SOIL NUTRIENT ANALYSIS OF AMARGADHI, BAGARKOT AND ALITAL VDCs OF DADELDHURA, NEPAL

S.Devkota[1], B. Sunar[2] and A. Pandey[3]

ABSTRACT

A soil analysis of Amargadhi Municipality, Bagarkot and Alital VDC was conducted to identify the soil fertility status in April, 2017. Organic matter, Nitrogen, Phosphorus and Potassium contents were determined by using the Walkley and Black method, Modified Olsen Method and Flame Photometer Method respectively. Soil was pH was measured by using pH meter. Findings of the soil revealed that pH of Amargadhi and Bagarkot ranges from 5.2 to 6.4. The organic matter content was low with value 1.59% in an average Nitrogen content was also low with value 0.08 % whereas the Phosphorous and Potassium content were very high with average value 216.87 Kg/ha and 445.17 Kg/ha respectively. Similarly, the pH of Alital VDC is slightly acidic with average value 5.91 whereas the organic matter and Nitrogen content was low with average value1.4% and 0.068% respectively. The Phosphorous and Potassium content of Alital was found to be rich with average value of 283.23 Kg/ha and 476.39 Kg/ha respectively. The observed results determined to improve overall soil fertility status by following sustainable soil management practices, addition of organic matter and balanced used of chemical fertilizers.

Keywords: Nutrient, organic matter, soil

INTRODUCTION

Various types of soils are found in territory of Nepal (Shrestha and Singh, 2008). Soils of hilly area are mostly acidic in nature and have very less organic matter (MO) content (Fu *et al.*,2000; Desbiez *et al.*, 2004; Paudel and Thapa, 2004). According to Bajracharya and Sherchan (2009), majority of Nepalese soil (over 90%) fall into the low to medium ranges with respect to OM and TN content. Also, good proportion (55%) of soils is acidic in nature, while phosphorus and potassium content is sufficient in soil. Dadeldhura is a hilly district located in Mahakali Zone in Far Western Development Region with latitude 28^0 58' to 28^0 26' north and longitude $80^0$12' to 80^0 east. The district has elevation ranging

1 Ministry of Agriculture and Livestock Development
Corresponding author: Email: sudip.devkota@nepal.gov.np

2 Agribusiness Promotion Cooperation and Training Center, Province 5, Email: agbinod.afu@gmail.com

3 Institute of Agriculture and Animal Science, E mail: pandeyamita01.ap@gmail.com

from 462-2638 masl (DADO, 2017). Since it is extended from the inner terai to mid-hills diversity of soil can be found here. Different textures of soil found in Dadeldhura are sandy, sandy loam, loam, clay loam and clay. Due to diversity of soil and productive land it has been a potential area for the commercial vegetable production and fruit farming. With the objective of identifying the soil fertility status, research was conducted on Amaragadhi Municipality, Bagarakot and Alital VDCs of Dadeldhura, Nepal by District Agriculture Development Office, Dadeldhura under Prime minister agriculture modernization project at April 2017.

METHODOLOGY

Soil sampling and testing was done from Bagarkot VDC, Amargadhi municipality and Alital VDC in May 2017. The program was conducted in coordination with Regional Soil Testing Laboratory, Khajura, Banke. The soil samples were collected from the farmers' field of Bagarkot, Amargadhi and Alital by the direct observation of agriculture technicians. Among 148 samples, 26 samples from Bagarkot VDC, 53 samples from Amargadi Municipality and 69 samples from Alital VDC were collected and analyzed at RSTL Khajura to determine different soil parameters like Nitrogen, Phosphorous, Potassium, Organic Matter and pH by using different chemical methods. Organic matter, Nitrogen content, Phosphorus content and Potassium content on soil were determined by using the Walkley and Black method (Schumacher, 2002), modified Olsen method (Subbiah and Bajaj, 1962) and flame photometer method (Okalebo *et al.*,2002) respectively. pH of the soil was measured by using pH meter. According to the rating system of the soil test values suggested by Soil Management Directorate (SMD), Nepal; level of nutrient and pH status of soil has been classified.

RESULTS AND DISCUSSION

Soil test result showed that pH of the Amaragadhi and Bagarakot are slightly acidic in nature with value ranging from 5.2 to 6.4.The organic matter content is low with average value of 1.59 %. Likewise the organic nitrogen content is also low with value 0.08 %whereas the Phosphorous and Potassium content are very high with average value of 216.87 Kg/ha and 445.17 Kg/ha respectively analyzing the result obtained from the soil test of Bagarkot VDC, 77% samples contain very high amount of Phosphorous and 61% samples contain very high amount of Potash while the amount of Nitrogen and organic matter content was very poor. The pH of the soil is found to be slightly acidic. Among fifty three samples from Amargadhi municipality 73.58% samples had very high phosphorous content followed by Potassium (43.39%) while the organic matter

and Nitrogen content in the soil was found very less. Among the samples 67.92% soil samples were found highly acidic while 32.07% samples were found slightly acidic (Table 1).

Table 1: Percentage of soil organic matter, nitrogen, phosphorus and potassium

	Bagarkot				Amargadhi				Alital			
	OM	N	P	K	OM	N	P	K	OM	N	P	K
Low	100	92	4	4	100	100	5	4	100	98	0	0
Medium	0	7	0	31	0	0	6	8	0	2	1	6
High	0	0	19	4	0	0	15	45	0	0	12	69
Very high	0	0	77	61	0	0	74	43	0	0	87	25

Among 69 soil samples collected and analyzed from previously maize and wheat grown area of Alital, 80 % of the soil sample was found slightly acidic and 20 % was found acidic .The organic matter content was low in 67 samples andvery low in two samples. Tested result showed that Nitrogen content of the soil was very low whereas the Phosphorous and Potassium content was found very high. According to the soil test report the pH of the hill area (Amargadhi and Bagarkot) is slightly acidic with minimum, average and maximum value of 5.2, 5.68 and 6.4 respectively. The organic matter content is low with value 1.59% on an average. Likewise the Nitrogen content is also low with value 0.08% whereas the Phosphorous and Potassium content are very high with average value 217.87 Kg/ ha and 445.17Kg/ha respectively, the pH of inner terai (Alital) is slightly acidic with average value 5.91 whereas the organic matter and Nitrogen content is low with average value1.4% and 68% respectively.The Phosphorous and Potassium content of maize block is found to be rich in with average value of 283.23 Kg/haand 476.39kg/ha respectively Table 2, Figure 1 and 2.

Table 2: Soil nutrient content of Bagarkot, Amargadhi and Alital of Dadeldhura, Nepal

	Bagarkot			Amargadhi			Alital		
	Min	Av	Max	Min	Av	Max	Min	Av	Max
PH	5.5	6.24	6.7	5.1	5.82	6.5	5.2	5.68	6.4
OM(%)	0.62	1.47	2.419	0.62	1.12	1.756	0.96	1.59	2.28
Nitrogen(%)	0.031	0.07	0.121	0.031	0.056	0.087	0.048	0.08	0.11
Phosphorus(Kg/ha)	46.37	235.54	715.2	10.3	397.28	920.2	41.22	216.87	510.143
Potash(Kg/ha)	96	530.28	647.5	85.44	453.74	693.6	191.28	445.17	734.64

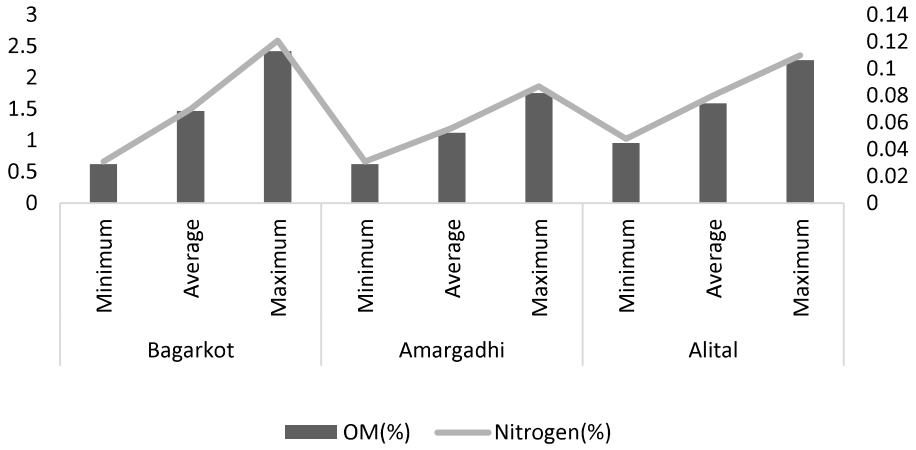

Figure 1. Minumum, Average and Maximum Organic matter and organic Nitrogen content of tested soil samples.

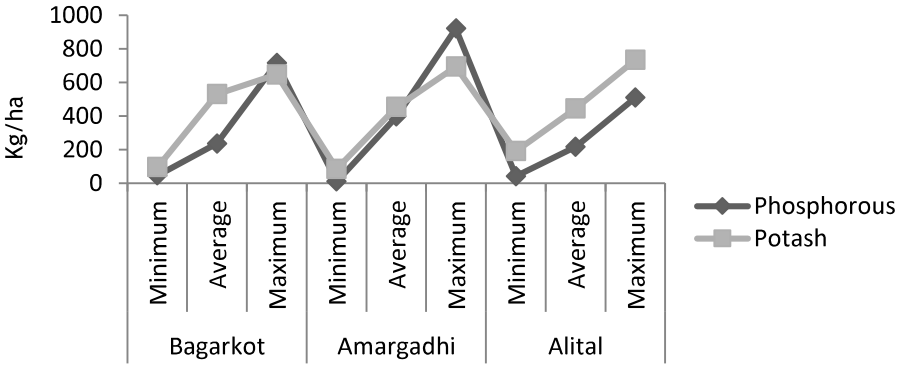

Figure 2. Minimum , average and maximum Phosphorus and Potash content of tested soil samples

Main reason for soil fertility decline in mid hills of Nepal are Soil erosion, poor organic recycling and unbalanced fertilization. It is estimated that runoff and erosion of 1-rnm top soil remove 10 kg of Nitrogen, 7 kg P and 15 kg of potassium from one hectare of land (Rijal, 2001). Loss of nitrogen from soil erosion and leaching are the major factors causing the very low soil nitrogen in mid hills of Nepal (Schreier *et al.*, 1994). Continuous erosion and runoff remove of Ca and Mg from soil and build up of soil acidity in hills. Many studies indicated that under acidic condition the crop did not respond to the sole chemical fertilizer and performed better only with FYM or with combination of both.

Declination of soil fertility and organic carbon is also due to less application of organic manure like FYM and compost. Changing farming system in mid hills of Nepal reduces the livestock population in family farming which is the major cause of less availability of FYM on farmer's field. Because of labor intensive soil management practice, migration of economically active population is another factor affecting sustainable soil management practices in rural areas (Pilbeam *et al.*, 2000). During most of the peak periods farmers are facing the problems to get required amount of chemical fertilizer. Geographical constraints and problem of transportation might be the other reasons of farmer's poor access to chemical fertilizer. Poor soil fertility status including problem of acidic soil, poor organic matter and very low level of nitrogen content are might be due to the above mentioned reasons in Dadeldura. Continuous degradation of soil fertility and imbalance soil nutrient status can reduce the overall productivity of major crops. Consequences of nutrient deficiency and toxicity may play the crucial role for overall productivity reduction which will directly effect on livelihood of rural people.

CONCLUSION AND RECOMMENDATION

The study has clearly indicated that soils of study area are poor in Soil Organic Matter content and are slightly acidic to acidic soil pH.There are different causes and effects of low SOM, one of the important factors being the soil degradation might be due to erosion in hilly areas. Organic matterand organic Nitrogen content is deficit in the soil. Although the farmers are using organic manure but this is not sufficient enough to improve the chemical and physical property of the soil. For this the use of well decomposed organic matter in the form of compost or in the form of farmyard manure should be encouraged. While high nutrient status of Phosphorous and Potash was observed in all around the districts more focus should be given to balanced used of chemical fertilizer. Primary concern of all stakeholders should be centered on to increase soil organic matter to improve overall chemical, physical and biological properties of the soil and this will ultimately increase the productivity of the soil.In order to improve the soil fertility status, farmers should adopt sustainable soil management practices like crop rotation with leguminous crop, use of green manure and bio fertilizer, crop residue management, application of well decomposed FYM, use of balanced fertilizer dose, conservation agriculture practices to control soil erosion and runoff.

REFERENCES

Bajracharya, R. M., and Sherchan, D. P., 2009. Fertility status and dynamics of soils in the Nepal Himalaya: a review and analysis. *Soil Fertility*, 111-135.

DADO.2017. Annual report of District Agriculture Development Office, Dadeldhura.

Desbiez, A., Matthews, R., Tripathi, B., and Ellis-Jones, J.,2004.Perceptions and assessment of soil fertility by farmers in the mid-hills of Nepal.*Agriculture, ecosystems & environment*, *103*(1), 191-206.

Fu, B., Chen, L., Ma, K., Zhou, H.,and Wang, J., 2000. The relationships between land use and soil conditions in the hilly area of the loess plateau in northern Shaanxi, China. *Catena*, *39*(1), 69-78.

Okalebo, J. R., Gathua, K. W., and Woomer, P. L., 2002. Laboratory methods of soil and plant analysis: a working manual second edition. *TSBFCIAT and SACRED Africa. Nairobi, Kenya*.

Paudel, G. S., and Thapa, G. B. 2004.Impact of social, institutional and ecological factors on land management practices in mountain watersheds of Nepal.*Applied Geography*,*24*(1), 35-55.

Pilbeam, C. J., Tripathi, B. P., Sherchan, D. P., Gregory, P. J., and Gaunt, J., 2000. Nitrogen balances for households in the mid-hills of Nepal. Agriculture, Ecosystems & Environment, 79(1), 61-72.

Rijal, S. P., 2001. Soil fertility decline in Nepal: Problem and strategy. Nepal Journal of Science and Technology, 3(1).

Schreier, H., Shah, P. B., Lavkulich, L. M., and Brown, S., 1994. Maintaining soil fertility under increasing land use pressure in the Middle Mountains of Nepal. Soil use and Management, 10(3), 137-142.

Schumacher, B. A., 2002. Methods for the determination of total organic carbon (TOC) in soils and sediments. Ecological Risk Assessment Support Center Office of Research and Development US. Environmental Protection Agency

Shrestha, B. M., and Singh, B. R., 2008. Soil and vegetation carbon pools in a mountainous watershed of Nepal. *Nutrient cycling in Agroecosystems*, *81*(2), 179-191.