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Review on effects of integrated soil fertility management on sustainable crop production in Ethiopia

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Abstract
Soil fertility decline is the main issue in African agriculture in general and in Ethiopian in particular. Farmers in most parts of the country actually work hard, in seasons of the year when the rainfall is favorable for their cropping. Declining of soil fertility is a fundamental problem to agricultural growth and a major reason for slow growth of food production. Most of the soils in Northern Ethiopia are low in soil OM, CEC, and fertility. So this review try review and compile findings related to the importance of integrated soil fertility management and revise the limitations of using sole organic or inorganic fertilizer. In this review it indicated that integrated use of all these soil management factors helps to reduce considerable amount of inorganic fertilizers. To improve crop yield, application of organic and inorganic resources is very crucial. If it is applied in combination by following considering the biological, physical and chemical property of the soil, it reduces the cost of the commercial fertilizer and improve SOM content and increase the yields of the crop.

Keywords: integrated soil fertility management, sustainable crop production

1. Introduction

Agriculture is the backbone of Ethiopian economy, about 85% of the economically active population lives in rural areas and engaged in agriculture. Soil fertility decline is the main issue in African agriculture in general and in Ethiopian in particular. In Ethiopia, large number of population is hardly satisfied by reliable production, instead a decline in their crop yield is letting them to suffer from poverty and malnutrition. Studies indicated that in some parts of Ethiopia farmer suffer from lack of what to eat particularly in months starting from June up to September (Abera, 2003) [1].

Farmers in most parts of the country actually work hard, in seasons of the year when the rainfall is favorable for their cropping. There are a number of researches done by different stakeholders to address the problems of soil fertility, but most of these concentrate on application of different types of mineral fertilizers and pesticides for which the farmer is very far away to afford them. Irrespective of the different local research studies in Ethiopia until now the fertilizer application undertaken by farmers is based on a national level forwarded by the government. It is based on some general soil studies, for immediate solution of production problems of the country; and this national fertilizer recommendation is known as the blanket recommendation, but it is now found to be antiquated practice that cannot address the existing condition of the farmers.

If scholars have to do a research to address the problems of the farming community, it should be in collaboration/participation of the farmer himself, in the manner that he/she is able to analyze the problem and understand the solutions given on his farm by interpreting to his own standard. The blunder with this agricultural problem is very intricate in nature, the complexity arises from various condition of the country such as the agro-climate, topography of the lands, the soil types and socioeconomic status of the farming community and the combination of these; the overall effect of which is finally reflected by soil fertility decline and reduction in yield of crops. In the expansion process of the agriculture, farmers deforest the existing forest lands and bring a new form of land use and on their agricultural land they almost take no organic matter management. Besides, livestock productions on unprotected land lead to overgrazing process and bare the land of grasses. Soil is a thin layer that covers a land surface. It is used as medium for plant growth.

Soil fertility is the capacity of the soil to support plants life. Soil fertility is the status of the soil with respects to its ability to supply essential elements for the growth without toxic concentration of any elements. Thus soil fertility focus on the adequate and balanced supply of nutrients to satisfy the needs of the plants. Because plants are evolved in different climates and on different soils which have different needs for essential nutrients and had different tolerance of the toxic elements (Henry D. and Boyd G. ELLI 1997).

Declining of soil fertility is a fundamental problem to agricultural growth and a major reason for slow growth of food production. Most of the soils in Northern Ethiopia are low in soil OM, CEC, and fertility. This low level of soil OM combined with poor land cover have resulted in poor soil structure, limited rooting depth and susceptibility to accelerated erosion (Wakene, 2001).

According to Mugwari and Curwari (1998), to overcome this problem, integrated soil fertility management is an important technology. Integrated soil fertility management (ISFM) is the technology that combines a mix of organic and inorganic materials (fertilizers) used with closer attention to timing and placing of the inputs to maximize nutrient use efficiency of the soil. This technology also used to reduce the dependence on commercial fertilizer and there is a different locally available organic fertilizer as alternative sources. To date different research result indicates the advantages on integrating different fertilizer source for crop production. The concept of ISFM is more recent and needs to be more research and information generated on the optimal combined use of mineral fertilizers and various techniques to increase soil OM.

The need for both organic and inorganic mineral inputs was advocated because: - Both resources fulfill different functions to maintain the plant growth. In urban most small scale farming conditions neither of them is available or affordable in sufficient quantities to be applied alone. So ISFM or integrated uses of chemical and organic fertilizers are required to supply and maintain the better soil fertility for sustainable crop production on a given soil. Mugwari and Mukwari (1998) reported that the uses of organic fertilizers are more beneficial when combined with commercial fertilizers.

1.1 The objective of this paper is

To review and compile findings related to the importance of integrated soil fertility management and revise the limitations of using sole organic or inorganic fertilizer.

2. Literature review

2.1. Soil fertility status of Ethiopian soils

In the different regions of Ethiopia there exist various topographic, climatic or Agro-climatic and soil conditions. And these varying conditions together with socioeconomic status of the society, creates various factors that cause soil fertility loss with varying degrees. Therefore, the soil fertility status of Ethiopia cannot simply be generalized, because there are different local soil fertility statuses which may range from fertile soil to highly infertile soil. But in general the soils of most Sub-Saharan Africa particularly the east African soil are generalized as infertile with "Orthodoxy", Orthodoxy is to mean that infertility of the soil in this region is an apparent phenomenon, which does not need any proof. "The existence, the extent and causes of soil fertility problem are accepted without question" (Taye and Yifru, 2010) [12].

2.2 Types of fertilizers used in integrated soil fertility management

The highest and sustainable pains in crop productivity per unit nutrients are achieved from two types of fertilizers used for integrated soil fertility management. These are organic fertilizer and inorganic or commercial (chemical fertilizers). These two types of fertilizers are more important as it is used by mixture rather than using them individually to plant nutrient requirements, to increase the productivity of the soil, to cover the land by the available economy of the farmer, to maintain soil fertility status and its production capacity, and to improve the soil physical condition, chemical properties of the soil and biological activity or condition of the soil (Nlle C.N Brady, 2002).

2.2.1. Organic fertilizers (Inputs)

Organic fertilizers are nutrients sources that can be used in organic terming that are organic from chemical stand point as G.W. Cooke (1975). Explain that organic fertilizers are produced from locally available materials. These nutrients are released much more slowly than synthetically produced or chemical fertilizers. So to make nutrients available to plants, first the organic matter must be broken down by microorganism working in the soil and converted in to a water soluble form that plants are able to absorb. This process happens gradually so that there is less chance of gardeners causing damage to planets through over fertilizing of organic fertilizers.

2.2.1.1. Importance of organic fertilizer

An organic fertilizer provides essential elements and improves soil structures. Organic matter helps to breakdown heavy clay soil to improve air circulation and drainage capacity of the soil. It also increase the capacity of sand soil to retain water and make easier for roots of the plant to reach the moisture and to absorb the nutrients in the soil. It provides nutrient release over an extended period of time; in particular N can be minerized over a season to eliminate the needs for repeated application (Daniel Hillel 2005). An organic matter depletion of the soils is a wide spread problem in Ethiopia, investigation made by MARC (2007) as cited by Zelleke *et al*. (2010) indicates that soils of the different areas can be rated as low concerning their organic matter and total nitrogen content.

2.2.1.2. Sources of organic materials

2.2.2.1. Compost

Compost is rotting down of plant or animal residue (remains) in heap or pits before the residue is applied to the soil. In the preparation of the compost, the rate of decomposition is controlled by the aeration condition and water contents of the pits. If it is too dry too compacted or too water logged little decomposition takes place and if it is kept moist and olden the rate of decomposition is at its maximum (E.W Russel, 1973).

2.2.2.1.1. Effects of compost on soil

The application of compost to the soil initiates a series of physical, chemical and biological transformation that affects both soil properties and processes.

2.2.2.1.2. Physical effects

Compost changes several critical soil physical functions including water holding capacity and transport gas's exchanges and transfer. At the soil surface compost provides a barrier to a rain drop impact reduce surface sealing and allowing rapid infiltration of rainfall or irrigation water. This factor can delay the onset of runoff. Deeper in the soil profile the structural effects of the compost particles typically increases both soil porosity and permeability enhancing gas transfer as well as saturated water flow. According to Daniel Hillel (2005). Organic matter (compound) introduced with the compost to the soil and produced by the subsequent biological activity work to promote soil aggregation and enhance aggregate stability. These soils aggregates as well as compost itself increase water holding capacity which can improve irrigation efficiency and mitigates drought stress.

2.2.2.1.3. Chemical effects

As Mycle C. Brady (2002) stated that when compost is incorporated in soil there are immediate calculable changes in the concentrations of nutrients trace metals and other chemical compounds that result from the application rate and composition of two materials. Compost contains more amount of carbon so carbon is the dominant element in composts primarily occurring as the structural back bone of organic bimolecular. This bimolecular have open ion exchange sites that can react with other compounds in the soil system increasing the overall CEC and chelating minerals and heavy metals in the soil. Some compounds also includes significant amount of mineral carbonates either from feed stock or accidentally blended in from the surface of compost pads. Both carbonates and organic carbon in the compost can changes the soil pH. Carbonate raises pH value of the soil through their affinity of hydrogen ions while organic carbon lends to buffer the system somewhere near neutral (Nyle C. Brady and Ray R.Well 2002).

2.2.2.1.4. Biological effects

Organic carbon added to the soil through compost provides a major energy resource for biological activity and growths while the added nutrients and mineral cycle through both microorganisms and plants. In addition to increasing over all microbial activity compost also increases the activity of specific enzymes the amount of active microbial biomass and the overall diversity of microbial ecology in the soil system (Daniel Hillel, 2005).

2.2.3. Green manure

2.2.3.1 Effects of green manure

In agriculture a green manure is a type of cover crop grown primarily to add nutrients and organic matter to the soil typical a green manure crop is grown for specific period of time and then ploughed under and in corporate in the soil shale green or shortly after flousering green manure crops are commonly associated with organic and are considered essential for annual cropping system that wish to be sustainable. Traditionally the practice of the green manuring can be traced back to follow the cycle of crop rotation which was used to allow soils to recover. Organic relies on soil health and cycling of nutrients through the soil using natural processes. Green manures perform the vital function of fertilization in concert which there are a variety of beneficial aspects of the use of green manure there are also limitation to consider. Another function contribute of green manure to agricultural fields the nitrogen riding ability and consequent nitrogen accumulation in the soil with green manure use the amount of nitrogen that is available to the succeeding crop is usually in the range 40-60% of the total amount of nitrogen that is counted with the green manure crops. The amount of humus found in the soil also increase with higher rates of the decomposition. It also come from a shade plant or tree whose cuttings or taller leaves are suitable to plopping into the soil (E.W. Russel 1973).

2.2.3.1 Nitrogen addition

One important reason for using green manure legume crop is that they supply additional N. depending on the yield and N content. When the non-legume plant is lured under, only N from the soil or that supplied in fertilizer is returned (used) for the crop (Neely *et al*., 1987). As Neely *et al.* (1987) stated, one of the benefits attributed from the use of green manure is organic matter (OM).

2.2.3.2 Protection of the soil against erosion

Protection against erosion is one of the most important advantages of using green manure. As green manure is applied to the soil, it will increase. In addition, the practice of green manure improves the soil structure, increase the ability of the soil to retain water, protect the soil from dehydration and temperature fluctuation (Nyle B Brady and Rayr well 1999).

2.2.4. Animal manure

Described that animal manure is animals' excrement usually mixed with straw or leaves. The amount and quality of this excrement depends on the animal minimal reeds. Methods for handling and Storing animal manure will affect its nutrient contents previously the common method of disposal was to collect the manure plus bedding and spread it on the fields liquid waste systems have since been developed in which manure is diluted with water stored

Table 1: Annual raw manure production per 1, 000 IB animal manure weight

Animal type	Manure ton/year	Percent solid	Nutrient content		
			N	P_2O_5	K_2O
Dairy	15.9	12.7	10	4.1	7.9
Beef	11.5	11.6	13.3	8.4	9.5
Veal	11.5	8.4	8.7	2.1	9
Sheep	7.3	25.0	22.0	7.6	19.6
Goat	7.0	31.7	33.4	5.4	15.1
Layers	9.7	25.0	23.4	1.7	12.5
Turkey	8.4	25.0	23.7	2.8	16.9
Horse	8.2	21.0	12.1	4.6	9

Source: Ohio state university extension department of horticulture and crop science 2011 Cottey road. Colum bus lhio 43210-11344.

2.2.4.1 Importance of animal manure

Used properly animal manures are available source of plant nutrients some of the beneficial effects of manure use are, increase or plant available increase mobility and availability of P and cicro nutrients due to OM compellation increased soil OM increased soil moisture retention improved soil structure decrease soil bulk density and increased infiltration rate increase butter capacity reduced Al + 3 toxicity in alid soil by completion with organic maters and increased co2 in the plant canopy particularly plant stands with restricted air circulation. Greater attention is being given to effective disposal manure because of increased use of confinement production system and associated manure handling problems and increase concern over contamination r ground surface water by N03 and H2PO4 in the manure maximizing crop recovery of soil applied manure nutrients depends on manure nutrient content application method and time on short day plant and long day term availability manure nutrient. Content application method and time on short day plant and long day term availability manure nutrient. Jajm L. Haulin and Werner L. Nelson (2005).

2.2.4. Mulches

Mulch is any types of material that is spread over the surface of the soil covering. It is used to retain moisture in the soil suppress weeds keep the soil cool and make the garden bed look more attractive organic mulches also help improve the fairs fertility as they decompose organic much will also improve your fairs fertility and of course its organic content. The maintained of crop residues on or near the surface reduces evaporation and consisted an essential phase of water management in potentially wind eradicable arable soil which is the great single factors in wind erosion control. The threshold velocity for movement of un decomposed crop residues even it scattered on the surface of the ground in higher than most of the redouble soil particles it the wind is root strong some of its force is absorbed by residue and soil erosion part of the much material about the surface forms an effective trap for soil particles moaning by salutation or surface creep. The principal use of multiples in dry and terming is forest highly erosive knolls and blow wants particularly in sandy soil. It has been absorbed that use of 1-2 tones straw or hay 4-5 tones corn cobs 6 to 8 tones manure or about 5 tones cotton gin trash per acre effectively controls erosion on venerable spots and prevents their spreading to other parts of field. Much has a great importance in the soil as the source of organic matter (MMRSL, 2002).

2.2.4.1 Effects of mulching on soil environment

Mulching improves the physical properties chemical environment and biological activities of the soil of a give area. Effects of mulching on physical condition of the soil controlling evaporation access from the soil mulching reduces evaporation from the soil surface by retarding the intensity of radiation and decreasing wind velocity on the mulched surface improves integration rate of the soil because it serves as a barrier of runoff which provides more opportunity for water to infiltration in to the soil profile (Meyer, 1963). Modify soil thermal regime mulching has a moderating influences on the soil thermal regime and the effect varies among soils climate kinds of mulching materials used and rates of application. It increases soil temperature enduring cooler weather and decrease the temperature of the soil during hot weather condition. Modify soil thermal regime mulching has a moderating influences on the soil thermal regime and the effect varies among soils climate kinds of mulching materials used and rates of application. It increases soil temperature during cooler weather and decreases the temperature of the soil during hot weather condition. Improve soil aeration crop residue mulch proves soil aeration this is facilitate by improvements of structural stability total porosity and macro porosity, decreasing g of surface crusting and by improving the overall soil drainage (Gupta *et al*., 1983).

2.2.4.2. Effects of mulches on chemical condition of soil

Much has the influence on leguminous green mulching on physical, chemical and environmental conditions on the soil. Measurements are reported on the influence of much on the chemical condition of the soil. Much also influence the availability of nutrients through conditions hydro thermal regime and biological activity of the soil. Daniel Hillel, (2005). Mulching residues evaporation and increasing g wind velocity on the mulch surface. Improve indentation rate of the soil mulching with organic materials improves the infiltration rate of he soil because interfuse as a barrier of runoff which provides more opportunity for ware to infiltrate in to the soil profile. According to Meyer 1963. Changes can be formed as the result of much on the soil chemical conditions capacity exchange action which measures either Melton per unit could be reduces and the concentration of the nutrient improves with PH values declining. iii) Effects of much on biological activity of the soil. Soil biological activity is either directly influenced by the supply of food substrates by organic mulches through of alteration of the soil hydro thermal regime. The activity and diversity of soil organism is substantially influenced by the quality of mulch materials and the rate its application. The soil micro-organism like bacteria fungi and action my cetes and soil fauna like organic earth worm millipede centipede etc. help in the decomposition of soil organic matter and hence the availability of nutrients. However mulching with materials of high carbon to nitrogen ration results in immobilization these micro-organisms munching with organic residues of weeds like wilds age or evaporation under conservation tillage practices enhances the earth worms populating due to the supply of foods subtract sand the better hydrothermal rigeo me under mulch. Generally mulching is an important practice for the biology activity carried out in the soil like increasing the population of the decomposes in soils and for activating them by supply of rood substrates (Rattan Lal 2008).

2.2.5. Commercial or in organic fertilizers

According to Rattan Lal (2008) mineral fertilizers defined as the types of fertilizer which is composed of systemic chemicals on mineral or is a chemical fertilizer produced by chemical fertilizer industry through chemical reactions of different elements or products. Nitrogen phosphate and potash fertilizers are primary mineral fertilizers proposes fertilizers are primary minerals fertilizers produced by the fertilizer industry. Harvested crops remove nutrients. Unless the removed nutrients are replenished soil fertility declines and the capacity of the soil to produce additional crops is degrades. To maintain soil healthy and productivity nutrients must be continuously soil replaced because natural process can replenish only climate quantity of nutrients removed. These nutrients must be supplied from sources including organic materials biological fixation and mineral fertilizers. Although organic and biological sources are important in supplying nutrients these are not sufficient to meet the nutrient requirements of rood and timber production needed for an over proving would population.

The importance of using in organic fertilizers are nutrients are immediately available to plants and the exact amount of a given elements can be measured before reading the plants. The composition of mineral fertilizers is much more precisely defined than is in the case of organic fertilizer. In most cases this fertilizer are used to supply plants with the macro nutrients such as N.P and K sometimes called the primary fertilizer elements. Generally inorganic mineral fertilizer are usually simple chemical compounds made in factory or obtained by mining which supply plant nutriments and are not residues of plants or animals life (G.W. Cooke 1975).

2.2.6. Effect of integrated effect of organic and in organic source fertilizers on crop productivity

Integration of both organic and inorganic forms has significant effect on crop production. For instance experiment conducted in northern Ethiopia using treatments of manuring, liming and inorganic fertilizers significantly affected the growth of Wheat. Grain yield of wheat higher in combination of manuring + Liming and Manure + P fertilizer.

Table 1: Main and two-way interaction of manure effects on grain yield (t-ha-1)

Manure t/ha	Lime t/ha			P kg/ha Manuring			
	0	2.2	3.3	0	20	30	
0	0.898	1.98	1.787	1.191	1.654	1.820	1.56
5	1.741	2.689	2.17	1.466	2.501	2.619	2.2
10	2.215	2.736	2.212	1.958	2.515	2.704	2.39
Lime and P	1.618	2.468	2.056	1.538	2.223	2.381	

Source: Mekonen *et al.*, 2014

From the table it is observed that the effect of interaction higher than the main effect. A combination of 10 t/ha manure and 2.2 t /ha lime produced greater yield and from the combination of P and Manure 10 t/ha and 20 P kg/ha produced more gain yield in Wheat. Lime rates were quadratic ally increased grain yield while the yield increased linearly by manure rates. (Mokonen *et al*,. 2015). Regarding the economic analysis Marginal rate of return of the combined 2.2 t lime and 5 t ha-1 manure treatment was 51.50 which gave net benefit of 515 Eth. birr ($28) ha-1 as compared with combined 5 t manure and 20 kg P ha-1 due to 70 kg ha-1 grain yield Increment (Mokonen *et al.*, 2005) thus use of lime and Manure was found economic way of managing soil in residual p soil of acidic soil in northern Ethiopia.

In an experiment conducted in central highland Ethiopia on integrated soil fertility in Wheat and Teff showed that the organic carbon content increase under Organic and combination of organic and in organic condition. Application of inorganic or organic nutrient sources alone or mixed has significant effect on wheat grain yield, total biomass and harvest index but didn't affect the thousand grain weight. Higher yield, total biomass and straw yield was obtained from the combination of organic and inorganic compounds yield increase was over 100%. (Agegneu *et al.*, 2014). The same is true that grain yield, total biomass, straw yield has also responded for combined use of organic and in organic plant nutrients.

Another experiment conducted on the effect of integrated soil fertility on Maize acidic in Nitosols in southern western Ethiopia, the experiment was conducted on three sites Burka, Wenji and Waktola showed that the highest grain yield recorded at the site of Wenji and Waktola is on treatments of recommended 50% NP + 50% Tithiona biomass and recommended 50% NP + 50% compost respectively with grain yield of 4684.3kg/ha and 3936.8 kg/ha (Solomon and Jafar, 2015) Thus integrating organic and in organic sources of nutrients can give better yield tha sole application of inorganic fertilizers in most cases and also be economical rather than depending on entirely on inorganic fertilizers and also helps maintain soil fertility which a concern especially in sub sharhan Africa.

2.2.7. Use of improved germplasm

It is important for a farmer to use seeds or seedling that is best adapted to that environment in terms of Responsiveness to nutrient, Adaption to local environment and resistance to pest and diseases. Improved germplasm usually has a higher harvest index (HI) (the ratio of crop product to total biomass production) because more of the total biomass production is converted into the harvested product than in unimproved varieties. Improved legume varieties with a lower harvest index are sometimes selected, however, because they can be treated as 'dual-function' crop plants. For example, multi-purpose soyabean varieties used for food, feed and soil fertility improvement provide a large biomass that benefits the next crop in the rotation in addition to an acceptable grain yield. (Fairhust, 2012).

2.2.8. Optimizing agronomic efficiency

Agronomic efficiency refers to the amount of additional yield obtained per kg nutrient applied. The definition focuses maximizing the efficiency of fertilizers and organic inputs in areas where agricultural intensification is needed. (Vanlauwe and Zingore, 2011). The ways to increase agronomic efficiency is apply fertilizers nutrient at the right time, right place, apply fertilizers at split application and proper planting density. From the figure below, typical response curve to applied fertilizer shows a steep linear response at lower rates of fertilizer application (i.e., 0–50 kg/ha), as the rate of fertilizer application increases from 50 to 250 kg N/ha the rate of response decreases and reaches aplateau, in this case at about 6, 000 kg/ha. (Fairhust, 2012).

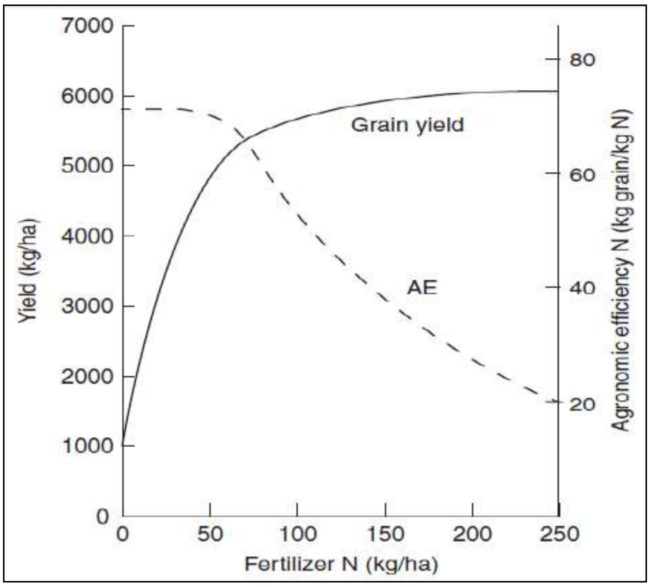

Fig 1: Diagram to show the conceptual relationship between fertilizer application rate, yield and agronomic efficiency (AE)

If we use the response curve to calculate AE, we can see that in this example there is an initial part where AE is at a constant and maximum value of about 70 kg grain/kg N As the response curve moves towards the plateau, the value of AE decreases reaching a low point of 20 kg grain/kg N applied.

This shows that when we are applying very large amount of inputs the agronomic efficiency decreases. Therefore achieving efficient agronomic efficiency is necessary for optimizing value to cost ratio and a part of consideration of integrated soil fertility management.

2.2.9. Sound agronomic principles

The ISFM approach assumes that proper crop management practices are used to achieve the maximum return to investments in the germplasm and nutrients used. Good crop management includes the use of appropriate varieties, appropriate land preparation, spacing, planting dates and practices, weeding, pest and disease management practices, and eventually appropriate intercropping arrangements. (Fairhust, 2012).

2.2.9. Importance of ISFM and limitations of using sole fertilizers

2.2.9.1. Importance of ISFM

As ISFM is the technology of maintained or adjustment of soil fertility and of plan nutrient supply to an optimum level of sustaining the desired crop productivity on one hand and to min mile nutrient losses to the environment on the other hand it is achieved through efficient managements of all nutrient sources. ISFM is not a matter of conserving soil alone but rather it combines organic and mineral methods of soil fertility management with physical and biological measures of soil and water conservations. It integrates technologies that are site specific to agronomic and socio economic conditions to redress nutrient imbalance and organic matter deterioration. Integrated soil fertility management must essentially look in to their main challenges: judicious use of mineral fertilizers maximize use of organic fertilizers (materials) and Maximize negative environmental impacts (Rattan Lal 2008).

Generally integrated soil fertility management has much importance's which is described as follows. Waste lands are converted high fields on the same lands for many fears eliminating the needs for clearing new lands by using integrated soil fertility management farmers better use of organic materials available on farm to build up soil organic matter. Also farmers shares knowledge by working in groups.

2.2.9.2. The limitations of using fertilizers separately

2.2.9.2.1 Using sole organic fertilizers

As dilute source of nutrients when compared to inorganic fertilizers transporting large amount of fertilizer in cur's higher costs especially with slurry and manure. The composition of organic fertilizers lands to be manure complex and variable than a standardized in organic product from plant or animals matter that are harmful to humans or plant. However proper composting should remove them more labor is need to compost organic fertilizer increasing labor cost. Some of this cost is offset by reduced as purchase. Conventional farming application in on organic farming compromise between the use of article and organic fertilizer is common often using in organic fertilizers supplemented with the application of organic that are readily available such as the return of crop residues or the application of manure (Graham P.H 1981) [7].

2.2.9.2.2. Using sole inorganic fertilizers

Many in organic fertilizers may not replace trace mineral elements in the soil which become gradually depleted by crops. This depletion has been linked to studies which have shown a marked tall the quantities at such minerals present in fruits and vegetables. In organic fertilizer are now produced in many which the cortically cannot be continued indefinitely by definition as the resources used in their production are non-renewable. A disadvantage with inorganic fertilizers includes trace mineral depletion over fertilization high energy consumption and long term sustainability (Donovan G. and F Casey 1998) [4].

2.2.9.2.3. Principles of ISFM

International agricultural research has significantly contributed to the developments of sound soil management principles that aim at sustainable crop production without compromising the ecosystem service function of the soil. These principles of integrated soil fertility management include: - The integration of cover crops and multipurpose, woody and herbaceous legumes to improve crop yield. Improved sustainability of nutrient cycles through integration of livestock with arable production. Application of organic resources of animal or plant origins in combination with mineral inputs to maximize in put use efficiency. Using soil conserving methods to control soil loss and improve water cup true and use efficiency. Enhancement of the soil organic carbon pool as an integration of various soil based function s related to production and ecosystem services and integration of different sectors for managements of the soil like water sector forest sector in order to get sound soil management practice. Generally as ISFM is more important than using g sole fertilizer. It is critically necessity to follow or consider the principle.

2.2.9.2.4. How to apply integrated soil fertility management

It should be applied in a manner that all sorts of soil fertility losses are minimized, such as the soil erosion, and nutrient mining from the soil and causes that result for these two major problems. IFDC-Africa promotes ISFM through a participatory and process-oriented approach that builds on a solid understanding of local settings, indigenous knowledge and scientific expertise, and targets at different spatial and temporal scales both technological and institutional change. The complexity of farmer reality requires much emphasis on farmer experimentation and participatory learning, and building of partnerships between soil fertility management stakeholders (farmers, credit providers, input dealers, research and extension agencies, government) from village to district to national level (Marco and Maatman, 2002) [9].

2.2.9.2.5. Effect integrated soil fertility management in yield of crops

Under Ethiopian condition particularly in the highlands, integrated soil fertility management can give better yields as high as balanced application of fertilizer and significantly higher yields than the traditional cultivation method other than the integrated methods. For instance in Benishangul Gumuz region a research done on woredas Agalometi and Sirba indicates that a combination of few Agronomic management practices like tillage (not local type), application of manure and compost resulted in higher yields of different varieties of maize (Vaje, 2007) [13].

3. Conclusion

Integrated use of corporation inorganic and organic fertilizers for crop production increases yield. Integrated use of all these soil management factors helps to reduce considerable amount of inorganic fertilizers. The use of this method is to sustain crop production and productivity, ensuring essential plant nutrients to replenishment in the soil of the area. Organic fertilization enhances the responses to mineral fertilizer there by increases the fertilizer use efficiency improves the efficiency of mineral fertilizers with SOM could expand the number of fertilizer uses hence reduced the cost of chemical fertilizers.

Furthermore, use of inorganic soil ameliorants in conjunction with slow release mineral has the advantages of increasing the nutrient storage capacity of the soil. Integrated use of different soil management technologies is not well known in the country Ethiopia as a whole. Therefore, advising, training and assisting the farmers in using locally available materials and cheapest technology economize the rising cost of chemical fertilizers. For soil fertility management, it is paramount important technology and should be scaled up on farmers filed for sustainable crop production in the zone.

4. Recommendation

In developing countries like Ethiopia with low input utilization of fertilizers, integrated use of organic and inorganic fertilizers can be a solution. To vitiate this problem, integrated use of fertilizers is an important solution as an integrated soil fertility management, which includes the combination of organic fertilizer and in organic fertilizer. There are different sources of organic matter like compost, FYM, Green manure and mulching, and there are also different sources of inorganic elements from nitrogen, phosphorus and potassium fertilizers which are synthesized in industry. Application of mineral fertilizer requires extra labor. Applicant of inorganic fertilizer has limit as nutrients are easily leached out by rain or irrigating water, environmentally unsustainable and too expensive for the farmers to cover their land. Therefore, different principles should be followed W/C which includes improving nutrient cycles, integrating cover crops and multipurpose woody and herbaceous legumes. If it is applied in combination by following considering the biological, physical and chemical property of the soil, it reduce the cost of the commercial fertilizer and improve SOM content and increase the yields of the crop.

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