Evaluation of Blended Fertilizer (NPSZnB) Rates on grain yield, nutrient uptake and economic feasibility of maize (Zea mays L.) in Kolla-Temben, Central zone of Tigrai, Ethiopia

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Abstract

Background: Maize is an important cereal crop grown and consumed in Ethiopia. However, its yield is constrained by low soil fertility and improper utilization of fertilizer. Therefore the objective of this finds was to study the effect of NPSZNb fertilizer rates on grain yield, nutrient uptake and economic feasibility of maize.

Methods: A field experiment was conducted at Bega-Sheka in 2018/19 & 2019/2020 cropping season. The treatments were consisted of six blended fertilizer rates (0, 50, 100, 150, 200 and 250 kg NPSZnB ha -1) and recommended p (40 kg ha -1). Treatments were arranged in RCBD design with three replications.

Result: Analysis of variance indicated that blended fertilizer rate had statistically significant ($p < 0.005$) effect on plant height, ear length, number of seeds per row, grain and biomass yield. However, it did not have a significant effect on phonological traits, number of grain rows and 1000-grains weight. Application of NPSZnB fertilizer ranging from 150 to 250 kg ha-1 and 200 kg ha-1 of DAP gives the highest grain and biomass yields. Hence the higher nutrient uptake of N and P was recorded from the maximum rate of NPSZnB and P fertilizer, respectively. The MRR value showed that the highest MRR of 529% was obtains from 150 kg NPSZnB ha -1 .

Conclusions: From the result of the study, application of 150 kg NPSZnB ha -1 increases yield and yield component of maize and give maximum return from unit investment which can be recommended for the study area.

Background

Maize is one of the pillar cereal crops ranking first in total production and productivity in Ethiopian agriculture, and second to tef in area coverage (FAOSTAT, 2017). In spite of the large area coverage under maize, the national (Ethiopia) and regional (Tigray)average grain yields reached about 3.6 t ha-1(FAOSTAT, 2017) these yields were certainly below the world's average yield which was about 6 .2 t ha-1(CSA, 2015).

In Tigray, maize crop production is one of the high priority food security crops and the vision

portends the intention of the government to transform the agricultural sector from a rural based economy to commercial and industry oriented sector to boost agricultural productivity. As the result it involves in extensive area.

However, the yield obtained by the farmers in the study areas is low due inappropriate agronomic practice, lack of stable high yielder varieties, drought, soil erosion and poor essential soil nutrient (ATA, 2014). Deteriorating soil fertility, shallow soil depth, high run-off and low infiltration capacity of the soil are the major restriction for supportable agricultural production in Kolla-Temben. So something is done to repair soil fertility first to increase crop production.

Chemical fertilizers have been the important tools to overcome soil productiveness problems and they are also responsible for a large part of the food production increases worldwide (Sanchez, A. P. and R. B. Leakey, 1997). It has been estimated about 50% of crop yield increment is attributable to application of commercial fertilizers (Stewart *et al*., 2005). Low soil fertility is highly affects the growth and development of maize as compared to other crops. As the result, it is often said “maize speaks” implying that maize cannot produce maximum yields unless sufficient nutrients are available (Delorite, R. J. and H. L. Ahlgren, 1967). The correct application rates of plant nutrients are determined by knowledge about the nutrient requirement of the crop and the nutrient supplying power of the soil (Foth, H. D. and B. G. Ellis, 1997). Unblended fertilizer use favored the emergence of multi nutrient deficiency in Ethiopian soils Wassie and Shiferaw, 2011) and resulted in low crop production.

To overcome this problem of nutrient deficiency balanced fertilizers containing N, P, S, B, Fe and Zn have been recommended for site specific nutrient deficiency and thereby increase crop production and productivity, water and labor productivity. The major recently recommended blended fertilizers for Bega-Sheka by ATA is NPSZnB (ATA, 2014) but the optimum rates of the recommended blended fertilizer for maize crops is not yet identified for Kolla-Temben district. Therefore, the main objective of the study was to evaluate the effects of NPSZnB fertilizer rates on grain yield, nutrient uptake and feasibility of maize at Bega-Sheka

Materials And Methods

Description Of The Study Area

The study area (Bega-Sheka) is considered as one of the most important place in Kolla Temben district, Tigray Region (Northern Ethiopia) ((Fig. 1 :) for the production of maize. It is located between 13°36.0’-13°39.0’ N and 38°53.0’ – 38°59.0’ E. Total annual rainfall of the area ranges from 500–800 mm. The mean annual temperature of the area is 24°c, with a minimum of 17°c and a maximum of 30°c at an altitude of 1898 m.a.s.l on the site. It is categorized as a Dry Weina-Dega zone.

Experimental Design And Treatment

The experiment was fixed in randomized complete block design (RCBD) arrangement with three replications. The experiment consisted seven treatments including recommended blanket P fertilizer with an amount of 40 kg P ha^{-1}. The blended fertilizer rates were consisted of six levels of NPSZnB which is (0, 50, 100, 150, 200 and 250 kg ha) and were adjusted with N to N of the recommended N since the N content of blended fertilizer of NPSZnB is smaller as compared to P_2O_5 which the N content of 100 kg NPSZnB is about 17 kg. This revealed that all treatments except contro received 69 kg ha-1. A full dose of blended fertilizer was applied at planting time close to seed drilling line, while the remaining N was applied in split, half at 35 and 65days after planting in the form of urea. The gross plot size was 16 m^2 (3.75m × 4 m) that accommodated five rows as an experimental unit with 9 m2 (2.25m × 4 m) net plot. A high yielder maize variety of Gibe-III was used as a test crop on the sites that was spacing of 75*20 cm among rows and plants, respectively. Two seeds of maize were planted per hill and after; thinned to one plant per hill. Hence, 9 m2 of net plot size was used for the data collection.

Soil Sampling And Analysis

A disturbed composite soil sample f the study site were collected from 0–20 cm depth before planting for analysis. Soil texture was determined using the Bouyoucos hydrometer method (Bouyoucos, 1962). The pH of the soil was measured in the supernatant suspension of a 1:2.5 soil to water ratio using a PH meter (Rhoades,1982). Organic carbon (%) was determined by method as described by (Walkely and Black 1934). Available P (ppm) was analyzed by employing the Olsen method using ascorbic aci as the reducing agent (Olsen et al., 1954). Total nitrogen was measured using Kjedahl method as describe by (Bremner and Mulyaney,1982). CEC in cmol (+) kg-1soil was determined by ammonium acetate method

Agronomic Data Collection

Days to tasseling (DT): The number of days from planting to when 50% of the plants in a plot will start to tasseling. **Days to Silking (SD)**: Is recorded as the number of days from planting to when 50% of the plants in a plot produced 2–3 cm long silk. **Ears Per Plant (EPP)**: HLs was recorded as total number of ears harvested from a plot divided by the total number of plants in a plot at harvest. **Plant Height (PH)**: The height of from five randomly taken plants from harvestable row was measured from the base of the plant to the to the point where the tassel starts branching and the average value was recorded. **Days to Maturity (DM)**: This was recorded as number of days from planting to 90% of the plants in the plot reached physiological maturity. **Number of ears/plant (NEP)**: This was recorded as the was recorded as the ration of the total number ears from five randomly taken plants from harvestable row and harvested to the total number of plants harvested. **Ear length (EL)** : The length of five randomly taken plants from harvestable row ears was measured and the mean value was recorded per plant basis.

Number of seeds per rows: was counted on five representative ears and the average value was recorded for each plot. **Number of seed rows per cob**: was counted on five representative ears and the average value was recorded for each plot.**1000 Seed Weight (SSW) (g)**: One thousand seeds per sample was counted using electronic counter and then weighed using sensitive balance. **Grain Yield (GY)**: Grain was manually harvested from central rows and converted to kg ha^{-1}after adjusting the moisture content to 12.5%. **Biomass Yield (BY)**: was estimated as the sum of stover weighed and grain yield. **Harvest index (HI)**: Is the ratio of grain yield to total biomass yield which was estimated by dividing grain yield by total biomass.

Plant Tissue Sampling And Analysis

Grain and straw yield nutrient uptake were calculated by multiplying nutrient with respective straw and grain yield ha^{-1}: NU=(NC*Y)/100 ; where, NU,NC and Y stand for nutrient uptake ,nutrient concentration of gran or straw, and grain yield or straw, respectively.

Statistical Analysis

The collected data were subject to analysis of variance (ANOVA) using SAS computer program following the procedures described by (Gomez, KA.and A.A. Gomez, 1984). Mean separation of significant treatment were carried out using the least significant difference (LSD) test at $P \leq 0.05$ level..

Partial Budget Analysis

Partial budget analysis was done to investigate the economic feasibility of the treatments by using partial and marginal analysis. Marginal rate of return (MRR) was calculated as the change in net benefit (NB) divided by the change in total variable cost (TVC) of the successive net benefit and total variable cost levels (CIMMYT, 1988). The variable cost are application costs and price of each fertilizer that vary for each treatment. The fertilizer cost was (1786 ETB/qt) NPSZnB and DAP and price of the grain yield was 12 ETB /kg on the local market.

Results And Discussion

Soil Analysis

The result of the soil sample before planting of physical and chemical analysis of the site was done in Mekelle soil laboratory. The soil of the experimental site has a proportion of 30% sand, 56% silt and 14% clay and it is classified as silt loam soil according the soil triangle texturally (Table 1). The organic carbon content of the soil was 0.8% which rated under low, in agreement with the finding of (Tekalign, 1991). The pH valve of the soil result at the experimental site 7.4 was almost neutral. The cation exchange capacity was 35.4 Meq/100 gm soil which is categorized as medium.

The results in (Table 2) indicated that the soil comprised total N of 0.121% and thus the composite soil sample of the experimental area was rated as low (London, 1991). The available P in the experimental soil contains 8.46 ppm. According Olson *et al(1954)*, it has medium level of available P in the experimental site. This is may be due to the cropping history of the area was maize so, maize is not required in as high amounts as N.

Table 1
Some Physio-chemical properties of the soil at the experimental field before sowing

Properties	Values	Method code	Remark
Soil physical properties			
Sand (%)	30	MSL-M7.02-8	
Clay (%)	14	MSL-M7.02-8	
Silt (%)	56	MSL-M7.02-8	
Soil texture			**Silt Loam**
Soil chemical properties			
Organic carbon (%)	0.28	MSL-M7.02-8	Low
pH (by 1:2.5 soil water ratio)	7.4	MSL-M7.02-5	Almost neutral
Cation exchange capacity Meq/100 gm soil	35.4	MSL-M7.02-8	Low
Total nitrogen (%)	0.121	MSL-M7.02-8	Low
Available phosphorus (ppm)	8.46	MSL-M7.02-8	Medium
Mekelle soil laboratory (2019)			

Phenology And Growth Parameters

Phenology traits

The analysis of variance for days to tasseling and silking maize crop was not significantly affected by fertilization of blended fertilizer doses (Table 2).Mostly those fertilizer expected to have encouraged early establishment, rapid growth and development of the crop thus; shortening the days to tasseling, silking and maturity but the current result were revealed the reverse. This may be due to application of N fertilizer treatment to all treatments at the same rate of blended fertilizer and thus effect of N was insignificant. This work is similarly reported by Tekulu et al (2019) 50% of tasseling, silking and 90% maturity was not affected by the blended fertilizer treatments. This result is unlike the work of Bakala (2018) found that 50% tasseling, silking and maturity to be significantly affected by the application of blended fertilizer rates.

Growth Parameter

Plant height

Analysis of the variance showed that, there was a significant difference ($p \leq 0.05$) among the fertilizer rates on maize height. Application of blended fertilizer significantly increase plant height as compare to the control and lower rates. The heights plant height 230.5 cm, 228 cm and 227 cm was recorded from 250 and 200 kg ha-1 NPSZnB and 200 kg ha-1 DAP. This increment in plant height might be due to increase in cell elongation and more vegetative growth attributed to different nutrient content of micronutrients. Thus the result indicated that blended fertilizers application has enhanced the maize vegetative growth. On the other hand the minimum plant height in unfertilized and low level plots might have been due to low soil fertility level in the study area. This result is in agreement with that of Tekle and Wassie (2018) who found that application of blended fertilizers which significantly increased plant height as compared to the control.

Table 2
Effect blended fertilizer (NPSZnB) rates on yield and yield components of maize

Treatment (kg ha $^{-1}$)	**Two years combined result**					
	Days to 50% tasseling	**Days to 50% silking**	**Days to 90% maturity**	**plant height (cm)**	**N cobs PP**	**Ear length**
0	86	89.7	135.5	190.3d	1.03	13.4^{c}
50 kg ha-1 NPSZnB	86	90	136.3	191d	1	13.5^{c}
100 kg ha-1 NPSZnB	86	89.5	136.3	219.6c	1.1	14.2^{b}
150 kg ha-1 NPSZnB	84.7	89	136.2	222bc	1	15.4^{a}
200 kg ha-1 NPSZnB	84.7	88.3	136.7	228ab	1.03	15.2^{a}
250 kg ha-1 NPSZnB	83.3	88	136.3	230.5a	1.03	15.4^{a}
200 kg ha-1 DAP	82.7	87.3	136	227abc	1.03	15.3^{a}
Mean	84.6	88.8	136.2	206.5	1.03	14.6
LSD(0.05)	NS	NS	NS	215.5	NS	0.45
CV (%)	2.5	1.6	1.44	2.22	5.5	1.8

Where P = kg ha-1 Zn = g/L, LSD (0.05) = Least Significant Difference at 5% level; CV = Coefficient of variation, NS = Non significant, Means connected by the same letter are not different from each other at 5% level of significance

Yield-related Parameters

Number of Cobs per Plant and Number of Seed Rows per Cob

Analysis of variance of blended fertilizer treatments on number of cobs per plants and number of seed rows per cob did not show significant difference ($p \leq 0.05$).Unlike the work of Chimdessa (2016) application of blended fertilizer increased number of cobs and number of seed rows per cob over the control

Ear Length

Analysis of variance indicated that there is a significant effect between the blended fertilizer rates on maize ear length ($p \leq 0.05$). The ear length increment with the blended fertilizer application might be attributed to good photo assimilate supply of the blended elements. The highest ear length was recorded from the 100–250 kg of NPSZnB ha $^{-1}$

Number Of Seeds Per Row

Result of the analysis of variance ($p \leq 0.05$) revealed blended fertilizer rates have a significant effect on number of seeds per row. The highest number of seeds per row (35.5) was achieved from the treatments 150 kg NPSZnB ha^{-1}. On the other hand the similar number of seeds per row (30.8) was recorded from untreated plot(control)..These increments of number of seeds per row with the blended fertilizer could be due to the more plant nutrient contents of blended fertilizer. In agreement with result of this experiment,maize production depends mainly on the availability of essential plant nutrients and application of fertilizers (Adediran, 2003).

Table 3
Effect blended fertilizer NPSZnB rates on yield and yield components of maize

Treatment	**Two years combined result**					
(kg ha $^{-1}$)	**Number of seed rows/cob**	**Number of seeds /row)**	**Grain yield (kg ha-1)**	**Biomass yield (kg ha-1)**	**1000 seed weight (gm)**	**Harvest index**
0	13.9	30.8^{d}	5667^{c}	15314^{d}	328.58	0.357^{bc}
50 kg ha-1 NPSZnB	13.8	31.4^{cd}	5687^{c}	14927^{d}	336.33	0.38^{a}
100 kg ha-1 NPSZnB	13.7	33.2^{bc}	6031^{b}	16388.4^{c}	331.58	0.38^{a}
150 kg ha-1 NPSZnB	14.5	35.5^{a}	6666^{a}	18237^{ab}	341.42	0.37^{a}
200 kg ha-1 NPSZnB	13.9	34.7^{ab}	6447^{a}	18131^{ab}	339.75	0.355^{bc}
250 kg ha-1 NPSZnB	13.8	33.8^{ab}	6526^{a}	19141^{a}	333.67	0.34^{c}
200 kg ha-1 DAP	13.5	32.5^{bc}	6551^{a}	18737.4^{a}	343.92	0.349^{bc}
Mean	13.8	33.2	6225	17254.7	336.5	0.36
LSD(0.05)	NS	2.12	271	1015.9	NS	0.021
CV (%)	4.9	3.7	2.5	3.4	3.3	3.2

Where P = kg ha-1 Zn = g/L, LSD (0.05) = Least Significant Difference at 5% level; CV = Coefficient of variation, NS = Non significant, Means connected by the same letter are not different from each other at 5% level of significance

Grain Yield

The application of different rate of blended fertilizer showed a highly significant (< 0.001) effect on grain yield of maize. The highest grain yield recorded from the application of (150 to 250 kg ha-1 NPSZnB and 200 kg ha-1) DAP did not have statically deference each other. But they have a highly significance deference from the other treatments. Whereas, the lowest grain yield was recorded from plots treated with zero (5667 kg ha $^{-1}$) and 50 kg ha-1 (5687 kg ha-1) NPSZnB fertilizers. The grain yield increment may be beneficial effect of yield contributing character and positive interaction of nutrients in the blended fertilizers. This result in agreement with the current findings Tekle and Wassie (2018) found that grain yield of tef was found highest in blended fertilizers as compared to control treatment and recommended NP fertilizers. Additionally, Jafer (2018) found better grain yield from application of blended fertilizer compare to recommended NP fertilizer and unfertilized plot.

Biomass Yield

Analysis of the variance showed that, there is a significant difference ($P \leq 0.001$) between blended fertilizer rates on biomass yield of maize. The highest biomass yield was recorded from the treatment received the heights blended fertilizers rate of 150–250 kg NPSZnB /ha and 200 kg ha-1 DAP (Table 3) without statically difference. On the other hand the lowest biomass yields (14927 and 15314) obtained with the application of low NPSZnB fertilizer and control. The lowest biomass yields are might have been due to reduced leaf area development resulting low efficiency in the conversion of solar radiation to maintain efficient photosynthesis. When the application of blended fertilizer is increased biomass yield of maize showed increasing trend. The present results are in agreement with tekulu et al. (2019) who obtained significantly highest biomass yield of maize crop when high blended fertilizer rates applied.

Thousand Seed Weight (gm)

Thousand grain weight of maize did not show any significant variations ($p < 0.05$) amongst the blended fertilizer rates. This result is different from tekulu (2019) reported that thousand seeds weight of maize crop were found to be significantly affected by blended fertilizer rates compared to the control.

Harvest Index

Analysis of the result revealed that application of the blended fertilizer in compound had significant effect ($P < 0.05$) on harvest index of maize crop. The maximum harvest index was obtain from the application of 50 to 150 kg NPSZnB per ha as compared to the other fertilizer rates. The blended fertilizer might be attributed to positive interaction of nutrients in the blended fertilizer gives more grain weight and have positive relation to grain yield increment. This result agrees with the findings of Tekulu (2019) who reported that harvest index of maize was found to be highest at the rate of 150 kg NPSZnB per ha as weighed to the control treatment.

Nitrogen Uptake By Grain And Stalk

The results presented in (Table 4) indicated that, the highest N uptake form grain (10 kg /ha) and stover (20.67 kg /ha) was obtained in plot treated by (200 and 250 kg) NPSZnB /ha. While the lowest N uptake by grain (7.59 and 7.56 kg / ha) was recorded in control and a plot treated by the low level. The lowest N uptake by Stover (10.45 kg ha-1) was recorded from the plot treated by 50 kg NPSZnB /ha of blended fertilizer. The maximum N uptake form grain and stover are increased by 24.4 and 49.4 from the minimum uptake which treated by 50 kg ha-1 NPSZnB fertilizer. This study agreed with the findings of Jones (1996) who reported that agronomic practices affected not only yield, but also seed N contents. The highest yield was associated with highest dry matter production and Stover N uptake increased significantly with optimum nutrient application.

Table 4
The effect of blended fertilizer treatments on nutrient uptake of maize

Treatment	Nutrient uptake (Kg ha-1)					
	Nitrogen			Phosphorus		
	Grain	Stover	Total	Grain	Stover	Total
Control	7.59	15.93	23.52	2.27	18.38	20.64
50 kg ha-1 NPSZnB	7.56	10.45	18.01	4.04	19.85	23.89
100 kg ha-1 NPSZnB	8.89	13.77	22.66	5.12	19.67	24.78
150 kg ha-1 NPSZnB	8.93	15.69	24.62	5.12	32.41	37.53
200 kg ha-1 NPSZnB	10.0	16.32	26.31	5.09	33.18	38.27
250 kg ha-1 NPSZnB	9.33	20.67	30.00	5.22	36.94	42.16
200 kg ha-1 DAP	9.43	17.05	26.48	4.91\	45.53	50.45

Similarly, Fageria et al. (2009) reported that sufficient and blended form of fertilizer is absolutely enhance the total nutrient uptake of N. At the same time, productivity of the crop i.e. treatments that accumulates maximum N nutrient gives high yield.

Phosphorus Uptake By Grain And Stover

Application of different blended fertilizer rates on P uptake in grain and stover showed high difference and increasing trends. Due to the blended fertilizer treatment (Table 4), there were highly difference among treatments and the highest P uptake by grain (5.22 Kg / ha) was recorded in treatment treated by NPSZnB and stover (45.53 Kg ha-1) was received in treatment treated by DAP and the lowest (2.27 and 18.38 Kg /ha respectively recorded in control. Application of high blended fertilizer rates enhanced P uptake in grain by 56.5 as compared to the control.

Partial Budget Analysis

The result displayed in Table 5 reveals that, the partial budget analysis of fertilizer rates revealed that the maximum net benefit (79010.2 ETB/ha) was attained from application of 150 kg NPSZnB ha $^{-1}$ and the least net benefit (68662.6 ETB/ha) and (69885.9.ETB/ha) was obtained from the application of 50 kg NPSZnB /ha and unfertilized treatment. The dominance analysis showed that all the treatments, except the treatment with NPSZnB fertilizer rate of 100 kg ha $^{-1}$, and 150 kg ha $^{-1}$ were cost dominated.

The highest marginal rate of return (529%) was obtained from the treatment of 150 kg NPSZnB ha $^{-1}$ fertilizer followed by (113%) amended with 100 kg NPSZnB ha $^{-1}$ fertilizer (Table 5) gave maximum profit from unit investment. Generally, the analysis of marginal rate of return (MRR) indicated that the application of blended fertilizer on productivity of maize had MRR of greater than 100%. This indicates that maize production is profitable with these all alternatives. According to CIMMYT (1988), application of fertilizer with the marginal rate of return above the minimum level (100%) is economically feasible.

Table 5
Partial and marginal budget analysis of maize response for different NPSZnB fertilizer rates

Treatment	TVC (ETB/ha)	NB (ETB/ha)	DR	MB (ETB/ha)	MC (ETB/ha))	MRR (%)
Control	0	69885.9	-	-	-	
50 kg ha-1 NPSZnB	1073	68662.6	D			
100 kg ha-1 NPSZnB	2133	72323.46	ND	2437.56	2133	114
150 kg ha-1 NPSZnB	3396.5	79010.2	ND	6686.74	1263.5	529
200 kg ha-1 DAP	4386	77332.56	D			
200 kg/ha NPSZnB	4452	75691.2	D			
250 kg/ha NPSZnB	5612	76222.3	D			

Where, TVC = total variable cost, NB = net benefit, MB = Marginal benefit, MC = marginal cost MRR = marginal rate of return, D = dominated, ND = Non dominated, DR = Domination rank

Based on this result, this suggests that NPSZnB application at the rate of 150 kg ha $-^{1}$could be enough for optimum yield and maximum profit in conditions of sufficient nitrogen applied.

Conclusions And Recommendations

Based on the result of two years field experiment, the biomass yield, grain yield and nutrient uptake of maize variety (Gibe-III) was significantly affected by the application of different blended fertilizer rates. The highest grain and biomass yields of maize was obtained from the application of 150 to 250 NPSZnB and 200 kg ha-1 DAP fertilizer. The maximum nutrient uptake of N and P also recorded from the treatment received 250 kg NPSZnB ha^{-1} and 200 kg DAP ha^{-1} fertilizer, respectively. This result indicated that, when the rate fertilizer is increase the chance of NP uptake also rises. On the other hand, the highest marginal rate of return (529%) followed by (114%) was obtained from the treatment of 150 and 100 kg NPSZnB ha^{-1} fertilizer amended with enough N. Based on the result of (MRR)shown, application of blended fertilizer on productivity of maize had greater than 100%. Therefore, as the result of two years experiment it was possible to conclude that, in the presence of appropriate rate of N fertilizer; maize is responsive to high yield and maximum net benefit at 150 kg NPSZnB ha^{-1} of blended fertilizer. In order to increase the rate of fertilizer application and crop productivity the government should subsidize the cost of fertilizer to make it affordable for farmers. Further study can be important on different varieties and nutritional content.

Abbreviations

ANOVA: analysis of variance, Zn: zinc,TSP: triple super phosphate, N: nitrogen

Declarations

Ethics approval and consent to participate: Both are agreed

Consent for publication: Both area decide to publication

Availability of data and materials: Are from direct from field and research center

Competing Interest: The author declares no competing interest

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Author contributions: HM designed the study and collect data, analyzed the data and drafted the manuscript, FB contributed to data collected and reviewed the manuscript. Both authors check and agreed the final manuscript

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Figures

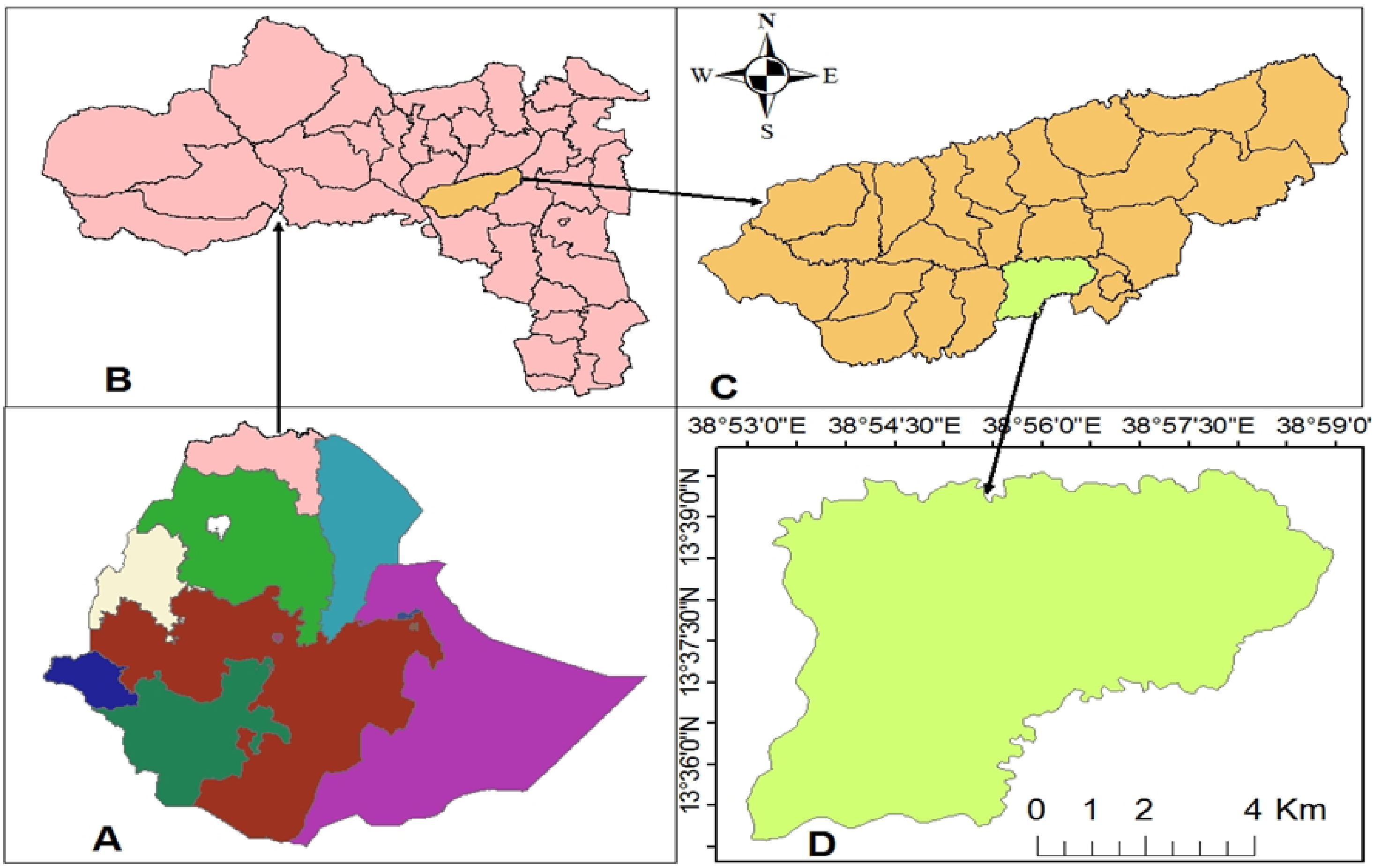

Figure 1

Map of the study area