Soil Nutrient Status and Farmers' Perception on Soil Fertility in Ethiopia: Review

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Abstract

Most of the essential elements in some parts Ethiopia especially the central high lands are found in deficient quantities in the mineral soils. The review deals with the assessment of macronutrients i.e., C, N, K, Ca, Mg, P, S and micronutrients i.e., Zn, Fe, Cu, Mn and framers' perception of soil fertility status. Deficiencies of macro and micronutrients have emerged as a new problem to crop productivity in Ethiopia. Particularly, deficiencies of N, P and S are widespread in different parts of the country. In some of the studies B and Mo deficiency were also reported. This review indicated that Farmer's knowledge of soil fertility status was based on observable plant and soil related characteristics namely; soil color, soil texture, crop productivity, soil water holding capacity and difficulty to work. Therefore, it is import to recognize farmer's knowledge and perception about condition of soil fertility status to design more appropriate research and to facilitate clear communication with farmers.

Keywords: soil fertility, farmers' perceptions, fertility status
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INTRODUCTION

Soil productivity in Africa is declining as a result of soil erosion, nutrient and organic matter depletion (Abraham, 2013). In sub-Saharan Africa, soil fertility depletion is the fundamental cause for declining per capital food production as crop lands have a negative nutrient balance, with annual losses ranging from 1.5 - 7.1t ha^{-1} of nitrogen (N), phosphorus (P) and potassium (K) mainly due to crop harvest, leaching and low inputs applied to the soil (Ahmed,2002 and Adesodun,2007).In the Ethiopian cultivated fields, about 42 t ha^{-1} of fertile soils have been lost every year together with essential plant nutrients mainly due to poor soil management. Soil degradation and nutrient depletion have gradually increased and have become serious threats to agricultural productivity. Nutrient balance calculations for countries by Stoorvogel and Smaling (1997) showed that Ethiopia was among the countries with the highest rates of net nutrient losses. The annual nutrient deficit is estimated at -41kgN, -6kgP and-26 kg Kha^{-1} yr^{-1}.

Assessing soil physicochemical properties are used to understand the potential status of nutrients in soils of different land uses. To meet the food demands of rapid increasing population, vast tract of land is being cultivated more intensively and large areas of grass and forestlands are being overgrazed and deforested. Changes in land use and soil management can have a marked effect on soil fertility mainly due to the conversion of natural ecosystem (forest land) to crop land which resulted in decline of soils physical, chemical and biological properties (Bray and Kurtz, 1945). Research findings from different corners of the world have revealed that prolonged intensive cultivation and fertilization have resulted in the deterioration of plant nutrients. Deforestation and cultivation of virgin tropical soils often lead to depletion of N, P, sulfur (S) and other plant nutrients that lead to aluminum (Al), iron (Fe) and manganese (Mn) toxicity which increase soil acidity (Barry and Ejigu, 2005).

Physical and chemical properties of the soils on land under continuous cultivation could vary from the other land uses. Cultivated soils are poor in its fertility status as it has high bulk density low total porosity, low pH and very low OM or organic carbon content. Cultivation has also altered other soil chemical properties and characterized by low in total N, available S, cation exchange capacity and exchangeable bases of calcium, magnesium, potassium and sodium but relatively high in available P. The survival and wellbeing of the present and future generation in countries with subsistence agriculture like Ethiopia depend on the extent of maintaining soil fertility. So, land must be carefully managed which urges to establish land use system for conserving its fertility in the long term.

Farmers' understanding of soil fertility varies with different Soil types. A number of studies have overlooked farmers' understanding of soil fertility for different soil types. Besides, indigenous knowledge of soil and soil fertility management is location specific, specific to the socio-cultural and biophysical environment of an area (Getahun, 2006). A number of studies were conducted on farmers' perception of soil fertility status (Desbiez et al., 2004; Getahun, 2006). There have also been studies of indigenous knowledge in the evaluation of soil fertility (Dea and Scoones, 2003).

As soil physicochemical analyses results and its productivity level revealed that at present, Wujiraba watershed becomes nutrient depleted and less productive which make very difficult the efforts that have been made for improving crop yields. Besides, the degree, extent, causes and measures of the soil fertility decline have not received adequate research attention in the northwestern highlands of Ethiopia in general and the study area in particular. Investigating soil physical and chemical properties under different land uses could assist policy makers, researchers, extension workers and farmers to have baseline information to improve the soil fertility and productivity of acid soils of the study area and elsewhere which have similar agroecology. Research on this line is of paramount importance as the results obtained from such studies could also be used for monitoring changes in soil fertility and productivity. Therefore, the objective of this paper was to review soil fertility status under different soil types and to assess farmers understanding on soil fertility conditions.

Fertility Situation in of Ethiopia

Soil fertility is a quality of a soil to supply nutrients in proper amounts without causing toxicity, whereas soil productivity is the capacity of a soil to produce a specific crop or sequences of crops at a specific management system. Optimum productivity of any cropping system depends on adequate supply of plant nutrients. Continued removals of nutrients with little or no replacement have aggravated the potential for future nutrient related plant stress and yield loss (Sheldrick *et al*., 2002, FAO, 2006). Soil fertility depletion is the major environmental challenge that affects agricultural production and the livelihoods of farmers in Ethiopia. Soil fertility depletion estimated by Mahmud *et al.* (2005) showed that about 106,000 km^2 (9.6% of the total area of the country) was not able to sustain crop yield. Stoorvogel *et al*. (1993) estimated that about 41 kg of N, 6 kg of P and 26 kg of K is lost per hectare per year from Ethiopian highlands. On the other hand, about 41% of the total arable land of the country is acidic, of which nearly one-third faces the problem of aluminum toxicity (EATA, 2013). The direct cost of this soil fertility depletion was estimated to be 3-7% of agricultural GDP (Berry *et al*., 2003).

In 1968, Murphy published a valuable report on the fertility status of specific Ethiopian soils. Altogether about 2200 soils widely distributed all over Ethiopia were collected and carefully analyzed. According to Murphy about 79% of the soils were under medium to high range in total nitrogen, 60.5 percent medium to high in available phosphorus and over 90 percent high in available potassium. For the Central Highlands his figures show adequate amounts of nitrogen and potassium and low amounts of available phosphate. They were repeatedly described as fertile but this was not supported by yields. Spielman *et al.* (2011) reported that when measured in terms of quantity, the use of fertilizer in Ethiopia has increased from 250,000 tons in 1995 to 400,000 tons of product in 2008. But Ethiopia faces a wider set of soil fertility issues beyond application of chemical fertilizer which has historically been the most important focus for extension workers, researchers, policymakers and donors. As reported by Gete *et al. (*2010), these issues relate with loss of soil organic matter, macronutrient (N, P and K) and micronutrient (Fe, Mn, Zn, Cu, B, Mo and Cl) depletion, topsoil erosion, acidity, salinity and deterioration of other physical soil properties.

Determinants of Soil Fertility Status

There are several factors that contributed to the decline of fertility status of Ethiopian soils. As the finding of Taye and Yifru (2010) indicated, land degradation is the major one because of great deforestation, human and livestock population pressure, inadequate use of crop residue and animal dung and little or no use of modern technologies to restore soil fertility. The most important determinant factors of soil fertility status are morphological, physical and chemical properties of soil. Different physical and chemical properties of the soil relate one to another and hence, the presence of one can indicate the status of the other (Brady and Weil, 2004).

Morphological properties

In order to place a soil in its perfect position in the classification system, a detailed knowledge on its morphological characteristics is necessary. Morphological properties of soil are the most important tool than physical and chemical properties of soil in soil classification because it is perceived under naturally undisturbed condition (Sharma, 2002). One of the most important properties which support to identify the kinds of soils and recognize the sequences of soil horizons or layers in soil profiles is Soil color. It has long been applied in order to identify soil and for qualitative measurements of soil properties and is a supportive field soil property for describing soil types. According to Wakene (2001), color of each soil type is a function of pH, redox reaction and organic matter content. A change in soil color from adjacent soil also indicates a difference in the mineral origin of soil (parent material) or in soil development (Sharma, 2002), geologic origin and degree of weathering of the soil material, and leaching or accumulation of chemical compounds such as iron, which may seriously influence the quality of soil. Dark color (low chroma) of soils could be related to the strong impregnation of the soil profile by organic matter in the course of pedogenesis or to prolong water logging (Dengiz *et al*., 2012).

Soil physical properties

The physical properties of soils mainly control the water and air supplying capacity of soil's to plants and their adaptation ability to cultivation and the level of biological activity that can be supported by the soil. Sanchez

(1976) stated that many soil physical properties vary with changes in the system of land use and its management such as intensity of cultivation, the instrument used and the nature of the land under cultivation, rendering the soil less permeable and more susceptible to runoff and erosion losses.

The size composition of elementary grains in a soil is referred as soil texture. It determines a number of physical and chemical properties of soils and has its own influence on infiltration and retention of water, soil aeration, absorption of nutrients, microbial activities, tillage and irrigation practices. The rate of increase in stickiness or ability to mold as the moisture content increases is a function of silt and clay particle content, the degree to which the clay particles are bound together into stable granules and the OM content of the soil. Berhanu (1985) reported that the Vertisols in Ethiopia generally contain more than 40% clay content in the surface layer (0-20 cm depth). The silt to clay ratio is one of the indices used to assess the rate of weathering and determine the relative stage of soil development. A ratio of silt to clay below 0.15 is considered as low and indicative of an advanced stage of weathering and/or soil development while >0.15 indicates that the soil is young containing easily weather-able minerals (Young, 1976).

Debele *et al*., (2011) stated that Soil bulk density shows the compactness of the soil. It has inverse relationship with the amount of pore space and soil organic matter content. Textural differences between soils influence the value of bulk density (for example, clay, silt clay and clay loam surface soils show low bulk density as compared to sands and sandy loam soils which show high bulk density values). Bulk density of a soil increases with the increase in soil profile depth because of variations in organic matter content, porosity and bulk density commonly decreases as mineral soils become finer in texture. Soils with low bulk density shows favorable physical conditions while soils with high bulk density show unfavorable physical conditions (Mitiku *et al.*, 2006).

Soil water lubricates the soil permitting root penetration, essentially for microbial mobility and action, and it allows nutrient mobility. Thus, it can be said that water is a controller of soil physical, chemical and biological processes. These processes, in turn, influence every part of soil development and behavior ranging from minerals weathering to the decomposition of organic matter, from the growth of plants to the pollution of groundwater. According to Hazelton and the water-holding capacity of the soil is highly dependent on different soil properties include: particle size distribution (with coarse sands, clays, silts and fine sands holding the least water, the most and in the available water range respectively), the type of clay particles (montmorillonite or swelling clays holding more water than kaolinite type clays), the amount of organic matter in the soil, the bulk density and structure of the soil (Murphy 2007).

Soil chemical properties

Soil chemical properties are those soil properties which are responsible in the chemical reactions and processes of soil and are the result of soil mineral component weathering, decomposition of OM in the soil and the activity of plants and animals pertaining to plant and animal growth and human development. The chemical reactions that arise in the soil highly affects processes leading to soil improvement and soil fertility buildup. As per the ratings for Ethiopian soils by Murphy (1968) and Taddese (1991), the soil pH was found to range from neutral to slightly alkaline with pH ranging from 7.2 to 7.9. Similar results were obtained by Debele (2000). This pH range is favorable for most crops. The electrical conductivity ranged from 0.1 to 0.22 dSm^{-1} in surface soil samples indicating that these soils have a low content of soluble salts and that there is no danger of salinity. The organic matter contents were in the range of 1.6- 3.2 % on the surface soils table1. These values fall under low to moderate range based on the ratings of soil test values established by Taddese. The values are similar to most cultivated soils of Ethiopia which is attributed to land use history such as complete removal of biomass from the field and rapid rate of mineralization (Abayneh,2001). The C to N ratio of the surface soil samples varied from 10 to 15 (Table 1), which is within the normal range for arable soil (murphy, 2007).

Data on total nitrogen of the surface soils are presented in Table 1. Total nitrogen levels between 0.1 and 0.2 % are taken as low while those below 0.1 % are very low for tropical soils (Landon 2004). It follows that soils of the study areas are low to very low in their total nitrogen status. Total nitrogen closely followed the trend of organic matter. Generally, a site low in organic matter was also low in total nitrogen. This supports earlier studies in the area by Debele (2000). One of the characteristic features of tropical environment is its high temperature which leads to rapid loss of soil organic matter due to volatilization.

Soil erosion due to steep slopes and heavy rainfall as well as leaching, may have contributed to nitrogen loss. Certainly, it is one of the most deficient elements in the tropics for crop production. Under local conditions, in addition to the above factors, continuous crop removal also contributes the low organic matter content in the study areas. Available P (Olsen extractable) in the studied sites varied between 3.8 and 14.6 mg kg^{-1}. It was found to be deficient (<10 mg kg^{-1}) and medium (between 10 and 17 mg kg^{-1}) in 80 and 20 % of the samples, respectively, when compared with the values reported by (Cottenie,1980). This result is in agreement with the findings of (Debele, 2000).

Table 1 Soil Chemical Properties

Location	pH	EC dS/m	SOM (%)	TC (%)	TN (%)	C: N
Akaki	7.40	0.15	1.90	1.20	0.10	12.30
Ambo	7.90	0.10	2.70	1.60	0.12	13.00
Chefe Donsa	7.80	0.20	1.90	1.10	0.10	11.60
Debre Zeit	7.90	0.17	2.70	1.69	0.11	14.80
Ginichi	7.80	0.22	2.30	1.34	0.11	12.70
Holeta	7.80	0.11	2.30	1.32	0.11	12.50
Mojo	7.20	0.13	2.80	1.65	0.12	14.30
Sheno	7.30	0.14	3.20	1.87	0.19	9.90
Tullu Bolo	7.20	0.12	1.60	0.94	0.08	12.00
Woliso	7.70	0.20	2.10	1.21	0.11	10.70

Source: Hillette *et al*, 2015

In neutral Vertisols, the exchangeable sites are occupied mainly by calcium (Ca) and magnesium (Mg) and to a lesser extent by potassium and sodium. Similarly, in the present study, the predominant exchange-able cation, which accounts for more than 80 % of the exchange complex was Ca^{++} followed by Mg^{++}, K^{+} and Na^{+}. According to the rating suggested by Hazelton and Murphy (2007), both Ca and Mg are in high range at all the sites (Table 2). The exchangeable K ranged between 1.3 and 2.3 cmol $_{(+)}$ kg^{-1}, which is in a very high range. Generally, the fairly high level of exchangeable Ca, Mg and K is consistent with the findings of earlier studies (Landon,2004). It has been suggested that the proportions of the basic cations of the effective cation exchange capacity are more relevant to plant performance than the actual levels. The potassium saturation percentage (3.2-5.4 %) of the studied soils was found to be desirable proportion for many plants (Table 2). Nevertheless, antagonistic effects could exist when disproportionate quantities of exchangeable cations are present in the soil. Potassium to magnesium ratio of the studied soils varied from 0.17:1 to 0.44:1, which indicated Mg-induced K deficiency using the rating of (Loide, 2004). This can be corrected by K application to bring the K to Mg ratio closer to 0.7:1. The low K to Mg ratios may result in K adsorption to cation exchange sites, which reduce K activity in the soil. Many soils with vermiculitic or micaceous components of the clay fraction have a preferential adsorption of K^{+} over Ca^{2+} or Mg^{2+}.If there is a high preferential K adsorption on the exchange sites of clay minerals, the amount of K desorbing may then decline, resulting in a reduced K uptake at low soil exchangeable K to Mg ratio. Vertisols usually have a relatively high CEC, which ranges between 20 and 45 cmol $_{(+)}$ kg^{-1} soil and even more. In Ethiopia, Debele (1985) reported that nearly all the Vertisols have high CEC of 35-70 cmol $_{(+)}$ kg^{-1}. According to the rating of Hazelton and Murphy (2007), CEC of the studied soils were very high and ranged between 37 and 58 cmol $_{(+)}$ kg^{-1} (Table 2). The very high value of CEC is mainly due to high clay content and pre-dominance of 2:1-layer clay minerals.

Table 2 Exchangeable bases and cation exchange capacity (CEC)

	Exchangeable bases (cmol (+) kg-1)				Cec
Location	Ca	Mg	K	Na	cmol (+) kg-1)
Akaki	38.00	9.40	1.60	0.16	49.40
Ambo	45.20	7.00	1.80	0.10	54.60
Chefe Donsa	32.80	5.20	1.80	0.27	42.10
Debre Zeit	49.00	5.20	2.30	0.07	56.50
Ginichi	48.80	6.70	1.90	0.17	58.00
Holeta	34.10	8.00	1.50	0.18	44.30
Mojo	32.40	9.80	1.90	0.13	44.50
Sheno	28.30	9.70	1.30	0.11	39.80
Tullu Bolo	27.10	8.80	2.20	0.41	38.80
Woliso	30.80	4.70	1.80	0.08	37.80

Source: Hillette *et al*,2015

Soil micronutrient

Chemical elements necessary only in a very small amount for the growth of plants is called Micronutrients. Micronutrients include iron (Fe), copper (Cu), manganese (Mn) and zinc (Zn) and others like boron (B), molybdenum (Mo) and chlorine (Cl). In Ethiopian soils Copper is most likely deficient, Zn contents are variable and, Fe and Mn contents are at an adequate level (Abayneh, 2005). However, micronutrient elements are required in small amount, they are as necessary as the macronutrients and any decisions and recommendation of soil fertility without micronutrients is no longer complete (Nazif *et al*., 2006).

A number of studies conducted so far showed that deficiency of Cu and Zn are widespread in many Ethiopian soils (table 3). For instance, in an attempt to produce countrywide information on status of micronutrients, Asgelilet al. (2007) collected a number of soil and Plant samples from different agro-ecologies and confirmed that Cu and Zn are deficient in both plant and soil samples (Table 3). They reported that soil samples were deficient in Cu and Zn, respectively and confirmed that Cu and Zn are deficient in both plant and soil samples. On the other hand, Fe and Mn in soils were found to be above the satisfactory limit and in some cases Mn toxicity were noted.

Table 3. Soil micronutrients studied in some Ethiopia soils

Soil type	Studied miconutrient	Micro nutrient deficient	Studied area	Source
Pellic vertisol and Eutric cambisol	Fe, Mn, Cu and B	B (97%) and Zn (20%)	Cheha distnict, Guraghe	Mohammed *et al* (2016)
vertisol (saline soil) and fluvisol	Fe, Mn, Cu, Zn and B	Fe, Zn, Mn and Cu	Amibara, Afar	Ashenafi *et al* (2016)
Pellic and chromic vertisol	Fe, Cu, Zn, and B	B (100%)	Alicho woriro district	Eyob *et al.* (2016)
Vertisols	Fe, Mn, Cu, Zn, B and Mo	Zn, B and Mo	Central high land of Ethiopia	Hillette *et al.* (2015)
Eutric Fluvisol, salic fluvisol and Eutric vertisol	Fe, Cu, Zn & Mn	Zn (100%)	Middle Awash irrigated farm	Wandimagegni and Abere (2012)
Nitisols	Mn, Fe, Cu and Zn	Zn (100%), B (31.9%), Cu (5.6%) and Mo (4.4%)	Western Ethiopia	Taklu et al (2003ab)
Vitric Andisols	B and Mo	Cu (100%) and Mo (40%)	Rift valley	Teklu *ET AL.* (2007)
Alfisols/Nitisols	Mn, Fe, Cu, Zn, B and Mo	Zn, B & Mo	Western Ethiopia bako	Wakene and Huluf (2003)
Alfisols/Nitisols	Mn, Fe, Cu, Zn and B	Cu	Delbo atiwaro watershed	Wondwosen and sheleme,2011
Nitisols	Fe, Cu, Zn and Mn	Cu and Zn	Jimma Zone	Abebe and Endalkachew (2012)
Eutric vertisol and vertic cambisol	Fe, Cu, Zn and Mn	Zn (100%)	Bale High land	Yerima et al (2013)
Vertisols	Fe, Cu, Zn and Mn	Zn (98%), Fe (96%) and Mo (20%)	Central high land	Yifru and Mesfin (2013)

Source: (Yifru Abera and Sofiya Kassa,2017)

In similar study, 75.4 and 43.3% maize leaf samples, 87.7 and 64.6% of tef leaf samples, 84.8 and 51.6% wheat leaf samples showed Cu and Zn deficiency, respectively. In line with this, different authors (Sahlemedhin *et al*., 2003; Demeke and Abayneh, 2003; Abayneh and Ashenafi, 2006; Abebe and Endalkachew, 2012) independently reported deficiency of Cu and Zn while Mn and Fe were above the critical limits in different parts of Ethiopia. Previously, Faye *et al* (1993) also reported that there was widespread deficiency of Zn and Cu in forages and blood of domestic ruminants in Ethiopia, implying that these nutrients could be limiting forage production. Some preliminary results from recent Ethiosis survey also indicated that boron, zinc and copper are deficient micronutrients in most Ethiopian soils (Samuel, 2014).The study conducted at Amibara irrigation project area, Gabiressu zone of Afar regional state by Ashenafi *et al* (2016) recently reported that DTPA extractable Fe, Zn and Mn were found to be deficient in all salt affected soils, whereas, Cu was deficient in saline sodic and sodic soil of Fluvisols but medium in non-saline, non-sodic soil and saline soil of Vertisols and Fluvisol

Farmer's Perceptions on Soil Fertility

Indigenous knowledge of soil is defined as the knowledge of soil properties and management Practices possessed by people living in a particular location for some period of time (Winklerprins, 2002). Taye and Yifru (2010) study on assessment of soil fertility status with depth in wheat growing highlands of southeast Ethiopia originate that farmers in the study areas have their own common criteria to evaluate and identify their soils. Corbeels *et al*. (2000) also study about Knowledge of farmers on soil fertility and local management practices in Tigray region of Ethiopia and reported that farmers use appearance of some weed species (Echinipshispidus and Xanthium spinosum*),* rocky out crops and crop wilting as sign of soil fertility decline or low soil fertility in Tigray region. They classified their land into three classes: reguid meriet (fertile), mehakelay meriet (moderately fertile), and rekik meriet (infertile). Based on soil color and texture farmers in the region distinguish between four different soil types. These are walka or tselim meriet (black, clay soil), keyih meriet (reddish, medium-texture soil), and elewayi (brownish, medium-texture soil) and bahakal (light colored, lightly textured soil). Similarly, in the Siaya District of Kenya, farmers base their classification of soil on the surface layer, taking into account the colour, texture, and heaviness of working. In southern Rwanda also soils classified into nine based on criteria such as crop productivity, soil depth, soil structure, and soil colour (Habarurema and Steiner, 1997).

According to Barry and Ejigu (2005), based on their study conducted in Wolaita, farmers rank the best soils as those which require little input to enrich them, the current fertility of a soil depends very much on nearness to the home, and therefore the amount of manure received, and overall soil management. Soil is classified as fertile where it comprises high organic matter and clay content, adequate supply of growth factors, large supply of plant nutrient, high water holding capacity, high infiltration rate and high biological activity with neutral PH whereas infertile soils have low organic matter content, presence of cementing materials (Al, Fe_2o_3 heavy clay) and low biological activity, physical, chemical and biological limitation, low PH, high PH and shallow in depth (Mrema *et al*. ,2003).

Farmers soil fertility management practices

Highest proportion of farmers used inorganic fertilizers as the sole source of improving soil fertility and productivity for cultivated land where cereal crops grow. Relatively, very few farmers tended to use a combination of organic and inorganic fertilizers instead of purely rely on inorganic fertilizers. According to Corbeels *et al*. (2000 stated that farmers need to be familiar with the use of organic fertilizer and mineral fertilizers in a complementary manner one with the other rather than replace each other. However, there was also a major constraint for small scale farming system to use both organic and inorganic fertilizer. The problem becomes high for poor farmers because of expensiveness of chemical fertilizer price and in accessibility to inorganic fertilizer attributed by low number of livestock and other causes. Major soil fertility management practices that are used by the small-holder farmers in different parts Ethiopia were listed below

Inorganic fertilizer use

In organic fertilizers have a dominant role in order to increase crop production, but its availability to the majority of the farmer is questionable. There is a wide spread supply limitation which is related to shortage of foreign currency at national level, lack of loan facilities and inefficient distribution system (Anthony, 1990). More than 90% of poor farmers use inorganic fertilizer while sawing (Amelework, 2017)

Organic fertilizer

Organic fertilizers are important constituents in crop production system of the high lands of Ethiopia. The organic inputs which are widely used by the farmers in Ethiopia are manure and compost. Manure fermented for a long period of time can offer balanced nitrogen and other macro and micro nutrients. Use of crop residues for livestock feeding is common practices in different parts of Ethiopia. Farmers transported residue from cereals crops (wheat, barley and teff) and legumes (beans and peas) from field to the home compound and stored for animal feed. In addition to this, teff residues are used mainly for fodder, fuel wood and fencing. It leads to soil fertility decline more rapidly in the fields (Amelework, 2017). Barry and Ejigu (2005) also indicated that the decline in the fertility status of Ethiopian soils is largely caused by extra pressure on land due to high population, decrease in the amount of organic input available for soil fertility. Only few farmers use crop residues to maintain soil fertility. In order to sustain agricultural productivity in the long term, soil organic matter needs to be maintained by continuous addition of organic manures and amendments especially composted materials (Diacono and montemurro, 2010). The main factors for soil organic matter enrichment are quantity, type and humification degree compost or vermicompost and soil properties such as soil type and clay content (Pereira *et al.,* 2014).

Conclusion

From this review, it can be concluded that different parts of Ethiopian soil showed deficiency in the levels of N, P, S, Zn, Mo, Fe, Zn and B. The nutrient deficiencies identified in this area could be due to either inherently low availability of these nutrients in the soils or as a consequence of continuous cropping without applying fertilizer or manure containing these nutrients. Farmers in ethiopia have a well-developed knowledge system about their soils, nutrient provision through decomposition of plant organic litter, and nutrient loss and cycling processes. This knowledge system is made up of experiences and phenomena that they can visualize and information retained from colleague farmers and extension officers. So, in order to explore better opportunity for soil fertility understanding farmers view and their soil fertility management is indispensable. Apart from local perceptions of soil fertility processes, socio-economic factors such as monetary value of management techniques heavily influence which techniques farmers implement.

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