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Integrated Use of Coffee Husk Compost and Inorganic Fertilizer Enhances Soil Properties, Coffee Growth and Yield in West Wollega, Ethiopia

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Abstract: Integrated application of inorganic and organic fertilizers is an important practice to sustainably manage and replenish plant nutrients in agricultural soils. However, determination of the optimum combination of these resources based on soil type and requirement of the crop species and variety is necessary. In this context, a field experiment was conducted at Haru research center to assess the effect of coffee husk compost and NPS fertilizer on soil physicochemical properties, and growth and yield of a released coffee variety (Manasibu) for the area. The treatments consisted of nine combinations of different rates of coffee husk compost and NP fertilizers, and laid out in randomized complete block design with three replications. Soil samples were taken and analyzed for selected physicochemical properties following the standard laboratory procedures. All relevant soil and agronomic data were collected and subjected to Analysis of Variance using SAS package and treatment means were compared at 0.05 probability level using least significant difference test. Results of the study showed that application of coffee husk compost increased soil pH. Moreover, application of coffee husk compost along with inorganic fertilizers increased the contents of organic matter, soil moisture content, total nitrogen, available phosphorus, and CEC. Combined application of higher doses of coffee husk compost and NP fertilizer significantly improved growth of coffee plants. Similarly, combined application of 7.5 t ha^{-1} of coffee husk compost and 50% of the recommended NP (86 and 38 Kg ha^{-1} NP respectively) significantly increased clean coffee yield up to 1.78t ha^{-1}. Therefore, it was concluded that the use of 7.5 t ha^{-1} coffee husk compost and 50% of the recommended NP (86 and 38 Kg ha^{-1} NP respectively), can be the best integrated soil fertility management option or optimum coffee production in the study area. Nevertheless, in order to come up with a conclusive recommendation, further studies are needed for different soil types and coffee varieties.

Keywords: Arabica coffee, NP Fertilizer, Organic fertilizer, soil property, yield.

Research Paper

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INTRODUCTION

Poor soil fertility is one of the major constraints to food production in most acid soil dominating areas of Ethiopian high lands (Zelleke *et al.*, 2010). In order to improve the fertility status of the soil, nutrient replenishment should be done. This is always done by applying chemical fertilizers for long time which can cause degrading of soil (Taye, 1998). Similarly, Anteneh *et al.*, (2010) have reported the timely unavailability of inorganic fertilizers and absence of credit system in particular, which makes the use of those inputs more difficult. However, to minimize those farmers input problem and to sustainable agriculture the use of composting input technology to coffee producing areas are getting acceptance.

On the other hand, Coffee crop production at Haru district produces a large amount of coffee-products (coffee husk) and are depositing without efficient use, Currently, there is a huge interest from regional and federal government to convert byproducts of coffee (for example coffee husk) into usable end products such as compost (Gezahegne *et al.*, 2011). Adding inorganic fertilizer alone may not be adequate to retain the soil fertility status to asufficient level. Moreover, in degraded soil where there is little organic matter, yield response to inputs is limited, even if artificial fertilizers are being used (Madeleine *et al.*, 2005). Beside this, coffee husk compost release nutrients very slowly to the plants. On other hand, nutrient content of compost is low compared to inorganic fertilizers, so compost is usually applied at large rates. Hence, an integrated approach, combining coffee husk compost and mineral fertilizer appears to be a better strategy for coffee production. Integrated soil nutrient management is an eco-friendly and cost-effective soil fertility management technique that enables smallholder farmers to produce reasonable crop with some limitations of soil fertility (Vanlauwe *et al*., 2010). Besides crop yield an advantage, this practice improves water use efficiency and soil chemical properties as compared to the use of inorganic fertilizers alone.

Similarly, integrated use of organic and chemical fertilizers is beneficial in improving sustainability of coffee crop production, on the other hands coffee production and its contribution in Ethiopian economy, the mean national coffee yield is low (0.62 t/ha) (CSA, 2018). Even though different factors are responsible for low productivity, low soil fertility status a major concern in the production of coffee crops in the country (Tolera and Gebremedin, 2015).

In recent years, chemical fertilizers, such as NP, have been introduced and recommended for different soil types and crops in the country. However, the chemical fertilizer recommendations did not consider integrated soil fertility management practices, such as: inclusion of organic sources. In this view, integrated nutrient management approach involving decomposed coffee husk and NP fertilizer needs to be investigated for coffee production. Thus, the objective of this study was, therefore, to determine the appropriate combination of coffee husk compost and inorganic NP fertilizer for improved physicochemical properties and, thus, soil health and sustainably enhanced coffee production in Haru district of Western Wollega-zone.

MATERIALS AND METHODS

Description of the Experimental Site

A field study was conducted at Haru Agricultural Research Sub-Center (HARSC) in West Wollega zone, Oromia National Regional State, Western Ethiopia. Haru Agricultural Research Sub-center of the Jimma Agricultural Research Center (JARC) was established in 1998 primarily to address the potentials and constraints in west Wollega specialty coffee growing areas. The center represents the sub-humid tepid to cool mid highlands coffee agro-ecological zone in West Ethiopia. The area is located a latitude of 8°54' 30" North, longitude of 35°52'0" East and at an elevation of 1750 m.a.s.l. The area is characterized by uni-modal rainfall pattern with an average annual rainfall of 1700 mm. The rainy season starts in March or May and extends up to October. The mean maximum and minimum air temperatures are 27.8 ºC and 12.4 ºC, respectively. The soil type of the center is *Acrisol* with sandy clay loam texture (Zebene and Wondwosen, 2008).

Treatments and Design

The experiment consisted of nine treatments combinations of organic(decomposed coffee husk, DCH) and inorganic NPS fertilizers), which were laid out in Randomized Complete Block Design (RCBD) with three replications (Table 1).Recommended rates of both nutrient sources were used to set treatment combinations in different proportions. A high yielding and adaptable coffee variety (Manasibu) which was released by JARC for Wollega area, was used as a test crop in the experiment.

Table 1: Treatment combinations

Treatment number	Treatment description and combination
1	10 t ha^{-1} CHC
2	172 kg ha^{-1} N and 77 kg ha^{-1} P
3	2.5 t ha^{-1} CHC + 172 kg ha^{-1} N and 77 kg ha^{-1} P
4	5 t ha^{-1} CHC + 129 kg ha^{-1} N and 57 kg ha^{-1} P
5	5 t ha^{-1} CHC + 86 kg ha^{-1} N and 38 kg ha^{-1} P
6	7.5 t ha^{-1} CHC + 86 kg ha^{-1} N and 38 kg ha^{-1} P
7	7.5 t ha^{-1} CHC + 43 kg ha^{-1} N and 19 kg ha^{-1} P
8	10 t ha^{-1} CHC + 43 kg ha^{-1} N and 19 kg ha^{-1} P
9	Control (no input)

CHC= Coffee husk compost

Soil Sample Preparation and Analysis

In order to determine soil physical and chemical properties of the experimental field, soil samples were randomly taken at a depth of 0-30 cm five different spots in each plot and composited using stainless steel soil auger. Samples were collected by core sampler to determine soil bulk density of each plot. The collected samples were air dried in a dust free packed and transported to Jimma University College of Agriculture and Veterinary Medicine Laboratory. To analyze for bulk density, gravimetric soil water content (moisture content), pH, available P, total N, organic carbon, exchangeable acidity and CEC at Jimma University College of Agriculture and Veterinary Medicine Laboratory.

Bulk density was determined using the core method as described by Jamison *et al*., (1950). Soil moisture content was determined using gravimetric method as described by Reynolds (1970). Soil pH was determined by the glass electrode pH meter using 1:2.5 soil to water ratio. To determine organic carbon, the Walkley and Black (1934) method was employed. Total N content of the soil was determined using the modified Kjeldahl procedure (Bremner and Mulvancy, 1982). Organic matter content of the soil was calculated by multiplying the organic carbon content by 1.724. Relative amount of carbon to nitrogen was determined by taking the ratio of soil organic carbon to total nitrogen content. Available P was extracted using Bray II method (Bray and Kurtz, 1945). The P extracted with this method was measured by spectrophotometer.

Furthermore, cation exchange capacity (CEC) was determined for soil samples extracted by Ammonium Acetate (NH_4OAC) at a pH of 7.0 (Chapman, 1965). Exchangeable acidity (exchangeable Al^{3+} and H^+ ions) was determined by saturating the soil samples with potassium chloride solution and titrating with sodium hydroxide (Mclean, 1965).

Coffee growth and yield parameters

Coffee growth parameters (plant height measured from base plant to apex leaf using a meter rule, Counts number of primaries branch per year, girth measured at 5cm from the surface using a Vernier calipers, canopy diameter by measuring four direction of coffee canopy using a ruler meter and yield data were collected red cherry coffee and then weigh change to clean coffee using conversion factor using the standard procedure before statistical analysis.

Statistical Analysis

The collected soil and plant data were summarized and subjected to ANOVA (analysis of variance) using SAS software (version 9.3) (SAS, 2011). Treatments means were separated using Least Significant Difference test at 0.05-P level.

RESULTS AND DISCUSSION

Soil Physical Properties

Mean soil bulk density showed significant (P < 0.05) variation among the different treatments (Table 2). The maximum bulk density (1.24 $g.cm^{-3}$) was recorded for the control plot, while the lowest value (1.16 $g.cm^{-3}$) was for the plot with 100% decomposed coffee husk. The lowest bulk density with application of 10 t ha^{-1} coffee husk compost might be due to the presence of high organic matter content in the compost. Similarly, Ghous *et al*., (2018) and Tesfaye *et al*., (2020) have reported the inverse relationship between soil bulk density and organic matter content.

Soil moisture content was significantly (P < 0.05) affected by the different treatments. The maximum soil moisture content (45.60%) was obtained from application of 10 t ha^{-1} coffee husk compost, followed by 7.5 t ha^{-1} coffee husk compost integrated with 86 kg ha^{-1}N and 38 kg ha^{-1}P (45.50%). While, the minimum soil moisture content was recorded for the control plot (39.60%) (Table 2). The increase in soil moisture content with application of decomposed coffee husk might be due to the presence of more organic matter. Similarly, Islam *et al*., (2012) reported increment in soil water content as a result of application of farm yard manure.

Table 2: Effect of coffee husk compost (CHC) and NP fertilizer on selected soil physical properties at Haru

Treat. No.	Treatments description	Bulk density (g/cm^3)	Moisture Content (%)
1	10 t ha^{-1} CHC	1.16^{d}	45.60^{a}
2	172 kg ha^{-1} N and 77 kg ha^{-1} P	1.23^{ab}	41.30^{bc}
3	2.5 t ha^{-1} CHC + 172 kg ha^{-1} N and 77 kg ha^{-1} P	1.22^{abc}	42.60^{b}
4	5 t ha^{-1} CHC + 129 kg ha^{-1} N and 57 kg ha^{-1} P	1.22^{abc}	43.30^{ab}
5	5 t ha^{-1} CHC + 86 kg ha^{-1} N and 38 kg ha^{-1} P	1.20^{bc}	43.00^{ab}
6	7.5 t ha^{-1} CHC + 86 kg ha^{-1} N and 38 kg ha^{-1} P	1.19^{cd}	45.50^{a}
7	7.5 t ha^{-1} CHC + 43 kg ha^{-1} N and 19 kg ha^{-1} P	1.19^{cd}	41.60^{bc}
8	10 t ha^{-1} CHC + 43 kg ha^{-1} N and 19 kg ha^{-1} P	1.21^{abc}	43.60^{ab}
9	Control (no input)	1.24^{a}	39.60^{c}
LSD (5%)		0.029	1.65
CV (%)		1.63	3.68

LSD = least significant difference; CV = coefficient of variation; numbers followed by the same letter(s) with in a column are not significantly different at 5% probability level.

Soil Chemical Properties

Soil pH was significantly (*P* < 0.05) affected by NPS and coffee husk compost treatments (Table 3). The highest soil pH value (5.58) was recorded for application of 10 t ha^{-1} coffee husk compost alone, followed by application of 43 kg ha^{-1}N and 19 kg ha^{-1}P + 10 t ha^{-1} coffee husk compost (5.46). While, the lowest value (4.92) was obtained from the control plot (Table 3). The improvement in soil pH due to application of 10 t ha^{-1} coffee husk compost was 11.82% over the control (4.92 to 5.58) (Table 3). This might be ascribed to alkalinity of the applied compost (Table 3). In agreement with this, an increase in soil pH due to the application of composts with high pH value has been reported by Kasongo *et al*., (2011).

Soil organic matter content was significantly ($P < 0.05$) affected by application of NP fertilizer and coffee husk compost (Table 3). Application of amendments with various levels increased soil organic matter over the control treatment (Table 3). The highest soil organic matter content (6.99%) was recorded for application of 10 t ha^{-1} coffee husk compost. Whereas, the lowest value (2.73%) was recorded for the control (Table 3). In line with this finding, Tesfaye *et al*., (2019) has reported an increase in soil organic matter following application of filter cake compost, filter cake and vinasse to soils.

Total content of soil nitrogen was significantly ($P < 0.05$) affected by the treatments (Table 3). The highest total nitrogen content of the soil (0.35%) was recorded for application of 10 t ha^{-1} coffee husk compost, while the lowest value (0.14%) was for the control plot. The highest total nitrogen content recorded for application of 10 t ha^{-1} coffee husk compost might be due to the release of nitrogen from organic matter as a result of mineralization. This result was in agreement with the finding of Bikila (2020), who reported direct association between total nitrogen content of a soil and its organic carbon (OC) content.

Soil available phosphorus was significantly ($P < 0.05$) affected by NP fertilizer and coffee husk compost treatments (Table 3). Application of 10 t ha^{-1} coffee husk compost gave the highest available phosphorus content (11.24 ppm), while, the lowest value (3.56 ppm) was obtained from the control plot (Table 3). The available phosphorus content recorded for compost applied plot was above the critical level of available P (8 mg kg^{-1}) for Ethiopian soils (Tekalign *et al*., 1991). This might be due to increased soil pH as a result of application of coffee husk compost. This result was in agreement with the findings of Bikila (2020) who suggested increases in available P content as a result of applied coffee husk compost. A similar study by Nduka *et al.*, (2015) has also shown that coffee husk compost could release organic substances that can form complex with ions of Fe and Al in soil solution consequently prevents phosphorus fixation.

Table 3: Mean value of some soil chemical properties as affected by application of decomposed coffee husk and NPS fertilizer at Haru

Treatment	Treatments description	pH-H_2O	OM (%)	TN (%)	Ava. P(ppm)	CEC (cmol (+) kg^{-1})
T1	10 t ha^{-1} CHC	5.58^{a}	6.99^{a}	0.35^{a}	11.24^{a}	17.26^{a}
T2	172 kg ha^{-1} N and 77 kg ha^{-1} P	5.11^{bc}	5.31^{cd}	0.26^{cd}	9.91^{bc}	15.50^{b}
T3	2.5 t ha^{-1} CHC + 172 kg ha^{-1} N and 77 kg ha^{-1}P	4.93^{d}	4.88^{d}	0.24^{d}	10.45^{bc}	16.05^{b}
T4	5 t ha^{-1} CHC + 129 kg ha^{-1} N and 57 kg ha^{-1} P	4.97^{cd}	6.41^{ab}	0.32^{ab}	10.57^{ab}	15.51^{b}
T5	5 t ha^{-1} CHC + 86 kg ha^{-1} N and 38 kg ha^{-1} P	5.01^{cd}	5.67^{bcd}	0.28^{bcd}	10.27^{bc}	13.80^{c}
T6	7.5 t ha^{-1} CHC + 86 kg ha^{-1} N and 38 kg ha^{-1} P	5.21$_{b}$	5.83^{bc}	0.29^{bc}	10.24^{bc}	11.90^{d}
T7	7.5 t ha^{-1} CHC + 43 kg ha^{-1} N and 19 kg ha^{-1}P	5.21^{b}	6.32^{ab}	0.32^{ab}	9.82^{c}	15.40^{b}
T8	10 t ha^{-1} CHC + 43 kg ha^{-1} N and 19 kg ha^{-1} P	5.46^{a}	5.94^{bc}	0.29^{bc}	10.42^{bc}	13.76^{c}
T9	Control (no input)	4.92^{d}	2.73^{e}	0.14^{e}	3.56^{d}	10.80^{d}
LSD (5%)		0.045	0.84	0.044	0.68	1.09
CV (%)		1.58	8.73	9.05	4.11	4.6

TN= total nitrogen; Ava. p= available phosphorous; Mean values followed by same letter(s) with in a column are not significantly different at $P \leq 0.05$.

Cation exchangeable capacity (CEC) of the soil showed significant ($P < 0.05$) difference with application of NP fertilizer and coffee husk compost (Table 3). Maximum CEC (17.26) cmol (+) kg^{-1}) was obtained from application of 10 t ha^{-1} coffee husk compost, while the (10.80 cmol (+) kg^{-1}) lowest value was recorded forth control plot (Table 3). As per the rating set by Landon (1991), the highest and lowest CEC values recorded in this experiment are classified as medium and low, respectively. The increase in CEC with application of coffee husk compost might be due to the increase in OM content and, thus, availability of nutrient; Samuel *et al*., (2000) have reported direct correlation between organic matter content and cation exchange capacity of soils.

Integrated effect of coffee husk compost and NP fertilizer on coffee growth parameters and yield

Plant Height of coffee

Mean height of coffee plants was highly significantly ($p < 0.01$) affected by rate of application of NP fertilizer and coffee husk compost. The maximum plant height (206.8 cm) was recorded for application of 86 kg ha^{-1}N and 38 kg ha^{-1}P + 7.5 t ha^{-1}coffee husk compost, while the lowest plant height (182.2cm**)** was obtained from the control plot (Table 4). Coffee plant height recorded for combined application of organic and inorganic fertilizers was higher than that of lonely application of either of the two sources. Increases in plant height in response to combined application of organic and inorganic fertilizers might be attributed to release of major nutrients and improved soil physical property, enhancing plant growth due to enhanced cell division, stem elongation, and leaf expansion (Muluneh, 2018). In agreement with this, Chemura (2014) has reported that combining inorganic and organic fertilizers performed better than just organic fertilizers alone in both mean height and final height of seedlings.

Number of primary branches

The number of Primary branches per plant of coffee was significantly ($p < 0.01$) affected by integrated application of NPS fertilizer and coffee husk compost. Application of 172 kg ha^{-1}N and 77 kg ha^{-1}P fertilizer resulted in the highest number of branches per plant (44.30), followed by 10 t ha^{-1} coffee husk compost (42.6). While the least number of branches per plant of coffee was recorded for the control plot (31.60) (Table 4). The increase in number of branches with application of decomposed coffee husk might be due to the positive effect of compost fertilizer on soil physical properties and on availability of major nutrients for the growth of coffee plants. In agreement with the present result, Chemura (2014) has reported increases in number of branches per plant of coffee due to application of compost to soils.

Girth or stem diameter

Stem diameter or girth of coffee plants showed highly significant ($p < 0.01$) difference due to treatments (Table 4). The maximum mean girth (57.50 mm) of coffee trees was recorded for application of 86 kg ha^{-1} N and 38 kg ha^{-1} P + 7.5 t ha^{-1}coffee husk compost, while, the lowest mean girth (46.10 mm) was recorded for the unfertilized control plot. The maximum mean girth recorded could be due to more nutrients gained from both fertilizer sources. The present result was in line with the findings of Bikila *et al*., (2020), who reported that there was a positive effect of application of combined amendments on stem diameter of coffee seedlings.

Table 4: Coffee growth parameters as affected by integrated use of coffee husk compost and NP fertilizer at West Wollega

Treatment description	Growth parameters			
	Plant height(cm)	Branch numbers	Girth (mm)	Canopy diameter(cm)
10 t ha^{-1} CHC	196.4b	42.6a	53.6b	183.8a
172 kg ha^{-1} N and 77 kg ha^{-1} P	206.4ab	44.3a	55.7ab	191.2a
2.5 t ha^{-1} CHC + 172 kg ha^{-1} N and 77 kg ha^{-1} P	202.8ab	42.5^{a}	55.5ab	186.6a
5 t ha^{-1} CHC + 129 kg ha^{-1} N and 57 kg ha^{-1} P	204.7ab	42.5a	55.7^{ab}	188.7a
5 t ha^{-1} CHC + 86 kg ha^{-1} N and 38 kg ha^{-1} P	199.4ab	40.3a	52.4b	186.3a
7.5 t ha^{-1} CHC + 86 kg ha^{-1} N and 38 kg ha^{-1} P	206.8a	41.3^{a}	57.5a	188.8a
7.5 t ha^{-1} CHC + 43 kg ha^{-1} N and 19 kg ha^{-1}P	196.6ab	40.6a	53.9ab	184.0a
10 t ha^{-1} CHC + 43 kg ha^{-1} N and 19 kg ha^{-1} P	200ab	40.6a	54.5ab	190.3a
Control (no input)	182.2c	31.6b	46.1c	162.0b
LSD (0.05)	10.35**	5.1**	5.1**	14.28**
CV (%)	2.99	7.23	7.23	4.46

CHC=coffee husk compost **= highly significant at $P \leq 0.01$. Mean values followed by the same letter(s) with in a column are not significantly different at $p \leq 0.05$.

Canopy Diameter

Integrated application of organic and inorganic fertilizers significantly affected ($p < 0.01$) canopy diameter of coffee trees. Accordingly, the highest mean canopy diameter was observed for application of 172 kg ha^{-1} N and 77 kg ha^{-1} P fertilizer with non-significant difference among fertilized treatments, but which was significantly higher than that of the control plot (Table 4). The current results were in agreement with the findings of Chemura (2014) who reported that there were no significant differences between the slopes of girth and number of primaries ($p \leq 0.05$) for organic, in organic and integrated fertilizer options over time.

Coffee yield

The effect of NP fertilizer and coffee husk compost was found to be highly significant ($p < 0.01$) for yields of coffee (Table 5). The highest (1.78 t ha^{-1}) mean clean coffee yield was obtained from application of 86 kg ha^{-1} N and 38 kg ha^{-1} P + 7.5 t ha^{-1}coffee husk compost, followed by mean yield of 1.65 t ha^{-1} clean coffee recorded for application of 129 kg ha^{-1} N and 57 kg ha^{-1} P + 5 t ha^{-1} Coffee husk compost. While the lowest (0.74 t ha^{-1}) yield was obtained from the unfertilized control plot (Table 5). The combination of 86 kg ha^{-1} N and 38 kg ha^{-1} P + 7.5 t ha^{-1}coffee husk compost fertilizer gave about 64.7% coffee yield increment over the control.

Table 5: Integrated effects of coffee husk compost and NP fertilizer on coffee yield at Haru, West Wollega

Treatment number	Treatment description	Clean coffee yield (t/ha)
1	10 t ha^{-1} CHC	1.25^{c}
2	172 kg ha^{-1} N and 77 kg ha^{-1} P	1.44^{bc}
3	2.5 t ha^{-1} CHC + 172 kg ha^{-1} N and 77 kg ha^{-1} P	1.48^{bc}
4	5 t ha^{-1} CHC + 129 kg ha^{-1} N and 57 kg ha^{-1} P	1.65^{ab}
5	5 t ha^{-1} CHC + 86 kg ha^{-1} N and 38 kg ha^{-1} P	1.44^{bc}
6	7.5 t ha^{-1} CHC + 86 kg ha^{-1} N and 38 kg ha^{-1} P	1.78^{a}
7	7.5 t ha^{-1} CHC + 43 kg ha^{-1} N and 19 kg ha^{-1}P	1.33^{c}
8	10 t ha^{-1} CHC + 43 kg ha^{-1} N and 19 kg ha^{-1} P	1.31^{c}
9	Control (no input)	0.74^{d}
LSD (0.05)		0.28**
CV (%)		11.93

CHC=coffee husk compost **= highly significant at P ≤ 0.01. Mean values followed by the same letter(s) with in a column are not significantly different at p≤0.05

The highest yield obtained from application of compost integrated with NP fertilizer might be attributed to supply of sufficient amount of nutrients and, thus, extraction of large quantity of those mineral nutrients by the crop In line with this, Anteneh *et al*., (2015) have reported that incorporation of organic and inorganic fertilizers improved soil physical property and nutrient availability that may have a direct effect on growth and yield attributes of coffee. Incorporating combination of coffee husk compost and NP fertilizers in the soil not only improved the nutrient status, but also resulted in good physical conditions of the topsoil, significantly favored optimum shoot and root growth and thus, enhanced nutrient use efficiency by the crop with ultimately increased coffee yield In agreement with this, Wairegi *et al*., (2014) have also reported that coffee yields can only be enhanced and sustained by the addition of integrated form of compost and mineral fertilizers.

CONCLUSIONS

Integrated use of coffee husk compost with NP fertilizer increased the contents of soil organic matter, soil pH, total nitrogen, soil moisture content, available phosphorus and CEC. It also increased growth parameters of coffee (plant height, number of primary branches per plant, canopy diameter and stem girth) over the control treatment. Higher clean coffee yield (1.78 t ha^{-1}**)** were obtained from application of 86 kg ha^{-1} N and 38 kg ha^{-1} P + 7.5 t ha^{-1}coffee husk compost and followed by (1.65 t ha^{-1}), which is obtained from combined application of 129 kg ha^{-1} N and 57 kg ha^{-1} P + 5 t ha^{-1} Coffee husk compost, while, the lowest yield (0.74 t ha^{-1}) was recorded for the control plot.

In general, application of integrated NP fertilizer and coffee husk compost with different rates improved soil physicochemical properties and yield and yield components of coffee. Nevertheless, the potential of coffee productivity in the area has not yet been exploited. Hence, integrated application of locally available coffee husk compost and blended NP fertilizer could be one option to reduce the yield gap.

Based on the result of the present study the following recommendation was drawn. Soil management practices that can increase soil fertility status and soil pH are important Haru area, where soil acidity is the major constraint of crop production.-Hence, results of the present study suggested that the use of 7.5 t ha^{-1}coffee husk compost + 86 kg ha^{-1} N and 38 kg ha^{-1} P fertilizer can be the best alternative integrated soil fertility management option, instead of sole application of inorganic fertilizers in West Wollega, Ethiopia. Nevertheless, in order to give a conclusive recommendation, further studies are needed for different soil types and coffee varieties.

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