyar	303	106	409
12. Sengkol	725	263	988
13. Pengembur	942	297	1.239
14. Ketara	270	63	333
15. Tanak Awu	556	422	978
Total	6.875	8.363	15.238

Source : BPP of Pujut District

Factors Causing Deterioration in Soil Quality

To find out in depth the causes of the decline in soil quality in the research location, it was carried out descriptively through 3 activities, namely in-depth interviews using a questionnaire of 45 respondents (Farmers) with 15 farmers in each village, counseling activities of 30 participants presenting 10 people from each village in the three locations and the Forum Group Discussion (FGD) which presented 8 stakeholders and policymakers including the Head of the Central Lombok Agriculture and Livestock Service, Pujut Sub-district Head, Secretary of the Tumpak Village Head, Terwai Village Head and Kuta Village Head, Extension Coordinator, Danramil Pujut and Pujut Police Chief.

Independent Interview Using Questionnaire and counseling

Based on the results of in-depth interviews and counseling using a questionnaire involving 75 farmers with 25 farmers per village, it is known that the causes of the decline in soil quality are are shown in Table 3.

Table 3. Factors Causing Soil Quality Decline

Factors causing the decline in soil quality	Number of people	percentage (%)
Eruption	1	1
Excessive use of pesticides	13	17
Reduced Soil Nutrients	2	3
Burning Leftovers	12	16
Land Function Transfer	18	24
Monoculture Planting Pattern	1	1
Deforestation	0	0
Type C Mining and Quarrying	19	25
Use of heavy equipment	5	7
Environmentally Unfriendly Development	4	5
Total	75	100.0

Table 3 shows the main factors of the decline in soil quality according to farmers in the three locations caused by 4 main factors with the highest percentage results, namely Mining Business 25%, Industrial Pollution 24%, Use of Pesticide Fertilizers 17%, Burning Leftovers 16%.

Forum Group Discussion (FGD)

To resolve the problem of decreasing soil quality, FGD activities were carried out aimed at providing information to stakeholders and policy makers in making policies to improve soil quality so that soil degradation can be reduced (Thorsøe et al., 2019). The 4 factors can be seen in the following table:

Table 4. The main factors causing land degradation

Soil Quality Deterioration Factors	Number of people	Percentage (%)
Mining and Quarrying Business Type C	19	25
Land Function Transfer	18	24
Excessive use of pesticides	13	17
Burning Leftovers	12	16

Based on the table 4, it shows that the main factor for decreasing soil quality or soil degradation is mining with a percentage of 25%. Construction or excavation of type C and B in the Kute and Prabu areas. Many people complain because it has an impact on agricultural land which is the source of livelihood in this area. In addition, land conversion with a percentage of 24% was caused by the Mandalika KEK and the construction of the Mandalika circuit because most people still question the construction of the Mandalika circuit which is detrimental to society. The use of pesticides or organic

fertilizers with a percentage of 17% Until now the community or farmers in the area research admits that 100% uses organic fertilizers due to lack of understanding and limitations of inorganic fertilizers suggested by the government and burning crop residues with a percentage of 16%, from survey results and observations farmers still clean up crop residues by burning crop yields even though harvested straw can be used as fertilizer (Pranata, 2010).

Based on the percentage results of the factors causing the decline in soil quality, an FGD was conducted with the aim of following up on existing problems. From the FGD activities involving the District and related agencies and other stakeholders, it resulted in the determination of solutions and socialization of the benefits of the solutions provided. The solutions and benefits of the causes of soil degradation can be seen in Table 5.

Evaluation

Evaluation activities carried out during the research were coordinating with the sub-districts and related agencies related to solutions or policies carried out in solving the problem of soil degradation.

The influence of factors causing soil degradation (soil degradation) on the level of agricultural productivity in Pujut District to determine the effect of factors causing land subsidence on the level of agricultural productivity in Pujut District with 3 villages as the main locations, namely Tumpak Village, Kuta Village and Teruwai Village, the regression results were obtained as table 6.

Based on the output display of the SPSS model summary, the value of R2 is 0.788, meaning that 78.8% of the change/variation in the value of the dependent variable (Y) can be explained by variations of all independent variables (X1, X2, and X3), and the remainder (100% - 78.8 % = 21.2%) is explained by other reasons outside the model.

Table 5. FGD results; provision of solutions and benefits to the factors causing land subsidence in Pujut District

Soil Quality Deterioration Factors	Solution	Benefit
Mining and Quarrying Business Type C	Closing the former mine excavation	minimize the kinetic energy of rain hitting the ground surface and inhibiting surface water flow (run-off) and causing water that enters the soil to increase so that soil erosion decreases and the environmental ecosystem is also improved. The more the soil surface is covered by vegetation, the better it is in protecting the soil from erosion.
Land Function Transfer	Providing assistance and incentives for farmers, increasing the capacity of human resources in the agricultural sector and strengthening policies in the agricultural sector	Farmers have capital in making businesses more independent
Excessive use of pesticides	Inorganic fertilizer application	Able to provide nutrients in a relatively short time, produce available nutrients that are ready to be absorbed by plants, contain more nutrients, do not smell pungent, practical and easy to apply.
Burning Leftovers	Application of rules prohibiting burning of crop residues in rice fields	Increasing soil nutrients which have an impact on improving soil quality and increasing production, Reducing pests and diseases caused by burning ash, reducing environmental pollution.

Table 6. SPSS output results Coefficient Determination (R^2)

Model	R	R Square	Adjusted R Square	Std. Error of Estimate
1	0.280[a]	0.788	0.026	1.00479

Table 7. Analysis Result by Anova

Model		Sum of Square	df	Mean Square	F	Sig.
1	Regression	5.994	4	1.498	1.484	0.0003[b]
	Residual	70.673	70	1.010		
	Total	76.667	74			

Based on the Table 7. ANOVA test or F-test, the F-count value is 1,484 with a probability of 0.003; because the probability is smaller than α = 0.05 then Ho is rejected. This means that together (simultaneously) all the independent variables (X1, X2, X3 and X4) included in the model have a significant effect on the level of agricultural productivity (Y).

Partial Significance Test (t-test)

Based on the coefficients table, it is known that the t-count value for X1 is 0.840 with a probability of 0.004; because the probability is smaller than α = 0.05 then Ho

is rejected, meaning that the regression coefficient X1 is significant or has a significant effect on the dependent variable (Y). The t-count value for X2 is 1,449 with a probability of 0.001; because the probability is smaller than α = 0.05 then Ho is rejected, meaning that the regression coefficient X2 is significant or has a significant (negative) effect on the dependent variable (Y). The t-count value for X3 is 0.746 with a probability of 0.003; because the probability is smaller than α = 0.05 then Ho is rejected, meaning that the regression coefficient X3 is significant or has a significant effect on the dependent variable (Y). X4 is 0.732 with a probability of 0.002; because the probability is smaller than α = 0.05 then Ho is rejected, meaning that the regression coefficient X4 is significant or has a significant effect on the dependent variable (Y). Based on the coefficients table, the regression equation can be written:

Y=5.398+0.97X1+0.125X2+0886X3+0.861X4

A constant of 5,398 states that if all independent variables are considered constant (fixed), then the average productivity level is 5,398; the X1 regression coefficient of 0.971 states that if the X1 variable (Mining and Quarrying Business Types c and b) increases by one unit and the other variables are considered constant (fixed), then the productivity level increases by 0.971; the X2 regression coefficient of 0.125 states that if the X2 variable (land conversion)) increases by one unit and the other variables are considered constant (fixed), then the productivity level is 0.125; the X3 regression coefficient of 0.886 states that if the X3 variable (excessive use of pesticides) increases by one unit and the other variables are considered constant (fixed), the productivity level is 0.886; and the X4 regression coefficient of 0.861 states that if the X4 variable (burning of crop residues) increases by one unit and the other variables are considered constant (fixed), the productivity level is 0.861.

Conclusion

Pujut District is a sub-district in Central Lombok Regency with the widest area among the 12 existing sub-districts, which is around 23,355 ha or occupies around 19.33 hectares. The research locations are Tumpak Village 3,454 with a percentage of 14.79%, Teruwai 2,965 with a percentage of 12.70% and Kuta 2,366 with a percentage of 10.13%. These three villages have dry, sandy soil texture. Pujut sub-district in general has a dry and sandy soil texture with a total paddy field area of 6875 and a dry land area of 8,363. Research activities include surveys, observations, in-depth interviews, counseling, FGD and evaluation of follow-up FGDs. Based on the primary data processed, there are 10 factors that cause land subsidence in Pujut sub-district, but there are 4 major factors that cause a decrease in soil quality which results in a decrease in agricultural productivity, namely mining and raking types C and B, land conversion, excessive use of pesticides and burning crop residues. it is on this basis that a Forum Group Discussion (FGD) is conducted. From the results of the SPSS multiple linear regression test, there is a significant relationship between the variable Y (level of agricultural productivity) in Pujut District and the factors that cause a decrease in soil quality or soil degradation that occurs at the study site.

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Author Contributions

The author's contribution to research activities are: Dr.Ir. Muh. Ansyar, MP (Head of Research) is in charge of coordinating with the research team during research activities, compiling preparation proposals, observing locations, collecting data, tabulating and analyzing data; Herdiana,S.Pi.,M.Sc (Member) prepares proposals and preparations, location observations, data collection, data tabulation. Students taking primary and secondary data and documentation.

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Conflicts of Interests

The activities of this entire series of research were fully funded by Al-Azhar Islamic University's internal funds where the output of this research was in the form of a reputable National journal which was published in the Sinta 2 journal according to funds and contracts from the donor party (UNIZAR) to researchers. The task of each researcher has been approved by both the chairman, members and students involved in this study. The results of the research will be submitted to the research monitoring and evaluation which time has been determined and the scope of the research is submitted to LPPM as the institution whose job is to carry out reporting on all research activities and service to the University. The research results will also be submitted to partners, namely Pujut District in the form of research results modules.

References

AbdelRahman, M. A. E. (2023). An overview of land degradation, desertification and sustainable land management using GIS and remote sensing applications. *Rendiconti Lincei. Scienze Fisiche e Naturali*, 1–42. https://doi.org/10.1007/s12210-023-01155-3

Ayu, I. W., Kusumawardani, W., & Wartiningsih, A. (2020). Peningkatan kapasitas petani untuk mencegah degradasi lahan pertanian berlereng di lahan kering Desa Pelat, Kecamatan Unter Iwes, Sumbawa. *Agroinotek*, *1*(1), 34–42. Retrieved from https://agroinotek.ub.ac.id/index.php/agroinotek/article/view/7

Chalise, D., Kumar, L., & Kristiansen, P. (2019). Land degradation by soil erosion in Nepal: A review. *Soil Systems*, *3*(1), 12. https://doi.org/10.3390/soilsystems3010012

Farhan, A. R., & Lim, S. (2012). Vulnerability assessment of ecological conditions in Seribu Islands, Indonesia. *Ocean & Coastal Management*, *65*, 1–14. https://doi.org/10.1016/j.ocecoaman.2012.04.015 Get rights and content

Hussain, A., Rehman, F., Rafeeq, H., Waqas, M., Asghar, A., Afsheen, N., Rahdar, A., Bilal, M., & Iqbal, H. M. N. (2022). In-situ, Ex-situ, and nano-remediation strategies to treat polluted soil, water, and air--A review. *Chemosphere*, *289*, 133252. https://doi.org/10.1016/j.chemosphere.2021.133252

Johnson, D. L., Ambrose, S. H., Bassett, T. J., Bowen, M. L., Crummey, D. E., Isaacson, J. S., Johnson, D. N., Lamb, P., Saul, M., & Winter-Nelson, A. E. (1997). Meanings of environmental terms. *Journal of Environmental Quality*, *26*(3), 581–589. https://doi.org/10.2134/jeq1997.00472425002600030002x

Karlen, D. L., Veum, K. S., Sudduth, K. A., Obrycki, J. F., & Nunes, M. R. (2019). Soil health assessment: Past accomplishments, current activities, and future opportunities. *Soil and Tillage Research*, *195*, 104365. https://doi.org/10.1016/j.still.2019.104365

Kheirfam, H., Sadeghi, S. H., & Darki, B. Z. (2020). Soil conservation in an abandoned agricultural rain-fed land through inoculation of cyanobacteria. *Catena*, *187*, 104341. https://doi.org/10.1016/j.catena.2019.104341

Kodirov, D., Muratov, K., Tursunov, O., Ugwu, E. I., & Durmanov, A. (2020). The use of renewable energy sources in integrated energy supply systems for agriculture. *IOP Conference Series: Earth and Environmental Science*, *614*(1), 12007. https://doi.org/10.1088/1755-1315/614/1/012007

Kuncoro, M. (2001). *Metode kuantitatif: Teori dan aplikasi untuk bisnis dan ekonomi*. In Yogyakarta: UPP-AMP YKPN.

Mentis, M. (2020). Environmental rehabilitation of damaged land. *Forest Ecosystems*, *7*(1), 1–16. https://doi.org/10.1186/s40663-020-00233-4

Pranata, A. S. (2010). *Meningkatkan hasil panen dengan pupuk organik*. AgroMedia.

Pratiwi, Narendra, B. H., Siregar, C. A., Turjaman, M., Hidayat, A., Rachmat, H. H., ... & Susilowati, A. (2021). Managing and reforesting degraded post-mining landscape in Indonesia: A Review. *Land*, *10*(6), 658. https://doi.org/10.3390/land10060658

Radiarta, I. N., Erlania, E., & Rusman, R. (2016). Pengaruh Iklim Terhadap Musim Tanam Rumput Laut, Kappaphycus alvarezii Di Teluk Gerupuk Kabupaten Lombok Tengah, Nusa Tenggara Barat. *Jurnal Riset Akuakultur*, *8*(3), 453–464. https://doi.org/10.15578/jra.8.3.2013.453-464

Reswita, R., Mulyasari, G., & Reflis, R. (2021). Hubungan Degrasi Lingkungan Dengan Kemiskinan. *Jurnal Inovasi Penelitian*, *2*(5), 1579–1584. https://doi.org/10.47492/jip.v2i5.936

Roy, P., Nei, D., Orikasa, T., Xu, Q., Okadome, H., Nakamura, N., & Shiina, T. (2009). A review of life cycle assessment (LCA) on some food products. *Journal of Food Engineering*, *90*(1), 1–10. https://doi.org/10.1016/j.jfoodeng.2008.06.016

Ruwayan, D. K. H., Kumurur, V., & Mastutie, F. (2020). Analisis Daya Dukung dan Daya Tampung Lahan di Pulau Bunaken. *SPASIAL*, *7*(1), 94–103. https://doi.org/10.35793/sp.v7i1.27788

Salim, M. A. (2013). Penggunaan limbah cair tahu untuk meningkatkan pertumbuhan dan produksi biodisel dari mikroalga Scenedesmus sp. *Jurnal Istek*, *7*(1). Retrieved from https://journal.uinsgd.ac.id/index.php/istek/article/view/235

Setiaji, B. (2006). *Panduan Riset Dengan Pendekatan Kuantitatif, Cetakan Pertama*. Muhammadiyah University Press, UMS. Retrieved from http://library.fip.uny.ac.id/opac/index.php?p=show_detail&id=3249

Sugiyono. (2015). *Statistik Non Parametris untuk Penelitian*. Alfabeta.

Sumarniasih, M. S., & Antara, M. (2020). Land suitability for food crops and plantations in Bangli regency Province Bali-Indonesia. *Plant Archives*, *20*(1), 1693–1701. Retrieved from http://www.plantarchives.org/20-1/1693-1701 (5619).pdf

Suriadi, A., Mulyani, A., Hadiawati, L., & others. (2021). Biophysical characteristics of dry-climate upland and agriculture development challenges in West Nusa Tenggara and East Nusa Tenggara Provinces.

IOP Conference Series: Earth and Environmental Science, *648*(1), 12014. https://doi.org/10.1088/1755-1315/648/1/012014

Suriadi, A., & Nasam, M. (2017). *Arahan pengembangan komoditas dan teknologi spesifik lokasi Mendukung konservasi lahan Di Lombok Tengah provinsi NTB*. Balai Besar Pengkajian dan Pengembangan Teknologi Pertanian. Retrieved from https://repository.pertanian.go.id/handle/123456789/15557

Thorsøe, M. H., Noe, E. B., Lamandé, M., Frelih-Larsen, A., Kjeldsen, C., Zandersen, M., & Schjønning, P. (2019). Sustainable soil management-Farmers' perspectives on subsoil compaction and the opportunities and barriers for intervention. *Land Use Policy*, *86*, 427–437. https://doi.org/10.1016/j.landusepol.2019.05.017

Tomaz, A., Palma, P., Fialho, S., Lima, A., Alvarenga, P., Potes, M., Costa, M. J., & Salgado, R. (2020). Risk assessment of irrigation-related soil salinization and sodification in Mediterranean areas. *Water*, *12*(12), 3569. https://doi.org/10.3390/w12123569