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LAND POTENTIAL FOR AGRICULTURE IN SUKOSARI VILLAGE, BANDONGAN DISTRICT, MAGELANG, CENTRAL JAVA

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Abstract

The purpose of this study is to characterize the physical, chemical, and biological properties of Sukosari land. The research was conducted via survey, evaluating the soil properties in agricultural areas to obtain 12 points at various altitudes. The results indicated that sand made up the most significant percentage of texture, ranging from 56 to 67 %. The analysis results of the soil's degree of acidity (pH) indicate that it is acidic, ranging between 4-5. The analysis of soil organic carbon, nitrogen, phosphorus, and potassium yielded low values. The total number of bacteria and fungi in the soil, on the other hand, is relatively high. As a result, it can be concluded that Sukosari's soil fertility is still relatively low. Additionally, it is recommended that the microorganisms present in each type of soil and land use Sukosari are identified.

1. Introduction

The land is a natural resource that plays a critical role in an ecosystem's functioning. The location of the land is essential to agricultural farming. Darmawijawa (1990) asserts that soil qualities, including physical, chemical, and biological aspects, are highly beneficial to plant growth and development. Soil physical properties are a critical environmental factor determining the availability of water, soil air, and, indirectly, plant nutrients. Physical features of soils, such as texture, structure, and permeability. While the chemical qualities of the soil play a significant part in determining its nature, the soil's features define its fertility. Among the notable chemical features of soil are the pH, the carbon-organic ratio, the nutrient content, and the natural soil biology associated with the activities of soil microbes.

Fertility of the soil refers to the soil's capacity to supply nutrients in sufficient quantities and in balanced forms to ensure optimal plant growth and production (Anna *et al*., 1985 *in* Yamani, 2010). Fertility levels vary among agricultural soils. Proper soil management is critical in determining the growth and yield of cultivated plants. Evaluation of soil fertility identifies nutrient deficiencies in the soil and makes fertilizer recommendations (Dikti, 1991). The nutrient requirements of plants for growth and production are determined by the soil's capacity to supply nutrients, which is not always sufficient. Without crop rotation, intensive land use can deplete essential nutrients from the soil at harvest, resulting in a continuous decline in soil fertility. Since declining soil fertility can significantly impact soil productivity, fertilization is critical to achieving profitable agricultural production by adding nutrients to the soil. Evaluation of fertility status to assess and monitor soil fertility is essential to ascertain which nutrients hinder plants. Evaluation of soil fertility status can be accomplished through a soil test approach, which is a relatively more accurate and rapid assessment method. Soil chemistry is then defined as a parameter of soil fertility in the soil fertility criteria (PPT, 1995).

Continuous use of land will alter the soil's qualities. Processing This varied land can affect the soil's physical, chemical, and biological attributes. In paddy fields, cropping patterns and inundation times vary, resulting in variances in paddy field features. The nature of paddy fields varies according to season and land usage. When rice is planted (wet), the soil qualities are different than when crops are grown (dry) (Hardjowigeno *et al*., 2004).

Sukosari is a village in Magelang's Bandongan subdistrict. Sukosari primary agricultural products are food crops, particularly rice plants. Sukosari has the potential for rice field development due to its nutrient-dense soil parent material (fertile soil). According to Sukosari potential, this research will focus on paddy fields' physical and chemical properties.

2. Method

This study took place in Sukosari, Bandongan, and Magelang. At the Faculty of Agriculture, Universitas Pembangunan Yogyakarta (UPN Veteran), physical, chemical, and biological properties were analyzed (UPN). This study took place between October 2020 and May 2021.

The soil profile is opened at a depth of 0-150 cm, and each layer is sampled for structural parameters (by feeling), several microorganisms (Most. method) Probable Number (MPN)). The soil profile was determined directly at the location of each sample.

In contrast, the texture parameters (Bouyoucos Hydrometer method), pH (using the pH meter Electrometric method), C-organic (Walkey & Black method), total N (Kjeldhal method), available P (Bray II method), K exchange (using NH4OAc extract), and soil respiration (Titration) were determined indirectly.

3. Result and Discussion

The physical properties of the soil are critical in promoting plant growth. The physical properties of the soil analyzed in this study were its texture. Sand had the highest percentage of texture in this study, ranging from 56 to 67 %. Meanwhile, clay comprises between 15 % and 17 % of the total (Table 1). According to Putra (2009), soil structure is comprised of soil particles such as sand, dust, and clay that combine to form soil aggregates. In other words, soil structure is associated with soil aggregates and their stability. Organic matter is inextricably linked to the stability of soil aggregates because it acts as a binder between primary mineral particles. According to BPPP (2006) and Syamsuddin (2012), the ideal soil texture for agricultural soil is dusty clay because it has a balanced composition of coarse and fine fractions and a high capacity for nutrient absorption.

Tabel 1. Result of physical soil

No Sample	BJ $g.cm^{-3}$	Kl 2mm (%)	Kl 0,5mm (%)	Debu (%)	Lempung (%)	Pasir (%)
1	2,04	11,73	11,34	21,45	17,70	60,85
2	2	11,52	11,23	20	17	63,00
3	2,01	11,12	10,45	19,11	15,38	65,51
4	2,02	11,01	11,01	21	15,76	63,24
5	1,99	12,10	11,58	21,52	17,76	60,72
6	1,98	11,79	12,02	24,52	15,77	59,71
7	1,99	11,31	10,76	25,82	15,41	58,77
8	1,99	11,22	11,35	26	17,54	56,46
9	1,98	12,32	11,86	28,30	15,54	56,15
10	1,96	12,01	11	21,52	17,77	60,71
11	1,97	12,23	12,2	28	15,41	56,59
12	1,96	12,21	11,35	14,81	17,77	67,41

The analysis results in the table indicate that the soil has an acidic degree of acidity (pH) in the range of 4-5 (Table 2). When the pH of the soil is neutral, between 6.5 and 7.5, both macro and micronutrients are available in sufficient amounts (optimal). Thus, soil pH serves as a proxy for soil fertility because it affects the availability of nutrients to plants (Hakim *et al*., 1989).

The analysis of C-organic soil yielded low results, ranging from 1 % to 1.74 % (Table 2). According to Musthofa (2007) research, the organic matter content must be maintained at a minimum of 2 %. As a result of the study, the sample that meets the 2 % criteria does not exist. As shown in the table, soil nitrogen levels range from very low to very high, namely 0.01-0.25, indicating that the average nitrogen criterion is in a low state (Table 2). It is because nitrogen is a very easily lost element from the soil. Additionally, Hakim *et al*. (1986) assert that inorganic nitrogen compounds are easily lost in the water. Thus, to remedy this situation, fertilizer must be added.

The increase in available P was proportional to the rise in pH, but not to the rise in organic C or total N. As shown in Table 2, the pH of the slightly acidic soil was consistent with the low P-available not with the C-organic and N-total soil. With increasing soil pH, the ratio of total organic carbon and nitrogen to total organic P increases. As shown in Table 2, the soil low K-exchange content is consistent with its low pH, as soil pH is a factor affecting potassium availability in the soil. It is consistent with Sri and Suci (2003), who state that organic farming systems increase the soil's available potassium content, and Nyakpa *et al*. (1988), who state that the availability of potassium in the soil is influenced by some factors, one of which is soil pH. The analysis results in the table 2 indicate that soil phosphorus levels are extremely low. As a result, phosphorus is available in an insufficient amount for plant growth and development.

Tabel 2. The result of chemical soil

No Sample	pH	Hara Mikro (ppm)				C-Org	N total	S total	P Tsd	K Tsd	Ca	Mg Tsd	KPK
		Fe Total	Fe tersedia	Mn	Zn	(%)	(%)	(%)	(ppm)	(me%)	(me%)	(me%)	(me%)
1	4,80	6000	300	2000	1500	1,74	0,15	0,02	0,04	0,92	53,63	17,99	8,34
2	4,80	5700	250	2500	1000	1,67	0,1	0,04	0,40	0,82	50,23	27,79	7,70
3	4,80	5600	300	3000	700	1,66	0,08	0,10	0,65	1,68	44,22	21,89	8,77
4	4,80	6000	320	2700	1000	1	0,07	0,12	0,55	1,55	30,22	19,72	8,26
5	5,40	6000	340	3000	750	1,10	0,07	0,02	0,25	1,04	42,93	20,51	8,01
6	5,35	6100	300	2000	1000	1,23	0,07	0,21	0,58	1,28	41,26	30,40	10,45
7	5,40	6150	300	2300	1200	1,53	0,08	0,11	0,38	0,81	55,54	23,49	8,04
8	5,40	5600	350	2500	1100	1,1	0,07	0,12	0,38	1,18	41,06	21,93	11,02
9	4,80	6000	420	3000	1200	1,24	0,25	0,21	0,36	0,54	63,24	24,26	11,72
10	4,80	6000	300	2100	1300	1,1	0,03	0,1	0,48	1,25	43,22	27,32	8,26
11	4,90	5500	320	2400	1500	1,5	0,25	0,02	0,36	1,28	63,51	23,88	8,54
12	4,90	6000	320	2300	1200	1,67	0,03	0,04	0,48	0,71	51,06	24,13	10,34

Increase the number of soil microorganisms in organic farming systems. It is consistent with Ardi (2010), who states that organic matter influences the development of soil microorganisms. The amount of CO_2 produced by soil microorganism activity is directly proportional to the number of microorganisms; where microorganism activity is high, CO_2 production is also high.

It is because organic matter affects the amount of CO_2 produced by soil microorganism activity. It is consistent with Ardi's (2010) research, which indicates that organic matter, moisture, aeration, and energy sources influence soil microorganism activity. When microorganisms are active, CO_2 production is also increased. On Sukosari land, the population size of bacteria and fungi affects soil respiration (Table 3).

Tabel 3. The result of biological soil

No Sample	Total Populasi Bakteri	Total populasi Jamur	Respirasi tanah
	cfu x 10^8	cfu x 10^8	mg C-CO_2 kg^-1 tanah hari^-1
1	5,06	10,12	6,95
2	5,26	10,54	8,76
3	5,76	14,79	7,13
4	6,67	17	6,23
5	5,76	15,61	6,23
6	6,27	14,21	6,21
7	5,71	15,85	7,88
8	6,07	17,21	6,32
9	5,71	15,82	7,24
10	5,28	14,21	8,87
11	6,75	15,86	6,43
12	5,25	12,21	7,13

The optimal nutrient status in the soil is not the same for all plants. Similarly, the optimal state of a plant varies according to the soil. Thus, only the bare minimum amount of nutrients is added to the maintenance dose for soil nutrients at their optimal levels to replace those lost during harvest. The addition of unnecessary nutrients contributes to environmental pollution. By determining the nutrient status of the soil, recommendations for fertilization can be made based on the level of soil fertility required for optimal plant growth. One of the recommendations for the agricultural system's sustainability is that it is necessary to test the critical parameters of soil properties that affect nutrient supply and account for the diversity of soil properties within the same soil order. According to Widjaya-(1986) Adhi's research, it takes 3-5 months or about one growing season to vary the soil's nutrient status. It is hoped that the chemical reaction between fertilizer nutrients and soil nutrients has reached equilibrium in the soil solution during this period or that fertilizer nutrients have converted to soil nutrients. According to Corey (1987), available nutrients are nutrients in ions or compounds that plants can absorb and use. Fink (1982) classified nutrient binding into four types: those that are not bound in solution are readily available; those that are weakly bound in the adsorption complex are readily available; those that are immobile but quickly released have a moderate availability, and those that are immobilized and challenging to break are not readily available.

4. Conclusion

According to the data analysis and discussion above, soil fertility is still quite low. Based on the findings of this study, it is suggested that the microorganisms found in each type of soil and land use Sukosari be identified.

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