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Determination on the Impact of Physio-Chemical Properties of Inorganic Fertilizer on Human Health from Selected Sites of Bauchi Metropolis

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ABSTRACT:
Human beings relied on farming as the basic source of food, due to the growing population and the constant demand of food. Soil fertility depletion is a main problem to sustain agricultural production and productivity in many countries. The use of inorganic fertilizer alone has positive and negative effect on plant growth, nutrients that are directly easy to get for plants. But continuous use of inorganic fertilizer such as nitrogen, phosphorous, and potassium(NPK) causes soil organic matter degradation, soil acidity and environmental pollution, these chemicals over time turn out to be a toxic substance to human and the soil. This work study on the effect of inorganic fertilizer on soil and human health, the research was conducted by analysis of the soil and three soil samples such as sandy, clay and silt fromGubi Dam and Waya Dam area of Bauch State, two different sites farmers and experimental were considered, the soils were collected by stratified random sampling method and analysed for physic-chemical properties (pH, organic matter, total nitrogen, phosphorous, exchangeable bases, exchangeable acid, micronutrients and cation exchange capacity were determine. the production of vegetables such as onion, tomato, pepper and okra under irrigation system were considered. The findings of the cultivation shows that, at 0/15kg level of inorganic fertilizer, highest number of fruits, diameter of fruits (cm) and weigh of fruits observed at farmers site while at experimental site 0.05kg and 0.10kg had the highest value for both Gubi Dam. Therefore farmers of Gubi Dam should maintain 0.15kg level of inorganic fertilizer in order to counteract the problems associated with the cultivation of pepper, tomato, okra and onion in their area.The soil of the study area has good internal drainage with moderate available nutrients; however sandy soil is the best and more suitable for eggplant especially for experimental site by 85% compared to farmers site by 83% for both Gubi and Waya Dam, it doesn't encounter permeability and salinity but sodality problems. From the result of the study it can be concluded that at the farmers site the best level of inorganic fertilizer that enhanced better growth and yield of eggplant (Solanummelongena) was 0.15kg while at experimental site was 0.10kg for both Gubi and Waya Dam. Chemical fertilizer used has more significant for improved the nutrients of the fruit instantly compared to NPK fertilizer. The spraying process when using liquid fertilizer (NPK) has effects on human health if not properly addressed.

Keywords: InorganicNPK Fertilizer, Liquid NPK fertilizer, Human health, Plants, and physio-chemical properties

I. INTRODUCTION

Rapid increase in world population and especially in developing countries brings about increase in food needs and this makes the development of dry season (irrigation) a potentially effective investment to service the basic needs for food and employment in these countries. The development of irrigation in Nigeria was dated by (Ibrahim, 1991) to the pre-colonial era when traditional means were used to apply water to land for dry season farming in the northern part of the country. According to (Aminu, 2006) the production of vegetables such as onion, tomato, pepper and okra under irrigation in northern states of Nigeria has been found to be a lucrative economic activity because of the readymade market available in the vicinity of production area and particularly in the southern states of the country where there has always been demand for themNayana and Ritu, (2017).

Pollution is one of the major concerns on the globe today. Farmers use a variety of chemical fertilizers to increase production and manage weeds and insect pests in order to meet the demand for agricultural products and to feed the growing population. Synthetic pesticides and fertilizers have been utilized excessively, which has had a negative impact on both the environment and human health. As a result, the greatest important hazard to humanity on the planet is the increasing degradation of environmental contents. The imbalance between human needs and resource sustainability was accelerated by the rapidly expanding population in developing nations. The use of chemical fertilizers in agriculture has caused numerous environmental and health issues while increasing agricultural productivity. Water pollution is mostly caused by phosphates and nitrates found in chemical fertilizers (Kumar and Keshar, 2017). By boosting agricultural productivity, chemical fertilizers have proven to be a blessing for farmers everywhere. Globalization and the new market economy have influenced the use of fertilizers in agriculture to produce a large. Fertilizers increases efficiency of soil to obtains better quality of agricultural product. In recent years, fertilizer consumption increased exponentially throughout the world, causes serious environmental problems. The application of chemical fertilizers and pesticides has become necessary by farmers to achieve maximum production of agriculture, produce and to feed the growing population. But excessive use of these fertilizers creates adverse effects to the public and environmental health. Excessive fertilisation used increased soil salinity, heavy metal accumulation, and accumulation of nitrate lead to problems of infertility in soil. Flora absorbs the chemical elements fertilizers through the soil and inter in the food chain. Use of exceed quantity of chemical fertilizers in soil, may contaminate the ground water and possibly the surface water of rivers and lakes with negative effects. Modern farming is based on commercial approach in which farmer are using huge quantity of chemical fertilizers and pesticides to produce large quantities of agriculture product. Organic or inorganic fertilisers both include the chemical components that help plants grow and produce more. The major ingredients of non-organic fertilisers are salts of phosphate, nitrate, ammonium, and potassium. The fertiliser business is thought to be a source of natural radionuclides including 238U and 232Th as well as heavy metals like Hg, Cd, As, Pb, Cu, Ni, and Cu. These chemical components are indirectly having deadly impacts on the environment and human health when they are utilised as pesticides and fertilisers in agricultural farms. Only by adopting new agricultural technological practises, such as switching from chemical intensive agriculture and using organic inputs like manure, bio fertilizers, bio pesticides, slow-release fertiliser, and Nano fertilizers, etc., can the harmful effects of these synthetic chemicals on human health and the environment be reduced or eliminated.Pollution is the term used to describe any material that is damaging to humans or other living things. Fertilizers are substances, either synthetic or natural, that are added to soils to provide vital nutrients for plant growth. A significant number of chemicals, mainly heavy metals like Hg, Cd, As, Pb, Cu, Ni, and Cu in the soil, are applied to agriculture each year in the form of fertilisers and pesticides (Atafaret al., 2010). Use of these pesticides and fertilisers outside of the allowed range results in a number of environmental issues, including soil, water, and air pollution. Due to these pesticides, water contamination is increasing, and even at low concentrations, these pesticides pose a major harm to the ecosystem (Agrawalet al., 2010). Water contamination is primarily caused by chemicals, particularly nitrates, which are present in chemical fertilisers. The primary component of fertiliser and a significant indicator of water pollution is nitrate. The most prevalent type of dissolved nitrogen in groundwater is nitrate. Nitrate is absorbed by the intestine from drinking water and has an impact on the excretory system. Chemical fertilisers also contain other substances including phosphates, arsenic, and chloride that contribute to water contamination in addition to nitrates. As a result of the deterioration in water quality and an increase in pollution from the growth of aquatic plants and algae, there is a high concentration of nitrogen and phosphorus compounds in the water. Sulphur dioxide and nitrogen oxide pollutants also contribute significantly to pollution by creating acid rain when they interact with atmospheric water. The pollution of chemical fertilisers poses serious threats to the environment and to creatures that are not the intended targets. Chemical Fertilizers and human health Use of agrochemicals are considered as a powerful weapon in the developing countries in order to enhance the agriculture productivity (Bhandari,2014). Continues use chemicals as fertilizer results in developing resistance of the pest, which become difficult to control. The nitrate and phosphates that are the component of the artificial fertilizers run-off in the agricultural fields or discharged into the nearest water bodies causing the eutrophication. Due to higher concentration of nitrates in the drinking water causes blood disorder in human beings in which, abnormal amount of methemoglobin produced that is unable to release oxygen effectively in body. High levels of sodium nitrate in groundwater can cause gastric cancer and testicular cancer.

Fertilizers are a mixture of toxic chemicals which are absorbed into the plants, leading toxins to enter the food chain via vegetables, cereals and water, create serious health issues. The study analysis of the last two decades regarding chemical fertilizers exposure and human health revealed that several pesticides cause neuron disorder; some effect embryo development and other are carcinogenic for human. Heavy metals such as Mercury, Lead, Cadmium and Uranium have been found in fertilizers, which can cause disturbances in the kidneys, lungs and liver and cause cancer (WHO,1990). Chemical fertilizer that are using from a long duration reduces the microbial activity and imbalance the pH of the soil. Some ingredients in the fertilizers are toxic to the dermal and respiratory system. Use of excessive quantity of chemical fertilizers damages the vegetation and reduces soil fertility. Ammonium Nitrate is causes other health problems such as eye and skin irritation, producing a burning sensation. Inhalation exposure of it can result another health problems like irritation of the nose, throat, and lungs. Due to use of this, one can also experience nausea, vomiting, flushing of the face and neck, headache, nervousness, uncontrolled muscle movements, faintness and collapse. Accumulation of excess nitrogen in plants causes an infant disease, methaemoglobinemia. Amines produced from the nitrogenous fertilizer cause cancer in human beings. Potassium Chloride interrupts function of nerve impulses andother body functions, mainly affects heart functioning. It can cause all kinds of gastric and stomach pains, dizziness, bloody diarrhoea, convulsions, headaches, mental impairments, redness or itching of the skin of eyes. Cadmium ultimately enters the human tissues resulting in diseases such as trachea-bronchitis, pneumonitis, pulmonary edema, renal failure, osteoporosis, and many others.Aluminium at high levels leads to birth defects, asthma, alzeimers and bone diseases. Calcium toxicity results in developmental and neurological toxicity, growth retardation, cognitive delay, kidney, nervous and immune system damage. Cobalt only at high levels leads to lung damage. Boron causes low sperm count, nose, and throat and eye irritation. Manganese is suspected to damage the respiratory reproductive and gastro intestinal systems. Lindane can cause breast cancer and acts as nerve poison. It also affects the reproductive system and is known as carcinogen. Chloropyriphos can cause fetal malnutrition, pneumonia, muscle paralysis and even death to respiratory failure. Malathion can damage nervous system, if it enters the body.In term of human health, DDT is the cause of many kinds of cancer, acute and persistent injury to the nervous system, lung damage, injury to the reproductive organs, dysfunction of the immune and endocrine systems, birth defects (Thuy, 2015). DDT a common insecticide affects the nervous system and could acts a carcinogen. Women diagnosed with breast cancer were six to nine times more likely to have the pesticides DDT or hexachlorobenzene in their bold streams compared to women who did not have breast cancer. There is a strong association between breast cancer and exposure to chemical pesticides. Organophosphate pesticides used in the vegetables gradually get deposit into human body and have a link with cancer Miahet al.,(2014).

Inorganic fertilizers are chemical products of either minerals or synthetic origin that provide nutrients to simulate plant growth. Unlike the organic, inorganic fertilizers are usually quick releasing formulas making nutrients rapidly available to growth. This may perhaps lead to deadly terminal diseases. The use of inorganic fertilizer alone has positive and negative effect on plant growth and human health, nutrients that are directly easy to get for plants. But continuous use of inorganic fertilizer such as nitrogen, phosphorous, and potassium (NPK) causes soil organic matter degradation, soil acidity and environmental pollution, these chemicals over time turn out to be a toxic substance to human and the soil.(Oyeniran 2011; Mgbenkaet al., 2015). Inorganic fertilizers are designed to address the tendency of soils nutrient, which is very common problem in farms. One distinctive advantage of inorganic fertilizer is it contains all the three major nutrients, nitrogen, phosphorous and potassium. Inorganic fertilizers work faster and may be utilized in balance of the farms need. They are also less

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costly than commercial organic fertilizer as well as may be used in concentrated amounts.

The main disadvantage of inorganic fertilizers is that they have acidic content. Acid that is present inorganic fertilizers such as hydrochloric acid and sulphuric acid leads to high level of soil acidity that could in turn have a destructive effect on nitrogen fixing bacteria. These microorganisms play a major role in the supply of nitrogen needed by growing plants. Another disadvantage is in over application of fertilizer, plants only need certain amount of nutrients that can be absorbed. When the fertilizers are used excessively, the rest of the unused or unabsorbed one has the tendency to travel into ground water due to irrigation and rain. The aim of this work is to find out the opinion of farmers as well as the effects of inorganic fertilizer (NPK) on human health and on soil characteristics and production of eggplant (solanummelongena L) in Gubi Dam and WayaDam irrigation area of Bauchi State.

Physio-chemical properties of inorganic fertilizer on human health may have effects as results of heavy metals such as Mercury, Lead, Cadmium, and Uranium have been found in fertilizers which can cause disturbances in the kidneys, lungs, liver and cause cancer.Miahet al., (2014).

Eggplant (Solanummelongena L.) also known as garden egg, aubergine, brinjal, or Guinea squash, is in the fourth ranked vegetable crops. It is of considerable economic importance in Asia, Africa, and subtropics (India, Central America), but is also grown in some warm temperature regions (Mediterranean area, South of the USA). In 1999, 1.3 million were cultivated in the world for a total production of 21.2 million metric tons of which 92.4% of the world production was covered by Asia F.A.O, (2012).

Although, lower than that of tomato, eggplant nutritious value is comparable to other common vegetables. Its fresh weight is composed of 92.7% moisture, 1.4% protein, 1.3% fibre, 0.3% minerals, and the remaining 4% consists of various carbohydrates and vitamins (A and C) (Fuchasia, 2006). Eggplant is susceptible to numerous diseases and parasites, particularly bacterial wilt, Fusarium and verticillium wilts, nematodes and insects. It exhibits partial resistance to most of these pathogens, but often at insufficient levels. This crop is highly vulnerable to plant parasitic nematodes especially with Meloidogyne spp. or root knot nematodes.

II. METHODOLOGY

2.1 Experimental Site:

The study was carried out at Gubi DamFiro, andWaya Dam.Gubi Dam village which is located in Ganjuwa Local Area of Bauchi state, with approximate location of latitude 10.4183^0 N, and longitude 9.8811^0E.Waya Dam which is located at Bauchi local Government of Bauchi State, with approximate location of latitude 10.30249^0N, and longitude 9.80136^0E. The area lies within the tropical continental climatic environment, with a very long period of dry season that last between 6 and8 months (October to April) and a shorter period of rainy season that is (May to September) with August at peak period of the rainy season; the main annual rainfall is less than 1000mm. Both mean annual temperature vary.The annual ranging between 1300mm in the south and only 700mm in the extreme north. The mean annual temperature is 28.97^0C (84.15^0F). The area is found within Sudan savannah region which is characteristically a grassland region. The soil of the experimental site is sandy soil. During the dry season, Gubi Dam and Waya Dam, Dam water is been used to irrigate about 900 ha of smallholder farmlands. The capacity of Gubi Dam stored $38.4\times106mm^3$cubic meters of water and has potential to irrigate 590 ha of land and Waya Dam stored $12.3\times54mm^3$ cubic meters of water and has potential to irrigate 310 ha of land.The major crops cultivated during the dry season are; pepper, tomato, okra, potato, melon, lettuce and onion Ibrahim et al., (2017).

Figure: 1 Okra 2 Months after planting atGubiDam Bauchi

2.2 Soil Sampling

The two sites of the study (farmers and experimental sites) were selected for the study. The soils of the two sites are similar, with similar land forms, geology, land use and vegetation and topography are similar. The main difference is the way each site support the growth and development of vegetation (especially pepper).

Stratified random sampling was used for the purpose of collecting soil sample Idris, (2010). Three soil samples were collected from each site which was stratified into three unit's base on physiographic and management system, and then each unit was randomly sampled. The soil samples were collected from both farmers and experimental sites. The soil samples (0-15cm depth) were sandy, clay and silt which were dried and crushed withmortar and pestle and pass through a 2mm sieve, the samples were analysed in the Laboratory for their physical and chemical properties (pH (H_2O, pH ($Cacl_2$) bulk density, electrical conductivity, texture, moisture, temperature,organic matter (OM); total nitrogen (TN), phosphorous (P), Nitrogen (N) exchangeable bases (Ca, Mg, K, Na), exchangeable acid (H+Al), micronutrients (Cu and Zn) and cation exchange capacity (C.E.C)Ibrahim et al., (2017).

Figure: 2 Sample of Soil Collected from Gubi Dam and Waya Dam Bauchi

2.3 Laboratory Techniques
2.3.1 Determination of soil pH

Soil to water ratio (1:2:5) was used to determine the soil pH. 20g of air-dry soil (passed 2mm sieve) to 50ml beaker was weighed and 20ml of distilled water was added. The suspension was vigorously stirred several times during the next 30 minutes with a glass rod. The suspension was then allowed to stand undistributed for about 30 minutes to allow most of the suspended clay to settle out from the suspension. The electrodes of the pH meter were inserted into the partly settled suspension and the pH value was taken within 30 secondsafter immersion Ibrahim et al., (2017).

2.3.2 Determination of organic matter

To determine the organic contents of the matter the percentage of organic carbon was determined first and the result multiplied by 1.729. To determine the organic carbon, the following procedure was followed:

1. Representative sample was taken, ground grid, and passed through 0.5mm sieve.
2. One gram of soil was weighed and place in the 250ml flask.
3. Ten mills of 1N K2Cr2O7 solution was pipette accurately into each flask and swirl gently to disperse the soil.
4. Twenty mills Conc. H2S04 was added rapidly from a measuring cylinder. Immediately the flask was swirl gently until soil and reagent are mixed, the swirl vigorously for one minute. The flask was rotated again and allowed to stand on a sheet of asbestos for about 30 minutes.
5. One hundred mills of distilled water was added after standing for 30 minutes and allowed cool again. The suspension was filtered because it was cloudy.
6. Five mills of O- phosphoric acid was added to sharpen the colour change at the end point.
7. Three to four drops of incubator were added and filtrated with 0.5N ferrous sulphate solution on a white background. As the point approached the solution took on a greenish cast and then changes to dark green. At this point ferrous sulphate drop was added until the colour changes sharply from blue to red (maroon colour) in reflected light against a white background.
8. The blank determination was made in the same way but without soil to standardize dichromate.
9. The results were calculated using the following formulae:

$$\% \text{ organic C in soil} = \frac{(K2Cr2O7 - FeSO\ 4\ 0.003x100x(F)}{\% \text{ of air in dry soil}} \ldots\ldots\ldots (1)$$

Where F = correction factor = 1.33 Ibrahimet al., (2017)

Meq = normality of solution x ml of solution sed

$$\text{or } \frac{\text{Organic C}}{\text{Air} - \text{dry basis}} = \frac{(\text{Blank titre} - \text{actual titre}) \times 0.3xmx\ (F)}{\% \text{ of air} - \text{dry soil}} \ldots\ldots\ldots (2)$$

Where F = correction factor = 1.33

M = concentration of $FeSO_4$

Percentage organic matter (OM) will be calculated thus: % OM = % OC x 1.729

2.3.3 Determination of exchangeable bases

Ammonia saturation method (at pH 7.0) was used to determine the exchangeable bases which include sodium (Na), Potassium (K), Calcium (Ca) and Magnesium (Ma). Ten grams of air dried soil sample was weighed into a plastic bottle, 100ml of 1N ammonium acetate solution was added and the content of plastic bottle was shaken for 30 minutes. The mixture was then allowed to settle. Then the supernatant liquid was correctly decanted, as completely as possible through a funnel ad filter paper into a 250ml volumetric flask. The processes were repeated twice, each time decanting the supernatural liquid into the 280ml flask. Finally the volume of flask was added with ammonium acetate solution. Ibrahim et al 1 However, sodium (Na) and potassium (K) was determined using flame photometer choosing appropriate range of standards from which the sample values were extrapolated while calcium (Ca) and magnesium (Mg) on the other hand were determined by EDTA titration. Calcium and Magnesium Twenty mills of the exchangeable base extracts were pipette into a clean conical flask. It drops of ammonium chloride, ammonium hydroxide buffer solution (NH_4O_4 – NH_4Cl) was added and then 2 drops of eriochrome black T was also added then the mixture was filtered against 0.01N EDTA solution until the true blue and point was obtained Ibrahim et al., (2017).

2.3.3.1 Calculations

Me/100g of Ca& Ma = M1 of EDTA used x normality 0.01 of EDTA 100 x Vol. of extracts ML of EDTA used for titration Ibrahim et al., (2017).

2.3.4 Determination of exchangeable acid in soil

Five grams of air dried soil was weighed into a 50ml centrifuge tube and add 30ml of INKCL the centrifuge was covered tightly with a rubber stopper and shake for 1 hour on a reciprocating shaker. The content was centrifuged at 2,000rpm for 15 minutes. The decant was carefully clear supernatant into a 100ml volumetric flask. Another 30ml of 1N CL was added to the same soil sample and shake for 30 minutes, step two were repeated and clear supernatant were transferred into the same volumetric flask. Step 3 was repeated for the third time and clear supernatant were decanted into the same volumetric flask. The volume was made up to mark with 1N KCL. Titration for H and Al Twenty five (ml) of KCL extract was pipette into a 250ml Erlenmeyer flask 100ml of distilled water was approximately added 5 drops of phenolphthalein indicator was added, and the solutions were titrated with 0.01m NaOH to a permanent pink and point with alternate stirring and standing. A few more drops of indicator were added to bring the solution back to the colourless condition and 10ml of NaF solution were added. While, stirring the solution constantly, the solution was titrated with 0.01 HCl until the colour of the solution disappears because the colours don't return within 2 minutes. The milli equivalents of acid used an equal to the amount of exchangeable Al. The value from the milli equivalent of total acidity was subtracted from the first titration to obtain the milli equivalent of exchangeable H and Al in meq per 100g of soil et al., (2017).

2.3.5 Determination of total N in soil

Two grams of soil was weighed into Kjeldahl flask or digestion tube, 20ml of distilled water was added, the flask was swirled for a few minutes and was allowed to stand for 30 minutes. About 3g of catalyst and 20ml of concentrated H_2SO4 was added. Heat continuously until the water has been removed and fronting has ceased the heat is increased until the digest clears. The mixture was boiled for 5 hours. The heating was regulated during this boiling so that the H_2SO4 condensed about half way up the neck of the flask or tube the flask is allowed to cool and some distilled water was added slowly with shaking. Carefully the digest was transferred into another clean flask, all the sand particles were retained in the original digestion flask because sand can cause severe pumping during distilled water for about 4 times and each portion were transformed into the same flask. The mark was made with distilled water. Ten (ml) of boric acid (H_3BO_3) solution was added into a 500ml Erlenmeyer flask which was then placed under the condenser of the distillation apparatus. The end of the condenser was at about 4cm above the surface of the H_3BO_3 solution 10ml of 40% NaOH was added slowly into 10ml of digest in the flask which has been attached to the distillation apparatus. The temperature was raised until it boils. The condenser kept cool (below 30^oC) by allowing sufficient water to flow through and regulate heat to minimize frothing ad prevent suck back. About 5oml distillate was collected and then stopped distillation. NH_3 liberated were titrated with standard HCl or H_2SO_4 .Three drops of indicator were added the colour change at the end point from green to pink. N constant in the soil was found Ibrahim et al., (2017)

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$$\%N = \frac{0.014 \times vd \times N \times 100 \times TV}{Wt\ of\ soil \times AD\ Where\ VD} \ldots\ldots\ldots\ldots (3)$$

Where VD= Volume of digest
N = Normality of acid
TV = Titre value
AD = Liquor or digest

2.3.6 Determination of available Phosphorus (P)

Bray No 1 method was used to determine available phosphorus (P). To do that, 1g of air dried soil was weighed into a 15ml centrifuge tube, 7ml of the extraction solution were added and shaken for 1 minute of a mechanical shaken and centrifuge the suspension at 2,000 rpm for 15 minutes. The solution was transferred into an acid washed volumetric flask. The phosphorus content was determined in the extract calorimetrically using ascorbic acid moly date blue because it is recommended for analysis of P in plant extracts Ibrahim et al., (2017).

2.3.6 Determination of Cu and Zn

Hydrochloric acid extraction method was used below is the procedure followed:
1. A 5g of 2mm sieved soil was weighed into 100ml plastic bottle
2. Fifty mills of 0.1m HCl was added and shaken for 30 minutes
3. The solution was filtered through No 42 filter paper or centrifuge
4. The Cu and Zn were determined on an atomic absorption spectrophotometer. Determination of CEC the C.E.C of the soils was determined by summing the value of exchangeable base and that of acid. Number, Weight and Diameter of Fruit the number of fruits on each plant selected was counted and their mean was recorded. The weight of ten (10) randomly selected fruits in a bed was weighed and their mean was recorded. The diameter of the fruit was obtained by rounding the fruits with a thread and later placed on a meter rule to get the exact diameter in centimetre (cm). Data Analysis All data recorded was statistically analysed by one way analysis of variance (ANOVA) Ibrahim et al., (2017).

2.3.6 Experimental design and treatments

The experiments were laid out in a randomized complete block design with two fertilizers types; inorganic fertilizer (NPK) and chemical fertilizer (Ibrahim et al., (2017). Inorganic fertilizer was supplied in the form of 400kg/ha NPK 15-15-15 and 5kg/ha liquid NPK 10-10-10 based on recommendations for eggplant (Ibrahim et al., 2017). The inorganic fertilizers were used. It was uniformly spread on the plots and lightly worked into the soil. The both NPK and liquid NPK fertilizer were applied 3 weeks after planting by ranging around pepper, tomato, okra, and onion. The plot size was $24m^2$both for Gubi Dam and Waya Dam. All the verities of eggplant were planted and the inorganic fertilizers used were NPK and liquid NPK fertilizers on the three varieties of soils such as clay, sandy and silt. The plots were weeded manually whenever throughout the experimental period. The spraying was commenced 5 weeks after planting at 1 week interval until full formation. The pepper, tomato were harvested fresh at 12 weeks(3 months) after planting. The effects of inorganic fertilizers were observed on the soils and human health was considered Ibrahim et al., (2017).

III. RESULTS AND DISCUSSION

Eggplant matures at 12 weeks (3 months) after transplanting when the colour of the fruits turns red/yellow (Komolafe and Joy, 1999). The greatest yield (%) in Gubi Dam area was 40-50 bags/ha which shows a decrease compared to the yield of 5-10 years back (Table 3, Part D). while for Waya Dam area was 30-40 bags/ha which also showed decrease compared to the yield of 5- 10 years back (Table 3). The highest number of fruits harvested per bed, the greatest diameter of fruit and the greatest weight of fruits per bed observed were in the fertilizer treated plants which differ from the quantity applied by the farmers with an increase in quantity from first application progressively as a result of which solidity effect occur which lead to low productivity and dryness of the plants after transplanting in the area. This was similarly observed by many workers, Osman and George (1984) reported an increase in study of the effect of mineral nutrition on seed yield and quality of sweet pepper plant. Gill et al. (1974) reported a considerable increase in number of fruits per plants as well as seed yield. Waknade and Morey (1982) similarly observed an increase in yield in field grown chillies upon application of phosphate. Changes in soil nutrients status: NPKFertilizers treatments had no significant effects on soil pH after cropping for 3 months compared to liquid NPK fertilizer.

Table 3. Physico-chemical parameters of the soil where farmer's and experimental sites for both Gubi Dam and Waya Dam

Soil variable	Farmers site Mean	St. dev	Experimental site Mean	St. dev	T-test value	Table value
Sand %	83	1.8	85	3.10	0.432	2.262
Clay %	10	1.30	9.60	4.80	0.410	2.262
Silt **%**	6.80	0.98	5.40	1.30	0.610	2.262
pH (H_2O)	6.30	0.20	6.30	0.20	N.S	2.262
pH ($CaCl_2$)	5.90	0.30	6.30	0.40	4.04	2.262
OM%	0.90	0.40	0.40	0.20	30.48	2.262
TN %	0.05	0.01	0.05	0.08	N.S	2.262
P (ppm)	95.90	14.90	20.10	7.70	0.450	2.262
Ca(me/100g)	3.30	1.50	1.97	0.50	1.390	2.262
Mg(me/100g)	0.80	0.20	0.64	0.30	3.478	2.262
K (me/100g)	0.20	0.12	0.48	0.83	6.81	2.262
Na (me/100g)	0.20	0.03	0.20	0.01	N.S	2.262
H+Al (me/100g)	0.80	0.30	0.80	0.20	N.S	2.262
Cu (ppm)	5.20	1.60	0.50	0.90	41.230	2.262
Zn (ppm)	0.20	0.50	3.80	0.20	0.40	2.262
C. E. C	6.80	3.80	4.01	1.50	17.375	2.262

Table 4. Mean number of fruits, diameter of fruits (cm) and weight of fruits (g) of solanummelongena treated with different level of Inorganic fertilizerinGubi Dam

Level of Inorganic Fertilizer	10 WEEKS AFTER TRANSPLANTING NF Site A	NF Site B	DF Site A	DF Site B	14 WEEKS AFTER TRANSPLANTING NF Site A	NF Site B	DF Site A	DF Site B	WF Site A	WF Site B
0.00kg/bed	0.52	2.25	2.57	4.65	8.54	8.75	11.00	11.73	42.03	42.80
0.05kg/bed	2.80	3.25	7.10	7.39	13.5	10.75	13.28	15.08	43.73	61.33
0.10kg/bed	3.25	3.58	10.73	9.68	10.00	14.25	13.98	14.30	63.13	62.35
0.15kg/bed	4.23	2.61	9.30	5.85	19.75	16.25	17.65	13.53	70.75	43.78
0.20kg/bed	2.67	2.35	7.85	5.91	9.75	9.50	12.58	10.00	26.08	27.30
LSD 5%	4.34	4.64	4.33	2.89	4.38	NS	2.21	2.06	4.76	5.05

Table 5. Mean number of fruits, diameter of fruits (cm) and weight of fruits (g) of solanummelongena treated with different level of Inorganic fertilizer in Waya Dam

Level of Inorganic Fertilizer	10 WEEKS AFTER TRANSPLANTING NF Site A	NF Site B	DF Site A	DF Site B	14 WEEKS AFTER TRANSPLANTING NF Site A	NF Site B	DF Site A	DF Site B	WF Site A	WF Site B
0.00kg/bed	0.50	1.25	2.55	4.50	8.25	8.75	10.00	12.73	41.03	40.80
0.05kg/bed	2.75	3.25	6.10	7.38	12.5	10.75	13.28	15.08	43.73	60.33
0.10kg/bed	3.25	3.50	9.73	9.68	10.00	14.25	13.98	14.30	63.13	62.35
0.15kg/bed	4.25	2.50	8.30	5.85	16.75	11.25	14.65	13.53	60.75	43.78
0.20kg/bed	2.50	2.25	5.85	5.90	9.75	9.50	12.58	10.00	26.08	27.30
LSD 5%	NS	NS	4.33	2.89	4.38	NS	2.21	2.06	3.56	4.05

WAT - Weeks after transplanting
NF - Number of fruit
DF – Diameter of fruit
WF- Weight of fruit
SITE A – Farmers site
SITE B – Experimental site
NS - Not significant

IV. CONCLUSION

The result of this investigation reveals that farmer's activities positively affect soil properties due to low productivity for both Gubi Dam and Waya Dam. Thephysio-chemical properties such as pH, organic matter,and total nitrogen, phosphorous, exchangeable bases, exchangeable acid, micronutrients and cation exchange capacity were determine with significant values, but has little effect on human health and soil. the production of vegetables such as onion, tomato, pepper and okra under irrigation system were considered. The findings of the cultivation shows that, at 0/15kg level of inorganic fertilizer, highest number of fruits, diameter of fruits (cm) and weigh of fruits observed at farmers site while at experimental site 0.05kg and 0.10kg had the highest value forGubi Dam.The soil area has good internal drainage with moderate available nutrients; however sandy soil is the best and more suitable for eggplant especially for experimental site for both Gubi and Waya Dam, it doesn't encounter permeability and salinity but sodality problems. Liquid fertilizer used has more significant for improved the nutrients of the fruit instantly compared to NPK fertilizer. More so, spraying process when used liquid fertilizer (NPK) has effects on human health if not properly addressed. After sprayed the liquid fertilizer, it was observed that pesticide used was exposed and human health revealed that the numerous negative health effects that have been associated with chemical pesticides includes dermatological, gastrointestinal, respiratory, reproductive and endocrine effect were observed, it can be concluded that use of excessive quantity of synthetic fertilizers is harmful for human health. The two sites plot where the eggplant was planted; there is contamination of air on the environment, soil and surface water and directly or indirectly affecting human health. As a results of high levels of nitrates and nitrites in the liquid NPKfertilizer which causes some diseases, such as irregularity respiration.

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