T.R.
VAN YUZUNCU YIL UNIVERSITY
INSTITUTE OF NATURAL AND APPLIED SCIENCES
DEPARTMENT OF HORTICULTURE

EFFECT OF ORGANIC FERTILIZER AND INTERCROPPING ON GROWTH AND YIELD OF SWEET CORN AND FRESH BEAN

Ph.D. Thesis

Prepared by: Kamaran Mustafa FATTAH
Supervisor: Prof. Dr. Suat ŞENSOY
Co-Supervisor: Prof. Dr. Akram Othman ESMAIL

VAN-2019

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ACCEPTANCE and APPROVAL PAGE

This thesis entitled "Effect of organic fertilizer and intercropping on growth and yield of sweet corn and fresh bean" presented by Kamaran Mustafa FATTAH under supervisions of Prof Dr. Suat ŞENSOYand Prof. Dr. Akram Othman ESMAILin the Department of Horticulture has been accepted as a Ph.D. thesis according to Legislations of Graduate Higher Education on 25/4/2019 with unanimity of votes members of jury.

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Director of Institute

THESIS STATEMENT

All information presented in the thesis obtained in the frame of ethical behavior and academic rules. In addition all kinds of information that does not belong to me have been cited appropriately in the thesis prepared by the thesis writing rules.

Signature

Kamaran Mustafa FATTAH

DEDICATION

This Piece of Work Dedicated To:

My Dear Father.

My Dear Mother.

My Beloved Wife.

My Sweet Children, (Kavar and Zhyar).

My Brothers and Sisters.

My Teachers.

My Friends.

All Those That Helped me

With Love And Respect

Kamaran Mustafa FATTAH

ABSTRACT

EFFECT OF ORGANIC FERTILIZER AND INTERCROPPING ON GROWTH AND YIELD OF SWEET CORNAND FRESH BEAN

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Ph.D. Thesis, Department of Horticulture
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The aim of thesis study was to determine the effect of intercropping and organic fertilizer on growth and yield of sweet corn(*Zea mays* L. var. *saccharate,* Sturt cv. Succar, F1)and fresh bean(*Phaseolus vulgaris* L. cv. Istride). The field experiments was carried out during the spring seasons in 2017 and 2018 in a private farm in Qushtapa, 30 km far from the center of Erbil in Iraq, with global positional system (G.P.S) reading (360 ON, 44001E),(0411359, 03997002UTM). The experiment was laid out in a split-plot design with three replicates. The study consists of two factors: 1-)Three systems of planting(B1:sweet corn, B2:fresh beans and B3:intercropping), and 2-) Five levels of organic fertilizer(A1:0, A2:5, A3:10, A4:15 and A5:20 kg per 7.8m^2).The results showed that the intercropping was significant effect onthe number of leaf per plant, the number of branches per plant and cob length of sweet corn. On the other hand, the mono-crop was significant difference on fresh cob yield of sweet corn and fresh pod yield of fresh bean in 2017 and 2018, recorded maximum value of fresh cob yield(21.68 ton ha^{-1})in 2017 and(21.52 ton ha^{-1})in 2018 of sweet corn and fresh pod yield(12.02 ton ha^{-1})in 2017 and(11.13 ton ha^{-1})in 2018 of fresh bean. However, organic fertilizer 15 and 20 kg per 7.8m^2 has been significantly influenced the all growth traits and fresh yield of sweet corn and fresh bean. The value of LER of intercropping, registered(1.08)and(1.06)in 2017 and(1.15)and(1.10)in 2018. The year 2017 recorded the highest value of some growth traits and yield and the lowest value was obtained in the year of 2018. The study concluded that intercropping was superior to mono-crop in some growth traits except yield of sweet corn and fresh bean. Increasing the amount of organic fertilizer to15 and 20kg per 7.8m^2 leads to improve and increase value of the growth traits and increase the fresh yield. Then, the interaction between intercropping and organic fertilizer 15 and 20 kg per 7.8m^2caused the improve and the increase of some of the growth traits and fresh yield of sweet corn and fresh bean.

Keywords: Fresh bean,Intercropping, LER, Organic fertilizer, Sweet corn, Yield.

ÖZET

TATLI MISIRVE TAZE FASULYEBİRLİKTE YETİŞTİRİCİLİĞİNDEORGANİK GÜBRELEMENİN BÜYÜME VE VERiM PARAMETRELERİNE ETKİSİ

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Haziran 2019, 167 Sayfa

2017 ve 2018 bahar mevsimi boyunca Qushtapa'daki özel bir çiftlikte, Irak'ın Erbil'in merkezine 30 km uzaklıkta, küresel konum sistemi (GPS) okuması (360 ON, 44001E), (0411359, 03997002UTM) ile tarla denemeleri yürütülmüştür.Birlikte yetiştiricilik ve organik gübrenin, tatlı mısırın (*Zea mays* L. var. *saccharate*, Sturt cv. Succar, F1) ve taze fasulyenin (*Phaseolus vulgaris* L. cv. Istride) büyüme ve verimi üzerindeki etkisi belirlenmiştir.Deneme, üç tekerrülü bölünmüş parseller deneme deseninde gerçekleştirilmiştir. Çalışma iki faktörden oluşmuştur: 1-)Üç ekim sistemi (B1: tatlı mısır, B2: taze fasulye ve B3: birlikte yetiştiricilik) ve 2-) Beş seviyedeki organik gübre (A1: 0, A2: 5, A3: 10, A4: 15 ve A5:20 kg organik gübre 7.8 m^2.Sonuçlar, birlikte yetiştiriciliğin tatlı mısırdabitki başına yaprak sayısı, bitki başına dal sayısı ve koçan uzunluğu.Tek ürün tatlı mısır ve taze fasulyeda taze bakla taze veriminde 2017 ve 2018'de önemli bir etkisi olduğunu göstermiştir. 2017'de azami taze koçan verim değeri 21.68 ton ha^{-1} 21.52 ton ha^{-1} olarak kaydedilirken,taze fasulyede bakla verimi 2017'de 12.02 ton ha^{-1}ve 2018'de 11.13 ton ha^{-1} olarak kaydedilmiştir. Bununla birlikte, organik gübreuygulamaları, tüm büyüme özelliklerinde ve taze mısır ve taze fasulye taze veriminde önemli ölçüde etkide bulunmuştur. Birlikteyetiştiricilikte LER değeri, 2017'de 1.08 ve 1.06, 2018'de 1.15 ve 1.10 olarak kaydedilmiştir. 2017 yılı, bazı büyüme özelliklerinin ve verimlerinin en yüksek değerini kaydetti ve en düşük değer 2018 yılında elde edildi.

Çalışmada bazı büyüme özelliklerinde birlikte yetiştiriciliğin tek ürün talı mısır ve taze fasulye yeteştiriciliğine göre verim hariç üstün olduğusonucuna varılmıştır.Organik gübre miktarının parsel (7.8 m^2) başına 15 ve 20 kg'a yükseltilmesi, büyüme özelliklerinin artmasına ve taze verimin artışın yol açmaktadır. Birlikte yetiştiricilik ve organik gübre 7.8 m2 başına 15 ve 20 kg arasındaki etkileşim, geliştirmek bazı büyüme özelliklerinin ve taze verimin artmasına neden olmaktadır tatlı mısır ve taze fasulyenin.

Anahtar kelimeler: Taze Fasulye, Birlikte yetiştiricilik, LER, Organik gübre, Mısır, Verim.

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2019

Kamaran Mustafa FATTAH

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SYMBOLS AND ABBREVIATIONS

Some symbols and abbreviations used in this study are presented below, along withdescriptions

Symbols	Description
N	Nitrogen
P	Phosphor
K	Potassium
Ca	Calcium
Mg	Magnesium
Na	Sodium
Mn	Manganese
Fe	Iron
B	Boron
C	Carbon
S	Sulfur
Cu	Copper
Zn	Zinc
g	gram
mg	miligram
kg	kilogram
Cmol	Cent mol
mmol	mili mol
ml	mililiter
L	litter
Cm	Centimeter
m	meter
m^2	square meter
mm	milimeter
ha	hectare

Symbols	**Description**
t	ton
ds m	decimal
k.m	kilo meter
km²	square kilometer
%	Percent

Abbrevations	**Description**
TR	Turkish Republic
R	Replication
B	Block
M.C	Mono-Cropping
I.C	Intercropping
S.C	Sweet Corn
F.B	Fresh Bean
ECe	Electric Conductivity
CEC	Cation Exchange Capacity
D.M	Dry Matter
F.M	Fresh Matter
O.M	Organic Matter
O.F	Organic Fertilizer
LER	Land Equivalent Ratio
S.C.M	Sweet Corn Monocrop
S.C.I	Sweet Corn Intercropping
F.B.M	Fresh Bean Monocrop
F.B.I	Fresh Bean Intercropping
ANOVA	Analysis of Variance
cv	Cultivar
et al.	Et all (and others)
e.g.	For example

Abbrevations	**Description**
etc.	Et cetera
Exp.	Experiment
Fig.	Figure
var.	Variety
FAO	Food and Agricultural Organization
SPSS	Statistical Package for the Social Sciences
GPS	Global Positional System
E.v.a	Equal variance assumed
E.v.n.a	Equal variance not assumed
B.Sc.	Bachelore of Science
M.Sc.	Master of Science
Ph.D.	Philosophy of Doctora

1. INTRODUCTION

Corn (*Zea mays* L.) is one of the most essential crops widely planted in the world after wheat and rice.The cultivated area for crop production in the world is 4.5% and 3.5% of this ratio are belonged corn (Ahmad et al., 2011; Khodarahmpour, 2012). There are more than 3500 different uses for corn products(Milind and Isha, 2013).There are 7 types of corn; waxy, pod, flint, dent, flour, popcorn and sweet corn. The most cultivated forms of corn are dent, popcorn and flint corn (Elci et al., 1994).This crop is used as food by human and animals. However, it is also produced for medicinal and industrial usages. Industrial production of several items such as alcohols, disposable containers, fabrics, oils, papers, plastics, proteins, starches, and sugars was reported for maize (Johnson et al., 2012). Sweet corn (*Zea mays* L. var. *saccharate*, Sturt) is a mutant corn having the locus Su (Sugary) on chromosome number 4. The genetic variation responses the increase of soluble sugars and polysaccharides in the endosperm of seeds (Tracy, 2000).Sweet corn consists of approximately 5 to 6% sugar, 10 to 11% starch, 3% water-soluble polysaccharides, and 70% water. Sweet corn also includes moderate levels of protein, vitamin A, and potassium (Walker, 2009; Najeeb et al., 2011).

Sweet corn is utilized as vegetable and basic nourishment for people. Sweet corn (*Zea mays* L. var. *succharata*) is a standout amongst the most famous summer vegetable harvests developed on the world. Like pepper, pumpkin, squash and beans, sweet corn is local to the new existence where it has been developed for over 4000 years ago. Nowadays, sweet corn is one of the most widespread vegetables in the world and its consumption is increasing due to its taste and abundance in vitamins. The processing (canning and freezing) and fresh vegetable value of sweet corn is in the second and fourth order respectively if compared with the other vegetables (Afsharmanesh, 2013). The material capacity within the endosperm is composed of sugars-glucose and sucrose and of middle polysaccharides items (Naik, 2011).

Fresh bean is one of the foremost cultivated leguminous vegetables within the world, and it is the foremost critical nourishment vegetable. Fresh bean (*Phaseolus vulgaris* L.) are well known vegetable and do settle a few required nitrogen, but the N settling microscopic organisms are not as dynamic as with other vegetables.The common fresh bean has been cultivated in Mexico for at least 7000 years ago.There are two dominant continents for production of fresh bean Asia and Europe with more than 50 and 30% of world production respectively. The leading world production countries China and Turkey product more than 17 and 13% of the world respectively(Rubatzkey and Yamagucbi, 1999).The total cover area available to production annual fresh beans in the world is greater than 960 272 ha, also the total fresh bean production of the world is 6 814 403 tonnes (FAO, 2009). However, around the world, green beans are produced on 1.5 million ha, with a production of 20.7 million tons in 2012 (FAO, 2012).

It is the foremost imperative vegetables in the local market, including green beans, protein supplementation in cereals and nutritional habit based on root products. In addition, it serves as green vegetables and gives protein, calories, vitamins, and minerals such as calcium, phosphorus and iron (Lemma, 2003).

Organic fertilizers are one of the most important sources of organic matters in the soil. Organic fertilizers can be a substitution to chemical fertilizers because they are increasing the plant with nutrients for a longer period, as well as increase soil fertility by increasing the activity of soil microorganisms (Belay et al., 2001). However, in the event that natural fertilizer was utilized as a complementary supplement source with chemical fertilizers, it would increment the commitment of fertilizers thus decreasing yield variability (Yan, 2010). Natural fertilizers are by items of existence, such as excrement and plant deny, natural fertilizers that are commonly utilized are composted animal excrement, compost, and household wastes. In this study we used mixture of organic fertilizer consist of sheep and goat fertilizer.

Intercropping is the development of two or more crops at the same time on the same field. It moreover implies the developing of two or more crops on the same field with the planting of the moment edit after the primary one has completed its advancement. The basis behind intercropping is that the diverse crops planted are impossible to share the same insect pests and disease-causing pathogens and to moderate the soil (Sangakkara et al., 2003; Belel et al., 2014).

The arrange for dispersing of distinctive sorts of vegetables have been vital things within the intercropping, must be ideal in a design that will allow each to get greatest light, contract dispersing driven to shade on the clears out, will develop less enthusiastically and be less profitable (Willey, 1979). Intercropping can be utilized by smallholder ranchers to extend the differences of their items and for the solidness of their yearly yield through a more successful utilize of arrive and other resources

(Okonji et al., 2012). One vital reason intercropping is prevalent within the creating world is that it is more steady than mono-cropping. (Horwith, 1985). Intercropping principles into an agricultural operation increases diversity and interaction between plants, reduces erosion, improved nutrient cycling, and crop nutrient uptake and soil quality (Zhang, 2003), and the best-documented advantage of intercropping is reduced damage from insects, nematodes, and disease (Horwith, 1985).

Cereal and vegetables which have ended up a prevalent combination among ranchers were likely due to vegetables capacity to combat disintegration and raise soil maturity levels. Intercropping cereal and vegetables (Cereal + Legium) were suggested by Ullah et al., (2007). In this study weused the vegetable crops, sweet corn (*Zea mays* L. var. *saccharata*, Succar, F1) andfresh bean(*Phaseolus vulgaris* L. var. Istride).

Land Equivalent Ratio (LER) is the most widely used index for measuring the advantages of using intercropping systems on the combined yield of both crops (Mead and Willey, 1980). LER is calculated as the relative yield of a crop in an intercropping system to the yield of that crop in a monocrop system (i.e., intercrop yield/monocrop yield). A major advantage of using LER analysis is that it provides a standardized basis for comparing systems under different situations and different crop combinations (Francis and Decoteau, 1993).

The objectives of this study:

- To develop an effective intercrop system using a relatively short-growing legume, (fresh bean) and a relatively tall-growing cereal crop, (sweet corn).
- To study the effect of intercropping system on growth and yield of sweet corn and fresh beans.
- To know the effect of the organic fertilizer on growth and yield of sweet corn and fresh beans.
- To determine the effect of interaction between intercropping and organic fertilizer on growth, yield, macro and micro elements in the plants of sweet corn and fresh bean.
- To evaluate the Land Equivalent Ratio (LER).
- To analyze the different of macro and micro element in the plant.

The research was carried out to determine effect of intercropping and organic fertilizer on the growth, yield, macro and micro elements and Land Equivalent Ratio

(LER) of sweet corn (*Zea mays* L. var. *saccharate*, Sturt cv. Succar, F1) and fresh beans (*Phaseolusvulgaris* L. cv. Istride).

2. LITERATURE REVIEW

2.1. Vegetables

Vegetables are considered as basic for well-balanced diets since they supply vitamins, minerals, dietary fiber, and phyto-chemicals. Each vegetable contains a special combination and sum of these phyto-nutriceuticals, which recognizes them from other vegetables (Dias, 2012). Vegetables make up a major section of the count calories of people in numerous parts of the world and play a important part in human nourishment, particularly as sources of phyto-nutriceuticals: vitamins (C, A, B1, B6, B9, and etc.), minerals, dietary fiber and phytochemicals(Quebedeaux and Bliss, 1988; Winston and Beck, 1999; Wargovich, 2000; Ryder, 2011).

A few phytochemicals of vegetables are solid cancer prevention agents and are thought to decrease the chance of persistent illness by ensuring against free-radical harm, by adjusting metabolic actuation and detoxification of carcinogens, or indeed impacting forms that modify the course of tumor cells (Winston and Beck, 1999; Southon, 2000; Wargovich, 2000; Herrera et al., 2009).

Vegetable are used in every day by human, they are more important especially in terms of health and diet, they have been emphatically related with by and large great wellbeing, advancement of gastrointestinal wellbeing and vision, diminished hazard for a few shapes of cancer, heart illness, stroke, diabetes, frailty, gastric ulcer, rheumatoid joint pain, and other inveterate infections (Earlier and Cao, 2000; Keatinge et al., 2010). A significant vegetable diet has been related with a lower hazard of cardiovascular illness in people (Mullie and Clarys, 2011).

As indicated by the world health report of 2007, unbalanced weight control plans with low vegetable admission and low utilization of complex carbohydrates and dietary fiber are assessed to cause some 2.7 million passings every year and were among the main 10 chance components adding to mortality (Silva, 2010). The precise components by which vegetable utilization lessens human infections have not yet been completely seen, in any case, the general consensus among doctors and nutritionists is that phyto-nutriceuticals in vegetables are in charge of moderating a portion of these ailments. A world vegetable overview demonstrated that 402 vegetable yields are developed around the world (Kays and Dias, 1995; Kays, 2011).

Some of the vegetables are grown in Iraq as follow: tomato, pepper, cucumber, potato, watermelon, melon, squash, okra, fresh bean, broad bean, peas, cowpea, eggplant, chilli, celery, onion, garlic, cabbage, lettuce, sweet corn, radishes, turnip, sunflower, cauliflower, spinach, arugula, dill, pumpkin, cabbage, broccoli, etc.

2.2. Sweet Corn

Corn (*Zea mays* L.) is local to America and has been developed in Central America in 3500 BC. It was a critical nourishment of the Incas, Aztecs, and Mayas of Mexico, just as the precipice inhabitants of the southwestern United States. Iroquois in Pennsylvania and New York grew an assortment of sweet corn that turned blue as it developed. Cortés conveyed corn to Spain, and from that point it was immediately brought into France and Italy (Orzolek et al., 2000). Corn is one of the most essential crops widely planted in the world after wheat and rice. The cultivated area for crop production in the world 4.5% and so 3.5% of this ratio are belonged to corn (Ahmad et al., 2011; Khodarahmpour, 2012).

There are more than 3500 different uses for corn products (Milind and Isha, 2013).There are seven types of corn; waxy, pod, flint, dent, flour, popcorn and sweet corn depending on the type of carbohydrate stored in the ear. The most cultivated forms of corn are dent, popcorn and flint corn (Elci et al., 1994). This crop used as foodby human and animals. However, it is also produced for medicinal and industrial usages. Industrial production of several items such as alcohols, disposable containers, fabrics, oils, papers, plastics, proteins, starches, and sugars were reported for maize (Johnson et al., 2012).

Sweet corn (*Zea mays* L. var. *saccharata*, Sturt) is a mutant corn having the locus Su (Sugary) on chromosome number 4. The genetic variation responses the increase of soluble sugars and polysaccharides in the endosperm of seeds (Tracy, 2000).Sweet corn gets its name from special genes that avert or hinder the typical change of sugar to starch amid piece advancement. Notwithstanding the different sugar types, sweet corn cultivars contrast in part shading (yellow, white, and bicolor) and development times- early (under 70 days), middle of the season (70 to 84 days), and late (over 84 days) appeared by Orzolek et al., (2000).

Fresh sweet corn (*Zea mays* L. var. *saccharata*) has been eaten up broadly by boiling or by barbecuing since past occasions. In Turkey, sweet corn is provided from dent corn and flint corn generally. Generation and utilization of sweet corn has expanded quickly as of recent. Sweet corn is a standout amongst the most famous vegetables in the USA, Canada and Australia. It is getting to be mainstream in India and other Asian nations. Sweet corn varies from different corns (field maize, popcorn and decorative) in light of the fact that the pieces have high sugar content in the milk on early batter organize. It is consumed in the immature stage of the harvest (Orzolek et al., 2000; Jett, 2006).

The flavor of sweet corn portions is 25-30% better than typical corn. At ideal market development, sweet corn will contain 5 to 6% sugar, 10 to 11% starch, 3% water-dissolvable polysaccharides, and 70% water. Sweet corn likewise contains moderate dimensions of protein, vitamin A (yellow assortments), and potassium (Walker and Dickerson, 2009; Najeeb et al., 2011). In the most recent year's utilization of sweet corn as boiled ear increments in beach front areas quickly. Kernel colour, sugar rate and yield are essential attributes for handling industry early and late out of season generation in the sweet corn for crisp utilization is of incredible criticalness because of the boiled ears.

In sweet corn produced for fresh utilization, generation in earliness and late season is very essential for giving the market new harvests. However, diverse seed sowing periods and seedling planting time are essential variables to expand developing season in various ecologies. In this way, broadened planting period influences yields to get progressively exposed to pressure brought about by climate and environment. Sweet corn must be gathered amid ideal development to get best eating quality, a limited limit of vegetable preparing offices and unfaltering interest for fresh produce require all collect period. Producers expand gather by stunning planting dates and plantin hybrids with different maturity dates (Williams, 2008). In like manner, a few investigations of sweet corn demonstrated that they have been directed in various ecologies with respect to seed sowing periods and it has been recognized that seed sowing times affect ear yield and quality.

In regions with boundless space, sweet corn is normally dispersed 10-15 inches in the line, with 36 to 42 inches between columns. A typical slip-up made by home gardeners is to plant sweet corn in just a couple of columns at any given moment. This generally results in poor fertilization and low yields. In little territories having restricted space, however with great soil dampness and natural issue, it is conceivable to plant in twofold columns that are 10 to 12 inches separated with 30 to

42 inches between each twofold line. Plants inside each line are separated around 12 inches separated. Planting at this spacings will give great fertilization and great yields as long as the squares are close to three or four arrangements of twofold columns wide and proper moist, nitrogen and weed control are given (Daniels, 2013).

Sweet corn is used as a vegetable and essential food for human beings. Nowadays, sweet corn is one of the most widespread vegetables in the world and its consumption is increasing due to its taste and abundance in vitamins. The processing (canning and freezing) and fresh vegetable value of this crop are the second and fourth respectively (Afsharmanesh, 2013). The capacity material in the endosperm is composed of sugars-glucose and sucrose and of moderate polysaccharides items (Naik, 2011). Albeit sweet corn must be reaped amid ideal development to acquire the best eating quality, a finite limit of corn processing facilities and enduring interest for crisp produce require a lengthened collect period (Williams, 2008).

2.3. Fresh Bean

Fresh beans are dicotyledonous plants, and individuals from the family, Fabaceae, forming part of the species *Phaseolus vulgaris*. The genus *Phaseolus* is originated in the American continent and a large number of its species is found in Mesoamerica (Freytag and Debouck 2002; Kaplan, 2003).Of the approximative 16 000 vegetables, more than 100 are developed regularly around the world (Winham et al., 2008).

Fresh bean is one of the most cultivated leguminous vegetables in the world, and it is the most important food legume. Asia and Europe are two dominant continents for fresh bean production with more than 50 and 30% of world production, respectively. The leading fresh bean producer countries, China and Turkey, meet more than 17% and 13% of the world production, respectively. The total cover area available to production annual fresh beans in the world are greater than 960272 ha, and the total fresh bean production of the world is 6814403 tonnes (FAO, 2009). Nonetheless, around the world, green beans are cultivated on 1.5 million ha, with a production of 20.7 million tons in 2012 (FAO, 2012).

Fresh bean is the most important vegetable legumes which are a rich source of, protein supplement in cereals and root crops based food habit, especially for the poorer populations of developing countries. In addition, in as green supply protein, calories, vitamin, fiber and minerals, for example, calcium, phosphorus, and iron (Lemma, 2003). The green pod is nutritionally rich which contains on an average of 1.7% protein, 4.5% carbohydrate, 1.8% fiber, calcium 50 mg, magnesium 29 mg, phosphorous 28 mg and iron 1.7 mg per 100 g of the pod (Shanmugavelu,1989).

Fresh beans have delicate pods with decreased fiber harvested before the seed development stage. Fresh bean is also known French bean, garden bean, green bean, consumable podded bean, string bean, snap bean or vegetable bean. As the name suggests, snap beans break effectively when the case is twisted, radiating a particular perceptible snap sound. The units of snap beans (green, yellow and purple in shading) are collected when they are quickly developing, beefy, delicate (not extreme and stringy), brilliant in shading, and the seeds are little and immature (8 to 10 days in the wake of blooming) (Singh et al., 2011; Singh et al., 2014; Singh and Singh, 2015).

Fresh beans contribute for a well-balanced diet, exhibiting healthful benefit against human disease, which are common to green vegetables (Byers and Perry, 1992). There are various herbal assortments of the species *Phaseolus* that change as far as development propensity, seed and pod attributes, agronomic highlights, reaction to biotic and abiotic stresses (Kay, 1979).

2.4. Intercropping and Advantages of Intercropping

Intercropping is the cultivation of two or more crops simultaneously on the same field (Willey, 1979; Sangakkara et al., 2003). There aregenerally four types of intercropping mixed or multiple cropping, relay cropping, row intercropping and strip cropping.Intercropping can be utilized by small farmers to expand the variety of their crop and the stability of their yearly yield through the powerful utilization of land and different assets (Khan et al., 1999). Legumes are known to fix air nitrogen, hence improving soil richness, and meeting the N needs of oats (Manna et al., 2003).

Different editing for sustenance generation is in boundless use by ranchers in the hotter area of the world at all dimensions of horticultural innovation. However, the type of various editing changes from territory to region contingent upon the ranchers' all out assets (Andrews and Kassam, 1976). Intercropping gives a quick and great ground spread and furthermore enables the roots to soil supplements at different complexities. The traditional ranchers appear to have unknowingly planned their cropping the framework with a perspective on keeping up the soil fruitfulness in light of the fact that intercropping produces a steady and maintainable agro-biological system (Steiner, 1991).

Concurring to Mehdizaheh et al. (2013), the need to receive eco-friendly rural practices for economical nourishment generation is of intrigued universally. Due to the high poverty rate among the country populace, rural input endowments separated from being an instrument of advancing agrarian development can too be seen as a social assurance instrument of guaranteeing get to to inputs, and get to and accessibility of nourishment to vulnerable band (Dorward et al., 2006).

Producers and researchers carry out various cropping systems to extend efficiency and sustainability by practicing crop rotation, really cropping system, and intercropping system of yearly vegetable legumes with cereals. Intercropping of cereals with vegetable legumes has been well known in tropics (Tsubo et al., 2005). The outcomes about moreover uncovered that higher leaf zone record was achieved in intercropped maize than the soles in spite of the fact that not noteworthy from each other. In addition, comparable to the leaf zone file, plant stature of intercropped maize was not altogether influenced by the cropping framework and after, that noteworthy variety was observed on the yield of maize due to fertilizer rates. On the other hand, the effect of the cropping system was importantly decreased within the leaf zone per plant of the companion crops (Zerihun et al., 2013).

Competition among mixtures is thought to be the major perspective impressive harvest as compared with single cropping of cereals. Species or cultivar selections, seeding proportions, and competition capability inside combinations may influence the development of the species utilized in intercropping frameworks, diverse seeding proportions or planting designs for cereal-legume intercropping have been practiced by numerous researchers (Santalla et al., 2001; Karadag and Buyukburc, 2004; Carr et al., 2004; Agegnehu et al., 2006; Banik et al., 2006; Dhima et al., 2007).

The essential advantage of intercropping is the more productive utilization of the accessible assets and the expanded efficiency compared with each sole edit of the mixture (Willey, 1979; Li et al., 1999; Hauggaard-Nielsen et al., 2001; Dhima et al., 2007). An alternate to harvest for evaluate the advances of intercropping is to utilize units such as financial units or nutritional values which may be similarly connected to component crops (Willey, 1985).

Intercropping, various cropping frameworks, has been practiced customarily by small-scale farmers within the tropics.Especially, cereal and legume intercropping is recognized as a common cropping framework all through tropical developing country (Ofori and Strict, 1987). Characteristically, cereal crops such as maize(*Zea mays* L.), millet (*Pennisetum glaucum* L.) and sorghum (*Sorghum bicolor* L.) are overwhelming crop/plant species while vegetable crops such as beans (*Phaseolus vulgaris* L.), cowpea (*Vigna unguiculata* L.), groundnut (*Arachis hypogaea* L.), pigeonpea (*Cajanus cajan* L.) and soybean (*Glycine max* L.) are the related plant species. Intercropping frameworks have been declared to be more profitable than sole crops developed on the same area (Kiari et al., 2011). In a previous study, it was observed that a cereal crop following a legume performed better than that grown on land that had no legume (Mureithi et al.,2000).

According to Saha et al. (2010), that the cereal-legume intercropping is an imperative agronomic application, in which the productivity of the framework as a entirety is as a rule way better than that of each component autonomously. Intercropping of maize and a legume for silage generation may increment protein generation in ranges where on-farm generation of protein for dairy animals is inadequately. At the same time, legumes, both alone and as an intercrop with cereals, have been supported not as it were for yield increase but too for upkeep of soil health, especially in degraded soils (Pogue and Arnold, 1979; Herbert et al, 1984; Banik and Bagchi, 1993). Sustainable product generation, requires cautious administration of all supplement sources accessible in a cultivate, especially in maize-based cropping frameworks. These incorporate inorganic fertilizers, natural fertilizers, and integration of vegetable crops in cereal-based mono-cropping (Negassa et al., 2007).

Intercropping led to balance between plant in light, water, and supplements are more totally retained and changed over to crop biomass, over time and space as a result of contrasts in competitive capacity for growth assets between the component crops, which misuse the variety of the mixed crops in characteristics such as rates of canopy improvement, last canopy measure (width and tallness), photosynthetic adjustment of canopies to irradiance conditions, and rooting depth (Tsubo et al., 2001).

Ijoyah (2012), showed that in the review of the intercropping system, studies on crop mixture have recently focused on the cereal-vegetable intercropping system, such as maize-okra, maize-tomato, maize-leafy green, maize-egusi melon, maize-cauliflower amongst others, from the reviewed results, obtained, it can be concluded that it is advantageous intercropping cereals with vegetable crops. It was founded highly complementary and suitable in the mixture. The efficient use of basic resources in the intercropping system depends partly on the inherent efficiency of the individual crops that make up the system and partly on complimentary effects between the crops (Willey and Reddy, 1981).Intercropping between high and low canopy crops is a common practice in tropical agriculture, and to improve light interception and yields of the shorter crops requires that they are planted between sufficiently wider rows of the taller plants (Ijoyah and Jimba, 2012).

A major cause of cropping frameworks is the lessening in soil efficiency that goes with most frameworks of ceaseless development, whereas intercropping more often than not incorporates a legume which fixes nitrogen, and which may give a few benefits to the framework, since the cereal component depends intensely on nitrogen for most extreme surrender. Legumes enhance soil by settling the air nitrogen changing it from an inorganic frame to shapes that are accessible for take-up by plants. Organic fixation of air nitrogen can supplant nitrogen fertilization entirely or in portion. When nitrogen fertilizer is finite, natural nitrogen fixation is the major source of nitrogen in legume-cereal mixed cropping systems (Ofori and Strict, 1987).

The nature and size of crop-weed competition diverge impressively between mono-crop and intercrop combinations. Crop-weed competition is decided by development propensity of the edit, intercropping maize with vegetables such as okra, egusi melon and leafy green impressively decreased the weed intensity compared with the mono-cropped maize by the diminish inaccessible light for weeds (Dimitrios et al., 2010). Compatible to Beets (1990), expanded leaf cover within the intercropping framework makes a difference to diminish weed populations once the crops are set up. Intercropping promises to be a really promising cultural application within the diminishment and control of pest and diseases. The crop of an intercropping framework may act as a obstacle against the spread of pest and infections, which were high in monocropping compared to intercropping, and the bother and disease were less in maize-tomato intercropping compared to tomato alone (Trenbath 1993; Pino et al., 1994).

Choudhary et al. (2014), defined that the intercropping maize-cowpea at a push extent of 1:2 gave higher yield and supplement take-up, and brought down nutrient mining by weeds with higher returns. In a zone where weeds are the major competitor with maize for site-specific assets, intercropping maize with cowpea at a push extent of 1:2 or 1:5 will offer assistance to stifle weeds conjointly to get higher maize comparable surrender. Higher yield gave way better returns. The incorporation of legumes increased the take-up of nutrient by maize. Intercropping has been considered beneficial in terms of economy of space, sparing on culturing, utilize effectiveness of supplement and humidity in unused space. Intercropping, through more compelling utilize of water, nutrient and sun based vitality, can altogether improve crop efficiency compared to the development of sole crops (Yildirim and Guvenc, 2005).

Benefits of consolidating intercropping principles into an agrarian operation increments differences and interaction between plants, arthropods, well evolved creatures, feathered creatures and microorganisms coming about in a more steady crop-ecosystem and a more productive utilize of space, water, daylight and nutrients. Furthermore, soil health is benefited by increasing ground coverage with living vegetation, which reduces erosion, and by increasing the quantity and diversity of root exudates, which enhance soil fauna. This collaborative type of crop management mimics nature and is subject to fewer pest outbreaks, improved nutrient cycling and crop nutrient uptake, and increased water infiltration and moisture retention. Soil quality, water quality and wildlife habitat all benefit(Zhang, 2003).The expanding concern on agricultural maintainability favors the support of the intercropping frameworks, due to a positive impact on soil preservation and change of soil richness, more steady yields of intercropping frameworks using natural resources more successfully (Andrews and Kassam, 1976).

The intercropping of legumes with cereals is of specific significance in natural farming to extend yield soundness and diminish weed repression and diseases (Hauggaard-Nielsen et al., 2009; Corre-Hellou et al., 2011). However, found within the consider on vegetable and cereal intercropping has been significant yield focal points of intercropping compared to sole cropping, with a arrive identical proportion (LER) of up to 1.34 and more noteworthy than one (Andersen et al., 2004; Ghaley et al., 2005). Yildirim and Turan, (2013), discoveries within the consider were conducted to decide the impact of intercropping lettuce-broccoli on development and yield along 2009 and 2010.

2.5. Organic Fertilizer and Advantages of Organic Fertilizer

Organic fertilizers are the sources of organic matter within the soil. Organic fertilizers can be an alternate to chemical fertilizers since they give the plant with supplements for a longer period, as well as they progress soil productiveness by expanding the action of soil microorganisms (Belay et al., 2001). Nevertheless, on the off chance that an organic fertilizer is utilized as a adjusting supplement source with chemical fertilizers, it will increment the impact of fertilizers to yield, hence diminishing yield inconsistence (Yan and Gong, 2010).

The results of Chivenge et al. (2011), showed that the addition of organic resources could ameliorate nutrient storage while crop yields are augmented and more so for high quality organic resources. The complimentary using of organic manure and mineral fertilizers have been proved to be a sound soil fertility management strategy in many countries of the world (Lombin et al., 1991).

Other benefits of organic fertilizers incorporate improvement of nitrogen accessibility, enhancement of soil structure and water maintenance and expanded soil organicmatter (Li et al., 1990; Ancheng and Sun, 1994).In an experiment to study the role of organic fertilizers and chemical in increasing the production of wheat, where the use of different amounts of organic fertilizer and chemical, found that the addition of organic fertilizer with chemical fertilizers gave an increase in production in all treatments (Nanwalet al., 1998).

The organic fertilizers, which comprise primarily of wooden debris, contain generally expansive rates of lignin and lignin-cellulose complexes, transcendently decayed by fungi. Within the case of horse fertilizer, the expanded fungal colonization may be due to analyzing by the fungal, caused to improve soil properties (Scheller and Joergensen, 2008). The application of organic fertilizers significantly expanded soil microbial biomass such as C, N, and P at all examining days. In most cases, this increase was significantly higher within the fertilizer than within the compost treatments, in spite of the reality that identical sums of organic C were included. This may be due to the higher substance of more promptly decomposable C fractions within the horse fertilizer, it may moreover be due to the higher microbial biomass substance within the excrement itself (Gattinger et al., 2004; Rochette et al., 2006).

Another advantage from the expanded utilize of organic materials is that it can offer assistance to illuminate contamination issues caused by agro-industrial wastes.

However,the soil must not be seen as a dumping ground for organic residual. In the event that as well much nitrogen fertilizer is connected, whether within the shape of organic matter or chemical fertilizer, a few of the abundance nitrogen is transformed over to nitrates, which are destructive to human wellbeing (Preap et al., 2002).

According to Sugiyanto (2011), stated that organic fertilizers have increased the farmers' incomes and improved the soil fertility. In general, the policy encourages reuse of organic fertilizer has been a positive response by farmers. Ketcheson and Beauchamp (1978), showed thatthe manure treatment without N fertilizer gave yields comparable with any other treatment. Badaruddin et al. (1999), found that the addition of 10 tons of organic manure ha^{-1} gave the best increase in production, with 14% compared with the treatment of the witness, and the factors that took the amounts of chemical fertilizer equivalent to the amount contained in organic fertilizer gave the lowest increase in production, with 5 %, indicating that organic fertilizer is a growth factor in addition to containing nutrients.

Organic agriculture and utilizing organic fertilizer looks for, at slightest in rule, to utilize nature as to demonstrate planning agriculture frameworks. Since nature reliably coordinating or its plants and animals into the assorted area, a major fundamental of feasible agribusiness is to form and keep up differences. Differences is nature's plan of intercropping, through more compelling utilize of water, nutrients and sun based vitality, can altogether upgrade edit efficiency compared to the development of solo crops (Francis, 1989). However, the nutrients contained in organic excrements are leaved more gradually and are stored for a longer time within the soil, thereby subsequently guaranteeing a long leftover impact (Sharma and Mittra, 1991). The utilization of natural fertilizers as a source of N and other nutrients for plants can enormously decrease the natural issues related with the utilize of inorganic fertilizers (Tilston et al., 2005). Organic material such as barnyard fertilizer enhances strides soil physical chemical properties that are imperative for plant development (Synman et al., 1998). Organic fertilizers has positive impact on root development by progressing the root rizosfer conditions (structure, mugginess, etc.) additionally plant development is energized by expanding the populace of microorganisms (Shaheen et al., 2007).

According to Mehdizadeh et al. (2013), that the cost of inorganic fertilizers is increasing enormously to the extent that they are out of reach for resource poor farmers, farmyard manure application has been a noble and traditional practice of maintaining soil health and fertility. The use of organic fertilizers such as farmyard manure, resultsin higher growth, yield and quality of crops farmyard manure enhances soil organic matter, humus content, soil water holding capacity, infiltration rate, aeration, porosity, moisture conservation, cation exchange capacity, and water stable aggregates, while decreasing bulk density (Benbi et al., 1998).

Organic fertilizer contains macro-nutrients, basic micro scale nutrients, numerous vitamins, supported factors variables like indole acidic corrosive (IAA), giberelic corrosive (GA) and useful microorganisms (Sreenivasa, et al, 2010). It has been demonstrated to move forward crop development by moving forward the soil's physical, chemical and organic properties (Mahmood et al., 1997). It additionally has an advantage over other organic fertilizer like green fertilizer in terms of having a shorter breakdown period for decay (Chupora, 1995). Organic fertilizer can move forward soil– water - plant relations through altering bulk thickness, add up to porosity, soil water connection and, thus, expanding plant development and water utilize effectiveness (Obi and Ebo, 1995).

Gore and Sreenivasa (2011), expressed that the application of fluid natural fertilizer advances organic action in soil and improves supplements accessibility. Awad et al. (2002), expressed that organic fertilizer contains tall levels of moderately accessible nutrientscomponents, which are basically required for plant development. Sustainability in agro-ecosystems includes ecology friendly methods based on organic and non-chemical strategies (Bonato and Ridray, 2007). Agriculture generation is gone up against with the challenges of distinguishing administration alternatives that will maximize the efficiency of consistent crops in a conventional croppingsystem (Gobeze et al., 2005).

2.6 The Effect Of Intercropping on Growth, Yield, Macro and Micro Elements in The Plant.

The fundamental reason for higher yields in intercropping was that the component crops are able to create way better generally utilize of natural resources than developed independently (Willey, 1979). Ogindo and Walker (2005), evaluated in the study, the intercropping help the plants to conserve water generally of the early tall leaf region. Numbers of pods per okra plant were lower in maize-okra intercropping compared to mono-cropping due to nutrients and light competition

(Ijoyah and Jimba, 2012). Plant height of chickpea increased by intercropping compared to mono-crop. This is due to increased competition for light (Sadeghi et al., 2002).However, the other researchers shows that the intercropping maize-legume caused decrease of the plant height in legume compared to mono-crop (Panwar et al., 1987; Sachan and Yotan, 1992; Mahfooz and Miger, 2004; Alizade et al., 2009)

Jeyakumaran and Seran (2007), appeared that when two morphologically different crops with diverse periods of development are intercropped, light is the imperative figure that decides yield. Yildirim and Turan (2013)'sstudy were conducted to determine the effect of intercropping lettuce-broccoli on growth and yield during 2009 and 2010. Then, intercropping systems compared to sole crop did not influence in a few development characteristics and yield of broccoli but affected for weight per plant. As appeared within the results of Amoah et al. (2012), the number of panicles per hill and the number of spikelets per panicle of rice were higher beneath intercropping than beneath sole cropping. Normally, rice grain yield was essentially lower beneath the intercropping than beneath the sole cropping.

Nasrollahzadeh et al. (2014) indicated that the intercropping and time of weeds control treatments had noteworthy impacts on all of the characteristics. Implies compression appeared that the number of pod within the primary stem, the number nod of the most stem, numbers of lateral stem, grain yield and harvest index were maximum in pure stand with complete control of weeds and in intercropping with no control of weeds were minimum. As the expansion of intensity in plant distinctive designs and increment of term of weeds control make diminish this characteristics exemption plant stature. Plant height of chickpea in intercropping treatments with no weeds control essentially was higher than pure stand and weeds control treatments.

Manna et al. (2003), found that intercropping maize with legumes pea (*Pisum sativum* L.), pigeonpea (*Cajanus cajan* L.), and soybean (*Glycine max* L. Merril) was a great procedure to essentially increment maize efficiency. Moreover, they found a few legumes species performed way better than others. This research was conducted to look at the impact of intercropping diverse vegetable species on development, and relative chlorophyll substance of sweet corn.

Consequently Ijoyah and Jimba (2012) found that the corn plant tallness at blooming, days to 50% blooming, the number of cobs per plot, cob length, cob diameter, cob weight, the weight of 1000 grains and corn yield were not altogether influenced by intercropping. Maize plant height at blooming, days to 50% blooming, the number of cobs per plot, cob length, cob diameter, cob weight, the weight of 1000 grains and maize yield were not altogether influenced by intercropping (Legwaila et al., 2012). Intercropping maize-climbing bean with ideal manure combination made the highest amount of the yield of component crops and expands the richness status of the soil properties, at that point the combination utilizes of inorganic and organic fertilizers offer feasible generation of maize-climbing bean intercropping framework, the yield of the intercropping were up to 443 kg ha^{-1} and 5132 kg ha^{-1} higher for climbing bean and maize than yield reached by developing component crops separately (Abera et al., 2005).

Yield advantages in intercropping framework are mainly since of differential utilize of growth resources by the component crops. The most way for complementarities to happen is when the growth designs of component crops change in time. The yield advantages in intercropping framework are related with a more full utilize of environmental source overtime (Willey et al., 1986). The outcomes that the intercropping possesses more prominent arrive utilize and gives higher net returns it gives the next cash return than expanding one edit alone (Kurata, 1986; Brintha and Seran, 2009). Concluded by Ijoyah and Dzer (2012), which the intercropping gave more prominent combined yields and money returns than those gotten from either grown alone. Intercropping of maize and cauliflower gave a high yield with higher quality compared to mono-cropping, it was detected by (Khatiwada, 2000). Sharma and Tiwari (1996), showed in the results, that the maize intercropped with tomato gives the highest amount of yields and gave more noteworthy financial returns than those gotten from the component crops developed as sole.

Choudhary et al. (2014) outcomes that the individual yield of maize was higher below the sole maize system, the yield was same to that gotten by intercropping maize with a legume at row proportions of 1:1 and 1:2, increment in yield beneath sole maize was due to the fact that the wider available space in sole maize reduced the competition for light and nutrients, which probably provided positive physical environments to produce a higher yield. However, the yield of maize was diminished within the plot of maize intercropped with a legume at a row portion of 1:5. This can be due to the lessening in plant population of maize in these row combinations. The increase in yield below sole maize was watched in prior research (Ullah et al., 2007; Hugar and Palled, 2008). Numerous researchers have shown that intercropping with diverse vegetables was more beneficial and productive than sole crop, since the complementary impacts of intercrops calculated by (Guvenc and Yildirim, 2006).

Poonia et al. (2014), stablished within the outcomes that the appropriation of a balanced fertilizer administration approach will safeguard the higher productivity and returns from money spent, not only on nutrients but also on relay cropping enterprise. Inorganic crop accepting suggested measurements of fertilizers gave the most elevated productivity and benefits. However, it improved the cost of production than the combined utilize of the Recommended Dose of Fertilizers (RDF) and organic sources. Over the years, the combined application of the Recommended Dose of Fertilizers (RDF) and organic fertilizers anticipated to coordinate or exceed expectations the fertilizer based generation structure within the groundnut-pigeonpea transfer intercropping framework.

Yilmaz et al., (2008) appeared within the research decided that intercropping of maize with common bean and cowpea totally different planting patterns and mix-proportions may influence seed yield, competition between two species (maize and vegetables), and financial matters of the planting designs as compared to single editing of the same species cowpea intercropped with maize was more competitive than the common bean.

Generally, maize was the overwhelming species in all blends and planting designs. In spite of the fact that, vegetables have a lower yield in blend but are more costly in markets, singular planting of them would not reach the beneficial level picked up with maize or other cereals cited within the writing. In expansion, the proportion of extent moreover appeared to altogether influence the productivity of intercropping. Alhassan et al., (2012) assessed that the sole cowpea demonstrated predominant to intercropped cowpea with Bambara groundnut in dry grain yield add up to plant biomass, and gather list. Efficiency records demonstrated that Bambara groundnut/cowpea intercropping was profitable, but cowpea was the overwhelming component of this intercropping framework. Choudhary et al., (2014) demonsrated that the intercropping maize with French bean gave hardly higher K take-up over sole maize in both 2009 and 2010. Such higher take-up could be due to the way better accessibility and supply of N by the vegetable intercropped with maize. Comparable to the take-up of N, take-up of P and K appeared a comparable drift. Intercropping with vegetables caused the wide extend of organisms of plant rhizosphere to mobilize the inalienable P and K and supplements expanding their accessibility and take-up by plants.

An prior think about moreover uncovered more noteworthy supplement absorption within the maize-legume intercropping framework than the sole maize (Chalka and Nepalia, 2006). Intercropping maize with vegetables had a synergetic impact and suppressed weed development, which expanded the take-up of N, P, and K (Katsaruware, 2009; Maereka et al., 2009; Eskandari and Ghanbari, 2010). However, there are critical gaps within the literature with respect to the impact of diverse species of vegetable crops (Sangakkara et al. 2003), examined the impact of intercropping beans (*Phaseolus vulgaris* L.) and sunhemp (*Crotalaria juncea* L.) with corn (*Zea mays*L.) beneath sticky tropical condition of Sri Lanka on development, yield and nitrogen substance of maize in a long term think about. They found a critical increment within the examined factors, particularly amid the most recent seasons of their tests, in maize biomass, yield, and leaf nitrogen substance.

According to the outcomes of Ayoola and Makinde (2007), the impact of organic and inorganic fertilizers on the development and yield of cassava/maize/melon intercrop with a relayed cowpea. The outcomes about appeared that maize performed best in terms of development and yield with complementary application of inorganic and organic fertilizers. Melon yield beneath the different fertilizer treatments did not vary factually in both a long time. Cassava root yield with the complementary application was comparable with the yield from sole inorganic fertilizer treatment within the to begin with year of experimentation when sole organic fertilizer had an altogether lower yield.

The outcomes of De Pailhe (2014) evealed that in more than half of the intercropping frameworks, component crops had not adequate space to create appropriately and/or were not planted in particular lines, which would encourage the organization. Before the complexity of planning suitable intercropping frameworks, by alluding to the‘intercropping guideline’ and keeping records of cropping comes about, farmer ought to overcome such shortcomings and continuously move forward their intercropping strategy and cultivating comes about.

The N balance was most prominent and positive within the fertilizer treatment, followed by millet husks. Mineral fertilizer on the intercropped dual-purpose cowpea expanded the agronomic N utilize proficiency of millet by compared with fertilizer. The utilize of little amounts of mineral fertilizer on the intercropped dual-purpose cowpea, therefore, is the most excellent combination for limited N-resources-farmers. Single fertilizer, millet husks also mineral fertilizer, or year-alternative-application are too recommendable depends on ranchers accessibility to the sources (Omae et al., 2014).

Ayoola and Makinde (2011) appeared that the impact of natural and inorganic fertilizers on the development and yield of cassava/maize intercrop. Soil N, P, K, and Natural C was most expanded with 10 t ha -1 organic-based fertilizer and 5 t ha^{-1} OBF+NPK. Edit yields and soil supplement status diminished with no fertilizer application. Cassava/maize intercrop gives ideal yields and most noteworthy soil N, P, K increment with 10 t ha^{-1} organic-based fertilizer.

Chivenge et al. (2011), appeared that the expansion of natural assets may enhance nutrient capacity whereas edit yields are expanded and more so for high quality organic sources. Comes about have appeared that the Phosphorus (P), sulfur (S), iron (Fe), and manganese (Mn) substance of broccoli takes off did not shift altogether depending on cropping frameworks. Nevertheless, intercropping caused diminish in nitrogen (N), potassium (K), magnesium (Mg), calcium (Ca) and zinc (Zn) concentration compared to sole broccoli cropping.

2.7. The effect of organic fertilizer on growth, yield, macro and micro elements inthe plants

According to Chinthapalliet al., (2015), it would be wise to recommend the use of organic fertilizers for farmers seeking a better yield for optimum growth of legumes. Uyanoz (2007) evaluated in the study of organic and biological fertilizer applications increased significantly plant height, yield and the number of pods. Moreover, there were better results in organic fertilizers than chemical fertilizers in each experimental year. The results of Lukiwati (2012) showed that the combination of organic and inorganic fertilizers from different sources produced a higher yield of sweet corn.

As shown Silwana et al. (2007), in the results of the experiment was repeated during the next season without fertilizer treatments as Experiment 2. Fertilization, whether organic or inorganic, was found to enhance morphological parameters for both maize and *Phaseolus* bean. The importance of organic manure and its longtime usefulness in increasing productivity of maize/bean intercrop.Zerihun et al.

(2013)concluded that, the higher plant height and leaf area index was recorded under the different rate of integrated fertilizer application when compared with the control. However, the application of recommended manure resulted in the maximum number of effective nodules which did not significantly vary with the control.

Jannoura et al. (2014) concluded that, the application of C-rich organic manures such as yard-waste compost, particularly horse fertilizer enormously fortified soil microbial biomass records, which was reflected by increased pea yields within the sole and intercropped frameworks. In contrast, compost and particularly excrement application did not improve oat yields due to the poor seedling development. The shading impact of the intercropped cereal component has antagonistic impacts on nodulation, N2 fixation, photosynthetic rates and biomass of the intercropped vegetable component, but the LER values appeared that intercropped plants utilized development assets on normal 10–20% more efficiently. According to the natural fertilizer recuperated as particulate natural matter (POM) as well as the CO_2 generation, horse fertilizer was more promptly accessible to soil microorganisms than compost, driving to expanded grain yields of the succeeding winter wheat.

Pannde et al. (2015)studied on the response of sweet corn to different sources of organic manures like urea, sheet manure, poultry manure, green manure led to influence in combination on growth, yield and quality parameters. Choudhary et al. (2002) showed in the study nitrogen is an inevitable component of any fertilizer management program. In advanced commercial agriculture, utilizations of high analysis manures in an unequal way force extra issues of soil wellbeing such as corrosiveness, alkalinity, different supplements lacks, particularly the smaller scale and auxiliary nutrients. This outcomes about in an add up to misfortune of soil wellbeing, other than natural contamination and brings down efficiency. Yields in organic agriculture are lower than chemical farming amid starting a long time of hone and it takes a couple years to stabilize the yields. Nevertheless, within the long run, if properly followed, yields with organic cultivating would be distant more prominent than those gotten with chemical farming. Tremendous amounts of natural materials such as barnyard fertilizer, poultry fertilizer, pig excrement, vermicompost, green excrements and crop residues can substitute the inorganic fertilizers to a expansive degree to preserve the efficiency and natural quality.

Siavoshi et al. (2011) concluded that the organic fertilizer treatments (2.0 ton ha^{-1}) produced the better grain yield compared to non organic fertilizer. From the economic point of view, farmers can use the combination of organic fertilizer and reduced rate of inorganic fertilizers to boost the yield of rice as well as to maintain and improve soil health. Yolcu (2011) showed that the organic and chemical fertilizers have been significantly influenced on morphological, yield and quality properties and mineral contents of common vetch (*Vicia sativa* L.), led to an increase in some morphological traits and yield of the common vetch.

According to Nagar et al. (2016), the outcomes about showed that lower bulk thickness, pH and electrical conductivity, higher natural carbon and accessible N, P, K and altogether most noteworthy soil microbial biomass carbon and microbial populace (parasitic, bacterial and actinomycetes) were watched in pigeonpea + blackgram and pigeonpea + greengram intercropping over sole pigeonpea framework. Among combined utilize of natural fertilizer, FYM + phosphocompost and pigeonpea stalk + phosphocompost brought in advancement of physical, chemical and biological organic properties of soil over the suggested dosage of manure application. A system of cropping and organic fertilizer caused the integrated different practices of soil fertility maintenance is required. This will incorporate the utilize of more application between distinctive plants of particularly cereal/legume (Steiner, 1991).

Amujoyegbe et al. (2007) concluded within the outcomes about, whereas important improvement is ordinarily merited within the utilize of natural and inorganic nutrients sources in edit generation, the enhancement in yield, biomass, and chlorophyll due to inorganic fertilizer and poultry manure (IFPM) proposed that its utilize in crop production would help both the vegetative and the postanthesis improvement of the crops. Considering the impacts of the nutrients sources on the chlorophyll substance, there were critical impacts of the nutrients sources on the chlorophyll and typically more often than not apparent within the dull green coloration of such crops and a flag to nutrients productivity. In any case, the impact was assist watched to diminish resistance to dry season by the crops. It is subsequently suggested that for ideal execution of maize and sorghum, inorganic fertilizer and poultry manure (IFPM) or poultry manure (PM) may well be utilized by the subsistence farmer to diminish the high cost of fertilizer. Late season cropping of sorghum should be encouraged as it is more resistant to drought in case of rain failure.

The results of this study concluded that the single factors of organic fertilizer concentrations and also the interaction of two treatment factors greatly affected the parameters of growth and yield of red ginger rhizome (Soeparjono, 2016). Yoldas et al. 2011) concluded that, in the first year, organic fertilizer influenced K content, but did not influence N, P, Ca, Na, Mg, Fe, Zn, Cu and Mn contents of the onion bulb. In the second year, the treatments influenced Na content, but did not influence the others.According to the results of Fattah et al., (2019a and 2019b), findings increase of organic fertilizer to 25 ton ha^{-1} caused the increase of fresh yield and some of the growth traits of the sweet corn and fresh bean.

2.8 Land Equivalent Ratio (LER).

When two crops are grown together, yield advantages occur because of differences in their use of resources (Willey et al., 1983). Land equivalent ratio (LER) is the most common index adopted in intercropping to measure land productivity. It is often used as an indicator to determine the efficacy of intercropping (Brintha and Seran, 2009). LER is a standardized index that is defined as the relative area required by sole crops to produce the same yield as intercrops (Mead andWilley, 1980). It is formulated as follows:

LER = intercrop 1 / pure crop 1 + intercrop 2 / pure crop 2

LER = intercrop sweet corn /pure sweet corn + intercrop green beans / pure green beans

Total LER = LER sweet corn + LER green beans

LER sweet corn = intercrop sweet corn /pure sweet corn

LER green beans = intercrop green beans / pure green bean

LER value greater than one indicates greater effective and efficiency of land utilization in the intercropping system. The yield advantage indicators in vegetable cereal crops - vegetable legume crops intercropping system under different studies are shown under.As results of Ijoyah and Jimba (2012), intercrop okra yield was significantly affected, and increase yield and LER in 2009 and 2010 compared to mono-cropped okra. Total intercrop yield was greater than the component crop yield, either planted as sole or in the mixture.

Intercropping okra and maize gave land equivalent ratio (LER) values of 1.84 and 1.80 respectively, for years 2009 and 2010, indicating that higher productivity per unit area was achieved by growing the two crops together than by growing them separately. Maize sown at 50 000 plants per hectare into okra plots gave the highest LER values of 1.83 and 1.86 respectively, in years 2010 and 2011 (Ijoyah et al., 2012a). Maize-egusi melon intercropping gave LER values of 1.80 and 1.76 respectively, in years 2010 and 2011 (Ijoyah et al., 2012b). While, Khatiwada (2000) reported LER values of 1.50 and 1.40 respectively, in years 1999 and 2000, in a maize-cauliflower intercropping system. Sharma and Tiwari (1996) also reported LER values of 1.68 and 1.60 in a maize-tomato intercropping system. Ijoyah and Dzer (2012) reported that LER increased to a maximum of 45 % by intercropping maize with okra compared with the sole crop.

Ijoyah (2012) showed that in the review of the intercropping system, studies on crop mixture have recently focused on the cereal-vegetable intercropping system, such as maize-okra, maize-tomato, maize-leafy green, maize-egusi melon, maize-cauliflower amongst others, from the reviewed results, obtained, it can be concluded that it is advantageous intercropping cereals with vegetable crops. This is associated with greater intercropped yields, higher land equivalent ratio values greater than 1.0, the greater percentage of land saved and greater monetary returns.According to the results of Jannoura et al. (2014), the land equivalent ratio (LER) of intercropped peas and oats exceeded 1.0, indicating a yield advantage over sole cropping. Soil microbial biomass was positively correlated with pea dry matter yields both in the sole and intercropped systems.

In particular, LER verifies the effectiveness of intercropping for using the resources of the environment compared to sole cropping (Mead and Willey, 1980; Dhima et al., 2007). When LER is greater than 1, the intercropping favors the growth and yield of the species. In contrast, when LER is lower than 1, the intercropping negatively affects the growth and yield of plants grown in mixtures (Ofori and Stern, 1987; Caballero et al., 1995; Dhima et al., 2007).Dasbak and Asiegbu (2009), reported that the Land Equivalent Ratio (LER) values were greater than 1.0 in all pigeonpea/maize mixtures under both open-pollinated maize and hybrid maize mixtures in the two seasons of production. ICPL 87 had above 1.50 LER values in mixtures with both hybrid and open-pollinated maize in 2005 cropping season while ICP 7120 had above 1.60 LER values under open-pollinated maize in both 2005 and 2006 cropping seasons, the total income exhibited the great benefit of the intercrop.

According to Bilalis et al. (2005), the Land Equivalent Ratio (LER) values determined for all chosen parameters were statistically higher in control plots relative to plots treated with compost. In the maize-bean intercrop system, LER values were statistically higher than in maize-cowpea. A similar trend in the LER values was reflected by root system parameters. Statistically significant correlations were observed between LER values for above-ground plant characteristics and corresponding root characteristics, leading to the conclusion that the LER index may be used for root systems. Hadidi et al. (2011) showed that almost all the intercropping combinations with their row arrangements tested gave LER values more than one indicating the superiority of intercropping over sole cropping.

As shown in the results of Amoah et al. (2012), the land equivalent ratios (LER) increased under all the fertilizer treatments indicating the efficiency of the mixed-cropping system. The results of the experiment suggest that rice–cowpea mixed cropping under cow dung is a viable production option. Higher grain yield of maize and climbing bean was obtained from sole cropping compared to intercropping. LER values were significantly increased with N application. The LER values ranged from 1.15 to 1.42 indicting more productivity and land use efficiency of intercropping in terms of food production per unit area than separate planting (Abera et al., 2005).

3. MATERIALS AND METHODS

3.1. Location of experiment

The field experiment was carried out during two years (2017 and 2018 spring growing season) in a private farm in Qushtapa, 30 km far of center Erbil- province in Iraq, located to the south of Erbil city with global positional system (GPS) reading (360 ON, 44001E), (0411359, 03997002UTM) (Figure 1). The field experiment was practically in the first year (2017) started at the 1/ 4/ 2017 and was finished at the 1/7/2017. However, the field experiment was practically in the second year (2018) started at the 1/4/2018 and was finished at the 1/7/2018.Staying period of the plant in the field each year was three months (90 days) from planting seeds until harvest.

3.2. Field Experiment Design

The experiment was laid out in a split-plot design with three replicates (three blocks). The study included two factors:

1- Three systems of planting (single sweet corn , single fresh beans, intercropping one line sweet corn- one line fresh beans) (B_1, B_2, and B_3) respectively.

2- Five levels of organic fertilizer (mixed in sheep and goat manure) (0, 5, 10, 15 and 20) kg per experimental unit (A_1, A_2, A_3, A_4, and A_5) respectively.

Total number of experimental unit (45), the area of each experimental unit (plot size) (2.60m x3m = 7.8m^2), real area (12m x 53m = 636m^2) and total area (14m x 55m = 770m^2), the distance between blocks (1.5 m) and distance between experimental unit (1m). Each experimental unit had four rows of plant, each row consist of 12 plants and the number of plant in one experimental unit was 48 plants. Distance between rows (65 cm) and distance between plants (25 cm) were as shown in Figure 2.

3.3. Agricultural practices

Tillage, softening and combing of the field before to planting, and the process of dilution of the excess plants in the drilling, and the re-planting of plants not germinated in the drilling after two weeks of cultivation and the processof thinning seedlings were performed. The process of weedingwas 3-4 times during agriculture. In addition, the plants were sprayed once with insecticides, and plants to protect against viral and insect diseases.

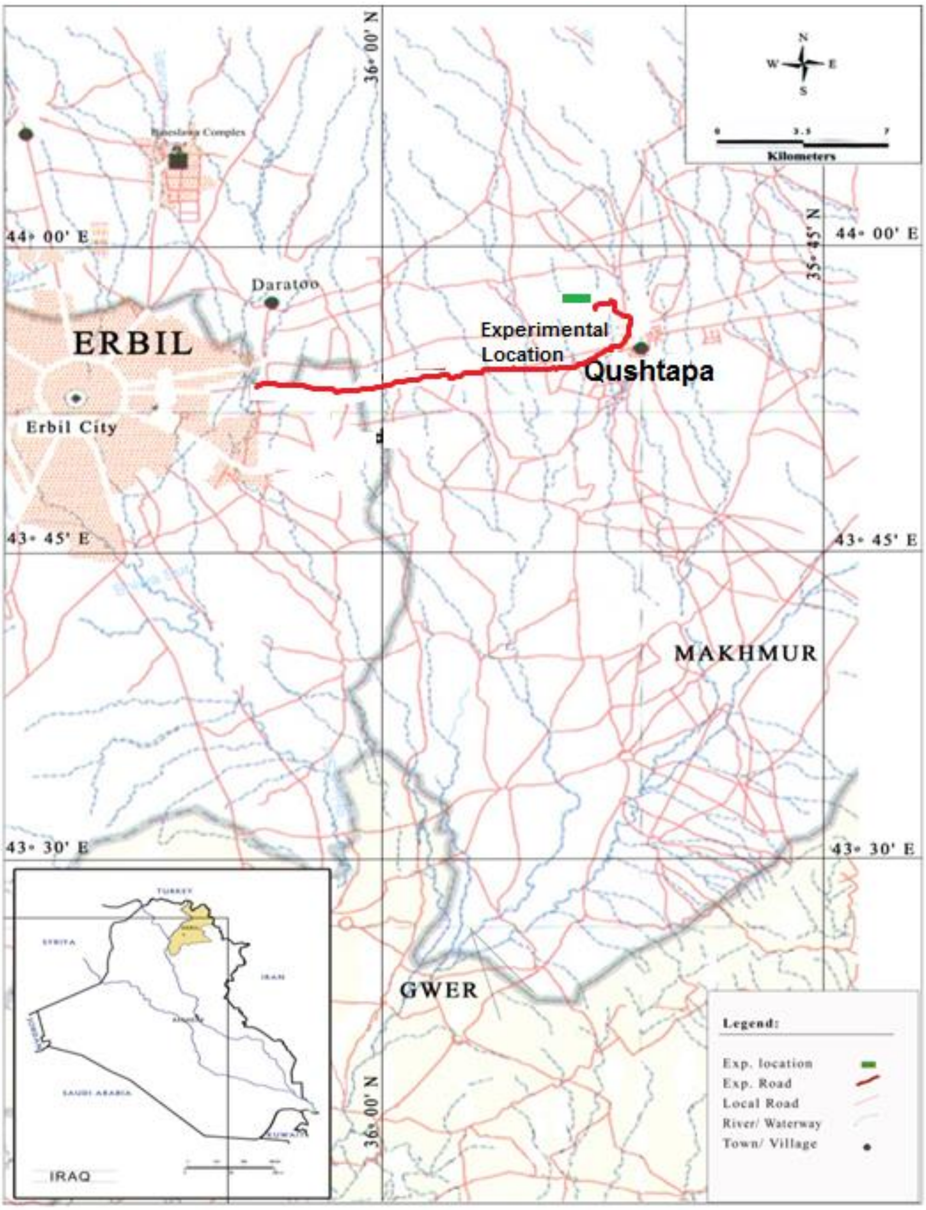

Figure 3.1. Location of field experiment.

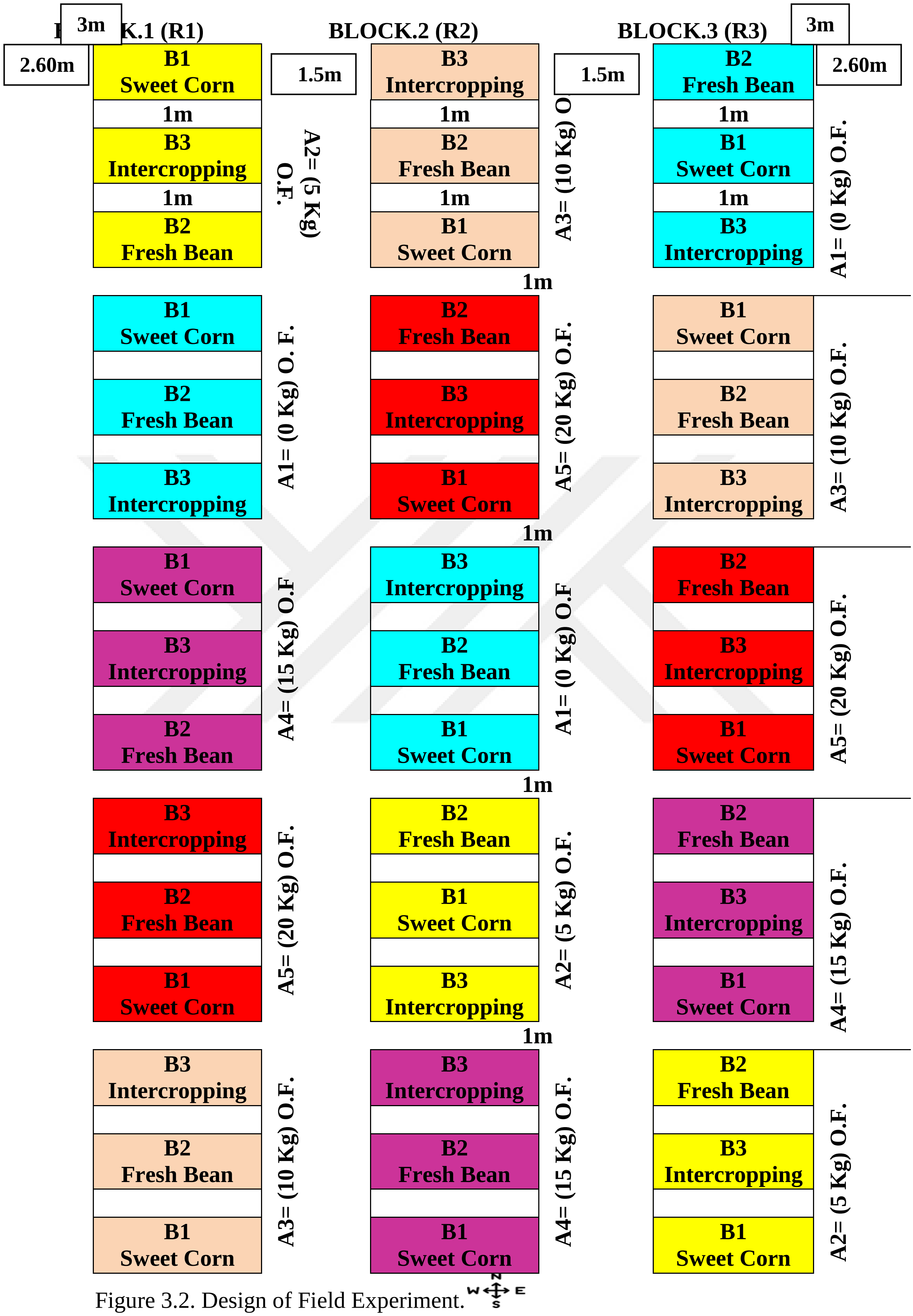

Figure 3.2. Design of Field Experiment.

3.4. Soil Sampling

The composite soil sample was taken by Jarrett auger from the surface layer(0-0.3m depth) before planting, then the samples were made and air dried, thoroughly mixed, ground passed through a 2mm sieve, and stored in plastic bottles for analysis.

3.4.1. Soil analysis

Some physical and chemical analysis were done on the 2 mm sieving samples as follows:

3.4.1.1. Physical analysis

The physical analysis was done as follows as shown in Table 3.1.

1- Particle size distribution

Particle size distribution was performed by the pipette method as described in Black, (1980).

2-Soil moisture content

The soil moisture content at (0, 33 and 1500 k Pa) was determined according to Black, (1980).

3- Density (Bulk density and Particle density)

The soil bulk density was determined according to Page et al., (1982)The soil specific gravity was measured by using pycometer as described by Black and Hartge,(1986).

3.3.1.2. Chemical analysis

The chemical analysis was done as follows as shown in Table 3.2.

1- Elctrical conductivity(ECe)

The electrical conductivity of the soil saturation extract was determined by using EC-meter as mentioned by Jackson, (1973).

2- Soil pH

The pH of the soil saturation extract was measured by pH-meter Jackson, (1973).

3- Organic matter

The oxidizable organic matter was determined by the Walkley and Black, wet dichromate oxidation procedure as described by Jackson, (1973).

4- Equivalent $CaCO_3$

Calcium carbonate was determined by acid(HCl 1*N*) neutralization method according to Richards as described in Rowell, (1996).

5- Active $CaCO_3$

Active lime was determined titrimetrically according to Kozekov and Yakovleva, (1977),anddescribe by Allen, (1974). Procedure as clarified below:

Shaking soil with 0.2Nammonium oxalates solution to precipitate calcium oxalate and the excess ammonium oxalate was determined by potassium permanganate.

6- Cation exchange capacity (CEC)

The CEC was determined by using an ion exchange process method using 1.0M sodium acetate (NaOAc) as mentioned by Rowell, (1996).

7- The residual phosphorus in soil

It has been extracted by using distilled water with 0.01 M KCL and determined spectrometrically by the method of Murphy and Riley, (1962) as described in Black, (1980) by using the spectrophotometer.

8- Soluble cations and anions

The soluble cations and anions was determined as follows:

a- Calcium and magnesium

Calcium and magnesium are determined using 0.01N EDTA titrimetric method as described in Black, (1980).

b- Sodium and Potassium

According to Jackson (1973),they were determined sodium and potassium using Corning 400 Flame photometer.

c- Carbonate and bicarbonate(CO_3HCO_3)

These were determined by titremetric method using 0.01N HCL and phenolphthalein and methyl orange as indicators as described in Black, (1980).

d- Chloride (Cl^-)

Chloride was determined titremetrically by Mohr method as described in Black, (1980).

e- Sulphate

Sulphate was indirectly determined from combined Ca and Mg by titration with 0.01*N* EDTA as explained in Jackson, (1973).

f- Iron, Manganese, Zinc andCopper:

Fe, Mn, Zn and Cu were extracted using DTPA-solutionas described inLindsay and Norvell, (1978).

Table 3.1. Some physicalproperties of the studied soil before planting

Physical Properties		Value
Particle Size Distribution	Sand	118 g kg^{-1}
	Silt	432 g kg^{-1}
	Clay.	450 g kg^{-1}
Textural Name	**Silty Clay**	
Density	Bulk Density	1.325 g cm^{-3}
	Particle Density	2.550 g cm^{-3}
Water Content	Moisture content	58.41 at 1500 k Pa
	Moisture content	31.45 at 33 k Pa
	Moisture content	16.91 at 0 k Pa

Table 3.2. Somechemical properties of the studied soil before planting

Chemical Properties	Value	Chemical Properties	Value
PH	7.86	Total Nitrogen	0.80 g kg^{-1}
ECe	0.50 dS m^{-1}	Available - P	9.3 mg kg^{-1}
CEC	22.87 Cmolc kg^{-1}	Carbonate Mineral	250 g kg^{-1}
Organic Matter	9.7 g kg^{-1}	Active $CaCO_3$	15.55 g kg^{-1}
Iron	2.98 mg kg^{-1}	Copper	0.80 mg kg^{-1}
Manganese	2.77 mg kg^{-1}	Zinc	0.50 mg kg^{-1}
Soluble cation and anion			
Chemical Properties	Value	Chemical Properties	Value
Potassium	1.14 mmol L^{-1}	Chloride	2.30 mmol L^{-1}
Magnesium	1.55 mmol L^{-1}	Bicarbonate	3.50 mmol L^{-1}
Sodium	0.95 mmol L^{-1}	Carbonate	0.00 mmol L^{-1}
Calcium	2.50 mmol L^{-1}	SO_4^{-2}	0.86 mmol L^{-1}

3.5. Manure Sampling:

The samples (goat manure and sheep manure) were dried (60 ^{o}C), ground, and screened via a 0.5-mm sieve for various analyses.For the determination of water extractable nutrients, 10 g manure samples were added 100 mL of distilled water and the samples were shaken on a mechanical shaker and thereafter filtered shown in Table 3.3.

Different methods were used to determine nutrients in manure as follow:

1- The pH of manure suspension with manure: water ratio of 1:10 was determined using a pH meter (Model: HANNA 213).

2- Electrical conductivity (EC) in the manure suspension was measured by an electrical conductivity meter (Model: HANNA 215).

3- Total nitrogen content (N)was determined following the method of Winkleman et al., (1984).

4- Phosphorus (P)was measured with a spectrophotometer according to the phosphomolybdate blue method Olsen and Sommers, (1982).

5- Potassium (K) and sodium (Na) were measured with a flame photometer Soltanpur and Workman, (1979).

6- Calcium (Ca), magnesium (Mg), iron (Fe), zinc (Zn), copper (Cu) and manganese (Mn) were determined using the wet digestion method based on 25-5-5ml of HNO_3 – $H2SO_4$ – $HClO_4$ acids described by Aoac, (1970).

7- Boron (B) was determined with a spectrophotometer at 420 nm following the method of Rashid et al., (1994).

8- The sulfur (S) was determined following the method of Ogejo et al., (2010).

9-Total carbon content(C) was determined by dry-combustion using the method proposed by Nelson and Sommers, (1982).

10- C/N Ratio was calculated by the value of carbone divided to the value of nitrogen.

11- C/P Ratio was calculated by the value of carbone divided to the value of phosphor.

Table 3.3. Some chemical properties of the goat manure, sheep manure and mix between them (%50 + 50%)

Manure	Goat manure		Sheep manure		Mix. manure (50%Goat+50%Sheep)	
Ch. Pro.	2017	2018	2017	2018	2017	2018
PH	7.98	7.58	8.26	8.54	8.10	8.18
EC (dS m^{-1})	8.11	7.91	8.90	8.66	8.30	8.15
N (g kg^{-1})	8.55	8.25	7.85	7.55	8.15	8.35
P (g kg^{-1})	4.92	5.15	4.59	4.88	4.55	4.95
K (g kg^{-1})	10.56	9.88	8.95	9.25	9.15	9.00
Na (g kg^{-1})	3.25	3.55	2.99	3.12	3.00	3.20
Ca (g kg^{-1})	7.33	7.13	7.00	6.86	7.11	6.98
Mg (g kg^{-1})	12.72	12.57	11.5	12.00	11.92	11.85
Mn (g kg^{-1})	0.06	0.05	0.06	0.05	0.05	0.05
Fe (g kg^{-1})	0.080	0.075	0.075	0.065	0.070	0.070
Zn (g kg^{-1})	0.70	0.72	0.66	0.55	0.0.57	0.50
B (g kg^{-1})	0.55	0.53	0.48	0.45	0.40	0.40
S (g kg^{-1})	35.2	31.6	34.3	30.5	32.7	30.5
C (g kg^{-1})	190	205	155	175	165	200
C/N ratio	22	25	20	23	22	24
C/P ratio	39	40	34	36	36	40

3.6. Tillage

Tillage is the agricultural preparation of soil by mechanical agitation of various types such as digging, stirring, and overturning. Human-powered tilling methods using special agricultural machinery were applied for tillage. Tillage is often classified into two types, primary and secondary. The primary tillage is deeper than secondary tillage. The plowing was done in two perpendicular directions. Its depth reaches was 30 cm.

3.7. Planting

On the first day of April in the two years 2017 and 2018, two seeds of sweet corn (*Zea mays L*. var. *saccharata*, Sturt cv. Succar, F1)and three seeds of fresh bean (*Phaseolus vulgaris* L. var. Istride) were planted in each bed at 5cm depth and then thinned to 1 seedlings after two weeks of germination. The space between rows was 65cm, and the space between plants was 25cmused intercropping system.

3.8. Fertilization

Five levels of organic fertilizer were used (0,5,10,15 and 20)kg per experimental unit (7.8m^2) consisted of mix manure (%50goat manure+%50sheep manure). was applied.

3.9. Irrigation

Irrigation water was applied to treatment using a drip irrigation system. The water is applied after depletion 60-70% of available water. The gravimetric method was used to measure and determine the time of irrigation. However, sometimes it was determined via the eyes and hands comes from with experience.

3.10. Plant Sampling

At harvest, the plant samples were cut from the soil surface and immediately separated into shoots and leaves, and then they were dried in oven at 65˚C for 72 hours. The leaves were ground separately for all experiment units. They were stored in plastic bottles for chemical analysis.

3.10.1. Plant analysis

Plant samples taken at harvest time from sweet corn and fresh bean were digested using 1:1 H_2SO_4 and H_2O_2 and analyze for N, P, K^{+1},Na^{+1}, Ca^{+2},Mg^{+2}, Fe^{+2}, Mn^{+2}, Zn^{+2}, Cu^{+2}, while for the determination of SO_4^{-2} the plant samples were digested using 9:4 conc. $HClO_4$ and HNO_3 (Motsara and Roy,2008).
Different methods were used to determine nutrients in plants as follow:

1- Total nitrogenwas determined using kjeldahl method as described in Rowell, (1996).
2- Phosphate was determined according to the colorimetric method as described by Gupta, (2000) by using spectrophotometer at 660 nm.
3- Potassium and sodiumwere determined using Flame Photometer method described by Baruah, (1999).
4- Calcium and magnesium were determined by the titrimetric method using EDTA-2Na (0.01N) as described by Jaiswal, (2004).
5- Iron, manganese, zinc and copperwere determined using atomic absorption spectrometry (AAS) described by Steponeniene, et al., (2003).
6- Protein content of plantwasdetermined according to the equation described by EL-Sahookie, (1990) as follow: Protein % = N% x 6.25

3.11. LeafArea (LA)

The leaf area of sweet corn plant was determined by using the following equation: leaf area = (length * width of leaf * 0.75) as described by Saxena and Singh, (1985). Moreover, the leaf area of fresh beans plant was determined by Graphic lines and Images (Jonckheere et al., 2004), (Figure.3).

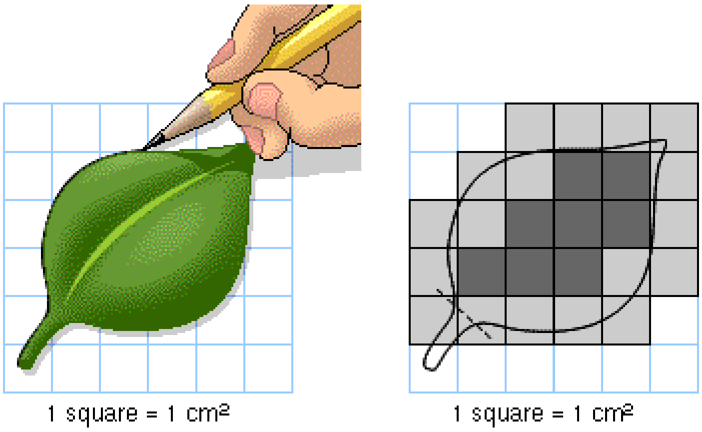

Figure 3.Leaf area measures.

3.12. Chlorophyll (SPAD) Readings

The chlorophyll-SPAD-meter (At LEAF+) readings were taken from recently fully expanded leaves for each replicate. It was used to estimate nitrogen concentration in leaves. Nitrogen is closely related to chlorophyll in leaves (Alcantar et al., 2002).

3.13. Harvesting and Some Growth Traits

Vegetable plants were harvested softly (fresh harvest). Determined some vegetative growth traits of fresh bean are ((the plant height (cm), the number of branches (branch/plant), the number of leaves (leaf/plant), SPADvalue (SPAD), dry plant weight of 100 g fresh matter (g), leaf area (m^2), the number of seeds (seed/pod), length of pod (cm), and total yield (ton/hectare)). Then determined some vegetative growth traits of sweet corn are (plant height (cm), the number of branches (branch/plant), the number of leaves (leaf/plant), dry plant weight of 100 g fresh matter (g), length of cob (cm), diameter of cob (cm), the number of cobs (cob/plant), the number of rows per cob (row/cob), the number of seeds per row (seed/row), and total yield (ton/hectare).

3.14. Land Equivalent Ratio (LER)

To calculate the LER, divide the intercrop yield of one crop (sweet corn) by the yield of the pure stand and add that to the intercrop yield of the next crop (fresh beans) divided by the yield of the pure stand and so on. If LER is greater than 1.0 usually shows that intercropping is advantageous, if the LER is less than 1.0 shows a disadvantage as explained inMead and Willey, (1980) and Kantor, (1999). The equation goes like this:

LER = intercrop 1 / pure crop 1 +intercrop 2 / pure crop 2

LER = intercrop sweet corn /pure sweet corn + intercrop green beans / pure green beans

Total LER = LER sweet corn + LER green beans

LER sweet corn = intercrop sweet corn /pure sweet corn

LER green beans = intercrop green beans / pure green bean

3.15. Statistic analysis

For statistical analysis,the data were compiled and tabulated properly. The data were then statistically analyzed to find out the significance of variance resulting from the experimental treatments on various plant characters. Analysis of variance (ANOVA) was done with the help of a computer package program MSTAT-C and mean differences were adjusted by Duncan's Multiple Range Test (Gomez et al., 1984).

$$R_p = r_{\alpha,p,\nu}\sqrt{MSE/n} \quad (3.1)$$

where:

$r_{a,p,n}$ is the *Duncan's Significant Range Value* with parameters,(***p*** = range-value).

(MSE)= Mean of Square Error,(***n*** = degree-of-freedom) and (***a***= a_{joint}).experiment-wise alpha level

T test was used to compare two different set of values (difference between year 2017 and 2018, and difference between mono-cropping and inter-cropping). It is generally performed on a small set of data. T test generally applied to normal distribution which has a small set of values. This test compares the mean of two samples. T test uses means and standard deviations of two samples to make a comparison. The formula for T test was given below:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}} \tag{3.2}$$

Where,

x1¯= Mean of first set of values (group 1)

x2¯ = Mean of second set of values (group 2)

S_1 = Standard deviation of first set of values (group 1)

S_2 = Standard deviation of second set of values (group 2)

n_1 = Total number of values in first set (group 1)

n_2 = Total number of values in second set (group 2)

The formula for standard deviation was given by:

$$S = \sqrt{\frac{\sum(x - \bar{x})^2}{n - 1}} \tag{3.3}$$

Where,

x = Values given, x¯= Mean, n = Total number of values.

3.16. Climatologically Data

The climatologically data were taken from Erbil - Qushtapa metrological station. It shows the mean of air and soil temperature, rain and relative humidity around spring growing season (April - July) in 2017 and 2018 in Table3.4.

Table 3.4. The mean of monthly climatologically data during March to July,2017 and 2018

Months	Year	Air Temperature C˚			Soil Temperature C˚		Average of Relative Humidity (%)	Average of Atmospheric pressure Milli_Bar	Average of Sum of Rain (mm)
		Max	Min	Ave.	Deep 10 cm	Deep 30 cm			
March	2017	17.8	8.9	13.0	13.9	14.30	63.0	964.7	4.3
	2018	22.9	11.9	17.3	19.3	18.8	50.1	963.5	7.0
April	2017	25.1	12.3	18.7	21.6	20.1	52.0	964.8	24.3
	2018	26.1	13.9	19.9	22.5	22.3	45.3	961.4	69.9
May	2017	32.9	18.6	26.3	30.2	28.3	24.2	960.4	2.7
	2018	30.8	19.6	25.4	27.8	26.5	39.1	959.7	24.9
June	2017	38.9	24.0	32.4	35.4	33.8	15.3	955.6	----------
	2018	38.0	24.1	31.7	33.8	32.2	18.8	954.7	----------
July	2017	43.2	30.4	37.4	30.21	29.04	11.4	953.9	----------
	2018	41.3	29.4	35.8	29.5	28.3	14.7	952.7	----------

4. RESULTS

The statistical analysis and Duncan's Multiple Range Test at $P \leq 0.05$ leveland at $P \leq 0.01$ levelshowed the significance levelsamong the treatmentsin sweet corn and fresh bean Moreover, the T-test at $P \leq 0.05$ level was used to compare between the years and showed significance level between the years.

4.1. Sweet Corn Plant Height

Statistical analysis presented in Table 4.1 showed that there was an interaction between the sweet corn mono-crop andthe organic fertilizer and a significant difference on the plant height trait in 2017 and 2018. It was recorded with the highest value (165.60 cm in 2017 and 149.67 cm in 2018) in the treatment sweet corn mono-crop with 15 kg per 7.8m^2 organic fertilizer and with the lowest value (155.27 cm in 2017 and 139.00 cm in 2018) in the treatment sweet corn mono-crop with 10 kg per 7.8m^2

organic fertilizer and 0 kg per 7.8m^2 respectively. However, the interaction between the sweet corn intercropping and the organic fertilizer was not significantly effective on the plant height trait in 2017 and 2018.

The interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer in 2017 and 2018 showed significant difference in plant height traits. While the top values (165.60 cm in 2017 and 149.67 cm in 2018) was in the treatment of sweet corn mono-crop with 15 kg per 7.8m^2 organic fertilizer, the lowest values (151.20 cm in 2017 and 137.33 cm in 2018) in the treatment sweet corn intercropping with 10 kg per 7.8m^2.

The system of planting have been significant difference on plant height traits in 2017 and 2018, recorded top value (160.47 cm in 2017 and 145.71 cm in 2018) in the treatment sweet corn mono-crop, but recorded the lowest value (154.95 cm in 2017 and 142.16 cm in 2018) in the treatment sweet corn intercropping. The organic fertilizer was significantly effective on plant height in 2017.While the maximum values (160.67 cm in 2017) in the organic fertilizer 5 kg per 7.8m^2, thelowest values (153.24 cm in 2017) in the organic fertilizer 10 kg per 7.8m^2. However, the organic fertilizer was not significantly effective on plant height in 2018.

The significance level between mean of two years (2017 and 2018) was determined by Ttest to compare years. There were significant difference between mean of years on plant height. The highest value wasrecorded in 2017 with interaction between mono-crop and organic fertilizer (160.47 cm), and the lowest value was registered in 2018 (145.71 cm). However,the interaction between mean of intercropping and mean of organic fertilizer was significant and was registered upper value (154.95 cm) in 2017, and lower value (142.16 cm) in 2018. However, there were significantly affect by theplanting system (sweet corn and intercropping) had the highest value (157.71 cm) in the year 2017, but the lowest value (143.94 cm) was in 2018. However, the results showed thatorganic fertilizer had a significant difference in the years on the plant height. It was recorded maximum value (157.71 cm) in 2017 and minimum value (143.94 cm) in 2018.

Table 4.1. The effect of different level of mono-crop, intercropping, organic fertilizer and interaction between them on plant traits of sweet corn on the plant height in 2017 and 2018

Sweet Corn Plants	Organic Fertilizer	Plant Height (cm)	
		2017	2018
B1 (S.C.M) A x B1	A1	155.80 bc	139.00 cd
	A2	162.80 ab	146.11 ab
	A3	155.27 c	145.00 abc
	A4	165.60 a	149.67 a
	A5	162.87 ab	148.78 ab
	Mean	160.47*	145.71*
B3 (S.C.I) A x B3	A1	158.07 bc	144.22 abc
	A2	158.53 abc	144.12 abc
	A3	151.20 c	137.33 c
	A4	155.13 c	143.00 a-d
	A5	151.80 c	142.11 bcd
	Mean	154.95*	142.16*
(S.C.M)	B1	160.47 a	145.71 a
(S.C.I)	B3	154.95 b	142.16 b
	Mean	157.71*	143.94*
(O.F) Sweet corn	A1	156.94 ab	141.61 a
	A2	160.67 a	145.12 a
	A3	153.24 b	141.17 a
	A4	160.37 a	146.34 a
	A5	157.34 ab	145.45 a
	Mean	157.71*	143.94*

The significance level was set at P≤0.05. Differences between trait means were assessed using Duncan's Multiple Range Test at P≤0.05 level. (*)The significance level and (ns) non significant level was set at P≤0.05 to differences between years using T test to compare between year. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable plant (Sweet Corn). B1= (S.C.M) Sweet Corn Monocrop. B3=(S.C.I) Sweet Corn Intercropping.

4.2. Fresh Bean Plant Height

The data presented in Table 4.2 indicated that the interaction between the fresh bean mono-crop and the organic fertilizer was ignificantly influenced by the treatment on the plant height trait in 2017. The highest value (64.73 cm) was recorded in the treatment fresh bean mono-crop with 15 kg per 7.8m^2 organic fertilizer and the lowest value (60.00 cm) was in the treatment fresh bean mono-crop with 10 kg per 7.8m^2 organic fertilizer.However, the significant interaction between the fresh bean mono-cropand organic fertilizer could not be found for plant height in 2018. However, the interaction between the fresh bean intercropping and the organic fertilizer had significantly effective on the plant height trait in 2017 and 2018. While the maximum value (64.00 cmin 2017 and 56.11 cm in 2018) was in the treatment fresh bean intercropping with 15 kg per 7.8m^{2}organic fertilizer and fresh bean intercropping with 20 kg per 7.8 m^2 organic fertilizer, but the minimum value (57.47 cm in 2017 and 50.44 cm in 2018) was in the treatment fresh bean intercropping with 5 kg per 7.8m^2 organic fertilizer.

The interaction between mono-crop and intercropping of fresh bean in the different level of organic fertilizer in 2017 and 2018 was significant deference in plant height traits. The top value (64.73 cm in 2017 and 56.44 cm in 2018) was registerd in the treatment of fresh bean mono-crop with 15 kg per 7.8m^2 organic fertilizer, the lowest value (57.47 cm in 2017 and 50.44 cm in 2018) in the treatment (fresh bean intercropping with 5 kg per 7.8m^2 organic fertilizer). However, the system of planting didnot show significant difference for plant height.

The organic fertilizer had significant difference on plant height traits in 2017 and 2018 While the upper value (64.37cm in 2017 and 56.28 cm in 2018) was obtined in the organic fertilizer 15 kg per 7.8m^2, less value (59.34 cm in 2017 and 52.17 cm in 2018) was recorded in the organic fertilizer 5 kg per 7.8m^2.

The significance level of years (2017 and 2018) was determined by T testthere was significant difference between mean of years on plant height.The highest value was 2017 with interaction between mono-crop and organic fertilizer (61.88 cm), and the lowest value was in 2018 (54.29 cm). However, the interaction between mean of intercropping and mean of organic fertilizer was not significant between years. It has been significantly influenced by the planting system (sweet corn and intercropping).

The highest value (61.55 cm) ws registered 2017, the lowest value (54.09 cm) was in 2018. However, the results showedthat the organic fertilizer had a significant difference in the year on the plant height. It was recorded maximum value (61.55 cm) in 2017 and minimum value (54.09 cm) in the year 2018.

Table 4.2. The effect of different level of mono-crop, intercropping, organic fertilizer and interaction between them on plant traits of fresh bean on the plant height in 2017 and 2018

Fresh Bean Plants	Organic Fertilizer	Plant Height (cm)	
		2017	2018
B2 (F.B.M) A x B2	A1	61.07 abc	52.99 ab
	A2	61.40 abc	53.89 ab
	A3	60.00 bc	52.44 ab
	A4	64.73 a	56.44 a
	A5	62.20 ab	55.67 a
	Mean	61.88*	54.29*
B3 (F.B.I) A x B3	A1	62.33 ab	54.11 ab
	A2	57.47 c	50. 44 b
	A3	59.80 bc	52.67 ab
	A4	64.00 ab	56.11 a
	A5	62.47 ab	56.11 a
	Mean	61.21ns	53.89ns
(F.B.M)	B2	61.88 a	54.29 a
(F.B.I)	B3	61.21 a	53.89 a
	Mean	61.55*	54.09*
(O.F) Fresh bean	A1	61.70 ab	53.55 abc
	A2	59.34 b	52.17 c
	A3	59.90 b	52.56 bc
	A4	64.37 a	56.28 a
	A5	62.34 ab	55.89 ab
	Mean	61.71*	54.09*

The significance level was set at $P \leq 0.05$. Differences between trait means were assessed using Duncan's Multiple Range Test at $P \leq 0.05$ level. (*)The significance level and (ns) non significant level was set at $P \leq 0.05$to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8m^2), A2= (5 kg/7.8m^2), A3= (10 kg/7.8m^2), A4=(15 kg/7.8m^2) and A5=(20 kg/7.8m^2)). B= Vegetable Plant (Fresh Bean) B2= (F.B.M) Fresh Bean Monocrop. B3=(F.B.I) Fresh Bean Intercropping.

4.3. The Number of Leaves per Plant in Sweet Corn

It is clear in Table 4.3 that the interaction between the sweet corn mono-crop and the organic fertilizer was significant difference on the number of leaves trait in 2018. While the highest value (13.80 leaf pl^{-1}) was obtined in sweet corn mono-crop with 20 kg per 7.8 m^2 organic fertilizer, the lowest value (10.27 leaf pl^{-1}) was detected in sweet corn mono-crop with 0 kg per 7.8 m^2 organic fertilizer. However, the interaction between the sweet corn mono-crop and the organic fertilizer was not significant difference on the number of leaves trait in 2017. However, the interaction between the sweet corn intercropping and the organic fertilizer was significant on the no. of leaves trait in 2017 and 2018. While the maximum value (17.53 leaf pl^{-1} in 2017 and 16.33 leaf pl^{-1} in 2018) was obtined in sweet corn mono-crop with 15 kg per 7.8 m^2 organic fertilizer, the minimum value (14.07 leaf pl^{-1} in 2017 and 12.07 leaf pl^{-1} in 2018) was detected in sweet corn mono-crop with 0 kg per 7.8 m^2 organic fertilizer

The interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer in 2018 was significant in the number of leaves traits. While the top value (17.53 leaf pl^{-1} in 2017 and 16.33 leaf pl^{-1} in 2018) was in the treatment of sweet corn intercropping with 15 kg per 7.8m^2 organic fertilizer, the lowest value was registered (14.07 leaf pl^{-1} in 2017 and 10.27 leaf pl^{-1} in 2018) in the treatment sweet corn mono-crop with 0 kg per 7.8m^2.

The system of planting was significantly effective on the number of leaves traits in 2017 and 2018. The highest value (15.91 leaf pl^{-1} in 2017 and 14.27 leaf pl^{-1} in 2018) was registeredin the treatment sweet corn intercropping,the lowest value (13.11 leaf pl^{-1} in 2017 and 12.01 leaf pl^{-1} in 2018) was in the treatment sweet corn mono-crop. The organic fertilizer was significantly effective on the number of leaves per plant in 2017 and 2018. While the upper value (15.90 leaf pl^{-1} in 2017 and 14.87 leaf pl^{-1} in 2018) was registered in the organic fertilizer 15 kg per 7.8m^2, the lower value (12.90 leaf pl^{-1} in 2017 and 11.17 leaf pl^{-1} in 2018)was recorded in the organic fertilizer 0 kg per 7.8m^2.

The significance level between mean of years (2017 and 2018) was determined by T.test to compare between years. There was not significant difference between mean of years on the numberof leaves in interaction between mono-crop and organic fertilizer. The interaction between mean of intercropping with mean of organic fertilizer, planting system and organic fertilizer was not significant effective between years.

Table 4.3. The effect of different level of mono-crop, intercropping, organic fertilizer and interaction between them on plant traits of sweet corn on the number of leaves in 2017 and 2018

Sweet Corn Plants	Organic Fertilizer	No. of Leaves (Leaf Pl^{-1})	
		2017	2018
B1 (S.C.M) A x B1	A1	11.73 c	10.27 g
	A2	12.60 c	11.33 fg
	A3	11.93 c	11.27 fg
	A4	14.27 abc	13.40 cde
	A5	15.00 abc	13.80 cd
	Mean	13.11ns	12.01ns
B3 (S.C.I) A x B3	A1	14.07 bc	12.07 ef
	A2	16.67 ab	14.73 bc
	A3	15.00 abc	12.33 def
	A4	17.53 a	16.33 a
	A5	16.27 ab	15.87 ab
	Mean	15.91ns	14.27ns
(S.C.M)	B1	13.11 b	12.01 b
(S.C.I)	B3	15.91 a	14.27 a
	Mean	14.51ns	13.14ns
(O.F) Sweet corn	A1	12.90 b	11.17 c
	A2	14.64 ab	13.03 b
	A3	13.47 ab	11.80 ab
	A4	15.90 a	14.87 a
	A5	15.64 ab	14.84 a
	Mean	14.51 ns	13.14 ns

The significance level was set at P≤0.05. Differences between trait means were assessed using Duncan's Multiple Range Test at P≤0.05 level. (*****)The significance level and (ns**)** non significant level was set at P≤0.05 to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable plant (Sweet Corn). B1= (S.C.M) Sweet Corn Monocrop. B3=(S.C.I) Sweet Corn Intercropping.

4.4. The Number of Leaves per Plant in Fresh Bean

We concluded from Table 4.4 that the interaction between the fresh bean mono-crop and the organic fertilizer was not significantly influenced by the treatment on the number of leaves leaf pl^{-1} trait in 2017 and 2018.However, the significant interaction between the fresh bean interaction and organic fertilizer could not be found for the numberleaves leaf pl^{-1} in 2017 and 2018.

The interaction between mono-crop and intercropping of fresh bean in the different level of organic fertilizer in 2018 was significant in the number of leaves leaf pl^{-1}traits. While the top value (46.87 leaf pl^{-1} in 2018) was recorded in the treatment of fresh bean mono-crop with 15 kg per $7.8m^2$ organic fertilizer, the lowest value was registered (35.40 leaf pl^{-1} in 2018) in the treatment fresh bean intercropping with 10 kg per $7.8m^2$ organic fertilizer. However, the interaction between mono-crop and intercropping of fresh bean in the different level of organic fertilizer was not significant difference on the number of leaves leaf pl^{-1} in 2017.

The system of plantingdid not show significant difference on the number of leaf Pl^{-1} traits in 2017 and 2018. The organic fertilizer was not significant difference on the number of leaves per plant in 2017 and 2018.

The significance level between mean of years (2017 and 2018) was detected by T test. There was significant difference between mean of years on the number of leaves per plant.The highest value was recordedin the year of 2017 with interaction between mono-crop and organic fertilizer (47.24 leaf Pl^{-1}), and lowest value was observed in 2018 (42.24 leaf Pl^{-1}). However,the interaction between mean of intercropping and mean of organic fertilizer was not significant between years. Morover, presented that it was not significantly influences by the planting system (sweet corn mono-crop and intercropping). However, the organic fertilizer was not significant difference in the years on the number of leaves per plant.

Table 4.4. The effect of different level of mono-crop, intercropping, organic fertilizer and interaction between them on plant traits of fresh bean on the numberof leaves in 2017 and 2018

Fresh Bean Plants	Organic Fertilizer	No. of Leaves (Leaf Pl^{-1})	
		2017	2018
B2 (F.B.M) A x B2	A1	42.87 a	40.33 ab
	A2	50.87 a	39.67 ab
	A3	44.53 a	39.80 ab
	A4	50.73 a	46.87 a
	A5	47.20 a	44.53 ab
	Mean	47.24*	42.24*
B3 (F.B.I) A x B3	A1	38.13a	36.87b
	A2	40.20 a	37.87 ab
	A3	39.13 a	35.40 b
	A4	47.47 a	39.07 ab
	A5	38.93 a	36.40 b
	Mean	40.77ns	37.12ns
(F.B.M)	B2	47.24 a	42.24 a
(F.B.I)	B3	40.77 a	37.12 a
	Mean	44.01ns	39.68ns
(O.F) Fresh bean	A1	40.50 a	38.60 a
	A2	45.54 a	38.77 a
	A3	41.83 a	37.60 a
	A4	49.10 a	42.97 a
	A5	43.07 a	40.47 a
	Mean	44.01 ns	39.68 ns

The significance level was set at P≤0.05. Differences between trait means were assessed using Duncan's Multiple Range Test at P≤0.05 level. (*)The significance level and (ns) non significant level was set at P≤0.05 to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable Plant (Fresh Bean) B2= (F.B.M) Fresh Bean Monocrop. B3=(F.B.I) Fresh Bean Intercropping.

4.5. Dry Matter in 100 g Fresh Matter of Sweet Corn

We concluded from Table 4.5 that the interaction between the sweet corn mono-crop and the organic fertilizer had a significant effect on the dry matter in 100 g fresh matter trait in 2017 and 2018.While the highest value (47.75 g in 2017 and 48.05 g in 2018) was recorded in the treatment sweet corn mono-crop with 10 kg per 7.8m^2 organic fertilizer, the lowest value was recorded (41.52 g in 2017 and 41.31 in 2018) in the treatment sweet corn mono-crop with 0 kg per 7.8m^2. However, the interaction between the sweet corn intercropping and the organic fertilizer had significant effect on the dry matter in 100 g fresh matter trait in 2018.The maximum value (44.84 g in 2018) was observed in the treatment sweet corn intercropping with 15 kg per 7.8m^2, butthe minimum value (41.73 in 2018) was recorded in the treatment sweet corn intercropping with 10 kg per 7.8m^2. The interaction between the sweet corn intercropping and the organic fertilizer had not significantly effective on the dry matter in 100 g fresh matter trait in 2017.

The interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer in 2017 and 2018 was significantly different in dry matter in 100g fresh matter traits. While the top value (47.75 g in 2017 and 48.05 g in 2018) was registered in the treatment of sweet corn mono-crop with 10 kg per 7.8m^2 organic fertilizer, thelowest value was recorded (41.52 g in 2017 and 41.31 in 2018) in the treatment sweet corn intercropping with 0 kg per 7.8m^2.

The system of plantingwas not significantly effective on dry matter in 100 g fresh matter traits in 2017 and 2018.The organic fertilizer was significantly effective on dry matter in 100 g fresh matter in 2018.Upper value (44.89 g in 2018) was recorded in the organic fertilizer 10 kg per 7.8m^2, the lower value (41.54 g in 2018) in the organic fertilizer 0 kg per 7.8m^2.However, the organic fertilizer was not significantly effective on dry matter in 100 g fresh matter in 2017.

The significance level between mean of years (2017 and 2018) was determined by T test to compare between years.There was not significantly difference between mean of years on dry matter in 100 g fresh matter traits in 2017 and 2018 of sweet corn on all treatment (mono-crop, intercropping, organic fertilizer and interaction between them).

Table 4.5. The effect of different level of mono-crop, intercropping, organic fertilizer and interaction between them on plant traits of sweet corn on the dry matter in 100 g fresh matter in 2017 and 2018

Sweet Corn Plants	Organic Fertilizer	Dry Matter(g) in 100g Fresh Matter	
		2017	2018
B1 (S.C.M) A x B1	A1	41.52 b	41.31 d
	A2	45.49 ab	43.90 bcd
	A3	47.75 a	48.05 a
	A4	44.20 ab	43.35 bcd
	A5	43.31 ab	42.87 bcd
	Mean	44.45ns	43.90ns
B3 (S.C.I) A x B3	A1	43.24 ab	41.77 cd
	A2	44.93 ab	43.60 bcd
	A3	42.94 ab	41.73 cd
	A4	45.67 ab	44.84 b
	A5	45.60 ab	44.42 bc
	Mean	44.48ns	43.27ns
(S.C.M)	B1	44.45 a	43.90 a
(S.C.I)	B3	44.48 a	43.27 a
	Mean	44.47ns	43.59ns
(O.F) Sweet corn	A1	42.38 a	41.54 b
	A2	45.21 a	43.75 a
	A3	45.35 a	44.89 a
	A4	44.94 a	44.10 a
	A5	44.46 a	43.65 a
	Mean	44.47 ns	43.59 ns

The significance level was set at P≤0.05. Differences between trait means were assessed using Duncan's Multiple Range Test at P≤0.05 level. (*****)The significance level and (ns**)** non significant level was set at P≤0.05 to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable plant (Sweet Corn). B1= (S.C.M) Sweet Corn Monocrop. B3=(S.C.I) Sweet Corn Intercropping.

4.6. Dry Matter in 100 g Fresh Matter of Fresh Bean

As shown inTable 4.6 the interaction between the fresh bean mono-crop and the organic fertilizer was not significantly influenced by the treatment on the dry matter in 100 g fresh matter trait in 2017 and 2018.The interaction between the fresh bean intercropping and the organic fertilizer was significantly effective on the dry matter in 100 g fresh matter trait in 2018.The maximum value (43.15 g) was recorded in the treatment fresh bean intercropping with 20 kg per 7.8m^2 organic fertilizer, but the minimum value (37.48 g) was detected in the treatment fresh bean intercropping with 0 kg per 7.8m^2 organic fertilizer.However, the interaction between the fresh bean intercroppingand organic fertilizer was not significantly different for dry matter in 100 g fresh matter in 2017.

The interaction between mono-crop and intercropping of fresh bean in the different level of organic fertilizer in 2018 was significant difference in dry matter in 100 g fresh matter traits. While the top value (43.15 g in 2018) was registered in the treatment of fresh bean intercropping with 20 kg per 7.8m^2 organic fertilizer, the lowest value was registered (37.48 g in 2018) in the treatment fresh bean intercropping with 0 kg per 7.8m^2 organic fertilizer. However, the interaction between mono-crop and intercropping of fresh bean in the different level of organic fertilizer in 2017 was not significantly different in dry matter in 100 g fresh matter traits

The system of plantingwas not significantly different for dry matter in 100 g fresh matter. However, the organic fertilizer was found significantly different on dry matter in 100 g fresh matter traits in 2017 and 2018.While upper value (42.75 g in 2017 and 42.30 g in 2018) was detected in the organic fertilizer 20 kg per 7.8m^2 and 10 kg per 7.8m^2,less value (38.69 g in 2017 and 38.15 g in 2018) was recorded in the organic fertilizer 0 kg per 7.8m^2 .

The significance level between mean of years (2017 and 2018) was determined by T test to compare between years. Showed that there was not significantly difference between mean of years on dry matter in 100 g fresh matter traits in 2017 and 2018 of sweet corn on all treatment (mono-crop, intercropping, organic fertilizer and interaction between them).

Table 4.6. The effect of different level of mono-crop, intercropping, organic fertilizer and interaction between them on plant traits of fresh bean on dry matter in 100 g fresh matter in 2017 and 2018

Fresh Bean Plants	Organic Fertilizer	Dry Matter(g) in 100g Fresh Matter	
		2017	2018
B2 (F.B.M) A x B2	A1	40.16 a	38.81 bc
	A2	40.07 a	39.88 abc
	A3	41.78 a	41.01 ab
	A4	41.36 a	41.60 ab
	A5	41.99 a	41.45 ab
	Mean	41.07 ns	40.55 ns
B3 (F.B.I) A x B3	A1	37.21 a	37.48 c
	A2	42.21 a	41.09 ab
	A3	40.99 a	40.02 abc
	A4	39.95 a	42.56 a
	A5	43.50 a	43.15 a
	Mean	40.77 ns	40.86 ns
(F.B.M)	B2	41.07 a	40.55 a
(F.B.I)	B3	40.77 a	40.86 a
	Mean	40.92 ns	40.71 ns
(O.F) Fresh bean	A1	38.69b	38.15 b
	A2	41.14 a	40.49 a
	A3	41.39 a	40.52 a
	A4	40.66 a	42.08 a
	A5	42.75 a	42.30 a
	Mean	40.92 ns	40.71 ns

The significance level was set at $P \leq 0.05$. Differences between trait means were assessed using Duncan's Multiple Range Test at $P \leq 0.05$ level. (*)The significance level and (ns) non significant level was set at $P \leq 0.05$ to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable Plant (Fresh Bean) B2= (F.B.M) Fresh Bean Monocrop. B3=(F.B.I) Fresh Bean Intercropping.

4.7. Leaf Area of Sweet Corn

The results presented in Table 4.7 showed that the interaction between the sweet corn mono-crop with the organic fertilizer was not significantly effective on the leaf area trait in 2017 and 2018. However, the interaction between the sweet corn intercropping and the organic fertilizer was not significantly effective on the leaf area trait in 2017 and 2018.

The interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer in 2017 was significantly different in leaf area traits.While the top value (0.0463 m^2 in 2017) was recorded in the treatment of sweet corn intercropping with 20 kg per 7.8m^2 organic fertilizer, the lowest value was registered (0.0427 m^2 in 2017) in the treatment sweet corn mono-crop with 0 kg per 7.8m^2 organic fertilizer. However, the interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer was not significantly different in leaf area traits in 2018.

The system of plantingwas not significantly effective on leaf area traits in 2017 and 2018. However, the organic fertilizer was not significantly effective on leaf area in 2017 and 2018.

The significance level between mean of years (2017 and 2018) was detected by T test to compare between years. Showed that there was not significant difference between mean of years on leaf area traits between 2017 and 2018 of sweet corn on all treatment (mono-crop, intercropping, organic fertilizer and interaction between them).

Table 4.7. The effect of different level of mono-crop, intercropping and organic fertilizer and interaction between them on plant traits of sweet corn on leaf area in 2017 and 2018

Sweet Corn Plants	Organic Fertilizer	Leaf Area (m^2)	
		2017	2018
B1 (S.C.M) A x B1	A1	0.0427 b	0.0423 a
	A2	0.0437 ab	0.0420 a
	A3	0.0433 ab	0.0420 a
	A4	0.0453 ab	0.0450 a
	A5	0.0457 ab	0.0457 a
	Mean	0.0441 ns	0.0434 ns
B3 (S.C.I) A x B3	A1	0.0437 ab	0.0420 a
	A2	0.0453 ab	0.0430 a
	A3	0.0447 ab	0.0417 a
	A4	0.0443 ab	0.0440 a
	A5	0.0463 a	0.0433 a
	Mean	0.0449 ns	0.0428 ns
(S.C.M)	B1	0.0441 a	0.0434 a
(S.C.I)	B3	0.0449 a	0.0428 a
	Mean	0.0445 ns	0.0431 ns
(O.F) Sweet corn	A1	0.0432 a	0.0422 a
	A2	0.0445 a	0.0425 a
	A3	0.0440 a	0.0419 a
	A4	0.0448 a	0.0445 a
	A5	0.0460 a	0.0445 a
	Mean	0.0445 ns	0.0431 ns

The significance level was set at $P \leq 0.05$. Differences between trait means were assessed using Duncan's Multiple Range Test at $P \leq 0.05$ level. (*****)The significance level and (ns**)** non significant level was set at $P \leq 0.05$ to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable plant (Sweet Corn). B1= (S.C.M) Sweet Corn Monocrop. B3=(S.C.I) Sweet Corn Intercropping.

4.8. Leaf Area of Fresh Bean

As shown in Table 4.8 the interaction between the fresh bean mono-crop and the organic fertilizer was significantly influenced by the treatment on the leaf area trait in 2018. While the highest value (0.0145 m^2) was detected in the treatment fresh bean mono-crop with 15 kg per 7.8 m^2 organic fertilizer. The lowest value (0.0125 m^2) was recorded in the treatment fresh bean mono-crop with 0 kg per 7.8 m^2 organic fertilizer.However, the interaction between the fresh bean mono-crop and the organic fertilizer was not significantly influenced by the treatment on the leaf area trait in 2017. However, the interaction between the fresh bean intercropping and the organic fertilizer was significantly effective on the leaf area trait in 2017 and 2018. While the maximum value (0.0137 m^2 in 2017 and 0.0135 m^2 in 2018) was registered in the treatment fresh bean intercropping with 20 kg per 7.8m^2 organic fertilizer, the minimum value (0.0107 m^2 in 2017 and 0.0108 m^2 in 2018) was recorded in the treatment fresh bean intercropping with 5 kg per 7.8m^2 organic fertilizer.

The interaction between mono-crop and intercropping of fresh bean in the different level of organic fertilizer was significantly different for leaf area trait in 2017 and 2018.The highest value (0.0147 m^2 in 2017 and 0.0144 m^2 in 2018) was detected in the treatment fresh bean mono-crop with 5 kg per 7.8m^2 organic fertilizer.The lowest value (0.0107 m^2 in 2017 and 0.0108 m^2 in 2018) was recorded in the treatment fresh bean intercropping with 5 kg per 7.8m^2 organic fertilizer.

The system of plantinghad a significant difference on leaf area in 2017.The top value (0.0141 m^2 in 2017) was registered in the fresh bean mono-crop.The lowest value (0.0124 m^2 in 2017) was detected in the fresh bean intercropping. However, the system of plantingwas not significant difference on leaf area in 2017. The organic fertilizer did notshow a significant difference on leaf area traits in 2017 and 2018.

The significance level between mean of years (2017 and 2018) was determined by T test to compare between years. Showed that there was not significant different between mean of years on leaf area traits in 2017 and 2018 of fresh bean on all treatment (mono-crop, intercropping, organic fertilizer and interaction between them).

Table 4.8. The effect of different level of mono-crop, intercropping and organic fertilizer and interaction between them on plant traits of fresh bean on leaf area in 2017 and 2018

Fresh Bean Plants	Organic Fertilizer	Leaf Area (m^2)	
		2017	2018
B2 (F.B.M) A x B2	A1	0.0130 abc	0.0125 bc
	A2	0.0143 ab	0.0134 ab
	A3	0.0140 abc	0.0135 ab
	A4	0.0143 ab	0.0145 a
	A5	0.0147 a	0.0144 a
	Mean	0.0141 ns	0.0136 ns
B3 (F.B.I) A x B3	A1	0.0133 abc	0.0131 b
	A2	0.0107 d	0.0108 d
	A3	0.0123 bcd	0.0119 c
	A4	0.0120 cd	0.0131 b
	A5	0.0137 abc	0.0135 ab
	Mean	0.0124 ns	0.0125 ns
(F.B.M)	B2	0.0141 a	0.0136 a
(F.B.I)	B3	0.0124 b	0.0125 a
	Mean	0.0132 ns	0.0131 ns
(O.F) Fresh bean	A1	0.0132 a	0.0128 a
	A2	0.0125 a	0.0121 a
	A3	0.0132 a	0.0127 a
	A4	0.0132 a	0.0138 a
	A5	0.0142 a	0.0140 a
	Mean	0.0132 ns	0.0131 ns

The significance level was set at $P \leq 0.05$. Differences between trait means were assessed using Duncan's Multiple Range Test at $P \leq 0.05$ level. (*)The significance level and (ns) non significant level was set at $P \leq 0.05$ to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable Plant (Fresh Bean) B2= (F.B.M) Fresh Bean Monocrop. B3=(F.B.I) Fresh Bean Intercropping.

4.9. The Number of Branches per Plant in Sweet Corn

As shown in Table 4.9,the interaction between the sweet corn mono-crop with the organic fertilizer was significantlyeffective on the number of branches pl^{-1} trait in 2018.While the maximum value (1.87 branch pl^{-1} in 2018) was detected in the treatment sweet corn mono-crop with 20 kg per $7.8m^2$ organic fertilizer, the minimum value was recorded (1.20 branch pl^{-1} in 2018) in the treatment of the sweet corn mono-crop with 5 kg per $7.8m^2$. However, the sweet corn mono-crop with the organic fertilizer was not significantly effective on the number of branches pl^{-1} trait in 2017. The interaction between the sweet corn intercropping and the organic fertilizer was significantly effective on the number of branches pl^{-1} trait in 2018.While upper value (2.13 branch pl^{-1} in 2018) was registered in the treatment sweet corn intercropping with 15 kg per $7.8m^2$.Lower value (1.40 Branch Pl^{-1} in 2018) was detected in the treatment sweet corn intercropping with 0 kg per $7.8m^2$. However, the sweet corn intercropping with the organic fertilizer was not significantlteffective in the number of branches pl^{-1}in 2017.

The interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer in 2017 and 2018 was significantly different in the number of branches pl^{-1}. The top value (2.13 branch pl^{-1} in 2018) was recorded in the treatment of sweet corn intercropping with the 15 kg per $7.8m^2$ organic fertilizer, thelowest value was registered (1.40 branch pl^{-1} in 2018) in the treatment sweet corn mono-crop in the 0 kg per $7.8m^2$ organic fertilizer. However, the interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer in 2017 was not significantly different in the number of branches pl^{-1}.

The system of plantingwas significant difference on the number of branches pl^{-1} traits in 2017 and 2018, While the maximum value (2.05 branch pl^{-1} in 2017 and 1.75 branch pl^{-1} in 2018) was detected in the treatment sweet corn intercropping, the minimum value was recorded (1.57 branch pl^{-1} in 2017 and 1.52 branch pl^{-1} in 2018) in the treatment of the sweet corn mono-crop. However, the organic fertilizer was significantly effective on the number of branches pl^{-1}.While the top value (1.93 branch Pl^{-1} in 2018) was detected in the organic fertilizer 15 kg per $7.8m^2$, the less value (1.40 branch Pl^{-1} in 2018) was recorded in the organic fertilizer 5 kg per $7.8m^2$.

The significance level between mean of years (2017 and 2018) were determined by T test to compare between years. There was significant effect between the mean of years on thenumber of branches pl^{-1}, were recorded utmost value (1.57 branches Pl^{-1}) was recorded in the years of 2017 of interaction between mono-crop with organic fertilizer,thelowest value (1.52 branches Pl^{-1}) was recorded in 2018. However, the interaction between mean of intercropping and mean of organic fertilizer was not significantly differentbetween the years.Morover, there wasnot significantly effective of yearsin theplanting system. However, the organic fertilizer was not significant difference in the years on the number of branches pl^{-1}.

Table 4.9. The effect of different level of mono-crop, intercropping and organic fertilizer and interaction between them on plant traits of sweet corn on the number of branches in 2017 and 2018

Sweet Corn Plants	Organic Fertilizer	No. of Branches (Branch Pl^{-1})	
		2017	2018
B1 (S.C.M) A x B1	A1	1.40 b	1.47 cde
	A2	1.40 b	1.20 e
	A3	1.40 b	1.33 de
	A4	1.80 ab	1.73 a-d
	A5	1.87 ab	1.87 abc
	Mean	1.57*****	1.52*****
B3 (S.C.I) A x B3	A1	1.73 ab	1.40 de
	A2	2.13 a	1.60 b-e
	A3	2.00 ab	1.67 bcd
	A4	2.33 a	2.13 a
	A5	2.07 a	1.93 ab
	Mean	2.05ns	1.75ns
(S.C.M)	B1	1.57 b	1.52 b
(S.C.I)	B3	2.05 a	1.75 a
	Mean	1.81ns	1.64 ns
(O.F) Sweet corn	A1	1.57 a	1.44 b
	A2	1.77 a	1.40 b
	A3	1.70 a	1.50 b
	A4	2.07 a	1.93 a
	A5	1.97 a	1.90 a
	Mean	1.81 ns	1.64 ns

The significance level was set at P≤0.05. Differences between trait means were assessed using Duncan's Multiple Range Test at P≤0.05 level. (*****)The significance level and (ns**)** non significant level was set at P≤0.05 to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable plant (Sweet Corn). B1= (S.C.M) Sweet Corn Monocrop. B3=(S.C.I) Sweet Corn Intercropping.

4.10. The Number of Branches per Plant in Fresh Bean

As shown in Table 4.10 the interaction between the fresh bean mono-crop and the organic fertilizer was significantly affected by the treatment on the number of branches pl^{-1} in 2018. While the highest value (10.87 branch pl^{-1} in 2018) was detected in the treatment fresh bean mono-crop with 15 kg per $7.8m^2$ organic fertilizer, the lowest value was recorded (9.33 branch pl^{-1} in 2018) in the treatment of fresh bean mono-crop with 20 kg per $7.8m^2$ organic fertilizer.However, the interaction between the fresh bean mono-cropand organic fertilizer was not significantly different for the number of branches pl^{-1}in 2017. The interaction between the fresh bean intercropping and the organic fertilizer wasnot significantly effective on the numberof branches pl^{-1} in 2017 and 2018.

The interaction between mono-crop and intercropping of fresh bean in the different level of organic fertilizer in 2017 and 2018 was significantly different in the number of branches pl^{-1} traits.The top value (11.47 branches pl^{-1} in 2017 and 10.87 branches pl^{-1} in 2018) was detected in the treatment of fresh bean intercropping with 10 kg per $7.8m^2$ organic fertilizer and fresh bean intercropping with 15 kg per $7.8m^2$ organic fertilizer respectively. The lowest value was registered (8.73 branches pl^{-1} in 2017 and 9.20 branches pl^{-1} in 2018) in the treatment fresh bean intercropping with 20 kg per $7.8m^2$ organic fertilizer and fresh bean intercropping with 0 kg per $7.8m^2$ organic fertilizer.

The system of plantingwas significantly different on the number of branches pl^{-1}in 2017 and 2018, While the top value (10.96 branch pl^{-1} in 2017 and 10.05 branch pl^{-1} in 2018) was registered in the mono-crop planting system , thelowest value (9.57 branches pl^{-1} in 2017 and 9.39 branches pl^{-1} in 2018) was detected in the intercropping planting system . However, the organic fertilizer was significantly different on the number of branches pl^{-1}in 2018.The upper value (10.24 branch pl^{-1} in 2018) was recorded in the organic fertilizer 15 kg per $7.8m^2$.The less value (9.37 branches pl^{-1} in 2018) was detected in the organic fertilizer 0 kg per $7.8m^2$. The organic fertilizer was not significantly different for the number of branches pl^{-1} in 2017.

The significance level between mean of years (2017 and 2018) was determined by T test. There was significant difference between mean of years on the number of branches pl^{-1}. While the highest value (10.96 branches pl^{-1}) was detected in the year of 2017 of interaction between mono-crop with organic fertilizer.Thelowest value (10.05 branches pl^{-1}) was recorded in 2018. However, showed that the interaction between mean of intercropping and mean of organic fertilizer was not significantly different between years.Morover,Showedthat theywere significantly influenced by theplanting system. While the maximum value (10.27 branches pl^{-1}) was recorded in 2017, the minimum value (9.72 branches pl^{-1}) was detected in 2018. However, Results showedthat the organic fertilizer was significantly different in the years on the number of branches pl^{-1}. While the highest value (10.27 branches pl^{-1}) was recorded in 2017, the lowest value (9.72 branches pl^{-1}) was detected in 2018.

Table 4.10. The effect of different level of mono-crop, intercropping and organic fertilizer and interaction between them on plant traits of fresh bean on the number ofbranches per plant in 2017 and 2018

Fresh Bean Plants	Organic Fertilizer	No. of Branches (Branch Pl^{-1})	
		2017	2018
B2 (F.B.M) A x B2	A1	10.53 ab	9.53 b
	A2	10.67 ab	9.93 b
	A3	11.47 a	10.60 a
	A4	11.33 ab	10.87 a
	A5	10.80 ab	9.33 b
	Mean	10.96*	10.05*
B3 (F.B.I) A x B3	A1	9.47 ab	9.20 b
	A2	10.93 ab	9.47 b
	A3	9.27 ab	9.27 b
	A4	9.47 ab	9.60 b
	A5	8.73 b	9.40 b
	Mean	9.57ns	9.39ns
(F.B.M)	B2	10.96 a	10.05 a
(F.B.I)	B3	9.57 b	9.39 b
	Mean	10.27*	9.72*
(O.F) Fresh bean	A1	10.00 a	9.37 c
	A2	10.80 a	9.70 bc
	A3	10.37 a	9.94 ab
	A4	10.40 a	10.24 a
	A5	9.77 a	9.37 c
	Mean	10.27*	9.72*

The significance level was set at P≤0.05. Differences between trait means were assessed using Duncan's Multiple Range Test at P≤0.05 level. (*)The significance level and (ns) non significant level was set at P≤0.05 to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable Plant (Fresh Bean) B2= (F.B.M) Fresh Bean Monocrop. B3=(F.B.I) Fresh Bean Intercropping.

4.11. SPAD Value in Sweet Corn

The results presented in Table 4.11 showed that the interaction between the sweet corn mono-crop and the organic fertilizer showed a significant difference on the SPAD value trait in 2017 and 2018.While the top value (52.86 SPAD in 2017 and 53.26 SPAD in 2018) was detected in the treatment sweet corn mono-crop with 20 kg per 7.8m^2 organic fertilizer, the less value was registered (50.25 SPAD in 2017 and 48.07 SPAD in 2018) in the treatment sweet corn mono-crop with 0 kg per 7.8m^2 organic fertilizer and 10 kg per 7.8m^2, respectively. However, the interaction between the sweet corn intercropping and the organic fertilizer was significantly effective on the SPAD value in 2017 and 2018.The maximum value (50.73 SPAD in 2017 and 51.32 SPAD in 2018) was detected in the treatment sweet corn intercropping with 10 kg per 7.8m^2 and sweet intercropping with 15 kg per 7.8m^2, respectively.The minimum value (48.65 SPAD in 2017 and 48.13 SPAD in 2018) was recorded in the treatment of sweet corn intercropping with 5 kg per 7.8m^2 and sweet corn intercropping with 0 kg per 7.8m^2, respectively.

The interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer in 2017 and 2018 was significantly different in SPAD value traits.While the upper value (52.86 SPAD in 2017 and 53.26 SPAD in 2018) was detected in the treatment of sweet corn mono-crop with 20 kg per 7.8m^2 organic fertilizer, lower value was registered (48.65 SPAD in 2017 and 48.07 SPAD in 2018) in the treatment sweet corn intercropping with 5 kg per 7.8m^2 and sweet corn mono-crop with 10 kg per 7.8m^2.

The system of plantingwas significantly different on SPAD value traits in 2017.The highest value (51.26 SPAD in 2017) was registered in the treatment sweet corn mono-crop.The lowest value (49.83 SPAD in 2017) was recorded in the treatment sweet corn intercropping. However, the system of plantingwas not significantlyeffective on SPAD value traits in 2018. The organic fertilizer was significantly effective on SPAD value. While the top value (51.54 SPAD in 2017 and 52.27 SPAD in 2018) was detected in the organic fertilizer 20 kg per 7.8m^2, the less value (49.55 SPAD in 2017 and 48.84 SPAD in 2018) was recorded in the organic fertilizer 5 kg per 7.8m^2 and the organic fertilizer 0 kg per 7.8 m^2 respectively.

The significance level between mean of years (2017 and 2018) was determined by T test to compare between years. Showed that there was not significant differencebetween mean of years (2017 and 2018) on SPAD value traits of sweet corn on all treatment (mono-crop, intercropping, organic fertilizer and interaction between them).

Table 4.11. The effect of different level of mono-crop, intercropping and organic fertilizer and interaction between them on plant traits of sweet corn on SPAD value in 2017 and 2018

Sweet Corn Plants	Organic Fertilizer	SPAD value (SPAD)	
		2017	2018
B1 (S.C.M) A x B1	A1	50.25 bcd	49.55 bc
	A2	50.44 bc	49.63 bc
	A3	51.13 b	48.07 c
	A4	51.64 ab	51.14 ab
	A5	52.86 a	53.26 a
	Mean	51.26ns	50.33ns
B3 (S.C.I) A x B3	A1	49.01 cd	48.13 c
	A2	48.65 d	48.46 c
	A3	50.73 b	49.67 bc
	A4	50.56 bc	51.32 ab
	A5	50.21 bcd	51.27 ab
	Mean	49.83ns	49.77ns
(S.C.M)	B1	51.26 a	50.33 a
(S.C.I)	B3	49.83 b	49.77 a
	Mean	50.55ns	50.05ns
(O.F) Sweet corn	A1	49.63 b	48.84 b
	A2	49.55 b	49.05 b
	A3	50.93 a	48.87 b
	A4	51.10 a	51.23 a
	A5	51.54 a	52.27 a
	Mean	50.55 ns	50.05 ns

The significance level was set at P≤0.05. Differences between trait means were assessed using Duncan's Multiple Range Test at P≤0.05 level. (*****)The significance level and (ns**)** non significant level was set at P≤0.05 to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable plant (Sweet Corn). B1= (S.C.M) Sweet Corn Monocrop. B3=(S.C.I) Sweet Corn Intercropping.

4.12. SPAD Value in Fresh Bean

The results presented in Table 4.12 showed that the interaction between the fresh bean mono-crop and the organic fertilizer showed a significant effect on the SPAD value trait in 2017 and 2018.The maximum value (38.75 SPAD in 2017 and 39.02 SPAD in 2018) was detected in the treatment of fresh bean mono-crop with 15 kg per 7.8m^2 organic fertilizer and fresh bean mono-crop with 20 kg per 7.8m^2 organic fertilizer, respectively.The minimum value was recorded (33.98 SPAD in 2017 and 33.47 SPAD in 2018) in the treatment fresh bean mono-crop with 0 kg per 7.8m^2 organic fertilizer. However, the interaction between the fresh bean intercropping and the organic fertilizer was significantly influenced on the SPAD value in 2017 and 2018.While the upper value (36.11 SPAD in 2017 and 35.69 SPAD in 2018) was recorded in the treatment fresh bean intercropping with 20 kg per 7.8m^2 organic fertilizer, lower value (32.45 SPAD in 2017 and 30.82 SPAD in 2018) was registered in the treatment of fresh bean intercropping with 0 kg per 7.8m^2 organic fertilizer.

The interaction between mono-crop and intercropping of fresh bean in the different level of organic fertilizer in 2017 and 2018 was significantly different in SPAD value traits.While the top value (38.75 SPAD in 2017 and 39.02 SPAD in 2018) was detected in the treatment of fresh bean mono-crop with 15 kg per 7.8m^2 organic fertilizer and fresh bean mono-crop with 20 kg per 7.8m^2 organic fertilizer respectively, and the lowest value was registered (32.45 SPAD in 2017 and 30.82 SPAD in 2018) in the treatment of fresh bean intercropping with 0 kg per 7.8m^2 organic fertilizer.

The system of plantingwas significantlyeffective on SPAD value traits in 2017 and 2018.The highest value (37.19 SPAD in 2017and 37.00 SPAD in 2018) was detected in the treatment fresh bean mono-crop.The lowest value (34.54 SPAD in 2017and 33.60 SPAD 2018) was recorded in the treatment fresh bean intercropping. However, the organic fertilizer was significantly effective on SPAD value. While the top value (37.38 SPAD in 2017 and 37.36 SPAD in 2018) was registered in the organic fertilizer 15 kgper 7.8 m^2 and the organic fertilizer 20 kg per 7.8m^2 respectively, the less value (33.22 SPAD in 2017 and 32.15 SPAD in 2018) was recorded in the organic fertilizer 0 kg per 7.8m^2.

The significance level between mean of years (2017 and 2018) was determined by T test to compare between years. Showed that there was not significant difference between mean of years (2017 and 2018) on SPAD value traits of fresh bean on all treatment (mono-crop, intercropping, organic fertilizer and interaction between them).

Table 4.12. The effect of different level of mono-crop, intercropping and organic fertilizer and interaction between them on plant traits of fresh bean on SPAD value in 2017 and 2018

Fresh Bean Plants	Organic Fertilizer	SPAD value (SPAD)	
		2017	2018
B2 (F.B.M) A x B2	A1	33.98 cd	33.47 de
	A2	37.12 ab	37.06 b
	A3	37.86 ab	37.03 b
	A4	38.75 a	38.44 a
	A5	38.24 ab	39.02 a
	Mean	37.19ns	37.00ns
B3 (F.B.I) A x B3	A1	32.45d	30.82 f
	A2	33.81 cd	32.33 e
	A3	34.33 cd	34.64 cd
	A4	36.01 bc	34.52 cd
	A5	36.11 bc	35.69 bc
	Mean	34.54ns	33.60ns
(F.B.M)	B2	37.19 a	37.00 a
(F.B.I)	B3	34.54 b	33.60 b
	Mean	35.87ns	35.30ns
(O.F) Fresh bean	A1	33.22 c	32.15 d
	A2	35.45 b	34.70 c
	A3	36.10 ab	35.84 b
	A4	37.38 a	36.48 ab
	A5	37.18 ab	37.36 a
	Mean	35.87 ns	35.30 ns

The significance level was set at P≤0.05. Differences between trait means were assessed using Duncan's Multiple Range Test at P≤0.05 level. (*****)The significance level and (ns) non significant level was set at P≤0.05 to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable Plant (Fresh Bean) B2= (F.B.M) Fresh Bean Monocrop. B3=(F.B.I) Fresh Bean Intercropping.

4.13. Sweet Corn Cob Length

As shown in Table 4.13 the interaction between the sweet corn mono-crop and the organic fertilizer showed a significant difference on the cob length trait in 2017 and 2018.While the top values (20.80 cm in 2017 and 20.50 cm in 2018) was detected in the treatment sweet corn mono-crop with 20 kg per 7.8m^2 organic fertilizer, the smallest valuesrecorded (19.03 cm in 2017 and 18.60 cm in 2018) in the treatment sweet corn mono-crop with 0 kg per 7.8m^2 organic fertilizer. However, the interaction between the sweet corn intercropping and the organic fertilizer was significantly effective on the cob length in 2017 and 2018.The maximum value (20.97 cm in2018) was detected in the treatment sweet corn intercropping with 20 kg per 7.8m^2 h 15 kg organic fertilizer. The minimum value (19.50 cm in 2018) was registered in the treatment of sweet corn intercropping with 0 kg per 7.8m^2 organic fertilizer. The interaction between the sweet corn intercropping and the organic fertilizer was not significantly effective on the cob length in 2017.

The interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer in 2017 and 2018 was significantly different in cob length traits, While the maximum value (21.07 cm in 2017 and 20.97 cm in 2018) was recorded in the treatment of sweet corn intercropping with 5 kg per 7.8m^2 organic fertilizer and sweet corn intercropping with 20 kg per 7.8m^2 respectively, the lower value was registered (19.03 cm in 2017 and 18.60 cm in 2018) in the treatment sweet corn mono-crop with 0 kg per 7.8m^2 organic fertilizer.

The system of plantingwas significantly different on cob length traits in 2017 and 2018.The highest value (20.70 cm in 2017 and 20.49 cm in 2018) was detected in the treatment sweet corn intercropping.The lowest value (20.23 cm in 2017 and 19.72 cm in 2018) was recorded in the treatment sweet corn mono-crop. However, the organic fertilizer was significantly effective on cob length.While top value (20.73 cm in 2017 and 20.73 cm in 2018) was recorded in the organic fertilizer 20 kg per 7.8m^2, the lowest value (19.57cm in 2017 and 19.05 cm in 2018) was registered in the organic fertilizer 0 kg per 7.8m^2.

The significance level between mean of years (2017 and 2018) was determined by T test to compare between years. Showed that there was not significant differentce between mean of years (2017 and 2018) on cob length traits of sweet corn on all treatment (mono-crop, intercropping, organic fertilizer and interaction between them).

Table 4.13. The effect of different level of mono-crop, intercropping, organic fertilizer and interaction between them on plant traits of sweet corn on the cob length in 2017 and 2018

Sweet Corn Plants	Organic Fertilizer	Cob Length (cm)	
		2017	2018
B1 (S.C.M) A x B1	A1	19.03 b	18.60 e
	A2	20.43 a	19.47 d
	A3	20.50 a	19.87 cd
	A4	20.37 a	20.17 bcd
	A5	20.80 a	20.50 abc
	Mean	20.23ns	19.72ns
B3 (S.C.I) A x B3	A1	20.10 ab	19.50 d
	A2	21.07 a	20.67 ab
	A3	20.96 a	20.57 abc
	A4	20.70 a	20.77 ab
	A5	20.67 a	20.97 a
	Mean	20.70ns	20.49ns
(S.C.M)	B1	20.23 b	19.72 b
(S.C.I)	B3	20.70 a	20.49 a
	Mean	20.46ns	20.11ns
(O.F) Sweet corn	A1	19.57 b	19.05 c
	A2	20.73 a	20.07 b
	A3	20.73 a	20.22 ab
	A4	20.53 a	20.47 ab
	A5	20.73 a	20.73 a
	Mean	20.46ns	20.11ns

The significance level was set at P≤0.05. Differences between trait means were assessed using Duncan's Multiple Range Test at P≤0.05 level. (*****)The significance level and (ns**)** non significant level was set at P≤0.05 to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable plant (Sweet Corn). B1= (S.C.M) Sweet Corn Monocrop. B3=(S.C.I) Sweet Corn Intercropping.

4.14. Sweet Corn Cob Diameter

The results presented in Table 4.14 that the interaction between the sweet corn mono-crop and the organic fertilizer showed a significant difference on the cob diameter in 2017 and 2018.While the top value (15.53 cm in 2017 and 15.43 cm in 2018) was recorded in the treatment of sweet corn mono-crop with 20 kg per 7.8m^2 organic fertilizer and sweet corn mono-crop with 15 kg per 7.8m^2 organic fertilizer, the smallest values was registered (14.13 cm in 2017 and 13.37 cm in 2018) in the treatment sweet corn mono-crop with 0 kg per 7.8m^2 organic fertilizer. On the other hand, the interaction between the sweet corn intercropping and the organic fertilizer was significantly effective on the cob diameter in 2017 and 2018.The maximum values (15.57cm in 2017 and 15.67 cm 2018) was detected in the treatment sweet corn intercropping with 15 kg per 7.8m^2 organic fertilizer. The minimum values (14.70 cm in 2017 and 14.53 cm in 2018) was recorded in the treatment of sweet corn intercropping with 0 kg per 7.8m^2 organic fertilizer.

The interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer in 2017 and 2018 was significantly different in cob diameter traits.While the highest value (15.57cm in 2017 and 15.67 cm 2018) in the treatment of sweet corn intercropping with 15 kg per 7.8m^2 organic fertilizer.The lowest value was registered (14.13 cm in 2017 and 13.37 cm in 2018) in the treatment sweet corn mono-crop with 0 kg per 7.8m^2 organic fertilizer.

The system of plantinghadsignificant difference on cob diameter traits in 2018.The highest values (15.15 cm in 2018) was registered in the treatment sweet corn intercropping, the lowest values (14.84 cm in 2018) was recorded in the treatment sweet corn mono-crop. However, the organic fertilizer significantly effective on cob diameter was registered the top value (15.52 cm in 2017 and 15.55 cm in 2018) in the organic fertilizer 15 kg per 7.8m^2, the lowest value (14.42 cm in 2017 and 14.13 cm in 2018) was registered in the organic fertilizer 0 kg per 7.8m^2.

The significance level between mean of years (2017 and 2018) was determined by T test to compare between years. The results showed that there was not significant difference between mean of years (2017 and 2018) on cob diameter of sweet corn on all treatment (mono-crop, intercropping, organic fertilizer and interaction between them).

Table 4.14. The effect of different level of mono-crop, intercropping, organic fertilizer and interaction between them on plant traits of sweet corn on the cob diameter in 2017 and 2018

Sweet Corn Plants	Organic Fertilizer	Cob Diameter (cm)	
		2017	2018
B1 (S.C.M) A x B1	A1	14.13 b	13.73 c
	A2	15.53 a	15.17 ab
	A3	15.00 ab	14.50 b
	A4	15.47 a	15.43 a
	A5	15.53 a	15.37 a
	Mean	15.13ns	14.84ns
B3 (S.C.I) A x B3	A1	14.70 b	14.53 b
	A2	15.30 a	15.03 ab
	A3	14.80 ab	15.03 ab
	A4	15.57 a	15.67 a
	A5	15.43 a	15.50 a
	Mean	15.16ns	15.15ns
(S.C.M)	B1	15.13 a	14.84 b
(S.C.I)	B3	15.16 a	15.15 a
	Mean	15.15ns	15.00ns
(O.F) Sweet corn	A1	14.42 b	14.13 c
	A2	15.42 a	15.10 ab
	A3	14.90 ab	14.77 b
	A4	15.52 a	15.55 a
	A5	15.48 a	15.43 a
	Mean	15.15ns	15.00ns

The significance level was set at P≤0.05. Differences between trait means were assessed using Duncan's Multiple Range Test at P≤0.05 level. (*****)The significance level and (ns**)** non significant level was set at P≤0.05 to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable plant (Sweet Corn). B1= (S.C.M) Sweet Corn Monocrop. B3=(S.C.I) Sweet Corn Intercropping.

4.15. The Number of Cob per Plant in Sweet Corn

The data presented in Table 4.15 showed that the interaction between the sweet corn mono-crop and the organic fertilizer showed a significant difference on the number of cob per plant in 2018.While recorded the top values (1.67 cob per plant in 2018) in the treatment of sweet corn mono-crop with 20 kg per 7.8m^2 organic fertilizer, the lowest value was recorded (1.00 cob per plant in 2018) in the treatment sweet corn mono-crop with 0 kg per 7.8m^2 organic fertilizer.However, the interaction between the sweet corn mono-crop and the organic fertilizer was not significantly effective on the number of cobper plant in 2017. The interaction between the sweet corn intercropping and the organic fertilizer was significantly effective on the number of cobper plant in 2018.While the maximum value (1.93 cob pl^{-1} in 2018) was detected in the treatment sweet corn intercropping with 20 kg per 7.8m^2 organic fertilizer.The minimum value was registered (1.07 cob pl^{-1} in 2018) in the treatment of sweet corn intercropping with 0 kg per 7.8m^2 organic fertilizer.However, the interaction between the sweet corn intercropping and the organic fertilizer was not significantly effective on the number of cobper plant in 2017.

The interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer in 2017 and 2018 was significantly different in the number of cob per plant.The upper value (1.80 cob pl^{-1} in 2017 and 1.93 cob pl^{-1} in 2018) was recorded in the treatment of sweet corn intercropping with 5 kg per 7.8m^2 organic fertilizer and sweet corn intercropping with 20 kg per 7.8m^2 organic fertilizer respectively.The lowest value was registered (1.00 cob pl^{-1} in 2017 and 1.00 cob pl^{-1} in 2018) in the treatment sweet corn mono-crop with 0 kg per 7.8m^2 organic fertilizer.

The system of plantingshowed significant difference on the number of cob per plant traits in 2017 and 2018.While the highest value (1.55 cob pl^{-1} in 2017 and 1.57 cob pl^{-1} in 2018) was detected in the treatment sweet corn intercropping. The lowest value(1.15 cob pl^{-1} in 2017 and 1.23 cob pl^{-1} in 2018) was recorded in the treatment sweet corn mono-crop. However, the organic fertilizer was significantly effective on the number of cob per plant in 2018.The top value (1.80 cob pl^{-1} in 2018) was detected in the organic fertilizer 20 kg per 7.8m^2.The lowest value (1.03 cob pl^{-1} in 2018) was recorded in the organic fertilizer 0 kg per 7.8m^2.The organic fertilizer was not significantly effective on the number of cob per plant in 2017.

The significance level between mean of years (2017 and 2018) was determined by T test to compare between years. Results showed that there was not significant difference between mean of years (2017 and 2018) on the number of cobper plant traits of sweet corn on all treatment (mono-crop, intercropping, organic fertilizer and interaction between them).

Table 4.15. The effect of different level of mono-crop, intercropping, organic fertilizer and interaction between them on plant traits of sweet corn on the number of cobper plant in 2017 and 2018

Sweet Corn Plants	Organic Fertilizer	No. of Cob(Cob Pl^{-1})	
		2017	2018
B1 (S.C.M) A x B1	A1	1.00 b	1.00 c
	A2	1.00 b	1.00 c
	A3	1.07 b	1.13 c
	A4	1.20 ab	1.33 bc
	A5	1.47 ab	1.67 ab
	Mean	1.15ns	1.23ns
B3 (S.C.I) A x B3	A1	1.20 ab	1.07 c
	A2	1.80 a	1.67 ab
	A3	1.47 ab	1.33 bc
	A4	1.73 a	1.87 a
	A5	1.53 ab	1.93 a
	Mean	1.55ns	1.57ns
(S.C.M)	B1	1.15 b	1.23 b
(S.C.I)	B3	1.55 a	1.57 a
	Mean	1.35ns	1.40ns
(O.F) Sweet corn	A1	1.10 a	1.03 c
	A2	1.40 a	1.33 b
	A3	1.27 a	1.23 bc
	A4	1.47 a	1.60 a
	A5	1.50 a	1.80 a
	Mean	1.35ns	1.40ns

The significance level was set at $P \leq 0.05$. Differences between trait means were assessed using Duncan's Multiple Range Test at $P \leq 0.05$ level. (*****)The significance level and (ns**)** non significant level was set at $P \leq 0.05$ to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable plant (Sweet Corn). B1= (S.C.M) Sweet Corn Monocrop. B3=(S.C.I) Sweet Corn Intercropping.

4.16. The Number of Row per Cob in Sweet Corn

We concluded from Table 4.16 that the interaction between the sweet corn mono-crop and the organic fertilizer was a significantly influenced in the number of row per cob trait in 2018.While the highest values (17.57 row per cob in 2018) was detected in the treatment of sweet corn mono-crop with 15 kg per 7.8m^2 organic fertilizer. The lowest value was registered (16.43 row per cob in 2018) in the treatment sweet corn mono-crop with 10 kg per 7.8m^2 organic fertilizer. On the other hand, the interaction between the sweet corn mono-crop and the organic fertilizer was not significantly effective on the number of rowper cob in 2017. The interaction between the sweet corn intercropping and the organic fertilizer showed significantly difference on the number of row per cob in 2018.While the highest value (18.17 row per cob in 2018) was detected in the treatment sweet corn intercropping with 20 kg per 7.8m^{2}organic fertilizer. Thelowest value (17.27row per cob in 2018) was recorded in the treatment of sweet corn intercropping with 10 kg per 7.8m^2 organic fertilizer.However, the interaction between the sweet corn intercropping and the organic fertilizer was not significantly effective on the number of rowper cob in 2017.

The interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer in 2018 was significantly effective in the number of rowper cob.The top value (18.17 row per cob in 2018) was detected in the treatment of sweet corn intercropping with 20 kg per 7.8m^2 organic fertilizer.The lowest value was registered (16.43 row per cob in 2018) in the treatment sweet corn mono-crop with 0 kg per 7.8m^2 organic fertilizer. However, the interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer was not significantly influenced on the number of row per cob traits in 2017.

The system of plantingshowed significant difference on the number of row per cob traits in 2018.The maximum values (17.63 row per cob in 2018) was detected in the treatment sweet corn intercropping.The lowest values (17.18 row per cob in 2018) was recorded in the treatment sweet corn mono-crop. However, the system of plantingwas not significantlyeffective on the number of rowper cob in 2017.The organic fertilizer was significantly effective on the number of rowper cob.While themaximum values (17.83 row per cob in 2018) was detected in the organic fertilizer 20 kg per 7.8m^2.The minimum values (16.87 row per cob in 2018) was recorded in the organic fertilizer 0 kg per 7.8m^2.However, the organic fertilizer was not significantly effective on the number of rowper cob in 2017.The significance leval between mean of years (2017 and 2018) was determined by T test to compare between years. Results showed that there was not significant difference between mean of years (2017 and 2018) on the number of rowper cob of sweet corn on all treatment (mono-crop, intercropping, organic fertilizer and interaction between them).

Table 4.16. The effect of different level of mono-crop, intercropping, organic fertilizer and interaction between them on plant traits of sweet corn on the number of row per cob in 2017 and 2018

Sweet Corn Plants	Organic Fertilizer	No. of Row (Row Cob^{-1})	
		2017	2018
B1 (S.C.M) A x B1	A1	17.10 a	16.43 d
	A2	18.33 a	17.33 c
	A3	17.40 a	17.07 c
	A4	17.47 a	17.57 abc
	A5	17.40 a	17.50 abc
	Mean	17.54ns	17.18ns
B3 (S.C.I) A x B3	A1	17.40 a	17.30 c
	A2	17.87 a	17.37 bc
	A3	17.73 a	17.27 c
	A4	18.27 a	18.03 ab
	A5	18.20 a	18.17 a
	Mean	17.89ns	17.63ns
(S.C.M)	B1	17.54 a	17.18 b
(S.C.I)	B3	17.89 a	17.63 a
	Mean	17.72ns	17.40ns
(O.F) Sweet corn	A1	17.25 a	16.87 c
	A2	18.10 a	17.35 b
	A3	17.57 a	17.17 b
	A4	17.87 a	17.80 a
	A5	17.80 a	17.83 a
	Mean	17.72ns	17.40ns

The significance level was set at P≤0.05. Differences between trait means were assessed using Duncan's Multiple Range Test at P≤0.05 level. (*****)The significance level and (ns**)** non significant level was set at P≤0.05 to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable plant (Sweet Corn). B1= (S.C.M) Sweet Corn Monocrop. B3=(S.C.I) Sweet Corn Intercropping.

4.17. The Number of Seed per Row in Sweet Corn

As shown in Table 4.17 the interaction between the sweet corn mono-crop and the organic fertilizer showed a significant difference on the number of seed per rowin 2017 and 2018.While the top values (40.00 seed per row in 2017 and 38.67 seed per row in 2018) was recorded in the treatment of sweet corn mono-crop with 20 kg per 7.8m^2 organic fertilizer.The lowest value was recorded (36.97 seed per row in 2017 and 34.73 seed per row in 2018) in the treatment sweet corn mono-crop with 0 kg per 7.8m^2 organic fertilizer. On the other hand, the interaction between the sweet corn intercropping and the organic fertilizer have significantly effective on the number of seed per row in 2018.The maximum values (38.43 seed per row in 2018) was recorded in the treatment sweet corn intercropping with 20 kg per 7.8m^2 organic fertilizer.The minimum values (35.57 seed per row in 2018) was detected in the treatment of sweet corn intercropping with 5 kg per 7.8m^2 organic fertilizer.However, the interaction between the sweet corn intercropping and the organic fertilizer was not significantly effective on the number of seed per row in 2017.

The interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer in 2017 and 2018 was significantly different in the number of seed per row.The upper values (40.00 seed per row in 2017 and 38.67 seed per row in 2018) was detected in the treatment of sweet corn mono-crop with 20 kg per 7.8m^2 organic fertilizer.The lowest value was recorded (36.97 seed per row in 2017 and 34.73 seed per row in 2018) in the treatment sweet corn mono-crop with 0 kg per 7.8m^2 organic fertilizer.

The system of plantingwas not significantly different on the number of seed per row traits in 2017 and 2018. However, the organic fertilizer have been significantly effective on the number of seed per row.Themaximum values (38.97 seed per row in 2017 and 38.55 seed per row in 2018) was recorded in the organic fertilizer 20 kg per 7.8m^2. The minimumvalues (36.98 seed per row in 2017 and 35.22 seed per row in 2018) was detected in the organic fertilizer 0 kg per 7.8m^2.

The significance level between mean of years (2017 and 2018) was determined by T test to compare between years. Results showed that there was not significant difference between mean of years (2017 and 2018) on the number of seed per row of sweet corn on all treatment (mono-crop, intercropping, organic fertilizer and interaction between them) except system of plant.While upper value (37.76 seed per row) was recorded in 2017.The lowest value (36.70 seed per row) was detected in 2018.

Table 4.17. The effect of different level of mono-crop, intercropping, organic fertilizer and interaction between them on plant traits of sweet corn on the number of seed per rowin 2017 and 2018

Sweet Corn Plants	Organic Fertilizer	No. of Seed (Seed Row^{-1})	
		2017	2018
B1 (S.C.M) A x B1	A1	36.97 b	34.73 d
	A2	37.47 ab	35.40 d
	A3	37.87 ab	36.13 cd
	A4	37.47 ab	37.83 abc
	A5	40.00 a	38.67 a
	Mean	37.95ns	36.55ns
B3 (S.C.I) A x B3	A1	37.00 b	35.70 d
	A2	37.73 ab	35.57 d
	A3	37.73 ab	36.40 bcd
	A4	37.40 ab	38.13 ab
	A5	37.93 ab	38.43 a
	Mean	37.56ns	36.85ns
(S.C.M)	B1	37.95 a	36.55 a
(S.C.I)	B3	37.56 a	36.85 a
	Mean	37.76*	36.70*
(O.F) Sweet corn	A1	36.98 b	35.22 b
	A2	37.60 ab	35.48 b
	A3	37.80 ab	36.27 b
	A4	37.43 ab	37.98 a
	A5	38.97 a	38.55 a
	Mean	37.76ns	36.70ns

The significance level was set at P≤0.05. Differences between trait means were assessed using Duncan's Multiple Range Test at P≤0.05 level. (*****)The significance level and (ns**)** non significant level was set at P≤0.05 to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable plant (Sweet Corn). B1= (S.C.M) Sweet Corn Monocrop. B3=(S.C.I) Sweet Corn Intercropping.

4.18. The Number of Seed per Cob in Sweet Corn

The results presented in Table 4.18 the interaction between the sweet corn mono-crop and the organic fertilizer was a significantly influenced in the number of seed per cob trait in 2018.While the highest values (676.88 seed per cob in 2018) was detected in the treatment of sweet corn mono-crop with 20 kg per 7.8m^2 organic fertilizer.The lowest value was recorded (566.15 seed per cob in 2018) in the treatment sweet corn mono-crop with 0 kg per 7.8m^2 organic fertilizer. On the other hand, the interaction between the sweet corn mono-crop and the organic fertilizer was not significantly effective on the number of seedper cob in 2017. However, the interaction between the sweet corn intercropping and the organic fertilizer was significantly difference on the number of seed per cob in 2018.The highest values (687.84 seed per cob in 2018) was detected in the treatment sweet corn intercropping with 15 kg per 7.8m^2 organic fertilizer.The lowest values (617.61 seed per cob in 2018) was recorded in the treatment of sweet corn intercropping with 0 kg per 7.8m^2 organic fertilizer. The interaction between the sweet corn intercropping and the organic fertilizer was not significantly effective on the number of seedper cob in 2017.

The interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer in 2018 was significantly effective in the number of seed per cob. The top value (687.84 seed per cob in 2018) was recorded in the treatment of sweet corn intercropping with 15 kg per 7.8m^2 organic fertilizer.The lowest value was registered (566.15 seed per cob in 2018) in the treatment sweet corn mono-crop with 0 kg per 7.8m^2 organic fertilizer. However, the interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer was not significantly influenced on the number of seedper cob traits in 2017.

The system of plantingshowed significant difference on the number of seedper cob in 2018.While the maximum value (644.23 seed per cob in 2018) was recorded in the treatment sweet corn intercropping, the lowest values (627.65 seed per cob in 2018) was detected in the treatment sweet corn mono-crop. However, the system of planting did not showed significant difference on the number of seedper cob traits in 2017. The organic fertilizer was significantly effective on the number of seedper cob.While the top values (693.68 seed per cob in 2017 and 676.24 seed per cob in 2018) was detected in the organic fertilizer 20 kg per 7.8m^2 and organic fertilizer 15 kg per 7.8m^2 respectively.The less value (638.10 seed per cob in 2017 and 591.88 seed per cob in 2018) was recorded in the organic fertilizer 0 kg per 7.8m^2.The significance level between mean of years (2017 and 2018) was determined by T test to compare between years. The results showed that there was not significant difference between mean of years (2017 and 2018) on the number of seedper cob of sweet corn on all treatment (mono-crop, intercropping, organic fertilizer and interaction between them).

Table 4.18. The effect of different level of mono-crop, intercropping, organic fertilizer and interaction between them on plant traits of sweet corn on the number of seed per cob in 2017 and 2018

Sweet Corn Plants	Organic Fertilizer	No. of Seed (Seed Cob^{-1})	
		2017	2018
B1 (S.C.M) A x B1	A1	632.32 a	566.15 e
	A2	687.09 a	613.83 d
	A3	658.53 a	616.78 cd
	A4	654.08 a	664.63 abc
	A5	695.96 a	676.88 a
	Mean	665.60ns	627.65ns
B3 (S.C.I) A x B3	A1	643.88 a	617.61 cd
	A2	673.91 a	617.72 cd
	A3	669.88 a	628.63 bcd
	A4	683.16 a	687.84 a
	A5	691.40 a	669.34 ab
	Mean	672.45ns	644.23ns
(S.C.M)	B1	665.60 a	627.65 b
(S.C.I)	B3	672.45 a	644.23 a
	Mean	669.02ns	635.94ns
(O.F) Sweet corn	A1	638.10 b	591.88 c
	A2	680.50 a	615.78 b
	A3	664.21 ab	622.70 b
	A4	668.62 ab	676.24 a
	A5	693.68 a	673.11 a
	Mean	669.02ns	635.94ns

The significance level was set at P≤0.05. Differences between trait means were assessed using Duncan's Multiple Range Test at P≤0.05 level. (*)The significance level and (ns) non significant level was set at P≤0.05 to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable plant (Sweet Corn). B1= (S.C.M) Sweet Corn Monocrop. B3=(S.C.I) Sweet Corn Intercropping.

4.19. The Weight of 100-Seed in Sweet Corn

Statistical analysis showed in Table 4.19 that the interaction between the sweet corn mono-crop and the organic fertilizer showed a significant difference on the weight of 100-seed in 2017 and 2018.While the highest values (25.70 g in 2017 and 25.35 g in 2018) was detected in the treatment of sweet corn mono-crop with 20 kg per 7.8m^2 organic fertilizer and sweet corn mono-crop with 15 kg per 7.8m^2 organic fertilizer respectively.The lowest value was recorded (20.20 g in 2017 and 19.83 g in 2018) in the treatment sweet corn mono-crop with 0 kg per 7.8m^2 organic fertilizer. On the other hand, the interaction between the sweet corn intercropping and the organic fertilizer was significantly effective on the weight of 100-seed in 2017 and 2018.The maximum value (27.04 g in 2017 and 27.16 g in 2018) was detected in the treatment sweet corn intercropping with 20 kg per 7.8m^2 and sweet corn intercropping with 15 kg per 7.8m^2 respectively.The minimum value (22.06 g in 2017 and 21.46 g in 2018) was recorded in the treatment sweet corn intercropping with 0 kg per 7.8m^2 organic fertilizer.

The interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer in 2017 and 2018 showed significant difference in weight of 100-seed.While the top value (27.04 g in 2017 and 27.16 g in 2018) was detected in the treatment of sweet corn intercropping with 20 kg per 7.8m^2 organic fertilizer and sweet corn intercropping with 15 kg per 7.8m^2 organic fertilizer respectively. Tthe lowest value was registered (20.20 g in 2017 and 19.83 g in 2018) in the treatment sweet corn intercropping with 0 kg per 7.8m^2.

The system of planting showed significant difference on weight of 100-seed in 2017 and 2018.While upper value (24.92 g in 2017 and 24.59 g in 2018) was detected in the treatment sweet intercropping corn.The lowest value (23.40 g in 2017 and 22.93 g in 2018) was recorded in the treatment sweet corn mono-crop. However, the organic fertilizer was significantly effective on weight of 100-seed. The upper value (26.37 g in 2017 and 26.26 g in 2018) was registered in the organic fertilizer 20 kg per 7.8m^2 and 15 kg per 7.8m^2 respectively.The lowest value (21.13 g in 2017 and 20.65 g in 2018) was recorded in the organic fertilizer 0 kg per 7.8m^2.

The significance level between mean of years (2017 and 2018) was determined by T test to compare between years. The results showedthat there was not significantdifference between mean of years (2017 and 2018) on weight of 100-seedof sweet corn on all treatment (mono-crop, intercropping, organic fertilizer and interaction between them).

Table 4.19. The effect of different level of mono-crop, intercropping, organic fertilizer and interaction between them on plant traits of sweet corn on the weight of 100-seedin 2017 and 2018

Sweet Corn Plants	Organic Fertilizer	Weight of 100-seed (g)	
		2017	2018
B1 (S.C.M) A x B1	A1	20.20 f	19.83 f
	A2	22.23 e	21.78 e
	A3	23.72 cd	22.79 de
	A4	25.16 bcd	25.35 bc
	A5	25.70 abc	24.90 bc
	Mean	23.40ns	22.93ns
B3 (S.C.I) A x B3	A1	22.06 e	21.46 e
	A2	24.09 de	23.88 cd
	A3	24.62 cd	24.02 cd
	A4	26.76 ab	27.16 a
	A5	27.04 a	26.43 ab
	Mean	24.92ns	24.59ns
(S.C.M)	B1	23.40 b	22.93 b
(S.C.I)	B3	24.92 a	24.59 a
	Mean	24.16ns	23.76ns
(O.F) Sweet corn	A1	21.13 d	20.65 c
	A2	23.16 c	22.83 b
	A3	24.17 b	23.41 b
	A4	25.96 a	26.26 a
	A5	26.37 a	25.67 a
	Mean	24.16ns	23.76ns

The significance level was set at P≤0.05. Differences between trait means were assessed using Duncan's Multiple Range Test at P≤0.05 level. (*)The significance level and (ns**)** non significant level was set at P≤0.05 to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable plant (Sweet Corn). B1= (S.C.M) Sweet Corn Monocrop. B3=(S.C.I) Sweet Corn Intercropping.

4.20. The Pod Length in Fresh Bean

The data presented in Table 4.20 indicated that the interaction between the fresh bean mono-crop and the organic fertilizer was a significantly influenced by the treatment on the pod length trait in 2017 and 2018.While the highest value (15.37 cm in 2017 and 15.22 cm in 2018) was detected in the treatment fresh bean mono-crop with 15 kg per 7.8m^2 organic fertilizer and fresh bean mono-crop with 20 kg per 7.8 m^2 organic fertilizer respectively.The lowest value was recorded (13.50 cm in 2017 and 13.20 cm in 2018) in the treatment fresh bean mono-crop with 0 kg per 7.8m^2 organic fertilizer. On the other hand, the interaction between the fresh bean intercropping and the organic fertilizer was significantly effective on the pod length in 2017and 2018.The maximum value (14.45 cm in 2017 and 14.73 cm in 2018) was detected in the treatment fresh bean intercropping with 20 kg per 7.8m^2 organic fertilizer, the minimum value (13.55 cm in 2017 and 13.48cm in 2018) was recorded in the treatment fresh bean intercropping with 5 kg per 7.8m^2 organic fertilizer.

The interaction between mono-crop and intercropping of fresh bean in the different level of organic fertilizer in 2017 and 2018 was significant difference in pod length.The top value (15.37 cm in 2017 and 15.22 cm in 2018) was detected in the treatment fresh bean mono-crop with 15 kg per 7.8m^2 organic fertilizer and fresh bean mono-crop with 20 kg per 7.8 m^2 organic fertilizer respectively.The lowest value was recorded (13.50 cm in 2017 and 13.20 cm in 2018) in the treatment fresh bean mono-crop with 0 kg per 7.8m^2 organic fertilizer.

The system of planting was significantly influenced for pod length in 2017.While the upper value (14.59 cm) detected in the mono-crop planting system. The lowest value (13.99 cm) was registered in the intercropping plant system. However, the system of planting was not significantly different for pod length in 2018. The organic fertilizer showed significant difference on pod length in 2017 and 2018.The highest value (14.86 cm in 2017 and 14.98 cm in 2018) was detected in the organic fertilizer 20 kg per 7.8m^2,thelowest value (13.58 cm in 2017 and 13.38 cm in 2018) was recorded in the organic fertilizer 0 kg per 7.8m^2.

The significance level between mean of years (2017 and 2018) was determined by T test to compare between years. The results showed that there was not significant difference between mean of years (2017 and 2018) on pod length traits of fresh bean on all treatment (mono-crop, intercropping, organic fertilizer and interaction between them).

Table 4.20. The effect of different level of mono-crop, intercropping, organic fertilizer and interaction between them on plant traits of fresh bean on the pod length in 2017 and 2018

Fresh Bean Plants	Organic Fertilizer	Pod Length (cm)	
		2017	2018
B2 (F.B.M) A x B2	A1	13.50 c	13.20 c
	A2	14.22 abc	14.12 ab
	A3	14.58 abc	14.53 ab
	A4	15.37 a	15.13 a
	A5	15.28 a	15.22 a
	Mean	14.59ns	14.44ns
B3 (F.B.I) A x B3	A1	13.66 c	13.56 bc
	A2	13.55 c	13.48 bc
	A3	14.04 bc	13.91 ab
	A4	14.24 abc	14.35 ab
	A5	14.45 abc	14.73 ab
	Mean	13.99ns	14.01ns
(F.B.M)	B2	14.59 a	14.44 a
(F.B.I)	B3	13.99 b	14.01 a
	Mean	14.29ns	14.22ns
(O.F) Fresh bean	A1	13.58 b	13.38 c
	A2	13.89 b	13.80 bc
	A3	14.31 ab	14.22 ab
	A4	14.81 a	14.74 a
	A5	14.86 a	14.98 a
	Mean	14.29ns	14.22ns

The significance level was set at P≤0.05. Differences between trait means were assessed using Duncan's Multiple Range Test at P≤0.05 level. (*)The significance level and (ns) non significant level was set at P≤0.05 to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable Plant (Fresh Bean) B2= (F.B.M) Fresh Bean Monocrop. B3=(F.B.I) Fresh Bean Intercropping.

4.21. The Number of Seed per Pod in Fresh Bean

The results presented in Table 4.21 indicated that the interaction between the fresh bean mono-crop and the organic fertilizer was a significantly influenced by the treatment on the number of seed per pod in 2017 and 2018. While the highest value (6.37 seed per pod in 2017 and 6.36 seed per pod in 2018) was detected in the treatment of fresh bean mono-crop with 15 kg per 7.8m^2 organic fertilizer fresh bean mono-crop with 20 kg per 7.8m^2 organic fertilizer.The lowest value was recorded (5.57 seed per pod in 2017 and 5.45 seed per pod in 2018) in the treatment fresh bean mono-crop with 0 kg per 7.8m^2 organic fertilizer. On the other hand, the interaction between the fresh bean intercropping and the organic fertilizer was significantly effective on the number of seedper pod in 2017and 2018.The maximum value (6.44 seed in 2017 and 6.25 seed in 2018) was detected in the treatment fresh bean intercropping with 20 kg per 7.8m^2 organic fertilizer, the minimum value (5.56 seed in 2017 and 5.25 seed in 2018) was registered in the treatment fresh bean intercropping with 0 kg per 7.8m^2 organic fertilizer.

The interaction between mono-crop and intercropping of fresh bean in the different level of organic fertilizer in 2017 and 2018 showed significant difference in the number of seedper pod. The top value (6.44seed in 2017 and 6.36 seed in 2018) was in detected the treatment of fresh bean intercropping with 20 kg per 7.8m^2 organic fertilizer and fresh bean mono-crop with 20 kg per 7.8m^2 organic fertilizer respectively.The lowest value was recorded (5.56 seed in 2017 and 5.25 seed in 2018) in the treatment of fresh bean intercropping with 0 kg per 7.8m^2.

The system of planting was not significantly influenced for the number of seed per pod in 2017 and 2018. However, the organic fertilizer showed significant difference on the number of seedper pod in 2017 and 2018.While the highest value (6.30 seed in 2017 and 6.30 seed in 2018) was recorded in the organic fertilizer 20 kg per 7.8m^2,thelowest value (5.57 seed in 2017 and 5.36 cm in 2018) was detected in the organic fertilizer 0 kg per 7.8m^2.

The significance level between mean of years (2017 and 2018) was determined by T test to compare between years. The results showed that there was not significant difference between mean of years (2017 and 2018) on the number of seed per pod of fresh bean on all treatment (mono-crop, intercropping, organic fertilizer and interaction between them).

Table 4.21. The effect of different level of mono-crop, intercropping, organic fertilizer and interaction between them on plant traits of fresh bean on the number of seedper pod in 2017 and 2018

Fresh Bean Plants	Organic Fertilizer	No. of Seed (Seed Pod^{-1})	
		2017	2018
B2 (F.B.M) A x B2	A1	5.57 de	5.45 d
	A2	6.19 abc	5.99 ab
	A3	6.11 a-e	5.94 bc
	A4	6.37 ab	6.23 ab
	A5	6.15 a-d	6.36 a
	Mean	6.08ns	6.00ns
B3 (F.B.I) A x B3	A1	5.56 e	5.25 d
	A2	5.70 cde	5.59 cd
	A3	5.85 b-e	5.53 d
	A4	6.00 a-e	6.04 ab
	A5	6.44 a	6.25 ab
	Mean	5.91ns	5.73ns
(F.B.M)	B2	6.08 a	6.00 a
(F.B.I)	B3	5.91 a	5.73 a
	Mean	5.99ns	5.86ns
(O.F) Fresh bean	A1	5.57 b	5.36 c
	A2	5.95 ab	5.79 b
	A3	5.98 a	5.73 b
	A4	6.19 a	6.13 a
	A5	6.30 a	6.30 a
	Mean	5.99ns	5.86ns

The significance level was set at $P \leq 0.05$. Differences between trait means were assessed using Duncan's Multiple Range Test at $P \leq 0.05$ level. (*)The significance level and (ns) non significant level was set at $P \leq 0.05$ to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable Plant (Fresh Bean) B2= (F.B.M) Fresh Bean Monocrop. B3=(F.B.I) Fresh Bean Intercropping.

4.22. Fresh Seed Yield of Sweet Corn

As shown in Table 4.22 the interaction between the sweet corn mono-crop and the organic fertilizer showed a significant difference on the fresh seed yield of sweet cornin 2017 and 2018.While the top value (11.03 ton ha^{-1} in 2017 and 10.70 ton ha^{-1} in 2018) was detected in the treatment sweet corn mono-crop with 15 kg per $7.8m^2$ organic fertilizer, the less value was registered (8.67 ton ha^{-1} in 2017 and 7.87 ton ha^{-1} in 2018) in the treatment sweet corn mono-crop with 0 kg per $7.8m^2$ organic fertilizer. However, the interaction between the sweet corn intercropping and the organic fertilizer was significantly effective on the fresh seed yield in 2017 and 2018. The maximum value (7.38 ton ha^{-1} in 2017 and 7.70 ton ha^{-1}in 2018) was recorded in the treatment sweet corn intercropping with 15 kg per $7.8m^2$ organic fertilizer.The minimum value (5.27 ton ha^{-1} in 2017 and 5.57 ton ha^{-1} in 2018) was detected in the treatment of sweet corn intercropping with 0 kg per $7.8m^2$ organic fertilizer.

The interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer in 2017 and 2018 was significant difference in fresh seed yield. The upper value (11.03 ton ha^{-1} in 2017 and 10.70 ton ha^{-1} in 2018) was detected in the treatment of sweet corn mono-crop with 15 kg per $7.8m^2$ organic fertilizer. The lowest value was registered (5.27 ton ha^{-1} in 2017 and 5.57 ton ha^{-1} in 2018) in the treatment of sweet corn intercropping with 0 kg per $7.8m^2$ organic fertilizer.

The system of planting showed significant difference on fresh seed yield in 2017 and 2018. The highest value (10.14 ton ha^{-1} in 2017 and 9.75 ton ha^{-1} in 2018) was detected in the treatment sweet corn mono-crop.The lowest value (6.57 ton ha^{-1} in 2017 and 7.04 ton ha^{-1} in 2018) was recorded in the treatment sweet corn intercropping. The organic fertilizer was significantly effective on fresh seed yield in 207 and 2018. While the top value (9.20 ton ha^{-1} in 2017 and 9.20 ton ha^{-1} in 2018) was registered in the organic fertilizer 15 kg per $7.8m^2$, the less value (6.97 ton ha^{-1} in 2017 and 6.72 ton ha^{-1} in 2018) was detected in the organic fertilizer 0 kg per $7.8m^2$.

The significance level between mean of years (2017 and 2018) was determined by T test to compare between years. As shown in the results, there was not significant difference between mean of years (2017 and 2018) on fresh seed yield of sweet corn on all treatment (mono-crop, intercropping, organic fertilizer and interaction between them).

Table 4.22. The effect of different level of mono-crop, intercropping, organic fertilizer and interaction between them on the fresh seed yield of sweet corn in 2017 and 2018

Sweet Corn Plants	Organic Fertilizer	Yield (Fresh.Seed) ton ha^{-1}	
		2017	2018
B1 (S.C.M) A x B1	A1	8.67 bc	7.87 c
	A2	9.93 ab	10.27 ab
	A3	10.17 a	9.20 b
	A4	11.03 a	10.70 a
	A5	10.90 a	10.70 a
	Mean	10.14ns	9.75ns
B3 (S.C.I) A x B3	A1	5.27 e	5.57 d
	A2	6.58 de	7.02 c
	A3	6.42 de	7.25 c
	A4	7.38 cd	7.70 c
	A5	7.22 d	7.65 c
	Mean	6.57ns	7.04ns
(S.C.M)	B1	10.14 a	9.75 a
(S.C.I)	B3	6.57b	7.04b
	Mean	8.36ns	8.39 ns
(O.F) Sweet corn	A1	6.97c	6.72c
	A2	8.26b	8.64b
	A3	8.29b	8.23 ab
	A4	9.20 a	9.20 a
	A5	9.06 ab	9.18 a
	Mean	8.36 ns	8.39 ns

The significance level was set at $P \leq 0.05$. Differences between trait means were assessed using Duncan's Multiple Range Test at $P \leq 0.05$ level. (*****)The significance level and (ns**)** non significant level was set at $P \leq 0.05$ to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable plant (Sweet Corn). B1= (S.C.M) Sweet Corn Monocrop. B3=(S.C.I) Sweet Corn Intercropping.

4.23. Fresh Cob Yield of Sweet Corn

The data presented in Table 4.23 indicated that theinteraction between the sweet corn mono-crop and the organic fertilizer showed a significant difference on the fresh cob yield of sweet corn in 2017 and 2018.While the highest value (24.27 ton ha^{-1} in 2017 and 24.03 ton ha^{-1} in 2018) was detected in the treatment sweet corn mono-crop with 20 kg per 7.8m^2 organic fertilizer. The lowest value was recorded (16.97 ton ha^{-1} in 2017 and 17.37 ton ha^{-1} in 2018) in the treatment sweet corn mono-crop with 0 kg per 7.8m^2 organic fertilizer. However, the interaction between the sweet corn intercropping and the organic fertilizer was significantly effective on the fresh cob yield in 2017 and 2018.The maximum value (15.02ton ha^{-1} in 2017 and 16.27 ton ha^{-1} in 2018) was detected in the treatment of sweet corn intercropping with 15 kg per 7.8m^2 organic fertilizer.The minimum value (10.75 ton ha^{-1} in 2017 and 12.47 ton ha^{-1} in 2018) was recorded in the treatment of sweet corn intercropping with 0 kg per 7.8m^2.

The interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer in 2017 and 2018 was significant difference in fresh cob yield.While the top value (24.27 ton ha^{-1} in 2017 and 24.03 ton ha^{-1} in 2018) was registered in the treatment of sweet corn mono-crop with 20 kg per 7.8m^2 organic fertilizer, the lowest value wasrecorded (10.75 ton ha^{-1} in 2017 and 12.47 ton ha^{-1} in 2018) in the treatment sweet corn intercropping with 0 kg per 7.8m^2.

The system of planting showed significant difference on fresh cob yield in 2017 and 2018.While upper value (21.68 ton ha^{-1} in 2017 and 21.52 ton ha^{-1} in 2018) was detected in the treatment sweetcorn mono-crop, less value (13.40 ton ha^{-1} in 2017 and 14.47 ton ha^{-1} in 2018) was recorded in the treatment sweet corn intercropping. However, the organic fertilizer was significantly effective on fresh cob yield in 2017 and 2018. Upper value (19.44 ton ha^{-1} in 2017 and 19.94 ton ha^{-1} in 2018) was registered in the organic fertilizer 15 kg per 7.8m^2 and organic fertilizer 20 kg per 7.8 m^2 respectively.Lower value (13.86 ton ha^{-1} in 2017 and 14.92 ton ha^{-1} in 2018) was recorded in the organic fertilizer 0 kg per 7.8m^2.

The significance level between mean of years (2017 and 2018) was determined by T test to compare between years. The data showed that there was not significant difference between mean of years (2017 and 2018) on fresh cob yield of sweet corn on all treatment (mono-crop, intercropping, organic fertilizer and interaction between them).

Table 4.23. The effect of different level of mono-crop, intercropping, organic fertilizer and interaction between them on the fresh cob yield of sweet corn in 2017 and 2018

Sweet Corn Plants	Organic Fertilizer	Yield (Fresh. Cob) ton ha^{-1}	
		2017	2018
B1 (S.C.M) A x B1	A1	16.97 b	17.37 c
	A2	21.73 a	22.57 ab
	A3	21.57 a	20.13 b
	A4	23.87 a	23.50 a
	A5	24.27 a	24.03 a
	Mean	21.68ns	21.52ns
B3 (S.C.I) A x B3	A1	10.75 d	12.47 f
	A2	13.33 cd	14.51 def
	A3	13.32 cd	13.27 ef
	A4	15.02 bc	16.27cd
	A5	14.58 bc	15.85 cde
	Mean	13.40ns	14.47ns
(S.C.M)	B1	21.68 a	21.52 a
(S.C.I)	B3	13.40b	14.47b
	Mean	17.54ns	18.00ns
(O.F) Sweet corn	A1	13.86c	14.92d
	A2	17.53b	18.54b
	A3	17.44b	16.70c
	A4	19.44 a	19.88 a
	A5	19.43 a	19.94 a
	Mean	17.54 ns	18.00 ns

The significance level was set at P≤0.05. Differences between trait means were assessed using Duncan's Multiple Range Test at P≤0.05 level. (*****)The significance level and (ns**)** non significant level was set at P≤0.05 to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable plant (Sweet Corn). B1= (S.C.M) Sweet Corn Monocrop. B3=(S.C.I) Sweet Corn Intercropping.

4.24. Fresh Pod Yield of Fresh Bean

The results presented in Table 4.24 indicated that the interaction between the fresh bean mono-crop and the organic fertilizer showed a significant effect on the fresh pod yield of fresh bean in 2017 and 2018. While the maximum value (14.77 ton ha^{-1} in 2017 and 14.00 ton ha^{-1} in 2018) was detected in the treatment of fresh bean mono-crop with 20 kg per $7.8m^2$ organic fertilizer, the minimum value was recorded (9.23 ton ha^{-1} in 2017 and 8.13 ton ha^{-1} in 2018) in the treatment fresh bean mono-crop with 0 kg per $7.8m^2$ organic fertilizer. However, the interaction between the fresh bean intercropping and the organic fertilizer wasnot significantly influenced on the fresh pod yield in 2017 and 2018.

The interaction between mono-crop and intercropping of fresh bean in the different level of organic fertilizer in 2017 and 2018 was significant difference in fresh pod yield. While the top value (14.77 ton ha^{-1} in 2017 and 14.00 ton ha^{-1} in 2018) was detected in the treatment of fresh bean mono-crop with 20 kg per $7.8m^2$ organic fertilizer, the lowest value was registered (4.10 ton ha^{-1} in 2017 and 3.67 ton ha^{-1} in 2018) in the treatment of fresh bean intercropping with 0 kg per $7.8m^2$ organic fertilizer.

The system of planting showed significant difference on fresh pod yield in 2017 and 2018.While highest value (12.02 ton ha^{-1} in 2017 and 11.13 ton ha^{-1} in 2018) was detected in the treatment fresh bean mono-crop.The lowest value (4.97 ton ha^{-1} in 2017 and 4.56 ton ha^{-1} in 2018) was recorded in the treatment fresh bean intercropping. However, the organic fertilizer was significantly effective on fresh pod yield in 2017 and 2018.While the top value (10.23 ton ha^{-1} in 2017 and 9.52 ton ha^{-1} in 2018) was obtined in the organic fertilizer 15 kg per $7.8m^2$ and the organic fertilizer 20 kg per 7.8 m^2 respectively,the less value (6.67 ton ha^{-1} in 2017 and 6.90 ton ha^{-1} in 2018) was detected in the organic fertilizer 0 kg per $7.8m^2$.

The significance level between mean of years (2017 and 2018) was determined by T test to compare between years. The results showed that there was not significantdifference between mean of years (2017 and 2018) on fresh pod yield of fresh bean on all treatment (mono-crop, intercropping, organic fertilizer and interaction between them).

Table 4.24. The effect of different level of mono-crop, intercropping, organic fertilizer and interaction between them on the fresh pod yield of fresh bean in 2017 and 2018

Fresh Bean Plants	Organic Fertilizer	Yield (Fresh Pod) ton ha^{-1}	
		2017	2018
B2 (F.B.M) A x B2	A1	9.23 b	8.13 c
	A2	9.40 b	8.67 c
	A3	12.57 a	11.30 b
	A4	14.13 a	13.57 ab
	A5	14.77 a	14.00 a
	Mean	12.02ns	11.13ns
B3 (F.B.I) A x B3	A1	4.10 c	3.67 d
	A2	4.32 c	4.15 d
	A3	4.90 c	4.68 d
	A4	6.33 c	5.28 d
	A5	5.20 c	5.03 d
	Mean	4.97ns	4.56ns
(F.B.M)	B2	12.02 a	11.13 a
(F.B.I)	B3	4.97b	4.56b
	Mean	8.49ns	7.85ns
(O.F) Fresh bean	A1	6.67 c	5.90 b
	A2	6.86 bc	6.41 b
	A3	8.73 ab	7.99 a
	A4	10.23 a	9.43 a
	A5	9.98 a	9.52 a
	Mean	8.49 ns	7.85 ns

The significance level was set at $P \leq 0.05$. Differences between trait means were assessed using Duncan's Multiple Range Test at $P \leq 0.05$ level. (*)The significance level and (ns) non significant level was set at $P \leq 0.05$ to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable Plant (Fresh Bean) B2= (F.B.M) Fresh Bean Monocrop. B3=(F.B.I) Fresh Bean Intercropping.

4.25. Protein Content (%) in Sweet Corn

We concluded from Table 4.25 that the interaction between the sweet corn mono-crop and the organic fertilizer was not significantly influenced in the protein content (%) in 2017 and 2018.However, the interaction between the sweet corn intercropping and the organic fertilizer was significantly effective on the protein content (%) in 2017. While the maximum value (14.00 % in 2017) was recorded in the treatment sweet corn intercropping with the 15 kg per 7.8 m^2 organic fertilizer. The minimum value (11.07 % in 2017) was detected in the treatment sweet corn intercropping with the 0 kg per 7.8 m^2 organic fertilizer.However, the interaction between the sweet corn intercropping and the organic fertilizer was not significantly effective on the protein content (%) in 2018.

The interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer was significantly influenced on protein content (%) in 2017. While the highest value (14.00 % in 2017) was recorded in the treatment sweet corn intercropping with the 15 kg per 7.8 m^2 organic fertilizer. The lowest value (11.07 % in 2017) was detected in the treatment sweet corn intercropping with the 0 kg per 7.8 m^2 organic fertilizer. However, the interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer was not significantly influenced on protein content (%) in 2018

The system of planting did not show a significant difference on protein content (%) in 2017 and 2018. However, the organic fertilizer was not significantly effective on protein content (%) in 2017 and 2018.

The significance level between mean of years (2017 and 2018) was determined by T test to compare between years. The data showed that there was significantly affect onthe protien content by the planting system (sweet corn mono-crop and intercropping) had the highest value (12.19 %) in the year 2017, but the lowest value (11.34 %) was in 2018. However, the results showed that organic fertilizer had a significant difference in the years on the protien content (%). It was recorded maximum value (12.19 %) in 2017 and minimum value (11.34 %) in 2018. However, there was not significant difference between mean of years (2017 and 2018) on protein content (%) of sweet corn on the treatment interaction between mean of mono-crop and mean of organic fertilizer and interaction between mean of intercropping and mean of organic fertilizer.

Table 4.25. The effect of different level of mono-crop, intercropping, organic fertilizer and interaction between them on theprotein content (%) of sweet corn on the in 2017 and 2018

Sweet Corn Plants	Organic Fertilizer	Protein Content (%)	
		2017	2018
B1 (S.C.M) A x B1	A1	12.31 ab	10.94 a
	A2	11.49 ab	10.50 a
	A3	12.19 ab	10.59 a
	A4	11.32 b	11.78 a
	A5	13.01 ab	12.02 a
	Mean	12.06ns	11.17ns
B3 (S.C.I) A x B3	A1	11.07 b	11.70 a
	A2	12.40 ab	11.66 a
	A3	11.60 ab	12.34 a
	A4	14.00 a	10.57 a
	A5	12.50 ab	11.23 a
	Mean	12.31ns	11.50ns
(S.C.M)	B1	12.06 a	11.17 a
(S.C.I)	B3	12.31 a	11.50 a
	Mean	12.19*	11.34*
(O.F) Sweet corn	A1	11.69 a	11.32 a
	A2	11.95 a	11.08 a
	A3	11.90 a	11.47 a
	A4	12.66 a	11.18 a
	A5	12.76 a	11.63 a
	Mean	12.19*	11.34*

The significance level was set at P≤0.05. Differences between trait means were assessed using Duncan's Multiple Range Test at P≤0.05 level. (*)The significance level and (ns) non significant level was set at P≤0.05 to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable plant (Sweet Corn). B1= (S.C.M) Sweet Corn Monocrop. B3=(S.C.I) Sweet Corn Intercropping.

4.26. Protein Content (%) in Fresh Bean

As shown in Table 4.26 the interaction between the fresh bean mono-crop and the organic fertilizer was not significant influenced in the protein content (%) in 2017 and 2018. However, the interaction between the fresh bean intercropping and the organic fertilizer was significantly effective on the protein content (%) in 2017. While the maximum value (16.33 % in 2017) was recorded in the treatment fresh bean intercropping with the 20 kg per 7.8 m^2 organic fertilizer. The minimum value (11.32 % in 2017) was detected in the treatment fresh bean intercropping with the 5 kg per 7.8 m^2 organic fertilizer. However, the interaction between the fresh bean intercropping and the organic fertilizer was not significantly effective on the protein content (%) in 2017 and 2018.

The interaction between mono-crop and intercropping of fresh bean in the different level of organic fertilizer was significantly influenced on protein content (%) in 2017. While the highest value (16.33 % in 2017) was recorded in the treatment fresh bean intercropping with the 15 kg per 7.8 m^2 organic fertilizer. The lowest value (11.32 % in 2017) was detected in the treatment fresh bean intercropping with the 0 kg per 7.8 m^2 organic fertilizer.The interaction between mono-crop and intercropping of fresh bean in the different level of organic fertilizer was not significantly influenced on protein content (%) in 2017 and 2018.

The system of planting did not show a significant difference on protein content (%) in 2017 and 2018. However, the organic fertilizer was significantly effective on protein content (%) in 2017 and 2018.

The significance level between mean of years (2017 and 2018) was determined by T test to compare between years. The data showed that there was significantly affective on the protien content (%) by the planting system (sweet corn mono-crop and intercropping). While the highest value (12.89 %) in the year 2017, the lowest value (14.06 %) was in 2018. However, the results showed that organic fertilizer had a significant difference in the years on the protien content (%). It was recorded maximum value (12.89 %) in 2017 and minimum value (14.06 %) in 2018. However, there was not significant difference between mean of years (2017 and 2018) on protein content (%) of fresh bean on the treatment interaction between mean of mono-crop and mean of organic fertilizer and interaction betweenthe means of intercropping and mean of organic fertilizer.

Table 4.26. The effect of different level of mono-crop, intercropping, organic fertilizer and interaction between them on the protein content (%) of fresh bean in 2017 and 2018

Fresh Bean Plants	Organic Fertilizer	Protein Content (%)	
		2017	2018
B2 (F.B.M) A x B2	A1	12.16 bc	13.77 a
	A2	12.42 bc	14.59 a
	A3	15.35 ab	13.32 a
	A4	13.05 abc	14.42 a
	A5	12.79 abc	14.89 a
	Mean	13.15ns	14.20ns
B3 (F.B.I) A x B3	A1	11.96 bc	12.12 a
	A2	11.32 c	13.84 a
	A3	11.36 c	14.19 a
	A4	12.21 bc	15.34 a
	A5	16.33 a	14.10 a
	Mean	12.63ns	13.92ns
(F.B.M)	B2	13.15 a	14.20 a
(F.B.I)	B3	12.63 a	13.92 a
	Mean	12.89*	14.06*
(O.F) Fresh bean	A1	12.06 a	12.95 a
	A2	11.87 a	14.22 a
	A3	13.36 a	13.76 a
	A4	12.63 a	14.88 a
	A5	14.56 a	14.50 a
	Mean	12.89*	14.06*

The significance level was set at P≤0.05. Differences between trait means were assessed using Duncan's Multiple Range Test at P≤0.05 level. (*)The significance level and (ns) non significant level was set at P≤0.05 to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable Plant (Fresh Bean) B2= (F.B.M) Fresh Bean Monocrop. B3=(F.B.I) Fresh Bean Intercropping.

4.27. The Nitrogen Content in Sweet Corn Leaves

The data presented in Table 4.27 indicated that theinteraction between the sweet corn mono-crop and the organic fertilizer was not significantly influenced in the nitrogen g kg^{-1}content of the leaves of plant in 2017 and 2018.However, the interaction between the sweet corn intercropping and the organic fertilizer was significantly effective on the nitrogen content g kg^{-1} in 2017. While the maximum value (22.40 g kg^{-1} in 2017) was recorded in the treatment sweet corn intercropping with the 15 kg per 7.8 m^2 organic fertilizer. The minimum value (17.29 g kg^{-1} in 2017) was detected in the treatment sweet corn intercropping with the 0 kg per 7.8 m^2 organic fertilizer. However, the interaction between the sweet corn intercropping and the organic fertilizer was not significantly effective on the nitrogen content g kg^{-1} in 2018.

The interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer was significantly influenced on nitrogen content g kg^{-1} in 2017. While the highest value (22.40 g kg^{-1} in 2017) was recorded in the treatment sweet corn intercropping with the 15 kg per 7.8 m^2 organic fertilizer. The lowest value (17.29 g kg^{-1} in 2017) was detected in the treatment sweet corn intercropping with the 0 kg per 7.8 m^2 organic fertilizer. However, the interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer was not significantly influenced on nitrogen content g kg^{-1} in 2018

The system of planting did not significant difference on nitrogen content g kg^{-1} of the leaves of plant in 2017 and 2018. However, the organic fertilizer was significantly effective on nitrogen content g kg^{-1} of the leaves of plant in 2017 and 2018.

The significance level between mean of years (2017 and 2018) was determined by T test to compare between years. The data showed that there was significantly affective on the nitrogen content by the interaction between mean of mono-crop and organic fertilizer had the highest value (19.73 g kg^{-1}) in the year 2017, but the lowest value (17.86 g kg^{-1}) was in 2018. On the other hand the data showed that there was significantly affective on the nitrogen content by the planting system (sweet corn mono-crop and intercropping) had the highest value (19.65g kg^{-1}) in the year 2017, but the lowest value (18.13g kg^{-1}) was in 2018. However, the results showed that organic fertilizer had a significant difference in the years on the nitrogencontent g kg^{-1}. It was recorded maximum value (19.65g kg^{-1}) in 2017 and minimum value (18.13g kg^{-1}) in 2018. However, there was not significant difference between mean of years (2017 and 2018) on nitrogen content g kg^{-1}of sweet corn on the treatment interaction between the means of intercropping and mean of organic fertilizer.

Table 4.27. The effect of different level of mono-crop, intercropping, organic fertilizer and interaction between them on the nitrogen content of the leaves of sweet corn in 2017 and 2018

Sweet Corn Plants	Organic Fertilizer	N g kg^{-1}	
		2017	2018
B1 (S.C.M) A x B1	A1	21.07 ab	17.50 a
	A2	19.27 ab	16.80 a
	A3	19.51 ab	16.94 a
	A4	18.11 ab	18.85 a
	A5	20.67 ab	19.23 a
	Mean	19.73*	17.86*
B3 (S.C.I) A x B3	A1	17.29 b	18.71 a
	A2	19.58 ab	18.67 a
	A3	18.55 ab	19.74 a
	A4	22.40 a	16.92 a
	A5	19.99 ab	17.97 a
	Mean	19.65ns	18.40ns
(S.C.M)	B1	19.73 a	17.86 a
(S.C.I)	B3	19.56 a	18.40 a
	Mean	19.65*	18.13*
(O.F) Sweet corn	A1	19.18 a	18.11 a
	A2	19.43 a	17.74 a
	A3	19.03 a	18.34 a
	A4	20.26 a	17.89 a
	A5	20.33 a	18.60 a
	Mean	19.65*	18.13*

The significance level was set at P≤0.05. Differences between trait means were assessed using Duncan's Multiple Range Test at P≤0.05 level. (*)The significance level and (ns) non significant level was set at P≤0.05 to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable plant (Sweet Corn). B1= (S.C.M) Sweet Corn Monocrop. B3=(S.C.I) Sweet Corn Intercropping.

4.28. The Nitrogen Content in Fresh Bean Leaves

The results presented in Table 4.28 the interaction between the fresh bean mono-crop and the organic fertilizer was significantly effective on the nitrogen content g kg^{-1} in 2017. While the maximum value (24.57 g kg^{-1} in 2017) was recorded in the treatment fresh bean intercropping with the 10 kg per 7.8 m^2 organic fertilizer. The minimum value (17.90 g kg^{-1} in 2017) was detected in the treatment fresh bean intercropping with the 5 kg per 7.8 m^2 organic fertilizer. On the other hand the interaction between the fresh bean mono-crop and the organic fertilizer was not significantly influenced in the nitrogen content g kg^{-1} of the leaves of plant in 2018. However, the interaction between the fresh bean intercropping and the organic fertilizer was not significantly effective on the nitrogen content g kg^{-1} of the leaves of plant in 2017 and 2018.

The interaction between mono-crop and intercropping of fresh bean in the different level of organic fertilizer was significantly influenced on nitrogen content g kg^{-1} of the leaves of plant in 2017. While the highest value (24.57 g kg^{-1} in 2017) was recorded in the treatment fresh bean intercropping with the 10 kg per 7.8 m^2 organic fertilizer. The lowest value (17.90 g kg^{-1} in 2017) was obtined in the treatment fresh bean intercropping with the 5 kg per 7.8 m^2 organic fertilizer. However, the interaction between mono-crop and intercropping of fresh bean in the different level of organic fertilizer was not significantly influenced on nitrogen content g $kg^{-1}$of the leaves of plant in 2018.

The system of planting did not show significant difference on nitrogen g kg^{-1} of the leaves of plant in 2017 and 2018. The organic fertilizer was significantly effective on nitrogen content g kg^{-1} of the leaves of plant in 2018. While the top value (24.88 g kg^{-1} in 2017) was recorded in the organic fertilizer 15 kg per 7.8 m^2. The lowest value (20.71 g kg^{-1} in 2017) was obtined in the organic fertilizer 0 kg per 7.8 m^2. However, the organic fertilizer was not significantly effective on nitrogen content g kg^{-1} of the leaves of plant in 2017.

The significance level between mean of years (2017 and 2018) was determined by T test to compare between years. The data showed that there was not significant difference between mean of years (2017 and 2018) on nitrogen content g kg^{-1} of the leaves of fresh bean in the all treatment (mono-crop, intercropping and interaction between them)

Table 4.28. The effect of different level of mono-crop intercropping, organic fertilizer and interaction between them on the nitrogen content of the leaves of fresh bean in 2017 and 2018

Fresh Bean Plants	Organic Fertilizer	N g kg^{-1}	
		2017	2018
B2 (F.B.M) A x B2	A1	18.35 b	22.03 a
	A2	17.90 b	23.33 a
	A3	24.57 a	21.30 a
	A4	20.88 ab	25.20 a
	A5	20.46 ab	23.82 a
	Mean	20.43ns	23.14ns
B3 (F.B.I) A x B3	A1	21.19 ab	19.39 a
	A2	19.04 ab	22.14 a
	A3	18.18 b	22.70 a
	A4	19.90 ab	24.55 a
	A5	21.98 ab	22.56 a
	Mean	20.06ns	22.27ns
(F.B.M)	B2	20.43 a	23.14 a
(F.B.I)	B3	20.06 a	22.27 a
	Mean	20.25ns	22.71ns
(O.F) Fresh bean	A1	19.77 a	20.71b
	A2	18.47 a	22.74ab
	A3	21.38 a	22.00ab
	A4	20.39 a	24.88 a
	A5	21.22 a	23.19ab
	Mean	20.25 ns	22.71 ns

The significance level was set at $P\leq0.05$. Differences between trait means were assessed using Duncan's Multiple Range Test at $P\leq0.05$ level. (*)The significance level and (ns) non significant level was set at $P\leq0.05$ to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable Plant (Fresh Bean) B2= (F.B.M) Fresh Bean Monocrop. B3=(F.B.I) Fresh Bean Intercropping.

4.29. The Phosphorus Content in Sweet Corn Leaves

The results presented inTable 4.29 showed that theinteraction between the sweet corn mono-crop and the organic fertilizer was not significantly influenced in the phosphor content g kg^{-1} of the leaves of plant in 2017 and 2018.However, the interaction between the sweet corn intercropping with the organic fertilizer was notsignificantly effective on the phosphor content g kg^{-1} of the leaves of plant in 2017 and 2018.

The interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer was significantly influenced on phosphor content g kg^{-1} of the leaves of plant in 2017. While the highest value (0.166 g kg^{-1} in 2017) was recorded in the treatment sweet corn intercropping with the 20 kg per 7.8 m^2 organic fertilizer. The lowest value (0.113 g kg^{-1} in 2017) was obtined in the treatment sweet corn mono-crop with the 10 kg per 7.8 m^2 organic fertilizer.The interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer was not significantly influenced on phosphor content g kg^{-1} of the leaves of plant in 2018.

The system of planting did not show a significant difference on phosphor content g kg^{-1} of the leaves of plant in 2017 and 2018. The organic fertilizer was significantly effective on phosphor content g kg^{-1} of the leaves of plant in 2017. While the maximum value (0.162 g kg^{-1} in 2017) was recorded in the organic fertilizer 20 kg per 7.8 m^2. The lowest value (0.113 g kg^{-1} in 2017) was obtined in the organic fertilizer 10 kg per 7.8 m^2. However, the organic fertilizer was not significantly effective on phosphor content g kg^{-1} of the leaves of plant in 2017 and 2018.

The significance level between mean of years (2017 and 2018) was determined by T test to compare between years. The data showed that there was significant difference between mean of years on phosphor content g kg^{-1}. The highest value was recorded in 2018 with interaction between mono-crop and organic fertilizer (0.163 g kg^{-1}), and the lowest value was registered in 2017 (0.134 g kg^{-1}). However, the interaction between mean of intercropping and mean of organic fertilizer was significant and was registered upper value (0.160 g kg^{-1}) in 2018, and lower value (0.137g kg^{-1}) in 2017. However, there was significantly affective by the planting system (sweet corn mono-crop and intercropping) had the highest value (0.162 g kg^{-1}) in the year 2018, but the lowest value (0.136g kg^{-1}) was in 2017. However, the results showed that organic fertilizer had a significant difference in the years on the phosphor content g kg^{-1}. It was recorded maximum value (0.162g kg^{-1}) in 2018 and minimum value (0.136g kg^{-1}) in 2017.

Table 4.29. The effect of different level of mono-crop, intercropping, organic fertilizer and interaction between them on the phosphorus contentof the leaves of sweet corn in 2017 and 2018

Sweet Corn Plants	Organic Fertilizer	P g kg^{-1}	
		2017	2018
B1 (S.C.M) A x B1	A1	0.126 ab	0.168 a
	A2	0.135 ab	0.150 a
	A3	0.113 b	0.161 a
	A4	0.136 ab	0.180 a
	A5	0.157 ab	0.153 a
	Mean	0.134*	0.163*
B3 (S.C.I) A x B3	A1	0.129 ab	0.157 a
	A2	0.128 ab	0.142 a
	A3	0.126 ab	0.160 a
	A4	0.135 ab	0.175 a
	A5	0.166 a	0.164 a
	Mean	0.137*	0.160*
(S.C.M)	B1	0.134 a	0.163 a
(S.C.I)	B3	0.137 a	0.160 a
	Mean	0.136*	0.162*
(O.F) Sweet corn	A1	0.126 b	0.163 a
	A2	0.133 ab	0.146 a
	A3	0.124 b	0.161 a
	A4	0.136ab	0.178 a
	A5	0.162 a	0.159 a
	Mean	0.136*	0.162*

The significance level was set at P≤0.05. Differences between trait means were assessed using Duncan's Multiple Range Test at P≤0.05 level. (*)The significance level and (ns) non significant level was set at P≤0.05 to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable plant (Sweet Corn). B1= (S.C.M) Sweet Corn Monocrop. B3=(S.C.I) Sweet Corn Intercropping.

4.30. The Phosphorus Content in Fresh Bean Leaves

As shown in Table 4.30 the interaction between the fresh bean mono-crop and the organic fertilizer was not significantly influenced in the phosphor content g kg^{-1} of the leaves of plant in 2017 and 2018. However, the interaction between the fresh bean intercropping and the organic fertilizer was not significantly effective on the phosphor content g kg^{-1} of the leaves of plant in 2017 and 2018.

The interaction between mono-crop and intercropping of fresh bean in the different level of organic fertilizer was not significantly influenced on phosphor content g kg^{-1} of the leaves of plant in 2017 and 2018.

The system of planting was not significantly difference on phosphor content g kg^{-1} of the leaves of plant in 2018. However, the organic fertilizer was not significantly effective on phosphor content g kg^{-1} of the leaves of plant in 2017 and 2018.

The significance level between mean of years (2017 and 2018) was determined by T test to compare between years. The data showed that there was significant difference between mean of years on phosphor content g kg^{-1}. The highest value was recorded in 2017 with interaction between intercropping and organic fertilizer (0.160 g kg^{-1}), and the lowest value was registered in 2018 (0.134 g kg^{-1}). However, the interaction between mean of mono-crop and mean of organic fertilizer was not significant difference in the years on the phosphor content g kg^{-1}. On the other hand there was not significantly affective by the planting system (fresh bean mono-crop and intercropping) in the years on the phosphor content g kg^{-1}. However, the results showed that organic fertilizer was not significant difference in the years on the phosphor content g kg^{-1}.

Table 4.30. The effect of different level of mono-crop, intercropping, organic fertilizer and interaction between them on the phosphorus content of the leaves of fresh bean in 2017 and 2018

Fresh Bean Plants	Organic Fertilizer	P g kg^{-1}	
		2017	2018
B2 (F.B.M) A x B2	A1	0.140 a	0.140 a
	A2	0.110 a	0.110 a
	A3	0.120 a	0.120 a
	A4	0.119 a	0.119 a
	A5	0.115 a	0.115 a
	Mean	0.121ns	0.121ns
B3 (F.B.I) A x B3	A1	0.157 a	0.141 a
	A2	0.142 a	0.128 a
	A3	0.160 a	0.147 a
	A4	0.175 a	0.118 a
	A5	0.164 a	0.134 a
	Mean	0.160*	0.134*
(F.B.M)	B2	0.121 a	0.121 a
(F.B.I)	B3	0.160 a	0.134 a
	Mean	0.141ns	0.128ns
(O.F) Fresh bean	A1	0.149 a	0.141 a
	A2	0.126 a	0.119 a
	A3	0.140 a	0.134 a
	A4	0.147 a	0.119 a
	A5	0.140 a	0.125 a
	Mean	0.141 ns	0.128 ns

The significance level was set at P≤0.05. Differences between trait means were assessed using Duncan's Multiple Range Test at P≤0.05 level. (*)The significance level and (ns) non significant level was set at P≤0.05 to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable Plant (Fresh Bean) B2= (F.B.M) Fresh Bean Monocrop. B3=(F.B.I) Fresh Bean Intercropping.

4.31. The Potassium Content in Sweet Corn Leaves

We concluded from Table 4.31 thatthe interaction between the sweet corn mono-crop and the organic fertilizer was significantly influenced in the potassium content g kg^{-1} of the leaves of plant in 2018. While the highest value (9.83 g kg^{-1} in 2018) was recorded in the treatment sweet corn mono-crop with the 10 kg per 7.8 m^2 organic fertilizer. The lowest value (7.30 g kg^{-1} in 2018) was obtined in the treatment sweet corn mono-crop with the 15 kg per 7.8 m^2 organic fertilizertheHowever, the interaction between the sweet corn mono-crop and the organic fertilizer was not significantly influenced in the potassium content g $kg^{-1}$of the leaves of plant in 2017.On the other hand the interaction between the sweet corn intercropping and the organic fertilizer was significantly effective on the potassium content g kg^{-1} of the leaves of plant in 2018. While the maximum value (9.17 g kg^{-1} in 2018) was recorded in the treatment sweet corn intercropping with the 20 kg per 7.8 m^2 organic fertilizer. The lowest value (7.40 g kg^{-1} in 2018) was obtined in the treatment sweet corn mono-crop with the 15 kg per 7.8 m^2 organic fertilizer. However, the interaction between the sweet corn intercropping and the organic fertilizer was not significantly effective on the potassium content g kg^{-1} of the leaves of plant in 2017.The interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer wassignificantly influenced on potassium content g kg^{-1} of the leaves of plant in 2018. While the top value (9.83 g kg^{-1} in 2018) was recorded in the treatment sweet corn mono-crop with the 15 kg per 7.8 m^2 organic fertilizer, less value (7.30 g kg^{-1} in 2018) was detected in the treatment sweet corn mono-crop with the 10 kg per 7.8 m^2 organic fertilizer. The interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer was not significantly influenced on potassium content g kg^{-1} of the leaves of plant in 2017.The system of planting was not significant difference on potassium content g kg^{-1} of the leaves of plant in 2017 and 2018. However, the organic fertilizer was not significantly effective on potassium content g kg^{-1} of the leaves of plant in 2017 and 2018.The significance level between mean of years (2017 and 2018) was determined by T test to compare between years. The data showed that there was not significant difference between mean of years on potassium content g kg^{-1} with interaction between mono-crop and organic fertilizer. However, the interaction between mean of intercropping and mean of organic fertilizer was not significant effect between mean of years onpotassium content g kg^{-1}.

However, there was significantly affective by the planting system (sweet corn mono-crop and intercropping) had the highest value (8.31 g kg^{-1}) in the year 2018, but the lowest value (7.61 g kg^{-1}) was in 2017. However, the results showed that the organic fertilizer had a significant difference in the years on the potassium content g kg^{-1}. It was recorded maximum value (8.31 g kg^{-1}) in 2018 and minimum value (7.61 g kg^{-1}) in 2017.

Table 4.31. The effect of different level of mono-crop, intercropping, organic fertilizer and interaction between them on the potassium content of the leaves of sweet corn in 2017 and 2018

Sweet Corn Plants	Organic Fertilizer	K g kg^{-1}	
		2017	2018
B1 (S.C.M) A x B1	A1	7.93 a	7.70 bc
	A2	7.10 a	8.73 abc
	A3	7.20 a	9.83 a
	A4	8.27 a	7.30 c
	A5	7.93 a	8.57 abc
	Mean	7.69ns	8.43ns
B3 (S.C.I) A x B3	A1	7.37 a	8.07 bc
	A2	8.23 a	8.13 bc
	A3	6.96 a	8.20 abc
	A4	7.77 a	7.40 c
	A5	7.30 a	9.17 ab
	Mean	7.53ns	8.19ns
(S.C.M)	B1	7.69 a	8.43 a
(S.C.I)	B3	7.53 a	8.19 a
	Mean	7.61*	8.31*
(O.F) Sweet corn	A1	7.56 a	7.89 a
	A2	7.67 a	8.43 a
	A3	7.08 a	9.02 a
	A4	8.02 a	7.35 a
	A5	7.62 a	8.87 a
	Mean	7.61*	8.31*

The significance level was set at P≤0.05. Differences between trait means were assessed using Duncan's Multiple Range Test at P≤0.05 level. (*)The significance level and (ns) non significant level was set at P≤0.05 to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable plant (Sweet Corn). B1= (S.C.M) Sweet Corn Monocrop. B3=(S.C.I) Sweet Corn Intercropping.

4.32. The Potassium Content in Fresh Bean Leaves

As shown in Table 4.32 the interaction between the fresh bean mono-crop and the organic fertilizer was not significantly influenced in the potassium content g kg^{-1} of the leaves of plant in 2017 and 2018. However, the interaction between the fresh bean intercropping and the organic fertilizer was not significantly effective on the potassium content g kg^{-1} of the leaves of plant in 2017 and 2018.

The interaction between mono-crop and intercropping of fresh bean in the different level of organic fertilizer was not significantly influenced on potassium content g kg^{-1} of the leaves of plant in 2017 and 2018.

The system of planting was significantly effective on potassium content g kg^{-1} of the leaves of plant in 2017 and 2018. The organic fertilizer was significantly effective on potassium content g kg^{-1} of the leaves of plant in 2017. While upper value (10.67 g kg^{-1} in 2017) was detected in the intercropping plant system, the lowest value (8.47 g kg^{-1} in 2017) was recorded in the mono-crop plant system. However, the organic fertilizer was not significantly effective on potassium content g kg^{-1} of the leaves of plant in 2018.

The significance level between mean of years (2017 and 2018) was determined by T test to compare between years. The data showed that there was not significant difference between mean of years on potassium content g kg^{-1} with interaction between mono-crop and organic fertilizer. However, the interaction between mean of intercropping and mean of organic fertilizer was significant effect between mean of years on potassium content g kg^{-1}. While the top value was recorded (10.85. g kg^{-1}) in the year 2018, less value was detected (9.39 g kg^{-1}) in the year 2017. However, there was significantly affective by the planting system (fresh bean mono-crop and intercropping) had the highest value (10.85 g kg^{-1}) in the year 2018, but the lowest value (9.67 g kg^{-1}) was in 2017. However, the results showed that the organic fertilizer had a significant difference in the years on the potassium content g kg^{-1}. It was recorded maximum value (10.85 g kg^{-1}) in 2018 and minimum value (9.67 g kg^{-1}) in 2017.

Table 4.32. The effect of different level of mono-crop, intercropping, organic fertilizer and interaction between them on the potassium content of the leaves of fresh bean in 2017 and 2018

Fresh Bean Plants	Organic Fertilizer	K g kg^{-1}	
		2017	2018
B2 (F.B.M) A x B2	A1	10.83 a	11.30 a
	A2	9.43 a	10.77 a
	A3	10.43 a	11.20 a
	A4	8.60 a	10.70 a
	A5	10.43 a	10.33 a
	Mean	9.95ns	10.86ns
B3 (F.B.I) A x B3	A1	10.50 a	11.30 a
	A2	9.33 a	10.53 a
	A3	9.16 a	10.20 a
	A4	8.33 a	10.90 a
	A5	9.60 a	11.30 a
	Mean	9.39*	10.85*
(F.B.M)	B2	9.95 a	10.86 a
(F.B.I)	B3	9.39 a	10.85 a
	Mean	9.67*	10.85*
(O.F) Fresh bean	A1	10.67 a	11.30 a
	A2	9.38 ab	10.65 a
	A3	9.80 ab	10.70 a
	A4	8.47 b	10.80 a
	A5	10.02 ab	10.82 a
	Mean	9.67*	10.85*

The significance level was set at P≤0.05. Differences between trait means were assessed using Duncan's Multiple Range Test at P≤0.05 level. (*)The significance level and (ns) non significant level was set at P≤0.05 to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable Plant (Fresh Bean) B2= (F.B.M) Fresh Bean Monocrop. B3=(F.B.I) Fresh Bean Intercropping.

4.33. The Calcium Content in Sweet Corn Leaves

As shown inTable 4.33 theinteraction between the sweet corn mono-crop and the organic fertilizer was not significantly influenced in the calcium content g kg^{-1} of the leaves of plant in 2017 and 2018.On the other hand the interaction between the sweet corn intercropping and the organic fertilizer was significantly effective on the calcium content g kg^{-1} of the leaves of plant in 2017. While the maximum value (13.07 g kg^{-1} in 2017) was detected in the treatment sweet corn intercropping with the 10 kg per 7.8 m^2 organic fertilizer. The minimum value (8.53 g kg^{-1} in 2017) was recorded in the treatment sweet corn mono-crop with the 5 kg per 7.8 m^2 organic fertilizer However, the interaction between the sweet corn intercropping and the organic fertilizer was not significantly effective on the calcium content g kg^{-1} of the leaves of plant in 2018.

The interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer was not significantly influenced on calcium contentn g kg^{-1} of the leaves of plant in 2017and 2018. While the highest value (13.07 g kg^{-1} in 2018) was detected in the treatment sweet corn intercropping with the 10 kg per 7.8 m^2 organic fertilizer. The lowest value (8.53 g kg^{-1} in 2018) was recorded in the treatment sweet corn mono-crop with the 5 kg per 7.8 m^2 organic fertilizer. However, the interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer was not significantly influenced on calcium contentn g kg^{-1} of the leaves of plant in 2017 and 2018.

The system of planting did notshow a significant difference on calcium content g kg^{-1} of the leaves of plant in 2017 and 2018. However, the organic fertilizer was not significantly effective on calcium content g kg^{-1} of the leaves of plant in 2017 and 2018.

The significance level between mean of years (2017 and 2018) was determined by T test to compare between years. The data showed that there was not significant difference between mean of years on calcium content g kg^{-1} with interaction between mono-crop and organic fertilizer. However, the interaction between mean of intercropping and mean of organic fertilizer was not significant effect between mean of years on calcium content g kg^{-1}. However, there was significantly affective by the planting system (sweet corn mono-crop and intercropping) had the highest value (11.41 g kg^{-1}) in the year 2018, but the lowest value (10.42 g kg^{-1}) was in 2017. However, the results showed that the organic fertilizer had a significant difference in the years on the calcium content g kg^{-1}. It was recorded maximum value (11.41 g kg^{-1}) in 2018 and minimum value (10.42 g kg^{-1}) in 2017.

Table 4.33. The effect of different level of mono-crop, intercropping, organic fertilizer and interaction between them on the calcium content of the leaves of sweet corn in 2017 and 2018

Sweet Corn Plants	Organic Fertilizer	Ca g kg^{-1}	
		2017	2018
B1 (S.C.M) A x B1	A1	10.97 ab	10.47 a
	A2	10.37 ab	10.67 a
	A3	10.30 ab	9.63 a
	A4	10.43 ab	13.07 a
	A5	10.37 ab	10.10 a
	Mean	10.49ns	10.79ns
B3 (S.C.I) A x B3	A1	9.70 ab	10.33 a
	A2	8.53 b	11.80 a
	A3	13.07 a	12.27a
	A4	10.73 ab	13.37 a
	A5	9.70 ab	12.40 a
	Mean	10.35ns	12.03ns
(S.C.M)	B1	10.49 a	10.79 a
(S.C.I)	B3	10.35 a	12.03 a
	Mean	10.42*****	11.41*****
(O.F) Sweet corn	A1	10.34 a	10.40 a
	A2	9.45 a	11.24 a
	A3	11.69 a	10.95 a
	A4	10.58 a	13.22 a
	A5	10.04 a	11.25 a
	Mean	10.42*****	11.41*****

The significance level was set at P≤0.05. Differences between trait means were assessed using Duncan's Multiple Range Test at P≤0.05 level. (*****)The significance level and (ns**)** non significant level was set at P≤0.05 to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable plant (Sweet Corn). B1= (S.C.M) Sweet Corn Monocrop. B3=(S.C.I) Sweet Corn Intercropping.

4.34. The Calcium Content in Fresh Bean Leaves

As shown in Table 4.34 the interaction between the fresh bean mono-crop and the organic fertilizer was not significantly influenced in the calcium content g kg^{-1} of the leaves of plant in 2017 and 2018. However, the interaction between the fresh bean intercropping and the organic fertilizer was not significantly effective on the calcium content g kg^{-1} of the leaves of plant in 2017 and 2018.

The interaction between mono-crop and intercropping of fresh bean in the different level of organic fertilizer was not significantly influenced on calcium content g kg^{-1} of the leaves of plant in 2017 and 2018.

The system of planting did not show a significant difference on calcium content g kg^{-1} of the leaves of plant in 2018. However, the organic fertilizer was not significantly effective on calcium content g kg^{-1} of the leaves of plant in 2017 and 2018.

The significance level between mean of years (2017 and 2018) was determined by T test to compare between years. The data showed that there was significant difference between mean of years on calcium content g kg^{-1} with interaction between mono-crop and organic fertilizer. While utmost value was obtined (51.05 g kg^{-1}) in the year 2017. The lowest value was recorded (36.52 g kg^{-1}) in the year 2108. On the other hand the interaction between mean of intercropping and mean of organic fertilizer was significant effect between mean of years on calcium content g kg^{-1}. While the top value was recorded (49.73. g kg^{-1}) in the year 2017, less value was detected (33.45 g kg^{-1}) in the year 2018. However, there was significantly affective by the planting system (fresh bean mono-crop and intercropping) had the highest value (50.39 g kg^{-1}) in the year 2017, but the lowest value (34.99 g kg^{-1}) was in 2018. However, the results showed that the organic fertilizer had a significant difference in the years on the calcium content g kg^{-1}. It was recorded maximum value (50.39 g kg^{-1}) in 2017 and minimum value (34.99 g kg^{-1}) in 2018.

Table 4.34. The effect of different level of mono-crop, intercropping, organic fertilizer and interaction between them on the calcium content of the leaves of fresh bean in 2017 and 2018

Fresh Bean Plants	Organic Fertilizer	Ca g kg^{-1}	
		2017	2018
B2 (F.B.M) A x B2	A1	50.30 a	35.67 a
	A2	51.27 a	39.97 a
	A3	55.93 a	30.53 a
	A4	47.03 a	36.07 a
	A5	50.73 a	40.37 a
	Mean	51.05*	36.52*
B3 (F.B.I) A x B3	A1	51.43 a	33.80 a
	A2	44.13 a	30.80 a
	A3	45.30 a	33.87 a
	A4	54.43 a	38.83 a
	A5	53.37 a	29.97 a
	Mean	49.73*	33.45*
(F.B.M)	B2	51.05 a	36.52 a
(F.B.I)	B3	49.73 a	33.45 a
	Mean	50.39*	34.99*
(O.F) Fresh bean	A1	50.87 a	34.74 a
	A2	47.70 a	35.89 a
	A3	50.62 a	32.20 a
	A4	50.73 a	37.45 a
	A5	52.05 a	35.17 a
	Mean	50.39*	34.99*

The significance level was set at P≤0.05. Differences between trait means were assessed using Duncan's Multiple Range Test at P≤0.05 level. (*)The significance level and (ns) non significant level was set at P≤0.05 to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable Plant (Fresh Bean) B2= (F.B.M) Fresh Bean Monocrop. B3=(F.B.I) Fresh Bean Intercropping.

4.35. The Magnesium Content in Sweet Corn Leaves

The results presented in Table 4.35 showed that theinteraction between the sweet corn mono-crop and the organic fertilizer was significantly influenced in the magnesium content g kg^{-1} of the leaves of plant in 2017. While the highest value (10.03 g kg^{-1} in 2017) was detected in the treatment sweet corn mono-crop with the 0 kg per 7.8 m^2 organic fertilizer. The lowest value (8.17 g kg^{-1} in 2017) was recorded in the treatment sweet corn mono-crop with the 10 kg per 7.8 m^2 organic fertilizer. On the other hand the interaction between the sweet corn mono-crop and the organic fertilizer was not significantly influenced in the magnesium content g kg^{-1} of the leaves of plant in 2018.However, the interaction between the sweet corn intercropping and the organic fertilizer was not significantly effective on the magnesium content g kg^{-1} of the leaves of plant in 2017 and 2018.

The interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer was not significantly influenced on magnesium content g kg^{-1} of the leaves of plant in 2017. While the maximum value (10.03 g kg^{-1} in 2017) was detected in the treatment sweet corn mono-crop with the 0 kg per 7.8 m^2 organic fertilizer. The minimum value (7.50 g kg^{-1} in 2017) was recorded in the treatment sweet corn intercropping with the 0 kg per 7.8 m^2 organic fertilizer. The interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer was not significantly influenced on magnesium content g kg^{-1} of the leaves of plant in 2018.The system of planting did not show a significant difference in magnesium content g kg^{-1} of the leaves of plant in 2017 and 2018. However, the organic fertilizer was not significantly effective on magnesium content g kg^{-1} of the leaves of plant in 2017 and 2018.

The significance level between mean of years (2017 and 2018) was determined by T test to compare between years. The data showed that there was significant difference between mean of years on magnesium content g kg^{-1} with interaction between mono-crop and organic fertilizer had the highest value (8.79 g kg^{-1}) in the year 2017, but the lowest value (7.48 g kg^{-1}) was in 2018. However, the interaction between mean of intercropping and mean of organic fertilizer was not significant effect between mean of years on magnesium content g kg^{-1}. However, there was not significant difference by the planting system (sweet corn mono-crop and intercropping). However, the results showed that the organic fertilizer was not significant difference in the years on the magnesium content g kg^{-1}.

Table 4.35. The effect of different level of mono-crop, intercropping, organic fertilizer and interaction between them on the magnesium content of the leaves of sweet corn in 2017 and 2018

Sweet Corn Plants	Organic Fertilizer	Mg g kg^{-1} 2017	Mg g kg^{-1} 2018
B1 (S.C.M) A x B1	A1	10.03 a	7.40 a
	A2	8.53 ab	6.87 a
	A3	8.17 b	9.07 a
	A4	8.33 b	6.97 a
	A5	8.87 ab	7.10 a
	Mean	8.79*	7.48*
B3 (S.C.I) A x B3	A1	7.50 b	6.60 a
	A2	8.27 b	6.50 a
	A3	8.90 ab	9.37 a
	A4	7.93 b	8.50 a
	A5	8.67 ab	8.30 a
	Mean	8.25ns	7.85ns
(S.C.M)	B1	8.79 a	7.48 a
(S.C.I)	B3	8.25 a	7.85 a
	Mean	8.52ns	7.67ns
(O.F) Sweet corn	A1	8.77 a	7.00 a
	A2	8.40 a	6.69 a
	A3	8.54 a	9.22 a
	A4	8.13 a	7.74 a
	A5	8.77 a	7.70 a
	Mean	8.52 ns	7.67 ns

The significance level was set at P≤0.05. Differences between trait means were assessed using Duncan's Multiple Range Test at P≤0.05 level. (*)The significance level and (ns) non significant level was set at P≤0.05 to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable plant (Sweet Corn). B1= (S.C.M) Sweet Corn Monocrop. B3=(S.C.I) Sweet Corn Intercropping.

4.36. The Magnesium Content in Fresh Bean Leaves

The results presented in Table 4.37 showed that the interaction between the fresh bean mono-crop and the organic fertilizer was significantly influenced on the magnesium content g kg^{-1} of the leaves of plant in 2017. While the highest value (9.97 g kg^{-1} in 2017) was detected in the treatment fresh bean mono-crop with the 20 kg per 7.8 m^2 organic fertilizer. The lowest value (7.97 g kg^{-1} in 2017) was recorded in the treatment fresh bean mono-crop with the 15 kg per 7.8 m^2 organic fertilizer. On the other hand the interaction between the fresh bean mono-crop and the organic fertilizer was not significantly influenced on the magnesium content g kg^{-1} of the leaves of plant in 2018.

The interaction between the fresh bean intercropping and the organic fertilizer was significantly effective on the magnesium content g kg^{-1} of the leaves of plant in 2017. While the maximum value (9.90 g kg^{-1} in 2017) was detected in the treatment fresh bean intercropping with the 5 kg per 7.8 m^2 organic fertilizer. The lowest value (8.20 g kg^{-1} in 2017) was recorded in the treatment fresh bean intercropping with the 15 kg per 7.8 m^2 organic fertilizer. However, the interaction between the fresh bean intercropping and the organic fertilizer was not significantly effective on the magnesium content g $kg^{-1}$of the leaves of plant in 2018.

The interaction between mono-crop and intercropping of fresh bean in the different level of organic fertilizer was significantly influenced on magnesium content g kg^{-1} of the leaves of plant in 2017. The top value (9.97 g kg^{-1} in 2017) was detected in the treatment fresh bean intercropping with the 20 kg per 7.8 m^2 organic fertilizer, less value (7.97 g kg^{-1} in 2017) was recorded in the treatment fresh bean intercropping with the 15 kg per 7.8 m^2 organic fertilizer. However, the interaction between mono-crop and intercropping of fresh bean in the different level of organic fertilizer was not significantly influenced on magnesium content g kg^{-1} of the leaves of plant in 2017 and 2018.

The system of planting did not show a significant difference on magnesium content g kg^{-1} of the leaves of plant in 2017 and 2018. However, the organic fertilizer was not significantly effective on magnesium content g kg^{-1} of the leaves of plant in 2017 and 2018.

The significance level between mean of years (2017 and 2018) was determined by T test to compare between years. The data showed that there was not significant difference between mean of years on magnesium content g kg^{-1} with interaction between mono-crop and organic fertilizer. On the other hand the interaction between mean of intercropping and mean of organic fertilizer was significantly effective between mean of years on magnesium content g kg^{-1}. While the top value was recorded (8.83. g kg^{-1}) in the year 2017, less value was detected (6.99 g kg^{-1}) in the year 2018. However, there was significantly affective by the planting system (fresh bean mono-crop and intercropping) had the highest value (8.98 g kg^{-1}) in the year 2017, the lowest value (7.40 g kg^{-1}) was in 2018. However, the results showed that the organic fertilizer had a significant difference in the years on the magnesium content g kg^{-1}. It was recorded maximum value (8.98 g kg^{-1}) in 2017 and minimum value (7.40 g kg^{-1}) in 2018.

Table 4.36. The effect of different level of mono-crop, intercropping, organic fertilizer and interaction between them on the magnesium content of the leaves of fresh bean in 2017 and 2018

Fresh Bean Plants	Organic Fertilizer	Mg g kg^{-1}	
		2017	2018
B2 (F.B.M) A x B2	A1	9.13 abc	6.83 a
	A2	9.70 ab	6.50 a
	A3	8.83 abc	9.83 a
	A4	7.97 c	6.83 a
	A5	9.97 a	9.03 a
	Mean	9.12ns	7.81ns
B3 (F.B.I) A x B3	A1	8.50 abc	7.00 a
	A2	9.90 a	6.60 a
	A3	8.43 abc	8.10 a
	A4	8.20 bc	6.63 a
	A5	9.13 abc	6.60 a
	Mean	8.83*	6.99*
(F.B.M)	B2	9.12 a	7.81 a
(F.B.I)	B3	8.83 a	6.99 a
	Mean	8.98*	7.40*
(O.F) Fresh bean	A1	8.82 a	6.92 a
	A2	9.80 a	6.55 a
	A3	8.63 a	8.97 a
	A4	8.09 a	6.73 a
	A5	9.55 a	7.82 a
	Mean	8.98*	7.40*

The significance level was set at P≤0.05. Differences between trait means were assessed using Duncan's Multiple Range Test at P≤0.05 level. (*)The significance level and (ns) non significant level was set at P≤0.05 to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable Plant (Fresh Bean) B2= (F.B.M) Fresh Bean Monocrop. B3=(F.B.I) Fresh Bean Intercropping.

4.37. The Iron Content in Sweet Corn Leaves

The data presented in Table 4.37 indicated that theinteraction between the sweet corn mono-crop and the organic fertilizer was not significantly influenced on the iron content mg kg^{-1} of the leaves of plant in 2017 and 2018.However, the interaction between the sweet corn intercropping and the organic fertilizer was not significantly effective on the iron content mg kg^{-1} of the leaves of plant in 2017 and 2018.

The interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer was not significantly influenced on iron content mg kg^{-1} of the leaves of plant in 2017and 2018.

The system of planting did not show a significant difference in iron content mg kg^{-1} in the leaves plant in 2017 and 2018. However, the organic fertilizer was not significantly effective on iron content mg kg^{-1} of the leaves of plant in 2017 and 2018.

The significance level between mean of years (2017 and 2018) was determined by T test to compare between years. The present of datashowedthat there was significant difference between mean of years on iron content mg kg^{-1}. The highest value was recorded in 2018 with interaction between mono-crop and organic fertilizer (226.07 mg kg^{-1}), and the lowest value was registered in 2017 (87.74 mg kg^{-1}). However, the interaction between mean of intercropping and mean of organic fertilizer was significant and was registered upper value (231.26 mg kg^{-1}) in 2018, and lower value (90.40 mg kg^{-1}) in 2017. However, there were significantly affect by the planting system (sweet corn mono-crop and intercropping) had the highest value (228.67 mg kg^{-1}) in the year 2018, but the lowest value (89.07 mg kg^{-1}) was in 2017. However, the results showed that organic fertilizer had a significant difference in the years on the iron content mg kg^{-1}. It was recorded maximum value (228.67 mg kg^{-1}) in 2018 and minimum value (89.07 mg kg^{-1}) in 2017.

Table 4.37.The effect of different level of mono-crop, intercropping, organic fertilizer and interaction between them on the iron of the leaves of sweet corn in 2017 and 2018

Sweet Corn Plants	Organic Fertilizer	Fe mg kg^{-1}	
		2017	2018
B1 (S.C.M) A x B1	A1	89.00 a	195.67 a
	A2	90.67 a	214.67 a
	A3	81.67 a	198.33 a
	A4	83.00 a	237.33 a
	A5	94.33 a	284.33 a
	Mean	87.74*	226.07*
B3 (S.C.I) A x B3	A1	101.00 a	209.33 a
	A2	88.67 a	231.33 a
	A3	85.67 a	193.67 a
	A4	91.00 a	281.00 a
	A5	85.67 a	241.00 a
	Mean	90.40*	231.26*
(S.C.M)	B1	87.74 a	226.07 a
(S.C.I)	B3	90.40 a	231.26 a
	Mean	89.07*	228.67*
(O.F) Sweet corn	A1	95.00 a	202.50 a
	A2	89.67 a	223.00 a
	A3	83.67 a	196.00 a
	A4	87.00 a	259.17 a
	A5	90.00 a	262.67 a
	Mean	89.07*	228.67*

The significance level was set at P≤0.05. Differences between trait means were assessed using Duncan's Multiple Range Test at P≤0.05 level. (*)The significance level and (ns) non significant level was set at P≤0.05 to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable plant (Sweet Corn). B1= (S.C.M) Sweet Corn Monocrop. B3=(S.C.I) Sweet Corn Intercropping.

4.38. The Iron Content in Fresh Bean Leaves

As shown in Table 4.38 the interaction between the fresh bean mono-crop and the organic fertilizer was significantly influenced in the iron content mg kg^{-1} of the leaves of plant in 2018. While the highest value (365.00 mg kg^{-1} in 2017) was detected in the treatment fresh bean mono-crop with the 5 kg per 7.8 m^2 organic fertilizer. The lowest value (281.00 mg kg^{-1} in 2017) was recorded in the treatment fresh bean mono-crop with the 15 kg per 7.8 m^2 organic fertilizer. However, the interaction between the fresh bean mono-crop and the organic fertilizer was not significantly influenced in the iron content mg kg^{-1} of the leaves of plant in 2017. However, the interaction between the fresh bean intercropping and the organic fertilizer was not significantly effective on the iron content mg kg^{-1} of the leaves of plant in 2017 and 2018.

The interaction between mono-crop and intercropping of fresh bean in the different level of organic fertilizer was significantly influenced on iron content mg kg^{-1} of the leaves of plant in 2018. While the maximum value (365.00 mg kg^{-1} in 2017) was detected in the treatment fresh bean mono-crop with the 5 kg per 7.8 m^2 organic fertilizer. The minimum value (239.00 mg kg^{-1} in 2017) was recorded in the treatment fresh bean intercropping with the 10 kg per 7.8 m^2 organic fertilizer. However, the interaction between mono-crop and intercropping of fresh bean in the different level of organic fertilizer was not significantly influenced on iron content mg kg^{-1} of the leaves of plant in 2017.

The system of planting was significant difference on iron content mg kg^{-1} of the leaves of plant in 2018. While top value (317.47 mg kg^{-1}) was detected in mono-crop plant system. The lowest value (256.00 mg kg^{-1}) was recorded in the intercropping planting system. However, the system of planting was not significant difference on iron content mg kg^{-1} of the leaves of plant in 2017.

The organic fertilizer was significantly effective on iron content mg kg^{-1} of the leaves of plant in 2018. Upper value (321.00 mg kg^{-1}) was detected in organic fertilizer 5 kg per 7.8 m^2, lower value (269.17 mg kg^{-1}) was recorded in organic fertilizer 0 kg per 7.8 m^2However, the organic fertilizer was not significant effect on iron content mg kg^{-1} of the leaves of plant in 2017.

The significance level between mean of years (2017 and 2018) was determined by T test to compare between years. The present of data showed that there was significant difference between mean of years on iron content mg kg^{-1}. The highest value was recorded in 2018 with interaction between mono-crop and organic fertilizer (317.47 mg kg^{-1}), and the lowest value was registered in 2017 (197.87 mg kg^{-1}). However, the interaction between mean of intercropping and mean of organic fertilizer was not significant difference between mean of years on iron content mg kg^{-1}. However, there was significantly affective by the planting system (fresh bean mono-crop and intercropping) had the highest value (286.77 mg kg^{-1}) in the year 2018, but the lowest value (207.27 mg kg^{-1}) was in 2017. However, the results showed that the organic fertilizer had a significant difference in the years on the iron content mg kg^{-1}. It was recorded maximum value (286.77 mg kg^{-1}) in 2018 and minimum value (207.27 mg kg^{-1}) in 2017.

Table 4.38. The effect of different level of mono-crop, intercropping, organic fertilizer and interaction between them on the iron of the leaves of fresh bean in 2017 and 2018

Fresh Bean Plants	Organic Fertilizer	Fe mg kg^{-1}	
		2017	2018
B2 (F.B.M) A x B2	A1	191.67 a	290.33 bc
	A2	214.33 a	365.00 a
	A3	207.67 a	339.00 ab
	A4	185.00 a	281.00 bc
	A5	190.67 a	312.00 abc
	Mean	197.87*	317.47*
B3 (F.B.I) A x B3	A1	235.00 a	248.00 c
	A2	221.33 a	277.00 bc
	A3	188.33 a	239.00 c
	A4	205.00 a	276.33 bc
	A5	233.67 a	240.00 c
	Mean	216.67ns	256.07ns
(F.B.M)	B2	197.87 a	317.47 a
(F.B.I)	B3	216.67 a	256.07 b
	Mean	207.27*	286.77*
(O.F) Fresh bean	A1	213.34 a	269.17 b
	A2	217.83 a	321.00 a
	A3	198.00 a	289.00 ab
	A4	195.00 a	278.67 ab
	A5	212.17 a	276.00 ab
	Mean	207.27*	286.77*

The significance level was set at P≤0.05. Differences between trait means were assessed using Duncan's Multiple Range Test at P≤0.05 level. (*)The significance level and (ns) non significant level was set at P≤0.05 to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable Plant (Fresh Bean) B2= (F.B.M) Fresh Bean Monocrop. B3=(F.B.I) Fresh Bean Intercropping.

4.39. The Manganese Content in Sweet corn Leaves

Statistical analysis showed in Table 4.39 that theinteraction between the sweet corn mono-crop and the organic fertilizer was significantly influenced in the manganese content mg kg^{-1} of the leaves of plant in 2018.While the highest value (71.33 mg kg^{-1} in 2018) was detected in the treatment sweet corn mono-crop with the 5 kg per 7.8 m^2 organic fertilizer. The lowest value (50.00 mg kg^{-1} in 2018) was recorded in the treatment sweet corn mono-crop with the 15 kg per 7.8 m^2 organic fertilizer. On the other hand the interaction between the sweet corn mono-crop and the organic fertilizer was not significantly influenced in the manganese content mg kg^{-1} of the leaves of plant in 2017. The interaction between the sweet corn intercropping and the organic fertilizer was significantly effective on the manganese content mg kg^{-1} of the leaves of plant in 2018. While the maximum value (71.33 mg kg^{-1} in 2018) was detected in the treatment sweet corn mono-crop with the 5 kg per 7.8 m^2 organic fertilizer. The minimum value (50.00 mg kg^{-1} in 2018) was recorded in the treatment sweet corn mono-crop with the 15 kg per 7.8 m^2 organic fertilizer. However, the interaction between the sweet corn intercropping and the organic fertilizer was not significantly effective on the manganese content mg kg^{-1} of the leaves of plant in 2017. The interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer was not significantly influenced on manganese content mg kg^{-1} of the leaves of plant in 2017and 2018.The system of planting did not show a significant difference in manganese content mg kg^{-1} of the leaves of plant in 2017 and 2018. However, the organic fertilizer was not significantly effective on manganese content mg kg^{-1} of the leaves of plant in 2017 and 2018.

The significance level between mean of years (2017 and 2018) was determined by T test to compare between years. The present of data showed that there was significant difference between mean of years on manganese content mg kg^{-1}. The highest value was recorded in 2018 with interaction between mono-crop and organic fertilizer (62.13 mg kg^{-1}), and the lowest value was registered in 2017 (33.60 mg kg^{-1}). However, the interaction between mean of intercropping and mean of organic fertilizer was significant difference between mean of years on manganese content mg kg^{-1}, the top value (62.87 mg kg^{-1}).was obtined in 2018, less value(33.67 mg kg^{-1}) was detected in 2017. However, there was significantly affective by the planting system (sweet corn mono-crop and intercropping) had the highest value (62.50 mg kg^{-1}) in the year 2018, the lowest value (33.67 mg kg^{-1}) was in 2017. However, the results showed that the organic fertilizer had a significant difference in the years on the manganese content mg kg^{-1}. It was recorded maximum value (62.50 mg kg^{-1}) in 2018 and minimum value (33.64 mg kg^{-1}) in 2017.

Table 4.39. The effect of different level of mono-crop, intercropping, organic fertilizer and interaction between them on the manganese content of the leaves of sweet corn in 2017 and 2018

Sweet Corn Plants	Organic Fertilizer	Mn mg kg^{-1}	
		2017	2018
B1 (S.C.M) A x B1	A1	34.67 a	71.33 a
	A2	37.00 a	60.00 ab
	A3	29.33 a	64.33 ab
	A4	34.00 a	65.00 ab
	A5	33.00 a	50.00 b
	Mean	33.60*	62.13*
B3 (S.C.I) A x B3	A1	34.00 a	65.33 ab
	A2	33.33 a	60.33 ab
	A3	32.00 a	57.33 ab
	A4	33.00 a	61.00 ab
	A5	36.00 a	70.67 ab
	Mean	33.67*	62.87*
(S.C.M)	B1	33.60 a	62.13 a
(S.C.I)	B3	33.67 a	62.87 a
	Mean	33.64*	62.50*
(O.F) Sweet corn	A1	34.34 a	68.33 a
	A2	35.17 a	60.17 a
	A3	30.67 a	60.83 a
	A4	33.50 a	63.00 a
	A5	34.50 a	60.34 a
	Mean	33.64*	62.50*

The significance level was set at P≤0.05. Differences between trait means were assessed using Duncan's Multiple Range Test at P≤0.05 level. (*)The significance level and (ns) non significant level was set at P≤0.05 to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable plant (Sweet Corn). B1= (S.C.M) Sweet Corn Monocrop. B3=(S.C.I) Sweet Corn Intercropping.

4.40. The Manganese Content in Fresh Bean Leaves

The results presented in Table 4.40 showed that the interaction between the fresh bean mono-crop and the organic fertilizer was not significantly influenced in the manganese content mg kg^{-1} of the leaves of plant in 2017 and 2018. However, the interaction between the fresh bean intercropping and the organic fertilizer was not significantly effective on the manganese content mg kg^{-1} of the leaves of plant in 2017 and 2018.

The interaction between mono-crop and intercropping of fresh bean in the different level of organic fertilizer was significantly influenced on manganese content mg kg^{-1} of the leaves of plant in 2017. While the maximum value (82.33 mg kg^{-1} in 2017) was detected in the treatment fresh bean mono-crop with the 5 kg per 7.8 m^2 organic fertilizer. The minimum value (50.00 mg kg^{-1} in 2017) was recorded in the treatment fresh bean intercropping with the 10 kg per 7.8 m^2 organic fertilizer. However, the interaction between mono-crop and intercropping of fresh bean in the different level of organic fertilizer was not significantly influenced on manganese content mg kg^{-1} of the leaves of plant in 2018.

The system of planting did not show a significant difference on manganese content mg kg^{-1} of the leaves of plant in 2017 and 2018. However, the organic fertilizer was not significantly effective on manganese content mg kg^{-1} of the leaves of plant in 2017 and 2018.

The significance level between mean of years (2017 and 2018) was determined by T test to compare between years. The data showed that there was not significantly influenced between mean of years (2017 and 2018) on manganese content mg kg^{-1} of the leaves of fresh bean in the all treatment (mono-crop, intercropping, organic fertilizer and interaction between them).

Table 4.40. The effect of different level mono-crop, of intercropping, organic fertilizer and interaction between them on the manganese content of the leaves of fresh bean in 2017 and 2018

Fresh Bean Plants	Organic Fertilizer	Mn mg kg^{-1}	
		2017	2018
B2 (F.B.M) A x B2	A1	79.67 ab	79.67 a
	A2	82.33 a	78.00 a
	A3	69.67 ab	78.00 a
	A4	73.67 ab	69.67 a
	A5	66.33 ab	72.00 a
	Mean	74.33ns	75.47ns
B3 (F.B.I) A x B3	A1	75.67 ab	71.33 a
	A2	67.00 ab	71.33 a
	A3	50.33 b	75.67 a
	A4	58.33 ab	77.33 a
	A5	67.67 ab	68.33 a
	Mean	63.80ns	72.80ns
(F.B.M)	B2	74.33 a	75.47 a
(F.B.I)	B3	63.80 a	72.80 a
	Mean	69.07ns	74.14ns
(O.F) Fresh bean	A1	77.67 a	75.50 a
	A2	74.67 a	74.67 a
	A3	60.00 a	76.84 a
	A4	66.00 a	73.50 a
	A5	67.00 a	70.17 a
	Mean	69.07ns	74.14 ns

The significance level was set at P≤0.05. Differences between trait means were assessed using Duncan's Multiple Range Test at P≤0.05 level. (*)The significance level and (ns) non significant level was set at P≤0.05 to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable Plant (Fresh Bean) B2= (F.B.M) Fresh Bean Monocrop. B3=(F.B.I) Fresh Bean Intercropping.

4.41. The Zinc Content in Sweet Corn Leaves

The results presented in Table 4.41 showed that theinteraction between the sweet corn mono-crop and the organic fertilizer was significantly influenced in the zinc content mg kg^{-1} of the leaves of plant in 2018. While the highest value (21.00 mg kg^{-1} in 2018) was detected in the treatment sweet corn mono-crop with the 20 kg per 7.8 m^2 organic fertilizer. The lowest value (13.00 mg kg^{-1} in 2018) was recorded in the treatment sweet corn mono-crop with the 5 kg per 7.8 m^2 organic fertilizer. On the other hand the interaction between the sweet corn mono-crop and the organic fertilizer was not significantly influenced in the zinc content mg kg^{-1} of the leaves of plant in 2017.However, the interaction between the sweet corn intercropping and the organic fertilizer was not significantly effective on the zinc content mg kg^{-1} of the leaves of plant in 2017 and 2018.

The interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer was not significantly influenced on zinc content mg kg^{-1} of the leaves of plant in 2018. While the maximum value (21.00 mg kg^{-1} in 2018) was detected in the treatment sweet corn mono-crop with the 20 kg per 7.8 m^2 organic fertilizer. The minimum value (13.00 mg kg^{-1} in 2018) was recorded in the treatment sweet corn intercropping with the 15 kg per 7.8 m^2 organic fertilizer. However, the interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer was not significantly influenced on zinc content mg kg^{-1} of the leaves of plant in 2017and 2018.

The system of planting did not show a significant difference in zinc content mg $kg^{-1}$of the leaves of plant in 2017 and 2018. However, the organic fertilizer was not significantly effective on zinc content mg kg^{-1} of the leaves of plant in 2017 and 2018.

The significance level between mean of years (2017 and 2018) was determined by T test to compare between years. The data showed that there was significant difference between mean of years on zinc content g kg^{-1} with interaction between mono-crop and organic fertilizer had the highest value (17.40 g kg^{-1}) in the year 2018, but the lowest value (11.00 g kg^{-1}) was in 2017. However, the interaction between mean of intercropping and mean of organic fertilizer was significant effect between mean of years on zinc content g kg^{-1}, the highest value was obtined (17.40 g kg^{-1}) in 2018, the lowest value (11.00 g kg^{-1}) was detected in 2017. However, there was not significant difference by the planting system (sweet corn mono-crop and intercropping). However, the results showed that the organic fertilizer was not significant difference in the years on the zinc content g kg^{-1}.

Table 4.41. The effect of different level of mono-crop, intercropping, organic fertilizer and interaction between them on the zinc content of the leaves of sweet corn in 2017 and 2018

Sweet Corn Plants	Organic Fertilizer	Zn mg kg^{-1}	
		2017	2018
B1 (S.C.M) A x B1	A1	13.33 a	19.67 a
	A2	10.33 a	13.00 b
	A3	7.67 a	17.33 ab
	A4	10.67 a	16.00 ab
	A5	13.00 a	21.00 a
	Mean	11.00*	17.40*
B3 (S.C.I) A x B3	A1	10.00 a	15.00 ab
	A2	9.67 a	14.67 ab
	A3	9.00 a	12.67 b
	A4	9.33 a	13.00 b
	A5	7.00 a	16.67 ab
	Mean	9.00*	14.40*
(S.C.M)	B1	11.00 a	17.40 a
(S.C.I)	B3	9.00 a	14.40 a
	Mean	10.00ns	15.90ns
(O.F) Sweet corn	A1	11.67 a	17.34 a
	A2	10.00 a	13.84 a
	A3	8.34 a	15.00 a
	A4	10.00 a	14.50 a
	A5	10.00 a	18.84 a
	Mean	10.00 ns	15.90 ns

The significance level was set at P≤0.05. Differences between trait means were assessed using Duncan's Multiple Range Test at P≤0.05 level. (*)The significance level and (ns) non significant level was set at P≤0.05 to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable plant (Sweet Corn). B1= (S.C.M) Sweet Corn Monocrop. B3=(S.C.I) Sweet Corn Intercropping.

4.42. The Zinc Content in Fresh Bean Leaves

Table 4.42 showed that the interaction between the fresh bean mono-crop and the organic fertilizer was not significantly influenced in the zinc content mg kg^{-1} of the leaves of plant in 2017 and 2018. However, the interaction between the fresh bean intercropping and the organic fertilizer was significantly effective on the zinc content mg kg^{-1} of the leaves of plant in 2017 and 2018. While the highest value (32.33 mg kg^{-1} in 2018) was detected in the treatment fresh bean intercropping with the 15 kg per 7.8 m^2 organic fertilizer. The lowest value (19.33 mg kg^{-1} in 2018) was recorded in the treatment fresh bean intercropping with the 20 kg per 7.8 m^2 organic fertilizer.However, the interaction between the fresh bean intercropping and the organic fertilizer was not significantly effective on the zinc content mg kg^{-1} of the leaves of plant in 2017 and 2018.

The interaction between mono-crop and intercropping of fresh bean in the different level of organic fertilizer was not significantly influenced on zinc content mg kg^{-1} of the leaves of plant in 2017. While the highest value (34.33 mg kg^{-1} in 2018) was detected in the treatment fresh bean mono-crop with the 20 kg per 7.8 m^2 organic fertilizer. The lowest value (19.33 mg kg^{-1} in 2018) was recorded in the treatment fresh bean intercropping with the 20 kg per 7.8 m^2 organic fertilizerHowever, the interaction between mono-crop and intercropping of fresh bean in the different level of organic fertilizer was not significantly influenced on zinc content mg kg^{-1} of the leaves of plant in 2018.

The system of planting did not show a significant difference on zinc content mg kg^{-1} of the leaves of plant in 2017 and 2018. However, the organic fertilizer was not significantly effective on zinc content mg kg^{-1} of the leaves of plant in 2017 and 2018.

The significance level between mean of years (2017 and 2018) was determined by T test to compare between years. The data showed that there was significant difference between mean of years on zinc content mg kg^{-1} with interaction between mono-crop and organic fertilizer had the highest value (30.40 mg kg^{-1}) in the year 2017, the lowest value (23.40 mg kg^{-1}) was in 2018. However, the interaction between mean of intercropping and mean of organic fertilizer was not significant effect between mean of years on zinc content mg kg^{-1}. However, there was not significant difference by the planting system (fresh bean mono-crop and intercropping). However, the results showed that the organic fertilizer was not significant difference in the years on the zinc content mg kg^{-1}.

Table 4.42. The effect of different level of mono-crop, intercropping, organic fertilizer and interaction between them on the zinc content of the leaves of fresh bean in 2017 and 2018

Fresh Bean Plants	Organic Fertilizer	Zn mg kg^{-1} 2017	Zn mg kg^{-1} 2018
B2 (F.B.M) A x B2	A1	34.33 a	26.33 a
	A2	28.67 ab	26.00 a
	A3	28.33 ab	21.00 a
	A4	26.33 ab	26.00 a
	A5	34.33 a	17.67 a
	Mean	30.40*	23.40*
B3 (F.B.I) A x B3	A1	29.33 ab	22.67 a
	A2	23.33 ab	28.00 a
	A3	27.33 ab	26.00 a
	A4	32.00 a	18.33 a
	A5	19.33 b	19.00 a
	Mean	26.27ns	22.80ns
(F.B.M)	B2	30.40 a	23.40 a
(F.B.I)	B3	26.27 a	22.80 a
	Mean	28.33ns	23.10ns
(O.F) Fresh bean	A1	31.83 a	24.50 a
	A2	26.00 a	27.00 a
	A3	27.83 a	23.50 a
	A4	29.17 a	22.17 a
	A5	26.83 a	18.34 a
	Mean	28.33 ns	23.10 ns

The significance level was set at P≤0.05. Differences between trait means were assessed using Duncan's Multiple Range Test at P≤0.05 level. (*)The significance level and (ns) non significant level was set at P≤0.05 to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable Plant (Fresh Bean) B2= (F.B.M) Fresh Bean Monocrop. B3=(F.B.I) Fresh Bean Intercropping.

4.43. The Copper Content in Sweet Corn Leaves

We concluded from Table 4.43that theinteraction between the sweet corn mono-crop and the organic fertilizer was significantly effect in the copper content mg kg^{-1} of the leaves of plant in 2018. While the highest value (12.67 mg kg^{-1} in 2018) was detected in the treatment sweet corn mono-crop with the 5 kg per 7.8 m^2 organic fertilizer. The lowest value (9.00 mg kg^{-1} in 2018) was recorded in the treatment sweet corn monocrop with the 10 kg per 7.8 m^2 organic fertilizer.On the other hand the interaction between the sweet corn mono-crop and the organic fertilizer was not significantly effect in the copper content mg kg^{-1} of the leaves of plant in 2017.The interaction between the sweet corn intercropping and the organic fertilizer was significantly effective on the copper content mg kg^{-1} of the leaves of plant in 2018.While the maximum value (12.33 mg kg^{-1} in 2018) was detected in the treatment sweet corn intercropping with the 10 kg per 7.8 m^2 organic fertilizer. The lowest value (7.67 mg kg^{-1} in 2018) was recorded in the treatment sweet corn intercropping with the 0 kg per 7.8 m^2 organic fertilizer. However,the interaction between the sweet corn intercropping and the organic fertilizer was not significantly effective on the copper content mg kg^{-1} of the leaves of plant in 2017.

The interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer was significantly effect on copper content mg kg^{-1} of the leaves of plant in 2018. While the top value (12.67 mg kg^{-1} in 2018) was detected in the treatment sweet cornmono-crop with the 5 kg per 7.8 m^2 organic fertilizer, less value (7.67 mg kg^{-1} in 2018) was recorded in the treatment sweet corn intercropping with the 20 kg per 7.8 m^2 organic fertilizer. However, the interaction between mono-crop and intercropping of sweet corn in the different level of organic fertilizer was not significantly effect on copper content mg kg^{-1} of the leaves of plant in 2017.

The system of planting didnt show a significant difference in copper content mg kg^{-1} of the leaves of plant in 2017 and 2018. However, the organic fertilizer was not significantly effective on copper content mg kg^{-1} of the leaves of plant in 2017 and 2018.

The significance level between mean of years (2017 and 2018) was determined by T test to compare between years. The data showed that there was not significantly influenced between mean of years (2017 and 2018) on manganese content mg kg^{-1} of the leaves of fresh bean in the all treatment (mono-crop, intercropping, organic fertilizer and interaction between them).

Table 4.43. The effect of different level of mono-crop, intercropping, organic fertilizer and interaction between them on the copper content of the leaves of sweet corn in 2017 and 2018

Sweet Corn Plants	Organic Fertilizer	Cu mg kg^{-1}	
		2017	2018
B1 (S.C.M) A x B1	A1	13.67 a	11.33 ab
	A2	10.67 a	12.67 a
	A3	9.33 a	9.00 bc
	A4	12.67 a	10.67 abc
	A5	13.67 a	11.33 ab
	Mean	12.00ns	11.00ns
B3 (S.C.I) A x B3	A1	7.67 a	7.67 c
	A2	10.33 a	9.67 abc
	A3	9.00 a	12.33 a
	A4	11.67 a	10.33 abc
	A5	12.00 a	10.67 abc
	Mean	10.13ns	10.13ns
(S.C.M)	B1	12.00 a	11.00 a
(S.C.I)	B3	10.13 a	10.13 a
	Mean	11.07ns	10.57ns
(O.F) Sweet corn	A1	10.67 a	9.50 a
	A2	10.50 a	11.17 a
	A3	9.17 a	10.67 a
	A4	12.17 a	10.50 a
	A5	12.84 a	11.00 a
	Mean	11.07 ns	10.57 ns

The significance level was set at P≤0.05. Differences between trait means were assessed using Duncan's Multiple Range Test at P≤0.05 level. (*****)The significance level and (ns**)** non significant level was set at P≤0.05 to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable plant (Sweet Corn). B1= (S.C.M) Sweet Corn Monocrop. B3=(S.C.I) Sweet Corn Intercropping.

4.44. The Copper Content in Fresh Bean Leaves

As shown in Table 4.44 the interaction between the fresh bean mono-crop and the organic fertilizer was significantly effect in the copper content mg kg^{-1} of the leaves of plant in 2017. While the highest value (30.33 mg kg^{-1} in 2017) was detected in the treatment fresh bean mono-crop with the 10 kg per 7.8 m^2 organic fertilizer. The lowest value (19.00 mg kg^{-1} in 2017) was recorded in the treatment fresh bean monocrop with the 20 kg per 7.8 m^2 organic fertilizer. On the other hand the interaction between the fresh bean mono-crop and the organic fertilizer was not significantly effect in the copper content mg kg^{-1} of the leaves of plant in 2018.The interaction between the fresh bean intercropping and the organic fertilizer was significantly effective on the copper content mg kg^{-1} of the leaves of plant in 2017. While the maximum value (27.00 mg kg^{-1} in 2017) was detected in the treatment fresh bean intercropping with the 5 kg per 7.8 m^2 organic fertilizer. The lowest value (15.67 mg kg^{-1} in 2017) was recorded in the treatment sweet corn intercropping with the 10 kg per 7.8 m^2 organic fertilizer.However, the interaction between the fresh bean intercropping and the organic fertilizer was not significantly effective on the copper content mg kg^{-1} of the leaves of plant in 2018

The interaction between mono-crop and intercropping of fresh bean in the different level of organic fertilizer was significantly effect on copper content mg kg^{-1} of the leaves of plant in 2017 and 2018. The upper value (30.33 mg kg^{-1} in 2017 and 21.00 mg kg^{-1} in 2018) was detected in the treatment of fresh bean mono-crop with 10 kg per 7.8 m^2 organic fertilizer and fresh bean mono-crop with 20 kg per 7.8 m^2 organic fertilizer respectively. The lowest value was registered (15.67 mg kg^{-1} in 2017 and 11.67 mg kg^{-1} in 2018) in the treatment of fresh bean intercropping with 15 kg per 7.8 m^2 organic fertilizer and fresh bean intercropping with 20 kg per 7.8 m^2 organic fertilizer.

The system of planting was showed a significant difference on copper content mg kg^{-1} of the leaves of plant in 2017 and 2018. While, the highest value (22.27 mg kg^{-1} in 2017 and 17.80 mg kg^{-1} in 2018) was detected in the treatment fresh bean mono-crop. The lowest value (18.53 mg kg^{-1} in 2017 and 13.60 mg kg^{-1} in 2018) was recorded in the treatment fresh bean intercropping.

The organic fertilizer was not significantly effective on copper content mg kg^{-1} of the leaves of plant in 2017. While the highest value (24.50 mg kg^{-1} in 2017) was detected in the organic fertilizer 10 kg per 7.8 m^2. The lowest value (17.67 mg kg^{-1} in 2017) was recorded in the organic fertilizer 20 kg per 7.8 m^2However, the organic fertilizer was not significantly effective on copper content mg kg^{-1} of the leaves of plant in 2018.

The significance level between mean of years (2017 and 2018) was determined by T test to compare between years. The data showed that there was not significant difference between mean of years on copper content mg kg^{-1} with interaction between mono-crop and organic fertilizer. However, the interaction between mean of intercropping and mean of organic fertilizer was significant effect between mean of years on copper content mg kg^{-1}, the highest value (18.53 mg kg^{-1}) was obtined in the year 2017, the lowest value (13.60 mg kg^{-1}) was in 2018. However, there was not significant difference by the planting system (fresh bean mono-crop and intercropping). However, the results showed that the organic fertilizer was not significant difference in the years on the copper content mg kg^{-1}.

Table 4.44. The effect of different level of mono-crop, intercropping, organic fertilizer and interaction between them on the plant copper content of the leaves of fresh bean in 2017 and 2018

Fresh Bean Plants	Organic Fertilizer	Cu mg kg^{-1}	
		2017	2018
B2 (F.B.M) A x B2	A1	20.33 bc	17.67 ab
	A2	22.00 abc	16.67 ab
	A3	30.33 a	18.00 ab
	A4	19.67 bc	15.67 ab
	A5	19.00 bc	21.00 a
	Mean	22.27ns	17.80ns
B3 (F.B.I) A x B3	A1	17.00 c	14.00 ab
	A2	27.00 ab	16.00 ab
	A3	15.67 c	13.00 ab
	A4	16.67 c	13.33 ab
	A5	16.33 c	11.67 b
	Mean	18.53*	13.60*
(F.B.M)	B2	22.27 a	17.80 a
(F.B.I)	B3	18.53 b	13.60 b
	Mean	20.40ns	15.70ns
(O.F) Fresh bean	A1	18.67 bc	15.84 a
	A2	24.50 a	16.34 a
	A3	23.00 ab	15.50 a
	A4	18.17 bc	14.50 a
	A5	17.67 c	16.34 a
	Mean	20.40 ns	15.70 ns

The significance level was set at $P \leq 0.05$. Differences between trait means were assessed using Duncan's Multiple Range Test at $P \leq 0.05$ level. (*)The significance level and (ns) non significant level was set at $P \leq 0.05$ to differences between years using T test to compare between years. A= (O.F) Organic Fertilizer (A1= (0 kg/7.8 m^2), A2= (5 kg/7.8 m^2), A3= (10 kg/7.8 m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2)). B= Vegetable Plant (Fresh Bean) B2= (F.B.M) Fresh Bean Monocrop. B3=(F.B.I) Fresh Bean Intercropping.

4.45. Land Equivalent Ratio (LER) SweetCorn (Seed) + Fresh Bean (Pod)

The results presented in Table 4.45 showed that there was a difference in LER between single agriculture and intercropping agriculture in all treatment of organic fertilizer. The value of LER was 1 when cultivating sweet corn and fresh beanseparately. The value of LER increased to 1.06, 1.13, 1.04, 1.13 and 1.02 in 2017 and 1.16, 1.17, 1.23, 1.12 and 1.08 in 2018, in the organic fertilizer (0, 5, 10, 15 and 20 kg per 7.8 m^2) respectively, when sweet corn was mixed with fresh beans. However, the total mean value of LER in intercropping agriculture was 1.08 in 2017 and 1.15 in 2018 more than the single agriculture for sweet corn and fresh bean in 2017 and 2018 in the organic fertilizer treatment.

Table 4.45. Land Equivalent Ratio (LER) in 2017 and 2018 using fresh seed yield of sweet corn + fresh pod yield of fresh bean

Treatment	LER (Land Equivalent Ratio)	
	2017	2018
A1 B1	1	1
A1 B2	1	1
A1 B3	1.06	1.16
A2 B1	1	1
A2 B2	1	1
A2 B3	1.13	1.17
A3 B1	1	1
A3 B2	1	1
A3 B3	1.04	1.23
A4 B1	1	1
A4 B2	1	1
A4 B3	1.13	1.12
A5 B1	1	1
A5 B2	1	1
A5 B3	1.02	1.08
General Mean		
AB1	1	1
AB2	1	1
AB3	1.08	1.15

A= Organic Fertilizer. A1= (0 kg/7.8m^2), A2= (5 kg/7.8m^2), A3= (10 kg/7.8m^2), A4=(15 kg/7.8m^2) and A5=(20 kg/7.8m^2). B= Vegetable plant. B1= Sweet corn Mono-crop B2= Fresh bean Mono-crop. B3= Intercropping between Sweetcorn and Fresh bean.

4.46. Land Equivalent Ratio (LER) Sweet Corn (Cob) + Fresh Bean (Pod)

As shown in Table 4.46 there was a difference in LER between single agriculture and intercropping agriculture in all treatment of organic fertilizer.The value of LER was 1 when cultivating sweet corn and fresh bean separately. The value of LER increased to 1.08, 1.08, 1.03, 1.09 and 1 in 2017 and 1.16, 1.13, 1.10, 1.09 and 1.02 in 2018, in the organic fertilizer (0, 5, 10, 15 and 20 kg per 7.8 m^2) respectively, when sweet corn was mixed with fresh beans. However, the total mean value of LER in intercropping agriculture was 1.06 in 2017 and 1.10 in 2018 more than the single agriculture for sweet corn and for the fresh bean in 2017 and 2018 in the organic fertilizer treatment.

Table 4.46. Land Equivalent Ratio (LER) in 2017 and 2018, using fresh cob yield of sweet corn + fresh pod yield of fresh bean

Treatment	LER (Land Equivalent Ratio)	
	2017	2018
A1 B1	1	1
A1 B2	1	1
A1 B3	1.08	1.16
A2 B1	1	1
A2 B2	1	1
A2 B3	1.08	1.13
A3 B1	1	1
A3 B2	1	1
A3 B3	1.03	1.10
A4 B1	1	1
A4 B2	1	1
A4 B3	1.09	1.09
A5 B1	1	1
A5 B2	1	1
A5 B3	1.00	1.02
General Mean		
AB1	1	1
AB2	1	1
AB3	1.06	1.10

A= Organic Fertilizer. A1= (0 kg/7.8m^2), A2= (5 kg/7.8m^2), A3= (10 kg/7.8m^2), A4=(15 kg/7.8 m^2) and A5=(20 kg/7.8 m^2. B= Vegetable plant. B1= Sweet corn Mono-crop B2= Fresh bean Mono-crop. B3= Intercropping between Sweetcorn and Fresh bean.

5. DISCUSSION AND CONCLUSION

5.1. Discussion

Within the test of the intercropping, the concentration is routinely not set on the impact of intercropping in fresh bean on morphological parameters such as plant height, leaf area, SPAD value, the number of leaves, pod length, the number of seed per pod and the number of branches. However, there were such morphological parameters have been found to affect the yield of the crops. Morover, the mono-crop fresh bean was also found to produce an increase on no. of leaves, no. of branches, SPAD value, pod length, no of seed per pod yield and seed pod yield compared with fresh bean was grown intercropping. These results similar to findings of other researches (Lucas and Milbourn 1976; Wahua, 1985; Silwana and Lucas, 2002).

The results of the present study shows that the intercropping sweet corn-fresh bean caused decrease of the plant height in the fresh bean compared to mono-crop;these case is an agreement with the results of other researches (Panwar et al., 1987; Sachan and Yotan, 1992; Mahfooz and Miger, 2004; Alizade et al., 2009). Sadeghi et al., (2002) reported that the findings in the plant height of chickpea increased by intercropping compared to mono-crop. This is due to increased competition for light. Another study has been shown that the number of branches per plant had an important effect on the yield of common bean (Lucas and Milbourn, 1976). However, the intercropping reduced morphological parameters such as the number of branches, the number of leaves and leaf area per plant in fresh bean and the reduction in these parameters affected the yield of intercropped fresh bean a competition occured between sweet corn and fresh bean, and then appeared superior sweet corn on fresh bean (Wahua, 1985).The increase of shade caused the decrease of yield and some of the growth traits; the chlorophyll content or SPAD value decreased when increasing the shade. These results agree with findings by other researches (Fattah, 2012; Fattah et al., 2013).

The results showed that the SPAD value decreased in the fresh bean intercropping compared to fresh bean mono-crop. Since it has been credited the impact of the intercropping systems to the shading of legumes by the cereal and the consequent diminish in photosynthesis this case same to findings of Nambiar et al., (1983).

As shown in the results of the present study, the intercropping sweet corn-fresh bean led to improve and increase morphological traits of sweet corn such as plant height, leaf area, no. of leaves, cob length, the number of seed per cob and the number of branches compared to mono-crop;the result agree with the findings of Ijoyah and Jimba, (2012).

Due to the impact of cereal-legume competition, leaf region is seen to be most elevated in solo crops compared to that of the same species intercropped. In sweet corn and fresh bean the maximum leaf area was observed in plots treated with more organic fertilizer compared to less organic fertilizer and control treatments in both years. Leaf area was maximum for sweet corn and fresh bean when grown solo instead of as companion crops. This finding was contributed to the restricting impact on legume-cereal competition on leaf improvement in both species (Bilalis et al, 2005).

In intercropping systems, the design in which the component crops were planted and spaced in connection to one another has been found to have significant impacts on yield components and yield of the component crops (Willey, 1979). Yield components was directly related to yield (Adams, 1967). It can, hence, be concluded that higher fresh yield of sweet corn and lower fresh yield of fresh bean beneath intercropping can be connected to diminish a few values of the yield components of the crops beneath this framework. The result, moreover, highlighted the significance of organic fertilizers within the intercropping systems including sweet corn and fresh beans whether developed sole or intercropped, the crops gave the lowest yield when no natural fertilizer was applied. Same outcomes about with discoveries on the significance of fertilizer utilization in intercropping had been given for maize/mungbean, maize/bean intercrops and cassava/maize (Dhingra et al., 1991; Olasantan et al., 1996).

In the present study, the application of organic fertilizer had beneficial effects on morphological parameters of plant height, the number of leaves, leaf area, no. of branches, SPAD value, cob length, cob diameter, pod length, no. of seed per cob, no. of seed per pods and fresh yields of sweet corn and fresh bean both when grown sole or intercropped. There were similar results with findings by other researches (Lucas, 1986; Silwana and Lucas, 2002).

The present study, moreover, indicated that agriculturists would procure beneficial from the utilization of organic fertilizer as rapidly as within the two and third year of application. However, the nutrients contained in organic manure are discharged more gradually and are put away for a longer time within the soil, in this manner guaranteeing a long residual effect. It appears likely that the advantage of organic fertilizer would spread for a longer period; this case comparable to discoveries of (Mugwira, 1985; Sharma and Mittra, 1991). In spite of the fact that have some research declared here did not sustain beyond the second year.

Intercropping influences the vegetative development of both crops compared to single cropping, and in this way, is connected to advance the utilization of spatial, transient and physical assets both above and subterranean with greatest positive and lowest negative collaborations. However, intercropping affected on the fresh yield of both crops compared to single cropping led to decrease of fresh yield. These case agreement with findings by other researches (Jose et al., 2000; Silwana and Lucas, 2002; Kawooya, 2014).Intercropping influenced of both morphologically and physiologically would together have the option to abuse the all out condition more adequately than monoculture. In the event that two species become together are commonly gainful, at that point there is participation. Despite what might be expected, rivalry results when they will in general be commonly destructive and this challenge is for the most part for water, supplements, and light. These case similar with findings by (Dodiya et al., 2018)

When detecting the impact of intercropping, the basic sections generally put on the yields of crops with the small statement on the components that made up the yields, and these components had been found to impact yields (Adams, 1967). Yield more important in the intercropping system, the results showed that the intercropping led to adecrease in yield of sweet corn and fresh bean, this case is agreement with Yilmaz, et al, (2008). In general, sweet corn was the overwhelming species in all mixtures and planting designs. In spite of the fact that fresh bean had a lower yield within the mixture, but they are more costly in markets, singular planting of them would not reach the productive level picked up with corn or other cereals cited. Moreover, the proportion of extent too appeared to altogether influence the effectiveness of intercropping. However, the organic fertilizer has been significantly affected in the yield; the increase of organic fertilizer led to the increase in yield. Organic fertilizers are the sources of organic matter in the soil and important alternative to chemical fertilizers because they provide the plant with nutrients for a longer period, as well as increase soil productiveness by increasing the activity of soil microorganisms. These results are in accordance with the results of (Belay et al., 2001; Murray and Anderson 2004; Marlina et al, 2017). On the other hand the interaction between intercropping and organic fertilizer led to increases in the yield.

Plant development, differences in phenological and morphological characteristics and biomass are dividing results from high photosynthetic dynamic radiation block attempt, along these lines deciding the rate of dry issue amassing in harvests. Sun oriented radiation is one of the significant sources deciding development and yield of part crops when planted at the same time and together, particularly when different assets are restricting plant development. Under intercropping, when water is a constraining component, crops vie for water and consequently result in restrained development and low yield because of deficient supplement supply. These case similarly with findings by other researches (Montieth, 1977; Watiki et al., 1993)

Organic manure is exceptionally critical for development and yield of vegetable cropping; this result is agreement with the findings (Silwana et al, 2007); they assessed that by and large the advantageous impacts of the utilize of organic manure way better than inorganic manure.On the other hand, the organic manure better than inorganic manure, because inorganic manure appeared to be beneficial during the first year, although its effect was not very pronounced due to heavy rainfall during the first year experiment, which probably led to leaching of nutrients beyond the rooting zones of the crops, but the impact of organic manure keeps going more than the year (Zerihun et al., 2013).

In generally, the organic fertilizer has significantly effects on the some morphological traits of sweet corn; the increase of organic fertilizer led to the increase of some morphological traits of sweet corn. Organic fertilizers are the sources of organic matter in the soil and important alternative to chemical fertilizers because they provide the plant with nutrients for a longer period, as well as increase soil productiveness by increasing the activity of soil microorganisms. These results are in accordance with the results of Belayet al. (2001), Murray and Anderson(2004) and Marlinaet al., (2017).The organic manure had a positive role in agriculture because the essential sorce of organic matter, led to some improvement and increase of the quality and quantity of plant. The study showed that the orrganic manure increase of to 25 ton ha^{-1} caused the increase of fresh yield and some of the growth traits of the sweet corn and fresh bean. These case agreement with findings by other researches (Fattah et al., 2019a; Fattah et al., 2019b).

The interaction between organic fertilization and legume/cereal or cereal/legume intercropping area critical implies for progressing a few development characteristics and soil richness, not as it were in organic farming frameworks. The act comes about is accordance with our finding (Jannoura et al, 2014).

Yield focal points happen when two crops are developed together, since of distinctions in their utilization of sources (Willey et al., 1983). Land equivalent ratio (LER) is the most common index adopted in intercropping to measure land productivity. It is often used as an indicator to determine the efficacy of intercropping (Brintha and Seran, 2009). LER is a standardized index that is defined as the relative area required by sole crops to produce the same yield as intercrops (Mead and Willey, 1980). It is formulated as follows:

LER = intercrop 1 / pure crop 1 + intercrop 2 / pure crop 2

LER = intercrop sweet corn /pure sweet corn + intercrop green beans / pure green beans

Total LER = LER sweet corn + LER green beans

LER sweet corn = intercrop sweet corn /pure sweet corn

LER green beans = intercrop green beans / pure green bean

Intercrop advantage was calculated by the determination of land equivalent ratio (LER) (Ofori and Stern, 1987).The LER, an accurate assessment of the biologicalefficiency of the intercropping situation, was calculated as:

LER = (Yab/Yaa) + (Yba/Ybb).

Where Yaa and Ybb are yields as sole crops of a and b (sweet corn and fresh bean) and Yab and Yba are yields as intercrops of a and b (sweet corn intercrop and fresh bean intercrop).

Values of LER more prominent than 1 are considered profitable. LER rate major than one demonsrates more noteworthy effectiveness of arrive utilization within the intercropping system. The yield advantage indicators in vegetable cereal crops-vegetable legume crops intercropping framework distinctive researchs are appeared in Table 45&46. As shown in study the LER more than one in the different level of organic fertilizer. The Total LER in the year of 2017 (1.08) and in the year of 2018 (1.15) when calculated (fresh seed yield + fresh pod yield), and evaluated (fresh cobyield + fresh pod yield) the total LER (1.06) in the year of 2017 and (1.10) in the year of 2018; these results similar with Yilmaz, et al, (2008) and agreement with (Cui et al., 2017) advantages of yield Maize-Soybean more than one. The land equivalent ratio indices were the most prominent in maize-cowpea (1.72) and maize-common bean (1.61), pea-barley Chen et al., (2004) bean-wheat (Hauggaard-Nielsen et al., 2001), and maize-faba bean (Li et al., 1999). On the other hand, Banik et al. (2000) reported intercropping diminished the yield of mustard-pea, mustard-lentil, and mustard-gram blends over sole cropping. Total LER values were higher than one appearing the advantage of intercropping over sole stands in respect to the utilize of natural sources for plant growth (Mead and Willey, 1980), and then similar LER values greater than 1.0 in intercropping have been reported in the intercrop pigonpea-maize by other researches (Patra et. al., 1990 and Egbe & Adeyemo, 2006).

The results have shown that the intercropping had no negative effect on all macro and micro elements in the plant; this case is similar to the finding Yildirim et al, (2013) for example Phosphorus (P), sulfur (S), iron (Fe), and manganese (Mn) content of sweet corn and fresh bean; they did not vary significantly depending on cropping systems of (P, S, Fe and Mn). However, the results reported by Yildirim et al., (2013) in some macro and micro element in the plant, intercropping caused decrease in nitrogen (N), potassium (K), magnesium (Mg), calcium (Ca) and zinc (Zn) concentration compared to sole crop, then this case opposite with the results.On the other hand the effect of organic fertilizer in the results of 2018 was better than the results of 2017 in some macro and microelements in the plant (N, P, K, Fe and Mn) of sweet corn and fresh bean;however, it is supposed that gradual increase in maco and microelements in the plant and fresh yields in plots previously fertilized with organic manures to the slow release of nutrients in small proportions from the organic manures and the facts that nutrients from organic manures are not easily leached, the result agreement with findings of other researches (Mugwira, 1985 Belay et al, 2001)

5.2. Conclusion

From the data presented, analyzed, and discussed, the following conclusions can be drawn:

1- The presence of a close relationship between organic manure and vegetable growth of sweet corn plant and fresh bean plant, when increasing the amount of organic fertilizer from 0 to 20 kg leads to improve and increase value in the vegetable growth characteristics of sweet corn and fresh bean, and the effect of this factor clear on the different characteristics of the studied. There were significant influences in some of growth traits in sweet corn(plant height, dry matter, SPAD value, cob length, and cob diameter) in 2017 and 2018.

2-The presence of a close relationship between organic manure and fresh yield of sweet corn plant and fresh bean plant, when increasing the amount of organic fertilizer from 0 to 20 kg leads to increase the fresh yield of sweet corn and fresh bean, and the effect of this factor clear on the different value of yield of the studied. There were significant influences in some of the growth traits in fresh bean (plant height, dry matter, SPAD value, leaf area, and pod length) in 2017 and 2018.

3-Intercropped sweet corn with fresh bean was grown with organic manure at 20 kg/7.8m^2 gave significant influences in growth traits and fresh yield of sweet corn in 2107 and 2018 (plant height, cob diameter, weight of 100-seed,and total yields were higher than intercropped sweet corn and fresh bean were grown without organic manure at 0 kg/7.8m^2.

4- The planting system (mono-crop and intercropping) was significantly affected in fresh yield in 2017 and 2018,mono-crophad significantly higher values than the intercropping. However, in the growth traits, intercroppinghad significantly higher values than the mono-crop of sweet corn in cob length, no. of cob per plant and weight of 100-seedin 2017 and 2018.

5-Intercropping led to improve and increase the values of some growth traits (no. of leaves per plant, leaf area, no. of branch per plant and SPAD value) of fresh bean in 2017 and 2018.

6-Economically, the intercropping application can use more type of plants, leads to a variety of products in the same place at the same time and each plant benefit from each other.

7- Land Equivalent Ratio (LER) in the different level of organic fertilizer responds positively to intercropping application compared to mono-crop application.

8- From the reviewed results obtained, it can be concluded that it is advantageous intercropping sweet corn with fresh bean, the intercropping system was therefore found to be highly complementary and suitable in the mixture.

5.3. Recommendation

Based on the results of this study the following recommendations were recommended:

1- Interest in diverse and sustainable agriculture. Any application of intercropping system for the exploitation of patches or non-cultivated spaces to increase vegetation and production.

2- The interest in growing legumes and mixing with the cultivation of grain, and this to restore fertility of the soil and the formation of balance and recycling of nutrients, especially nitrogen because legumes led to nitrogen fixation in the soil.

3- The application of Intercropping system led to reducing of weeds, easy process for weed control.

4- Use the best proportion of mixed animal fertilizer consisting of (goat manure 50% + sheep manure 50%) 15-20 kg per 7.8$m^2$for the increase in production and harvest.

5-The intercropping application has been positively responded, cause increase in land equivalent ratio (LER).

6-Advantageous intercropping system sweet corn-fresh bean was found to be highly complementary and suitable in the mixture.

7-Conducting other studies using other crops in the field of interaction between the legume vegetable crops and cereal vegetable crops.

8- The interest in growing climbing bean with sweet corn instead fresh bean is better, because climbing bean less affected by shade of sweet corn compared to fresh bean

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EXTENDED TURKISH SUMMARY
(GENİŞLETİLMİŞ TÜRKÇE ÖZET)

TATLI MISIRVE TAZE FASULYE BİRLİKTE YETİŞTİRİCİLİĞİNDE ORGANİK GÜBRELEMENİN BÜYÜME VE VERiM PARAMETRELERİNE ETKİSİ

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Haziran 2019, 167 Sayfa

2017 ve 2018 bahar mevsimi boyunca Qushtapa'daki özel bir çiftlikte, Irak'ın Erbil'in merkezine 30 km uzaklıkta, küresel konum sistemi (GPS) okuması (360 ON, 44001E), (0411359, 03997002UTM) ile tarla denemeleri yürütülmüştür.Birlikte yetiştiricilik ve organik gübrenin, tatlı mısırın (*Zea mays* L. var. *saccharate*, Sturt cv. Succar, F1) ve taze fasulyenin (*Phaseolus vulgaris* L. cv. Istride) büyüme ve verimi üzerindeki etkisi belirlenmiştir.Deneme, üç tekerrülü bölünmüş parseller deneme deseninde gerçekleştirilmiştir. Çalışma iki faktörden oluşmuştur: 1-) Üç ekim sistemi (B1: tatlı mısır, B2: taze fasulye ve B3: birlikte yetiştiricilik) ve 2-) Beş seviyedeki organik gübre (A1: 0, A2: 5, A3: 10, A4: 15 ve A5:20 kg organik gübre 7.8 m^2. Sonuçlar, birlikte yetiştiriciliğin tatlı mısırda koçan uzunluğu ve taze koçan veriminde taze fasulyede yaprak alanında ve taze bakla taze veriminde 2017 ve 2018'de önemli bir etkisi olduğunu göstermiştir. 2017'de azami taze koçan verim değeri 24.80 ton ha^{-1} ve 2018'de 26.95 ton ha^{-1} olarak kaydedilirken, taze fasulyede bakla verimi 2017'de 12.02 ton ha^{-1} ve 2018'de 11.13 ton ha^{-1} olarak kaydedilmiştir. Bununla birlikte, organik gübre uygulamaları, tüm büyüme özelliklerinde ve taze mısır ve taze fasulye taze veriminde önemli ölçüde etkide bulunmuştur. Birlikte yetiştiricilikte LER değeri, 2017'de 1.08 ve 1.06, 2018'de 1.15 ve 1.10 olarak kaydedilmiştir.

Çalışmada bazı büyüme özelliklerinde birlikte yetiştiriciliğin tek ürün talı mısır ve taze fasulye yeteştiriciliğine göre verim hariç üstün olduğu sonucuna varılmıştır. Organik gübre miktarının parsel (7.8 m^2) başına 15 ve 20 kg'a yükseltilmesi, büyüme özelliklerinin artmasına ve taze verimin artışın yol açmaktadır. Birlikte yetiştiricilik ve organik gübre [parsel (7.8 m^2) başına 15 ve 20 kg] arasındaki etkileşim, taze verimin artmasına neden olmaktadır.

Anahtar kelimeler: Taze Fasulye, Birlikte yetiştiricilik, LER, Organik gübre, Mısır, Verim

1. GİRİŞ

Tatlı mısır (*Zea mays* L. var. *saccharate*, Sturt), 4 numaralı kromozomda Su (Şekerli) lokusuna sahip mutant bir mısırdır.Genetik varyasyon, tohumların endosperminde çözünür şekerlerin ve polisakaritlerin artışına tepki vermektedir (Tracy, 2000). Tatlı mısır yaklaşık % 5-6 şeker; % 10-11 nişasta; % 3 suda çözünür polisakarit ve% 70 sudan oluşur. Tatlı mısır ayrıca orta düzeyde protein, A vitamini ve potasyum da içerir (Walker, 2009; Najeeb ve ark., 2011).

Taze fasulye (*Phaseolus vulgaris* L.), dünyanın en önde gelen baklagil sebzelerinden birisidir.Fasulyenin az miktarda azotlu gübrelemey ihtiyacı bulunmaktadır. Dünya taze fasulyesi üretiminin sırasıyla % 50 ve % 30'undan fazlası, Asya ve Avrupa kıtalarında gerçekleşmektedir.Önde gelen üretim ülkeleri olarak, Çin ve Türkiye sırasıyla dünyanın taze fasulye üretiminin % 17 ve% 13'ünü karşılamtadır (Rubatzkey ve Yamagucbi, 1999).

Organik gübreler topraktaki en önemli organik madde kaynaklarından biridir.Organik gübreler, kimyasal gübrelerin yerine geçebilir, çünkü bitkiyi daha uzun süre bitki besin maddeleri ile desteklerler ve, ayrıca toprak mikroorganizmalarının aktivitesini artırarak toprağın verimliliğini arttırırlar (Belay et al., 2001).

Birlikte yetiştiricilik, aynı alanda aynı anda iki veya daha fazla ürünün yetiştirilmesidir ve birçok avantajlara sahiptir (Sangakkara ve diğerleri, 2003; Belel ve diğerleri, 2014). Bu tez çalışmanın amaçları:

• Nispeten kısa yetişen bir baklagil, (taze fasulye) ve nispeten uzun boylu bir tahıl mahsulü (tatlı mısır) kullanarak etkili bir birlikte yetiştiricilik sistemi geliştirmek,

• Birlikte yetiştiricilik sisteminin, tatlı mısır ve taze fasulye yetiştiriciliği ve verimi üzerine etkisini incelemek,

• Organik gübrenin, tatlı mısır ve taze fasulye yetiştiriciliği ve verimine etkisini bilmek,

• Birlikte yetiştiricilik ve organik gübre arasındaki etkileşimin tatlı mısır ve taze fasulye bitkilerinde büyüme, verim, makro ve mikro elementler üzerindeki etkisini belirlemek,

• Arazi Eşdeğer Oranını (LER) değerlendirmek,

• Bitkilerdeki makro ve mikro elementlerin farklılarını analiz etmektir.

2. KAYNAK BİLDİRİŞLERİ

Sebzeler vitamin, mineral, diyet lifi ve bitkisel kimyasallar sağladıkları için dengeli beslenenler için temel olarak kabul edilirler. Her sebze, bu bileşiklerin özel bir kombinasyonuna sahiptir (Dias, 2012).

Yedi farklı çeşit mısır vardır (Elci ve ark. 1994).Tatlı mısır (*Zea mays* L. var. *saccharata*), dünyada geliştirilen en ünlü yaz sebzeleri arasında göze çarpmaktadır.Endosperm içinde, şeker-glikoz ve sakaroz ile polisakarit bileşiklerinden oluşur (Naik, 2011).

Taze fasulye, özellikle gelişmekte olan ülkelerin en yoksul popülasyonları için, en önemli bitkisel protein kaynağı durumundaki baklagil sebzesidir.Proteine ek olarak vitamin, lif ilekalsiyum, fosfor ve demir minerallerini de içermektedir (Lemma, 2003).

Birlikte yetiştiricilik (intrecorpping) sisteminde aynı alanda aynı anda iki veya daha fazla mahsulün ekimi yapılır (Willey, 1979; Sangakkara ve ark. 2003); bitkiler arasındaki çeşitliliği ve etkileşimi arttırır, erozyonu azaltır, besin döngüsünü iyileştirir ve mahsulün besin alımını ve toprak kalitesini artırmak gibi birçok avantajlara sahiptir (Horwith, 1985; Zhang, 2003).

Çiftçiler arasında yaygın bir kombinasyona ulaşmış olan birlikte yetiştiricilikte toprağın olgunluk seviyesini arttırma kapasitesi yüksektir.Tahıl ve sebze birlikte yetiştiriciliği (Tahıl + Baklagil) önerilen sistemler arasında yer almaktadır (Ullah ve ark., 2007). Baklagillerin hava azotunu sabitlediği, dolayısıyla toprak zenginliğini arttırdığı ve diğer birkilerin azot ihtiyaçlarını karşıladığı bilinmektedir (Manna ve ark., 2003). Bununla birlikte, diğer araştırmacılar birlikte yetiştiricilikte baklagillerde bitkinin mono-mahsul ile karşılaştırıldığında birki boyunun azalmasına neden olduğunu göstermektedir (Panwar ve ark., 1987; Sachan ve Yotan, 1992; Mahfooz ve

Miger, 2004; Alizade ve ark., 2009). Jeyakumaran ve Seran (2007), farklı gelişim dönemlerine sahip morfolojik olarak farklı iki ürünün brilikte yetiştiriciliğinde, ışığın verime karar veren zorunlu birfaktör olduğunu belirtmektedir.

Organik gübreler topraktaki organik madde kaynaklarıdır. Organik gübreler, bitkiye daha uzun süre takviye uyguladıklarından ve ayrıca toprak mikroorganizmalarının etkisini arttırarak toprağın verimliliğini arttırdıkları için kimyasal gübrelere alternatif olabilir (Belay ve ark., 2001). Tatlı mısırın üre, yaprak gübresi, kanatlı gübresi, yeşil gübre gibi farklı organik gübrelere olan tepkisi büyüme, verim ve kalite parametreleri üzerinde birlikte etkide bulunmasına neden olmuştur (Pannde ve ark., 2015).

İki mahsul birlikte yetiştirildiğinde, kaynak kullanımlarındaki farklılıklar nedeniyle verim avantajları ortaya çıkar (Willey ve ark.,1983). Arazi eşdeğer oranı (LER), arazi verimliliğini ölçmek için birlikte yetiştircilikte uygulanan en yaygın endekstir.Birlikte yetiştiriciliğin etkinliğini belirlemek için genellikle bir gösterge olarak kullanılır (Brintha ve Seran, 2009). LER, birlikte yetiştiriciliğe oranla tek mahsullerin ihtiyaç duyduğu nispi alan olarak tanımlanan standart bir endekstir (Mead ve Willey, 1980).

3. MATERYAL VE YÖNTEM

Trala denemeleri, iki yıl boyunca (2017 ve 2018), Erbil-Irak ilinin güneyinde, 30 km uzağındaki özel bir çiftlikte yürürtülmüştür (360 ON, 44001E), (0411359, 03997002UTM).Deneme üç tekerrürlü split-plot deneme deseninde gerçekleştirilmiştir. Çalışmaya iki faktör dahil edilmiştir:

1- Üç ekim sistemi (tek mahsül tatlı mısır, tek mahsültaze fasulye ve bir sıra tatlı mısır - bir sıra taze fasulye birlikte yetiştiticiliği) (B1, B2 ve B3) ve

2- Parsel başına sırasıyla0, 5, 10, 15 ve 20 kg olmak üzerebeş organik gübre seviyesi (koyun ve keçi gübresiyle karışımı) (A1, A2, A3, A4 ve A5) denemiştir.

Bu çalışmada belirlenen özellikler şunlardır:

1- Toprağın bazı fiziksel ve kimyasal özelliklerinin ekimden önce 2 mm eleme numunesinde yapılmıştır.

2- Dikimden önce (keçi gübresi ve koyun gübresi) numuneleri kurutulmuş (60 ^{o}C), öğütülmüş ve 0.5 mm'lik bir elekle elenmiştir. Makro ve mikro elementlerin çeşitli analizleri yapılmıştır.

3- Tatlı mısır ve taze fasülyeden alınan bitki numunelerinde makro ve mikro element tayini yapılmıştır.

5- Taze mısır ve taze fasülyede büyüme özellikleri, taze verim ve LER miktarları belirlenmiştir.

4. BULGULAR

Birlikte yetiştirciliğin (intercropping)tatlı mısırda bitki başına düşen yaprak sayısı, bitki başına dal sayısı, koçan uzunluğu, bitki başına düşen koçan sayısı ve 100 tohum ağırlığı üzerinde 2017 ve 2018'de önemli bir etkisi olduğunu göstermiştir. Bununla birlikte fasulye tek-mahsul yetiştirciliği, bitki başına düşen dal sayısı ve SPAD değeri ile 2017 ve 2018 yılları arasında önemli bir fark göstermiştir.

Yıllar bazındatek-mahsultaze koçan mısır verimi ve taze bakla fasulye verimi üzerinde anlamlı bir farklılık göstermiştir: 2017'de (21.52 ton/ha) ve 2018'de(21.68 ton/ha) maksimum taze mısır koçan verimi değerini kaydedilmiş; 2017'de taze fazulye bakla verimi (12.02 ton/ha) ve 2018'de (11.13 ton/ha) olarak kaydedilmiştir.

Organik gübre, tüm büyüme özellikleri ve taze mısır ve taze fasulye verimi üzerinde önemli bir etkiye sahip olmuştur ve en yüksek değerler, parsel (7.8 m^2) başına 15 ve 20 kg organik gübre uygulamalarından elde edilmiştir.

Farklı organik gübre seviyelerinde tek mahsül tatlı mısır ve taze fasulye yetiştiricliği ve birlikte yetiştiricilik arasındaki etkileşim, bitki yüksekliği, SPAD değeri ve taze verim üzerine 2017 ve 2018'de önemli bir etki yapmıştır. En yüksek değerler, tatlı mısır ve taze fasulye tek mahsul yetiştiriciliğinde, 2017 ve 2018'de parsel başına15 ve 20 kgorganik gübre uygulamalarında elde edilirken, en düşük değerler, 2017 ve 2018'de parsel başına0 ve 10 kg organik gübre uygulamalarından elde edilmiştir.

Tek mahsül tatlı mısır ve taze fasulye yetiştirildiğinde LER değeri 1'dir.Tatlı mısır taze fasulyebirlikte yetiştiriciliğinde LER değeri 2017'de organik gübrede (parsel başına sırasıyla 0, 5, 10, 15 ve 20 kg) sırasıyla 1.08, 1.08, 1.03, 1.09 ve 1.0'e ve 2017'de 1.08, 1.08, 1.03, 1.09 ve 1.0'e yükselmiştir. Birlikte yetiştiricilikte LER'in toplam ortalama değeri, 2017'de 1.06 ve 2018'de 1.10 olarak, gerçekleşmiştir.

Tablo 4.1. 2017 ve 2018 yıllarında, taze mısırın taze mısır koçanı verimini ve taze fasulye tohumunun taze fasulye verimini kullanarak elde edilen Arazi Eşdeğer Oranı (LER)

Uygulama	Arazi Eşdeğer Oranı (LER),	
	2017	2018
A1 B1	1	1
A1 B2	1	1
A1 B3	1.08	1.16
A2 B1	1	1
A2 B2	1	1
A2 B3	1.08	1.13
A3 B1	1	1
A3 B2	1	1
A3 B3	1.03	1.10
A4 B1	1	1
A4 B2	1	1
A4 B3	1.09	1.09
A5 B1	1	1
A5 B2	1	1
A5 B3	1.00	1.02
General Mean		
AB1	1	1
AB2	1	1
AB3	1.06	1.10

A = Organik Gübre. A1 = (0 kg / 7.8 m^2), A2 = (5 kg / 7.8 m^2), A3 = (10 kg / 7.8 m^2), A4 = (15 kg / 7.8 m^2) ve A5 = (20 kg / 7.8 m^2). B = Yetiştiricilik sistemi B1 = Tatlı mısır tek-mahsül; B2 = Taze fasulye tek mahsül; B3 = Tatlı mısır ve Taze fasulye birlikte yetiştiriciliği.

5. TARTIŞMA ve SONUÇ

Tatlı mısır-taze fasulye birlikte yetiştiriciliği, taze-fasulye tek-mahsül yetiştiriciliği ile karşılaştırıldığında bitki yüksekliğinin m azalmasına neden olmuştur; bu durum diğer araştırmaların sonuçları ile uyuşumlu bulunmuştur (Panwar ve ark.,1987; Sachan ve Yotan, 1992; Mahfooz ve Miger, 2004; Alizade ve ark., 2009). Tatlı mısır-taze fasulye birlikte yetiştiriciliği SPAD değeritek-mahsül yetiştiriciliği değerlerine kıyasla azalmıştır; ve bu durum bitkilerin birbirine gölgeleme etkisiyle açıklanabilmektedir (Nambiar ve ark. 1983).

Organik gübre uygulamasının morfolojik parametrelerdenbitki boyu,yaprak sayısı, yaprak alanı, dal sayısı, SPAD değeri, koçan uzunluğu, koçan çapı, koçan uzunluğu, koçan başına tohum sayısı, bakla başına tohum sayısı ve verim değerlerindehem tek mahsül hem de birlikte yetiştiricilikte olumlu etkilere sahip olduğu gözlenmiştir. Bu durum iğer araştırmaların elde ettiği bulgularla benzer sonuçlar göstermiştir (Lucas, 1986; Silwana ve Lucas, 2002).Organik gübreler topraktaki organik madde kaynaklarıdır ve kimyasal gübrelere önemli bir alternatif oluştururlar çünkü bitkilere daha uzun bir süre besin sağlarlar ve ayrıca toprak mikroorganizmalarının aktivitesini artırarak toprağın verimini arttırırlar. Bu tezde elde edilen sonuçlar, diğer araştırmacıların sonuçları ile pararlellik göstermektedir (Belay ve ark., 2001; Murray ve Anderson 2004; Marlina ve ark.,, 2017).

Birlikte yetiştirciliğin (intercropping)avantajı, arazi eşdeğeri oranının (LER) belirlenmesiyle hesaplanmıştır (Ofori ve Stern, 1987).Bu çalışmada elde edilen LER değerlerinin 1.00’den fazla olması,birlikte yetiştirciliğinetkinliğini ortya koymuştur (Mead and Willey, 1980).

Çalışmada, taze mısır ve taze fasulyenin bazı büyüme özelliklerinde birlikte yetiştiriciliğintek-mahsül yetiştiriciliğine göre daha üstün olduğu sonucuna varmıştır.Organik gübre miktarının parsel başına 15 ve 20 kg'a yükseltilmesi, büyüme özellik değerlerinin ve taze verimin artmasına yol açmaktadır.Birlikte yetiştiricilik ve organik gübrenin parsel başına 15 ve 20 kg olması, verim değerlerinin de artmasına neden olmuştur.

CURRICULUM VITAE

Kamaran Mustafa FATTAH, was born in 1983 in Erbil-Iraq, and started to his education in Gal Primary School, then finished the Secondary School in Shahid-Abdulrahman, after that he entered to his higher education and completed his degree of Bachelor of Science (B.Sc.) for Agriculture Science in the College of Agriculture-Department of Plant production at SalahaddinUniversity/Erbil-Iraq in 2006. Then he got a degree of Master of Science (M.Sc.) for Agriculture science in the College of Agriculture-Department of forestry and Horticulture at Salahaddin University/Erbil-Iraq, in 2012, specialized in Agroforestry. He started his Ph.D. in 2015, currently a Ph.D. student under the supervision of Professor Doctor Suat ŞENSOY and Professor Doctor Akram Othman Esmail.in the Department of Horticulture at the Institute of Natural and Applied Science, in Van Yuzuncu Yil University. Van Turkey.

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