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Fertility Status of Soils in Mati, Davao Oriental

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Abstract

Fertility status of soils in Mati was evaluated through laboratory analysis of the following parameters: nitrogen, phosphorus, potassium, calcium and magnesium levels including pH. One hundred fifty-seven composite soil samples were obtained from 25 villages in Mati from November 2003 to November 2004. These were collected using standard sampling procedure. Topography, dominant vegetation and soil texture were noted and their influence on nutrient levels. Nitrogen level was found to be low with a mean value of 2.0% while phosphorus level was categorized as medium with at 28.80 ppm. In contrast, potassium level was high at 1 ,317.50 ppm. Calcium and magnesium were categorized to have high level in with 3,775.14 ppm and 655.0 ppm, respectively. However, some areas had relatively low Mg and with low pH also. Generally, Mati soils were found to have neutral pH 6.8. Hilly areas were found less fertile compared with plain areas with the latter having had higher nitrogen, phosphorus, potassium, calcium and magnesium. Dominant crops and soil texture were found to have varying effects on the fertility of the soil. Soils planted to root crops were found to have lower nutrient levels and pH level compared with those planted to vegetables and plantation crops. Nitrogen, phosphorus and potassium were higher and sufficiently available in loamy sand than in any other soil textures. High levels of calcium and magnesium were obtained in clay soils while low levels of same nutrients were observed in silty clay soils.

Keywords: *N*itrogen, Phosphorus, Potassium, Calcium, Magnesium levels

Introduction

Farming has always been the primary food sourcing activity of most Filipinos especially in the countryside. Even people in the middle class or even in the corporate world invest in farming through hired labor or tenants who perform the “dirty” job for them and simply wait for their clean share after harvest season.

The agriculture sector of the government, in its effort to attain sustainability and prevent food Shortage comes with several programs for the improvement of this

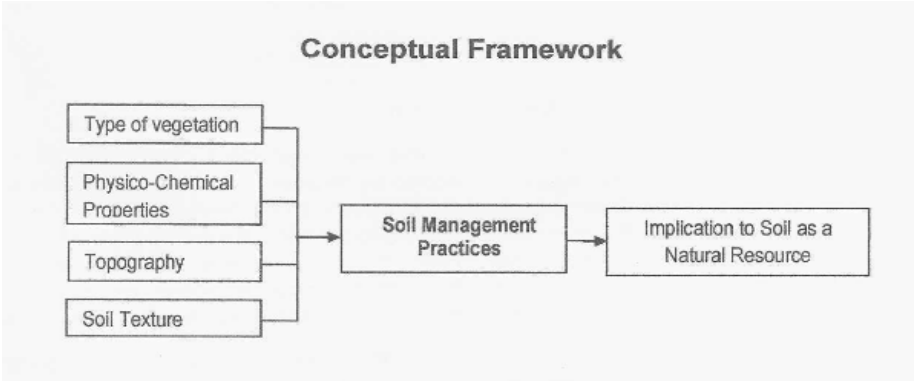
very important component of our economy. However, less of the benefits are given directly to the farmer level. Problems relating to production are seldom addressed. High inputs and low outputs resulted from farmer's dependence on traditional and unfounded agricultural practices.

Mati, as it is believed to literally mean "dries up quickly", is located in the southern section of Davao Oriental and lies between $6^0$56' north latitude and 126^0 east longitude. It is composed of 26 villages with a total land area of 79, 109 ha of which 37,515.47 is devoted to agriculture. This area is planted to annual and perennial crops which include corn, rice, root crops, vegetables, banana, coconut, durian, citrus, coffee and cacao. Among these, coconut is considered the major commodity with an average annual production reaching up to 1.4 mt. per ha in the year 2009-2010 (Jayavel & Dharmalingam, 2011).

The soil being an extremely variable resource must be given due importance if proper identification of crops to be planted; scientific approach in farming is adapted. applications of appropriate fertilizers-based Crops planted require certain amount of. on crop requirement and soil test values and nitrogen, phosphorus, potassium, calcium and magnesium and most importantly its pH - which influences the availability of these elements. The result of this study shall provide the information on the current status of the physico-chemical properties of soils in Mati to be able to employ management/ cultural practices and soil amendments for the sustainable resource utilization. From this point of view, farmers may realize the capability of their soil to support crop production. This may lead to a more nutrients to satisfy their requirement to produce good yield. Suitability Of crops in an area is also affected by the pH of the soil including its type and textural class (Miller, R. & Donahue R., 1990). Hence not all crops can grow well in an area and not all areas are suited for any kind of crop.

The soil as a reservoir of minerals needs to be evaluated to determine the levels of essential elements for optimum plant growth and development such as develop Other appropriate soil management practices.

This study aimed to evaluate through laboratory analyses the status of soil fertility in 25 villages in Mati, Davao Oriental. Results will serve as baseline information for possible soil amendments to maximize production, efficiency, yield and profit of farmers who continuously provide us food, and standing as the backbone



Objectives

To determine the levels of nitrogen, phosphorus, potassium, calcium and magnesium in the soils of Mati, Davao Oriental;

To determine the textural class, pH and topography of the soils and their effect to the nutrient availability;

To identify the vegetation and recommend suitable crops for the area tested;

To develop a nutrient map of municipality of Mati, 25 were considered in nitrogen, phosphorus, potassium, calcium this study.

Materials and Methods

Sampling Areas

Sites with intensive cropping farming activities were sampled. A minimum of five composite samples were collected from each area. Each composite sample was taken from 5-10 cores following "Z' or "W" pattern for plain or hilly areas, respectively — the categories of topography used.

Mati has a total land area of 79, 109 hectares, but only 37,515.47 hectares (47.42%) Of it are utilized for agriculture (Table 1). Of the 26 Villages comprising the Tagabakid was not sampled due and magnesium in Mati, Davao Oriental. to security reasons.

Table 1. The villages in Mati, their respective area and number of samples collected and analyzed.

Villages	Area (ha)	No. of Sites Sampled	No. of Composite Samples Collected	No. of Composite Samples Analyzed
Badas	1,802.95	7	35	7
Bobon	2,740.07	8	40	8
Buso	474.05	7	35	7
Cabuaya	15,044.63	7	35	7
Central	1,085.57	4	20	4
Culian	4,251.88	9	45	9
Dahican	1,452.88	7	35	7
Danao	2,088.90	6	30	6
Dawan	1,326.44	10	50	10
Don Enrique Lopez	3,510.57	6	30	6
Don M. Marundan	3,631.59	4	20	4
Don Salvador Lopez	4,523.38	9	45	9
Lanca	1,239.16	6	30	6
Lawigan	2,507.01	7	35	7
Libudon	1,011.19	5	25	5
Luban	1,328.21	5	40	5
Macambol	18,634.99	7	35	7
Mamali	3,003.88	5	20	5
Matiao	456.54	4	20	4
Mayo	1,057.71	4	20	4
Sainz	1,052.27	6	30	6
Sanghay	2,057.94	6	30	6
Tagbinonga	970.29	5	25	5
Taguibo	2,386.38	4	20	4
Tam-isan	786.96	9	45	9
Total	**78,425.14**	**157**	**795**	**157**

Sampling and Storage of Samples

Sampling was done during clear sunny days. Scheduling was done in such a manner that neighboring villages were sampled at once for cost saving reasons. At least five samples were taken in each collection site.

All soil samples (i.e., 5-10 kg.) collected from an area were mixed thoroughly and quartered in the field to come up with one kg composite sample. The composite sample was secured in a plastic bag, sealed properly and labeled with the specific area, Village, crop/vegetation. Soil samples Were then stored in an ambient condition.

Drying and Analysis

Plastic bags were opened to air dry the samples for one week. Thereafter, all samples belonging to the same area were thoroughly mixed and quartered. Again, I-kg soil was taken from the mixture, pulverized, sealed in a plastic bag and labeled accordingly.

Samples were secured in a container free from contamination. A total of 157 samples from 157 areas comprising 25 Villages Of the whole municipality of Mati were sent for analysis to the Regional Soils Laboratory of the Department of Agriculture in Davao City. Standard procedures in nutrient analysis were done in the laboratory to determine the following:

Soil Textural Class pH Total Nitrogen
Total Phosphorus
Total Potassium
Total Calcium
Total Magnesium
Results and Discussion

Majority Of the Soil types in Mati belonged to Malalag loam series (Table 2). Don Martin Marundan Where coconut, coffee, mango, pineapple and citrus were intensively grown belonged to Bolinao clay series- Mayo with its cacao, coconut and durian belonged to Cabangan clay loam and Malalag loam.

Loam soils dominated the soil texture of most villages followed by sandy loam and clay loams. The villages with loam soils were: Badas, Buso, Bobon, Central, Culian, Dahican, Dawan, Don Enrique, Lawigan, Don Salvador Lopez, Lawigan, Macambol, Mamali, Matiao, Mayo, Sainz, Sanghay Tagbinonga, Taguibo and Tam-isan.

Among the villages seen to have clay soils were Badas, Bobon, Danao, Dawan, Libudon Mamali, Sainz and Tamisan. Others had sandy foam texture like Buso, Dahican, Libudon, Luban, Macambol, Mayo, to mention some. Taguibo end Dahican were the only villages with silty loam and silty day texture, respectively Relatively high nitrogen level was observed in Cabuaya (Table 3) with 2.64% while it was lowest in Buso with an average of 1.3%. Only eight villages were found to have medium level of nitrogen and these were Bobon, Cabuaya, Dahican, Don Enrique Lopez, Lawigan, Libudon, Luban and Tam-isan while most of the villages had low nitrogen namely:

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Badas, Buso, Central, Culia-an, Danao, Dawan, Don Martin Marundan, Don Enrique Lopez, Lanca, Macambol, Mamali, Matiao, Mayo, Sainz, Sanghay, Tagbinonga and Taguibo, this condition necessitates organic matter application. Organic matter improves the physical properties of soils because as the organic materials decompose in the soil, essential plant nutrients are made available for plant use also. Soils high in organic matter are mellow since plant roots can penetrate easily and absorb water more readily than soils low in Organic matter. Dried animal manure and decomposed crop residues are good sources of nitrogen (Miller, R. & Donahue R., 1990).

Table 2. Soil type and textural class of Villages in Mati, Davao[1]

Village	Soil Type[1]	Soil Textural Class[2]
Badas	Malalag Loam, Matina Clay Loam	CL, L, SL, SiCL
Bobon	Matina Clay Loam	L,CL, LS
Buso	Camansa Sandy Clay	SL,L
Cabuaya	Malalag Loam	SiCL, SL
Central	Malalag Loam	L, CL
Culian	Malalag Loam	CL,L
Dahican	Bolinao Clay	L, SiC, LS, SL
Danao	Malalag Loam, Tugbok Clay,	SCL, L, C
Dawan	Malalag Loam	SCL, CL, C, L
Don Enrique Lopez	Cabangan Clay Loam, Malalag Loam	L, SL, CL, SCL
Don Martin Marundan	Bolinao Clay	CL, SL,
Don Salvador Lopez	Cabangan Clay Loam, Malalag Loam	CL, L, SL
Lanca	Bolinao Clay	CL, SiCL, SL
Lawigan	Malalag Loam, San Miguel Silty Clay Loam	C, L, SCL, SiCL
Libudon	Malalag Loam, Kidapawan Clay Loam	CL, SL, C
Luban	Hydrosol, Malalag Loam	SL
Macambol	Bolinao Clay	L, SL
Mamali	Malalag Loam	C, L, SCL
Matiao	Bolinao Clay	L, SCL
Mayo	Cabangan Clay Loam, Malalag Loam	L, SL, CL
Sainz	Malalag Loam	CL, L, C
Sanghay	Malalag Loam	L
Tagbinonga	Malalag Loam	L, SCL, SL
Taguibo	Malalag Loam	L, SL, SiL
Tam-isan	Bolinao Clay, Malalag Loam	C, SiCL, SCL, L, SL

[1]Mati Municipal Planning Office File 2001
[2]Soil Test Result, Bureau of Soils, Department of Agriculture, Davao City

Legend:

L	-	Loam	SiL	-	Silty Loam
C	-	Clay	SiCL	-	Silty Clay Loam
CL	-	Clay Loam	SCL	-	Sandy Clay Loam
SL	-	Sandy Loam			
LS	-	Loamy Sand			
SiC	-	Silty Clay			

Don Martin Marundan had the highest phosphorus level with 96.25 ppm while 6.11 ppm only was observed in Buso, the lowest P level. The average P level of all villages was categorized as medium.

Highest potassium level of 2,812.8 ppm was Observed in Tam-isan and lowest level of this nutrient was observed in Cabuaya with 370 ppm only- However, Mati soils in general had high level of potassium. Highest pH level was observed in Mamali with 7.24 and was categorized as neutral while lowest was 5.7 in Taguibo which is interpreted as weakly acidic. Most Of the barangays had weakly acidic soils making it suitable for almost any crop in terms of pH preference. pH is maintained at the proper

level for a given crop, plant nutrients are at maximum availability, toxic elements are often at reduced availability, and beneficial soil organisms are most active. Most plants prefer soil pH between 5.5 and 7.5 and the majority do best in the middle part of this range (Brady, N. 1985).

Highest calcium level was observed in Badas with 5,771.52 ppm while lowest level was Observed in Taguibo with only 1,327.65 ppm.

Properly limed soils with constant Magnesium level were highest in and adequate moisture will normally supply Macambol with 1 ,636.39 ppm while Taguibo sufficient Ca to plants. High humidity and had the lowest Mg of only 182.4 ppm. poor soil drainage hinders Ca movement into Like Ca, Mg is ordinarily supplied through these plant parts and should be avoided. liming.

Table 3. Nitrogen, Phosphorus and Potassium levels of soils in the villages of Mati, Davao Oriental[1]

Village	N (%)	Status	P (ppm)	Status	K (ppm)	Status
Badas	2.03	Low	23.14	Medium	2,225.00	High
Bobon	2.30	Medium	15.52	Medium	1,510.00	High
Buso	1.30	Low	6.11	Low	453.44	High
Cabuaya	2.64	Medium	10.29	Medium	370.00	High
Central	1.70	Low	31.25	High	2,743.80	High
Culi-an	2.03	Low	12.56	Medium	479.44	High
Dahican	2.52	Medium	14.30	Medium	1,388.00	High
Danao	1.77	Low	17.50	Medium	1,127.50	High
Dawan	2.00	Low	96.00	High	1,959.00	High
Don Enrique Lopez	2.80	Medium	62.50	High	1,415.00	High
Don Martin Marundan	1.90	Low	96.25	High	1,000.00	High
Don Salvador Lopez	1.91	Low	18.67	Medium	822.00	High
Langka	1.95	Low	5.27	Low	630.37	High
Lawigan	2.25	Medium	59.33	High	2,782.90	High
Libudon	2.14	Medium	64.00	High	1,655.00	High
Luban	2.46	Medium	7.32	Medium	383.76	High
Macambol	1.86	Low	24.43	Medium	2,140.70	High
Mamali	1.58	Low	28.80	Medium	1,911.00	High
Matiao	1.55	Low	15.50	Medium	910.00	High
Mayo	1.45	Low	25.50	Medium	1576.30	High
Sainz	1.75	Low	10.83	Medium	853.33	High
Sanghay	2.03	Low	17.83	Medium	754.17	High
Tagbinonga	2.02	Low	8.60	Medium	604.00	High
Taguibo	1.78	Low	9.00	Medium	430.00	High
Tam-isan	2.41	Medium	39.44	Medium	2,812.80	High
Mean	**2.00**	**Low**	**28.80**	**Medium**	**1,317.50**	**High**

[1]Based on Soil Test Result, Regional Soils Laboratory, Department of Agriculture, Davao City

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Acidity of the soil greatly affects the level Of Ca and Mg. Hence, calcitic or dolomitic limes are applied to acidic soil to raise its pH and increase calcium and magnesium levels (Sangatanan, P. & R. Sangatanan, 2002). Deficiency symptoms of these nutrients in crops include softening of tissues and uneven or lumpy fruit surfaces, failure of terminal buds to develop, dying resistance against adverse environmental conditions for Mg. (Sangatanan, P. & Sangatanan, R., 2002).

Since Ca and Mg are considered as macro-elements together with NPK, deficiency of these should be given proper attention specially when manifested by crops. Liquid Ca containing 6% of the of roots tip, and emergence and unfolding element for foliar spray is available in the of new leaves for calcium while yellowing market while Mg deficiency can be corrected of green parts, stunted growth and low easily by dolomite application.

Table 4. Average pH, and levels of Ca and Mg in the soils of Mati, Davao Oriental[1]

Village	pH	Category	Ca (ppm)	Category	Mg (ppm)	Category
Badas	7.00	Neutral	5,771.52	High	700.07	Very High
Bobon	6.17	W. acidic	5,389.51	High	643.11	High
Buso	5.93	W. acidic	2,013.45	High	430.64	Medium
Cabuaya	6.14	W. acidic	3,257.93	High	889.42	Very High
Central	7.00	Neutral	3,281.55	High	586.72	High
Culi-an	6.30	W. acidic	4,426.17	High	643.13	High
Dahican	6.84	Neutral	4,743.75	High	852.94	Very High
Danao	6.68	Neutral	3,220.29	High	539.09	High
Dawan	6.97	Neutral	4,835.65	High	995.90	Very High
Don Enrique Lopez	6.50	Neutral	4,625.900	High	810.67	Very High
Don Martin Marundan	6.42	W. acidic	3,076.14	High	869.44	Very High
Don Salvador Lopez	5.86	W. acidic	2,402.57	High	306.57	Medium
Lanca	6.64	Neutral	3,466.25	High	657.69	High
Lawigan	7.23	Neutral	5,555.09	High	374.53	Medium
Libudon	6.60	Neutral	4,200.38	High	865.79	Very High
Luban	6.21	W. acidic	2,307.01	High	1,016.09	Very High
Macambol	7.14	Neutral	4,076.71	High	1,636.39	Very High
Mamali	7.24	Neutral	4,348.68	High	690.69	High
Matiao	6.70	Neutral	2,800.59	High	297.92	Low
Mayo	6.42	W. acidic	3,757.50	High	437.76	Medium
Sainz	6.60	Neutral	4,078.14	High	537.07	High
Sanghay	6.13	W. acidic	3,951.22	High	502.61	High
Tagbinonga	5.86	W. acidic	1,751.36	High	231.04	Low
Taguibo	5.70	W. acidic	1,327.65	High	182.40	Low
Tam-isan	7.23	Neutral	5,713.63	High	659.34	High
Mean	**6.80**	**Neutral**	**3,775.14**	**High**	**655.00**	**High**

[1]Based on Soil Test Result, Regional Soils Laboratory, Department of Agriculture, Davao City
Legend: W. acidic – Weakly acidic

All of the nutrients analyzed were found to be higher in plain rather than in hilly areas (Table 5). Also, hilly areas were found to have lower pH than in plain areas. Generally, the nutrient levels in a certain area seemed to be affected by topography. Steeper slopes are prone to soil erosion, which in effect deplete soil nutrients. Soil erosion increases as the slope increases thereby increasing the rate of nutrient loss (Sangatanan, P & R. Sangatanan, 2002),

Several crops were noted in the sampling areas. However, seven most dominant crops were identified. Highest pH (6.99) was determined in soils planted to banana while lowest (6.05) was that in areas planted to root crops (Table 6).

For nitrogen, highest mean value of 2.9% was obtained in areas planted to durian followed by those planted to cacao/coffee (2.6%) and coconut (2.08%). Lowest (1_62%) was obtained in areas planted to root crops. Phosphorus was highest with 105 ppm in areas planted to durian while lowest was obtained from those planted to root crops with 17.5 ppm only. Highest level of potassium was obtained in areas planted to root crops (2,285 ppm) and lowest was obtained in areas planted to durian (937.5 ppm).

Table 5. Average pH, N, P, K, Ca and Mg Levels in soils of Mati relative to topography

Topography	pH	N (%)	P (ppm)	K (ppm)	Ca (ppm)	Mg (ppm)
Plain	6.79	2.16	33.47	1,486.30	4,122.14	694.66
Hilly	6.38	1.79	20.79	1,065.60	3,545.50	627.00

Table 6. Average pH, N, P, K, Ca and Mg Levels in soils of Mati relative to vegetation

Vegetation	pH	N (%)	P (ppm)	K (ppm)	Ca (ppm)	Mg (ppm)
Coconut	6.64	2.08	27.74	1,369.26	3,153.78	643.33
Mango	6.61	1.72	38.94	1,306.65	2,879.52	629.23
Durian	6.45	2.90	105.00	9,37.50	3,004.85	618.85
Banana	6.99	1.97	33.51	2,037.28	3,927.8	614.44
Rootcrops	6.05	1.62	17.50	2,285.00	2,321.26	527.32
Corn	6.42	1.86	20.83	1,254.89	3,424.31	575.81
Coffee/Cacao	6.70	2.60	65.00	1,555.00	3,338.51	689.23

Areas planted to banana had the highest Ca level at 3,927.8 ppm while root crop areas had the lowest Ca level with 2,321.26 ppm. Magnesium was found to be highest (689.23 ppm) in areas planted to coffee and cacao while lowest (527.32 ppm) levee was found in areas planted to root crops. Eight textural classes were identified

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in the analysis namely: day, clay loam, loam, sandy loam, sandy clay loam, loamy sand, silty clay and silty clay loam (Table 7). Both pH and N levels were found to be highest in loamy sand with values Of and 3.15 % respectively. Same parameters were also found to be lowest in areas with silty clay soil texture with 6.0 and 1.73 ppm, respectively.

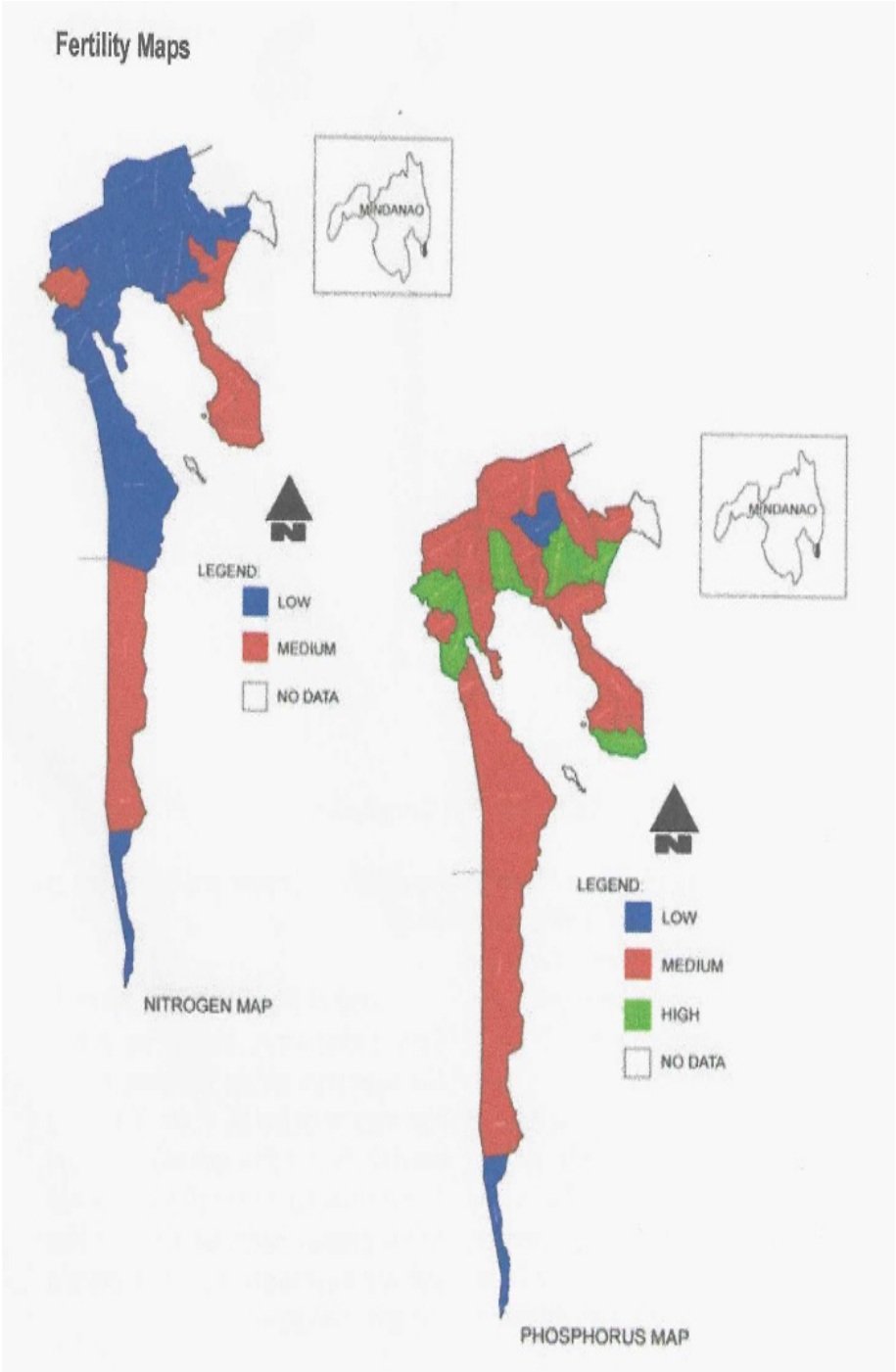
Highest P level was found in areas with clay loam soil texture (50.88 ppm) while lowest was obtained in loamy sand areas (4.0 ppm). For K, abundant (1 ,931.07 ppm) supply of this nutrient was found in sandy clay loam areas while lowest level (47,5 ppm) Was found in loamy sand areas.

Clay areas obtained the highest level of Ca (6,061.55 ppm) while silty clay areas obtained the lowest level of 3,001.23 ppm only. Magnesium level was found highest (906.91 ppm) in clay areas while lowest 514.32 ppm) was found in silty clay areas (51432 ppm).

Normally, the higher the Ca level, the greater the clay content of the soil. Recent limestone applications may be reflected in higher Ca levels. If the soil pH is maintained in the recommended range for the crop grown, Ca deficiency is very unlikely. Magnesium levels in the soil usually increase as clay content increases. Soils low in Mg are Often very acidic and low in calcium.

Table 7. Average pH, N, P, K, Ca and Mg levels relative to texture of soils in Mati

Soil Texture	pH	N (%)	P (ppm)	K (ppm)	Ca (ppm)	Mg (ppm)
Clay	6.94	2.39	38.42	1,786.83	6,061.55	906.91
Clay Loam	6.64	2.19	50.88	1,433.35	4,819.55	808.16
Loam	6.44	1.86	19.82	1,314.75	3,553.73	566.56
Sandy Loam	6.56	1.98	24.20	1,118.07	3,358.70	620.75
Sandy Clay Loam	6.84	1.88	36.00	1,931.07	3,780.34	509.85
Loamy Sand	7.50	3.15	4.00	47.50	3,424.23	634.50
Silty Clay	6.00	1.73	17.67	1,160.00	3,001.23	514.32
Silty Clay Loam	6.61	2.34	20.03	1,049.92	3,147.90	528.23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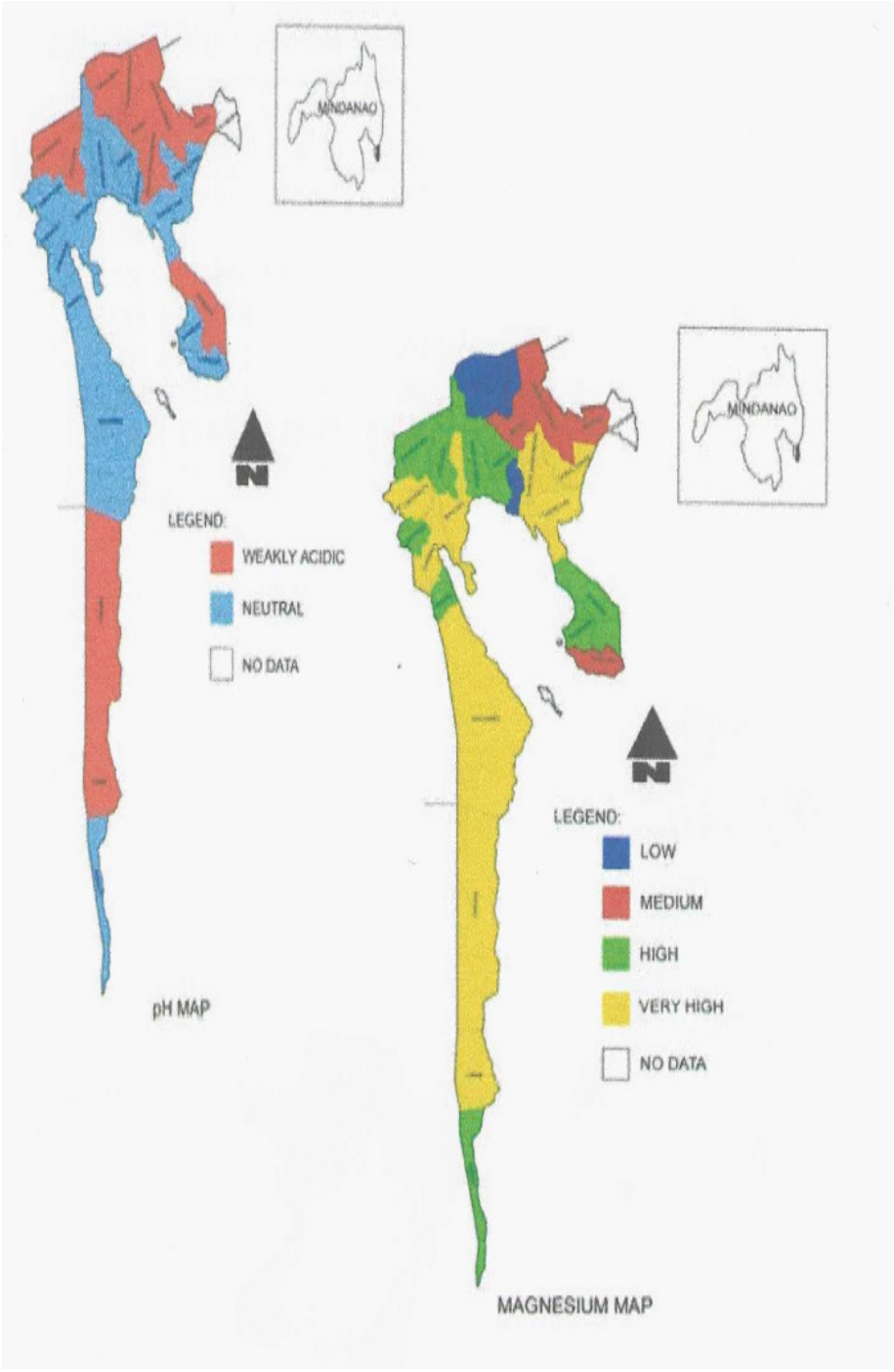
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Summary and Conclusion

One hundred fifty-seven composite soil samples from different sites of Mati, Davao Oriental were collected and analyzed for pH, nitrogen, phosphorus, potassium, calcium and magnesium levels. Of the 26 villages of Mati, 25 were considered in the study and sampling was done in different sites. At least five composite samples were Obtained from each site. These were analyzed by the Region Xl Soils Laboratory of the Department of Agriculture in Davao City. Laboratory results were related to topography, vegetation and soil texture of the areas.

Most of the soils in Mati belong to Malalag loam series. Most of the soils in Mati have loam texture. Generally, soils in Mati were of neutral pH (6.80). These had low N (2.0%), medium level (28.80 ppm) of P while K was high (1 ppm). Calcium and magnesium levels were high in Mati soils with mean levels of 3,775.14 ppm and 655 ppm, respectively.

Topography affected nutrient status of the soil; N, P, K, Ca and Mg were found higher in plain than in hilly or rolling areas. Dominant crops were found to have varying effects on the fertility Of Mati soils. Most of those areas planted to root crops had lower nutrient levels than those planted to vegetables and plantation crops.

While most of the nutrients were high in loamy sand areas, low levels were also found in silty clay soils.

Recommendations and Implications

Average nitrogen level was found low in Meti soils. For these villages including areas with sufficient N, application of organic matter (0M) is highly recommended. The general recommendation of 20 tons per ha maybe good enough to provide the nutrient and to make other nutrients be available to plants. Green manuring using high nitrogen crop residues is likewise beneficial to increase nitrogen level in the soil. Manure supplies part of the soil nutrients and provides added organic matter.

When using commercial fertilizers as N source, proper incorporation to the soil after application is important because it is highly volatile and mobile. Either from organic or manufactured forms, N is changed to same ionic forms when dissolved in soil water and used by plants. Since crops do have different requirements in terms of NPK, fertilization should be based on the soil test values for each site or village and the kind of crop planted on an area.

Other than organic matter application, liming areas lower than 5.5 - 7.5 pH as required by most crops is recommended. Available liming materials used for soil amendment are calcite and dolomite. Calcite contains calcium while dolomite contains calcium and some magnesium. However, proper care must be strictly observed as excess lime is likely to result in iron chlorosis of plants which is manifested by the interveinal yellowing of leaves. The veins are green and the tissue between the veins is yellow. Ata distance of several feet, chlorotic plants look very yellow. Beans and

tomatoes are two crops that may show iron chlorosis.

Root crops such as cassava, sweet potato, ubi and taro may be grown in areas with sandy loam and loamy sand texture. Root development of these crops is best enhanced in soils with good amount of sand in proportion to silt. The villages suitable for root Crop production include: Badas, Cabuaya, Buso, Dahican, Don Enrique, Taguibo, and Tagbinonga among others.

Vegetables (e.g., eggplant, tomato, leafy greens, cucurbits) and cereals .com and rice) are best grown in loam and silty areas of Buso, Danao, Dawan, Don Martin Marundan, Don Enrique, Don Salvador Lopez, Mamali, Taguibo, Sanghay and Tamisan. However, these crops also require sufficient amount of water. Planting these during rainy season is a good technique in the absence of irrigation.

Fruit trees and plantation crops such as mango, durian, cacao, coffee, papaya and pineapple can be grown with the traditional coconut when properly spaced and arranged. Multiple cropping is a way of increasing productivity of an area. Additional crop requirement pest and disease occurrence and compatibility should be considered for optimum productivity. Areas good for trees and plantation crops include Don Martin Marundan, Badas, Buso, Danao, Dawan, Don Enrique, Matiao, Mayo, Sainz, Taguibo and Tam-isan.

For every harvest made, a considerable amount of nutrient that varies with the crop is removed from the soil. This means that constant harvest without fertilization depletes soil nutrients. Some nutrients may be available in the soil but with time it normally drops when not supplemented. In some cases, some nutrients are made unavailable to crops though because Of soil acidity.

Contour farming is also recommended in hilly areas like in Badas, Buso, Culian, Danao Dawan, Sainz, and Sanghay, to mention some. Low nutrient levels in these areas may be attributed to rapid soil erosion. Establishment Of hedgerows using nitrogen fixing plants is good solution to this dilemma. These species trap sediment at the base thus, reducing surface run-off. While yield is of foremost concern, attention should also be given to soils.

This study should be conducted once every three to five years to monitor the fertility state of soils and farmers should be encouraged to do regular soil analysis of their farm land.

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Literature Cited

Brady, N. C. & R. R. vveil, 1999. The Nature and Properties of Soils. Twelfth Edition. Prentice-Hall (Singapore) Pte. Ltd. Singapore. p.

Miller, R. W. & Donahue, R. L. 1990. Soils: An Introduction to Soils and Plant Growth. Sixth Edition _ Prentice-Hal', Inc. New Jersey. p.

Sangatanan, P D. & R. L. Sangatanan. 2002. Soil Management. Iloilo City

Jayavel, R. & Dharmalingam, S-2011. Coconut: TheVersatilePalm. Retrieved September 28, 2012 from http://ffymag.com/admin/issuepdf/Coconut-May11.pdf/.