EFFECT OF LAND PREPARATION AND WEEDING REGIME ON THE GROWTH AND YIELD OF SWEET PEPPER (C*apsicum annuum* L.) IN MUBI, ADAMAWA STATE

By

DAUDA, MUSTAPHA BELEL

M.TECH/CP/06/0058

Being a thesis submitted to the Department of Crop Production and Horticulture, School of Agriculture and Agricultural Technology, Federal University of Technology, Yola. Nigeria in partial fulfilment of the requirements for the Award of Master of Technology (M.Tech) degree in Agronomy

September , 2010

EFFECT OF LAND PREPARATION AND WEEDING REGIME ON THE GROWTH AND YIELD OF SWEET PEPPER (C*apsicum annuum* L.) IN MUBI

by

DAUDA, MUSTAPHA BELEL
(B.Tech (Ed) Hons. Agricultural Technology, F.U.T. Yola)
M.TECH/CP/06/0058

Being a thesis submitted to the Department of Crop Production and Horticulture, School of Agriculture and Agricultural Technology, Federal University of Technology, Yola.
In partial fulfilment of the requirements for the Award of Master of Technology (M.Tech) degree in Agronomy.

Supervisor
Dr. Muhammad Sani Saidu

September, 2010

APPROVAL PAGE

This thesis entitled "Effect of land preparation and weeding regime on the growth and yield of sweet pepper (*Capsicum annuum* L.) in Mubi, Adamawa State'' by **Dauda, Mustapha Belel** (M.Tech/CP/06/0058) fulfils the regulations governing the award of Master of Technology Degree in Agronomy of the Federal University of Technology Yola, and is approved for its contributions to knowledge and literary presentation.

---------- ----------

Dr. M. S. Saidu Date

(Supervisor)

---------- ----------

Prof. A. A. Sajo Date

(Internal Examiner)

---------- ----------

Prof. S. Miko Date

(External Examiner)

---------- ----------

Dr. B. B. Jakusko Date

(Head of Department)

---------- ----------

Prof. A. Nur Date

(Dean, School of Postgraduate Studies)

DECLARATION

I hereby declare that this research entitled "Effect of land preparation and weeding regime on the growth and yield of sweet pepper (*Capsicum annuum* L.) in Mubi "is an original work which has not been previously presented or submitted to any other institution either in part or in full for the award of any degree or certificate.

Dauda, Mustapha Belel ……

Signature and date

Dedication

This work is dedicated to the memories of my late Father, Alh. Dauda Belel (OFR), the Galadiman Mubi.

ACKNOWLEDGEMENTS

Alhamdulillah, all thanks and praises go to ALLAH, and His Prophet Muhammad (SAW). I thank my supervisor, Dr. Muhammad Sani Saidu for his tireless efforts in guiding me and for taking his precious time to see this work to a successful conclusion. My Head of Department, Dr. B. B. Jakusko gave me enough inspiration and encouragement; I thank you so much for what you did and what you are to me. I equally thank all lecturers and other members of staff of the Crop Production and Horticulture Department of Federal University of Technology Yola, for their meaningful advices and encouragement towards the success of this work. I will continue by appreciating the patience and understanding shown by my beloved wife and children (Mohammed Auwal, Zainab, Hajara and Abubakar Siddiq) during this hectic time. My mother, brothers and sisters are also instrumental in making me feel strong by the equally strong for moral and financial support they gave me. Alh. Usmanu Baba-Diya (Accountant) also deserves to be acknowledged for his support during my stay in Yola.

My collegues especially Mrs Hassana, Aishatu Mala, Fakuta,Zamzam,Tayyu Abdulmalik , Ismaila and Moses all deserve a thank you for their various contributions. Specially, I appreciate the tremendous assistance of Mustapha Muhamman of Crop Science Department, Adamawa state University Mubi. My colleagues in the office such as Mr. Martin Bunu and Mal. Rabiu Barde assisted me in the field. I am equally grateful to all those too numerous to mention who in one way or the other assisted in making this work become a reality. Finally I want to thank The Federal Polytechnic, Mubi for sponsoring me to undertake this course of study.

ABSTRACT

Sweet pepper farmers do not seem to give the desired attention to the manner in which they prepare their lands. Also the number of weeding and the time at which these weeding are done is equally important. The effects of land preparation and weeding regime on sweet pepper (*Capsicum annuum* L.) were determined in a field experiment conducted during the 2008 and 2009 rainy seasons at the Teaching and Research Farm of The Department of Agricultural Technology, Federal Polytechnic, Mubi. The experiments were laid out in a split plot design with land preparation: zero tilled, Ploughed, Ploughed and Harrowed, and Raised beds, assigned to the main plot and weeding regimes: No weeding, weeded at 2WAT(Weeks After Transplanting), weeded at 2 and 4 WAT, and weeded at 2, 4 and 6WAT, were assigned to the sub plots. Data were collected on growth, yield and weeds characters and were subjected to analysis of variance (ANOVA). Means showing significant F- test were separated using Least Significance Difference (LSD). Dominant weeds specie were determined using the Relative Frequency (RF) , Relative Density (RD) and the Sum Dominance Ratio (SDR) of the flora population. Results obtained from the experiments shows that a highly significant ($P \leq 0.01$) effect of land preparation on leave count at 2WAT in 2008,stem diameter in 2008, days to weeds emergence at 6WAT in 2009, and weeds count at 2WAT in 2009. Land preparation was also significant ($P \leq 0.05$) for leave count at 6 and 8WAT in 2008, days to first flowering, fruit length, yield per plot, yield per hacter, weed weight and weed count all in 2008. However there was no significant ($P \geq 0.05$) effects of treatments for establishment count, number of primary branches, number of secondary branches, plant height and tallest weed at harvest. Weeding regime equally showed a highly significant ($P \leq 0.01$) effect on number of primary branches at 4WAT in 2009, number of secondary branches at 4WAT in 2009, plant height, leave count, days to 50% flowering, fruit length, fruit diameter, stem diameter (Base and Apex), number of fruits per plant, total number of fruits per plot, fruit yield per plot and per hacter. A significant ($P \leq 0.05$) effect was also shown by weeding regime on number of secondary branches at 10WAT, primary branches at 4WAT, and weed weight in 2009. Highly significant ($P \leq 0.01$) interaction was shown between treatments for days to 50% flowering, yield per plot and yield per hacter, weed emergence, weed weight and weed count. Significant ($P \leq 0.05$) interaction also was recorded for leave count at 2 and 8 WAT and number of fruits per plot. it can be concluded that land preparation has a significant effect on some growth and yield characters of sweet pepper. The weeded three times at 2, 4 and 6WAT equally made a significant impact in all the growth, yield and weed characters studied. The raised bed method of land preparation and weeding three times at 2, 4 and 6 WAT was therefore recommended for optimum pepper yield in the study area while ploughed and harrowed alone appeared best for growth characters of the pepper crop in the study area

TABLE OF CONTENTS

CHAPTER FOUR

LIST OF TABLES

LIST OF FIGURES

List of Appendices

CHAPTER ONE

1.0 INTRODUCTION

Sweet pepper (*Capsicum annuum* L.) also called bell pepper or pimento belongs to the family solanaceae (Olarewaju and Showemino, 2006). It is an important vegetable crop all over the world (Peet, 2006), which ranks third in worlds vegetable cycle after tomato and onion (Akinfasoye, *et al*, 2006). It is estimated that more than 7.5 million acres of capsicum are grown around the world (Peet, 2003), mostly in the tropics and sub-tropics (Aliyu, 2000) such as in Malaysia, East Africa, Central and West Africa, Carribeans and the Philippines. The crop is believed to have originated from the southern tropical America's probably in Mexico (Tindall, 1986), where its domestication occurred around 2000BC. Pepper was introduced to new world by Columbus in the fifteenth century (Tindall, 1986).

In Nigeria, sweet pepper has been grown for many years by peasant farmers in the northern part of the country (Olarewaju and Showemino, 2003). Nigeria is the fifth in the world pepper production (USDA, 2001) with over 630,000 metric tones (Kappeller, 1994).

The genus capsicum comprises of about 22 wild species and 5 domesticated species (Uguru and Madu, 2007), amongst which are *Capsicum annuum* and *Capsicum frutescens* (Uguru and Madu, 2007). The fruits of *Capsicum annuum* are usually mild in pungency (Bosland, 1996) due to low content of capsicin (Uguru and Madu, 2007).

Sweet Pepper, an important spice crop (Udo *et al.*, 2004.) is highly cherished for its pungent flavor. It is rich in vitamins A, C, E, B1, B2 and B3, potassium, phosphorus and calcium (Yayock, *et al.*, 1988).

Several varieties of *Capsicum annuum* exist. The common ones in West Africa as highlighted by Tindall (1983), include California wonder, Chinese giant, elephant trunk, Florida giant, Florida heart, large bell, sweet banana, Yolo wonder Valencia and Neapolitan

Sweet peppers are tender annuals or short lived perennials herbs, with a straight woody stem at the base and up to 1.5 meters in height. Stem are branched or erect, fleshy and round or slightly angular (Tindall, 1986). Leaves are variable in size

(12 cm long, 7.5 cm wide), pointed at tips with alternate, simple ovate to lanceolate (Tindall, 1983). Flowers are single 5 sepals sometime expanding with fruit development, 5-6 white- green petals giving a pendulous oval or long and narrow or rectangular fleshy fruit containing many flat, pale yellow, kidney shaped small (3-5 mm in length) seeds (1000 seed weight is approximately 5.5 g) (Tindall, 1986). The fruits when ripe turn reddish in color.

Sweet pepper is a warm season crop, and requires about the same growing condition as tomatoes and eggplant (Peet, 2006). It grows best between temperatures of 21^{o} C – 24^{o} C. When temperature falls below 18^{o} C or exceeds 27^{o} C for extended period, growth and yield are usually decreased. Rainfall range of 600-1200 mm per annum is adequate (Tindall, 1986), and a well drained, fertile loamy or silty- loam with high organic matter content, and a pH range of 5.5- 6.8 (Peet, 2002) is recommended. Mulching is an advantage in both dry and wet season. Most cultivars are adapted to altitude up to 2000 meters. The crop appears to be day length neutral (Tindall, 1986).

Sweet pepper is used in soup and stew, a pure and a most certain stimulant, also eaten raw in salad and sometimes preserved in brine (Tindall, 1986), or as a flavoring (Tindall, 1983), used medicinally, and as condiments. Externally it is used in the treatment of sprains, neuralgia and pleurisy. It is an effective sea-sickness preventive, and in asthma treatment (Chiej, 1984). The nutritional contents of fruit (excluding seeds) as maintained by Tindall (1983) includes: Water 90 ml, Protein 2 g, Fat 0.5 g, Carbohydrate 6 g, Fibre 1 g, Calcium 20 g, Iron l mg, vitamin A potency very variable (100-1200 IU), thiamine 0.06 mg, riboflavin 0.08 mg, nicotinamide 1 mg. Ascorbic acid 15 mg (variable)

Every seed requires a proper land preparation for optimum germination and emergence, and subsequent vigorous growth. Soil management practices such as tillage is useful in improving soil physical, chemical and biological conditions for enhanced crop performance (Peet, 2002).

Weeds comprise the most undesirable aggressive and troublesome elements of the world's vegetation, they are plants which grow out of their proper places and whose virtues have not yet been discovered (Kazi *et al.*, 2007) or as Ghulam and Mir (2006) puts it, they are plants whose negative values are more than their positive values. It is also considered as a plant growing at wrong place or where it is not desired (leela, 2002). Weed is equally one of the constraints in sweet pepper

production, which can substantially reduce yield without obvious sign of damage (Terry, 1983). Weeds are serious negative factor for crop production, which results in great losses in crop yield (Mansoor and Mohammed, 2005). Such losses may arise mainly from the direct competition between crops and weeds for light, water, space, and nutrients (Jilani *et al.*, 2003), or indirectly from harboring insect and disease causing organisms (Hakoomat *et al.*, 2005).Weeds always act as energy drain in the entire managed ecosystem such as agricultural crops, forestry, range management ,aquaculture, and horticulture. Some weeds are toxic (Ghulam and Mir, 2006), and may be poisonous to livestock or reduces human efficiency through causing allergies and poisoning (Ghulam and Mir, 2006). Weeds control is one of the most important production practices in farm management (Jilani, 2003). It is an unavoidable need for successful production of vegetable crops (Jilani *et al.*, 2003).

Farmers however, do not give desired attention to the manner in which they prepare their lands. Indeed, the number of weeding and the time at which these weeding are done are also important factors towards achieving optimum yield. Although little is known about the best land preparation and weeding regime, this study will try to examine the appropriate land preparation types and weeding regime to improve sweet pepper yield. Therefore, the objectives of the study are:

1. To determine the appropriate type of land preparation for sweet pepper production in the study area.
2. To determine the appropriate weeding regime for growing sweet pepper in the study area.
3. To determine the interaction between land preparation and weeding regime on the growth and yield of sweet pepper

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Effect of land preparation on growth and yield of sweet pepper

Tillage, a phenomenon of disturbing the soil, is essential in crop production and crop yield. For sweet pepper production, proper tillage is crucial for adequate soil management and optimal yield (Darbie, 2004). Tillage operations make the soil more suitable for seeding and seedling (or transplant) establishment and to provide the best soil structure for root growth and development (Darbie, 2004). This is accentuated by the work of Bankole and Ojeniyi, (2005) that root length and number of leaves for ridge base, furrow cleared and untilled soils gave high values. Sweet pepper may be planted or transplanted on flat or raised bed, since pepper do poorly in excessively wet soils, a raised bed facilitates drainage and help prevent "wet feet" in low or poorly drained soil (Darbie, 2004). However, a positive responses to tillage by cowpea was reported by Ndaeyo *et al*. (1995). Ojeniyi and Agboola (1995) concluded that tillage was essential for crop production under less humid climatic condition. One of the major objectives of tillage is to create optimum environmental condition for plant growth (Kaul and Egbo, 1985). This involves intensive working of the soil to produce a fine titlh which is often piled up in ridges, mound, raised on sunken beds (Youdeowei *et al.*, 1999). It was further contended that minimum tillage may not be suitable for some crops especially those that require fine tilth as used in nursery propagation. In a study on the effect of mechanized and herbicide based zero tillage, it was reported that zero tilled plot are superior (Lal *et al.*, 1978). However, the response of crop to tillage depends on microclimate and soil type (Bankole and Ojeniyi , 2005).

Saleem *et al.* (1987) found that planting on ridge gave 60 % higher yield than planting on flat. Similarly, seedling emergence in zero tillage was worse than in fully tilled soil (Huxley, 1979). Ndaeyo *et al.* (1995) found no significant effect of tillage on growth of cowpea in humid areas of Nigeria. Abimiku *et al.* (2002) in the Southern Guinea Savannah zone of Nigeria found that grain weight of sorghum was significantly reduced by surface hoeing (reduced tillage) when compared with flat bed and ridging. Likewise Ayub *et al.* (2003) in Pakistan observed that deep tillage resulted in significantly higher dry matter and fodder yield than zero tillage. For soil

moisture and compaction, the more compact furrow of the of ridge system, manually cleared, and zero tillage soil had relatively high values. The loose soil at the ridges side and top had low moisture content (Bankole and Ojeniyi , 2005).

2.2 Effects of weeds on the growth and yield of sweet pepper

Weeds are unwanted plant, which succeed in the struggle of existence in competition with crops (Lavabre, 1991). Weeds can substantially reduce yield without obvious sign of damage (Terry, 1983). The greatest loss in a crop yield due to weed competition occur during the critical period of weed competition , the period of the crop growth when it is most susceptible to weed competition (Lagoke *et al.,* 1986). In Nigeria, Alhassan *et al.* (2007) observed 70-80% reduction in yield arising from weed interference. Harry and Edward (1989) reported that yields from weed free-rows were as much as 50% greater than in rows in which weeds were not effectively removed. Similar observations were earlier reported by Kochar, (1986). However, Rubin (1990) reported that garlic yield attributes increased with the intensification of weed removal. This agreed with what was reported by Ahmed (1991) that most of the reduction in crops vigor and yield was as a result of weed competition with target crop. Although, there are other constraints such as nutrient, moisture, pest etc, weeds appear to have the most deleterious effect in the vegetable production causing yield reduction of between 53 and 67% (Adigun and Lagoke, 2003). Further to that, in another study, highest weed control rating was recorded when weeding was done at 3,6 and 9 WAS in millet. This result indicate that irrespective of the cropping pattern, the best weeding regime was when weeding was done at 3,6, and 9 WAS in millet (Joshua and Gworgwor, 2000). Joshua and Gworgwor (2000), further stated that for millet to be vigorous, weeding has to be done between 2 and 3 WAS and 4 to 6 WAS. This agrees with similar findings of Lagoke (1983). Joshua and Gworgwor (2000) have also observed that proper weeding regime and appropriate cropping population of millet- cowpea intercrop led to better weed control.

2.3 Interaction of land preparation and weeding regime on the growth and yield of sweet pepper

According to Akinyemi and Tijani – Eniola, (1997) tillage is a cultural practice long associated with weed control. Weeds have been reported to reduce yield significantly (Lado, 2004). The common method of weed control in Nigeria is by manual hoe-weeding. This is known to be tedious, time consuming and very expensive. The best way to control weed is by manipulating cropping system and making conditions more favorable for crop growth and less favourable for weeds (Stroud, 1993). This can be possible by adopting some agronomic or management practices which enhance the crops ability to compete with weeds (Alhassan *et al.,* 2007). In Nigeria, with very low technology and level of education of farmers, hoe weeding predominates other forms of weed control. The number of such hoe weeding during crop growth is usually at the discretion of the farmer as the weeding regime often extends from planting to harvest (Alhassan *et al.,* 2007). Although cultivation (Tillage) can bury some weeds seeds too deep to germinate, it also turns up previously buried weeds seeds which do germinate (Kaul and Egbo,1985). Weeds control method significantly affect yield parameters in both minimum tilled and herbicide treated plots. (Alhassan *et al*.,2007). Olofintoye (1989) found that plant height and tillering at early growth stage of rice crop were lower in no-till plot, thus indicating that some level of soil manipulation was necessary for satisfactory tillering in rice. Weed control is one of the most serious concerns to commercial pepper growers, both in transplant seedbed and in fields (Fitzroy *et al.,* 2004). In a study of weeding regime, a delay of 3 days in planting after land preparation resulted in 54% weed coverage compared with 36% observed in plots established on the first day. In the field, a delay of 9 days resulted in 30% more weed coverage (Alabi *et al.,* 2004).

CHAPTER THREE

3.0 MATERIALS AND METHODS

3.1 Study area

The experiment was conducted in two years during the 2008 and 2009 rainy seasons at the Teaching and Research Farm of the Federal Polytechnic Mubi. Mubi is located in the Northeastern part of Adamawa State between latitude 9^{o} $26^{'}$ and $10^{o}10^{'}$ N and longitudes 13^{o} $1^{'}$ and 13^{o} $44^{'}$ E. It has a land area of 506.40km^{2} (Adebayo, 2004), at an altitude of 696m above sea level (Encarta, 2007). The climate is characterized by alternating dry and wet season. The rains last from April to October with a mean annual rainfall from 700mm to 1050 mm (Udo, 1970; Adebayo, 2004). The land use types are mainly arable farming and livestock production (Tekwa and Usman, 2006).

3.2 Treatments and experimental design

The treatments consisted of four different land preparation methods namely: Zero tillage, Ploughed, Ploughed and harrowed, and Raised seed bed; and four weeding regime: weedy check, weeded at 2 WAT, weeded at 2 and 4 WAT as well as weeded at 2, 4 and 6 WAT. The treatments were laid out using a split –plot design with three replications. Sweet Pepper seeds, SAMARU MILD obtained from Adamawa State Agricultural Development Progarmme were sown by broad casting in a nursery before being transplanted to the field at 6 weeks after sowing. Tillage methods were assigned to the main plot and weeding regimes assigned to the sub-plot. The total land area used for the experiment was 9.5 m x 29.5 m (280.25 m^{2}), with a gross plot size of 2 m x 2 m and a net plot size of 0.9 m x 0.9 m. Alleyways of 0.50 m were allowed between the replications and the plots. The field layout is shown in Figure I.

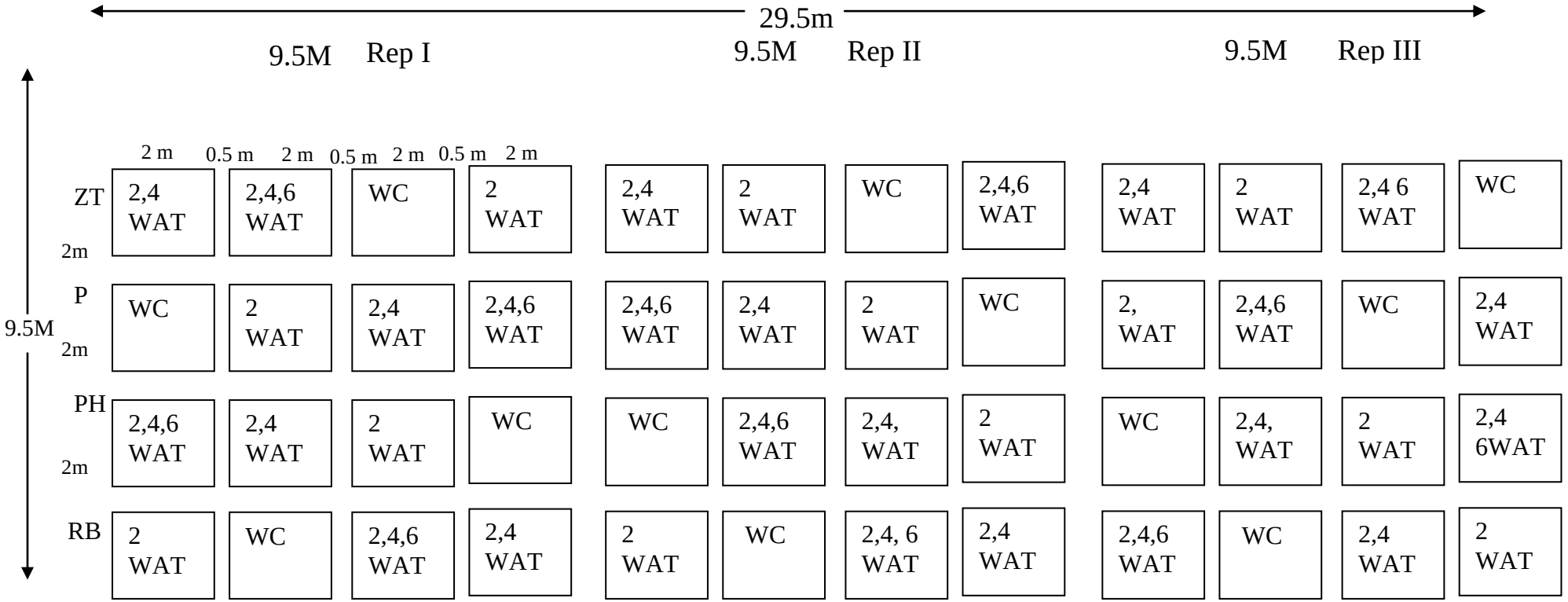

FIG 1: Field layout of the experiment.

KEY

2, 4 WAT = Weeded at 2nd, 4th Week after Transplanting
2WAT = Weeded at 2nd Week after Transplanting
2, 4,6WAT = Weeded at2nd, 4th, 6th Week after Transplanting
WC = Weedy check

P= Ploughed
PH= Ploughed and Harrowed
RB = Raised bed
ZT = Zero tillage

3.3 Soil sampling and analysis

Soil samples were collected at random at sixteen (16) different locations within the experimental area at a depth of 0-15 cm using soil auger, a composite samples of it were made, and the physical and chemical properties of the soil were determined. The samples were sun dried ground and sieved with a 2 mm sieve. The physical and chemical properties of the soil were determined. A particle size analysis was done by the bouyoucos hygrometer method (Shieldrick and HandWang, 1993). Soil pH was determined using the glass electrode pH meter at 1:2 soil and water ratio (Ibitoye, 2006). Organic carbon was determined by the dichromate wet oxidation method (Nelson and Sommers, 1996). Total N was determined by micro Kjeldahl method (Bremner, 1996). Available P was determined by Bray- 1 (Jaiswal, 2003). Bray and Kurtz 1 N ammonium acetate was used to extract the exchangeable bases. Ca and Mg were determined using EDTA complexiometric titration, while K was by flame photometry (Jaiswal, 2003)

3.4 Nursery practices

Sweet pepper seedlings were raised in seed boxes each measuring 1 mx1 m, in the nursery each nursery box was filled with soil medium at appropriate mixture of 3:2:1 (Topsoil, Farm Yard Manure and River sand). Seeds were sown by broadcasting on 3rd June and 2nd May for 2008 and 2009, respectively. Seedlings were irrigated using watering cans, and were transplanted to the permanent beds at six (6) weeks after sowing.

3.5 Site preparations and transplanting

The site for the experiment were measured and marked out using measuring tapes and wooden pegs. Plots were first sprayed with paraquat (Gramazone®) to kill all green vegetation and later various sub plot were made for the different land preparation. Plots for zero tillage (ZT) were left while those to be ploughed (P) were done using large hoes. The ploughed & harrowed (PH) plot was done manually using digging hoe. Raised seedbeds (RB) were made using large hoes after deep tilling. Transplanting in the plots was done when seedlings in the nursery were ready, at a spacing of 45 cm between plants and 45 cm between rows (Mark, 2002), giving a total of 1200 seedlings in the experiment (400 per replication), with only one seedling per

hole. The seedbeds were thoroughly watered on the day of transplanting. Replacement of death and weak seedlings was done after 7 days of establishment.

3.6 Weeding

Weeding was done using simple hoe at each weeding regime for the ploughed, ploughed and harrowed, and raised beds while simple hand picking was done for the zero tilled plots. This method was adopted till the end of the experiment in the two years.

3.7 Fertilizer application

Fertilizers were applied twice in each year, first at 3 weeks after the first weeding when the field was enriched with 350 kg/ha of NPK 15-15-15 fertilizer (Rasheed and Sola, 2005), and later top dressed with urea (46% N) at 6WAT at the rate of 70kg/ha. Fertilizers were applied by side placement method for all the treatments at these equal doses.

3.8 Insect and pest control

Incidence of black ants during transplanting was experienced. Rambo® insect killing powder was applied at the rate of 500g/ha, and later Lamdacyalothrin (Karate®) was applied using Knapsack sprayers at flowering and two weeks later at the rate of 1 liter/ha (50ml/15-litreof water) to control insect pests (Awodoyin *et al.*, 2005)

3.9 Weeds sampling and measurement

After all the land was prepared as designed, weeds in the field were collected at the end of the second week but before the first weeding. Collection was done using a 1meter square quadrant thrown at random in each of the plot for the first, second and third weeding regimes and at beginning of harvest for weedy check plot. The weeds gathered therein were carefully sorted specie by specie and were instantly weights using a digital weighing scale of 1kg capacity. Each specie identified was later carefully counted. Mean values were determined and then subjected to analysis of sum dominance ratio, relative density and relative frequency as described by Riaz *et al.* (2007).

3.10 Harvesting

Harvesting was done by hand picking once every week, when the sweet pepper fruits have changed colour from green to chocolate or red (Peet, 2003).

3.11 Data collection

The data that was collected from each plot during the period of the experiment include:

3.11.1 Plant height

Five plants per plot were sampled in situ at 2, 4, 6, 8 and 10 WAT, and their heights were measured using a meter rule. The average was computed and recorded.

3.11.2 Number of Leaves per plant

The numbers of leaves were counted at 2, 4 , 6 and 8 WAT. Five plants each were sampled in situ and their leaves were counted, and their means were computed and recorded.

3.11.3 Number of branches per plant

Five plants each were sampled at 4 WAT and at harvest. Both primary and secondary branches were counted and their average was computed and recorded.

3.11.4 Days to first weed emergence

Physical observation of the plots was done from the date of transplanting to determine the number of days taken for the first weeds to emerge on each plot. This observation continued for each weeding regime.

3.11.5 Weed count.

The weeds sampled within $1m^2$ quadrant were identified and separated on species basis and counted. The data on weeds count were analyzed following the formulae of Wirjahadja and Pancho (1975) and Riaz *et al*. (2007) where:

1. Relative frequency:

$$= \frac{\text{frequency value of one weed specie}}{\text{Total frequency for all weed species.}} \times 100$$

2. Relative Density:

$$= \frac{\text{Density of one weed specie}}{\text{Total density of all weed species.}} \times 100$$

3. Summed dominance ratio:

$$= \frac{\text{Relative density} + \text{Relative frequency}}{2} \times 100$$

3.11.6 Weed weight

Weed weight per plot were determined on wet weight basis. A metal square measuring 1meter in diameter was thrown randomly on each plot and the weeds there in were collected and weighed using a digital weighing scale. Weighing was done at each weeding regime. The total was computed at the end of the season for weeded and weedy check plots.

3.11.7 Weed height

Height of five tallest weeds per plot were taken at last harvest and averaged to give weed height per plot. Measurement was done using a measuring tape of 15metres capacity.

3.11.8 Days to 50% flowering

Individual plots were observed daily to establish the number of days taken for 50% flowering. Observation started from the first flower opening till 50% of the plants in each plot have flowered. The mean number of days was recorded.

3.11.9 Number of fruits per plant

Five plants were sampled in situ per plot, and their fruits were counted. The mean number of fruits per plant for each plot was computed and recorded at the end of the season.

3.11.10 Fruit length and diameter

Five fruits were sampled from five sampled plant per plot and each was measured using a vernier caliper and a meter rule, for fruit diameter and length respectively. The average for each plot was computed and recorded.

3.11.11 Yield per plot and yield per hactare

Mature fruits were harvested from five sampled plants per plot and weighed at each harvesting time. Yield per plot was determined at end of the season, and the yield per hectare was obtained by conversion of the net plot yield into kg/ha.

3.12 Statistical analysis

Data collected were analyzed using Analysis of variance (ANOVA) procedure according to Gomez and Gomez (1984). Data for the two years were combined and analyzed for growth, yield and weed characters. Mean separation was made for means with significant F- test at 5% level of probability using Least Significant Difference (LSD) test.

CHAPTER FOUR

4.0 RESULTS

4.1 Soil physico - chemical properties

The result of the soil physical and chemical properties of the experimental sites before and after each year of the field trial is presented in Table 1. There were higher values of some of the soil properties in both 2008 and 2009 rainy seasons. Potassium (K) had a value of 1.148 cmol/kg before the 2008 cropping season, while Magnesium (Mg) had a value of 0.460 cmol/kg after the 2008 rainy season. Also, there was high CEC value of 15.48 meq/100g, before the commencement of the 2009 cropping season. The soil was sandy loam in texture, low in organic carbon, total N, available P, and exchangeable ca.

4.2.1 Effects of land preparation and weeding regime on establishment count, number of primary branches, number of secondary branches, plant heights and number of leaves of sweet pepper

Table 2 presents the mean values for establishment count, number of primary branches, and number of secondary branches of sweet pepper during the 2008 and 2009 rainy seasons.

4.2.1.1 Establishment count

There were no significant ($P \geq 0.05$) variation on establishment count in the two seasons for both land preparation and weeding regime. Similarly, the combined analyses did not show any significant ($P \geq 0.05$) variation for the treatments.

4.2.1.2. Number of branches

Number of primary branches at 4WAT did not differ from each other in 2008 and in the combined seasons for both land preparations and weeding regime, but differ significantly ($P \leq 0.01$) in 2009 for weeding regime, with plots weeded 3 times having 1.25 and the control plot (Zero weeding) having 0.32. However, at 10WAT, number of primary branches did not differ significantly ($P \geq 0.05$) in both 2008 and 2009 for land preparation, but differ significantly ($P \leq 0.01$) higher for land preparation in the combined seasons, with zero tilled plots recording 2.59 and raised beds plots recording

Table 1: Analysis of properties of soils of the Experimental sites in 9 rainy seasons

	2008		2009	
	Before cropping	After cropping	Before cropping	After cropping
Exchangeable bases				
Potassium(K) (cmol/kg)	1.148	0.007	0.009	0.011
Sodium(Na) (cmol/kg)	0.141	0.160	0.126	0.108
Cal) (cmol/kg)	0.11	0.16	0.12	0.18
Magnesium(Mg) (cmol/kg)	0.342	0.460	0.230	0.296
Organic carbon (%)	0.800	0.253	0.156	0.0195
Available Phosphorus(P) (ppm)	2.975	1.275	1.422	0.135
To	0.013	0.028	0.014	0.084
Texture (%)				
Silt	44.10	33.97	13.04	4.42
Clay	19.20	3.93	2.15	9.14
Sand	36.70	62.10	84.81	86.44
PH	6.0	6.5	5.7	5.9
CEC(meq/100g)	11.3	18.78	15.48	8.59

Soil textural class: Sandy loam

4.92. The highly significant ($P \leq 0.01$) effects of weeding regime on primary branches was recorded in both 2008, 2009 and the combined seasons. The control plots had 2.07 in 2008, 1.05 in 2009 and 1.56 in the combined seasons, while the high number of primary branches of 7.27 and 5.82 was recorded on plots weeded 3 times in 2008 and 2009 respectively. There were no significant ($P \geq 0.05$) effect of both land preparation and weeding regime on the number of secondary branches at 4WAT in 2008. Also in 2009 and in the combined years, land preparations had no significant effect ($P \geq 0.01$) but weeding regimes had highly significant effect ($P \leq 0.01$) in 2009, with plots weeded 3 times recording 0.40 as against the control plots (zero weeding) with 0.02. Significant ($P \leq 0.05$) effect of weeding regime was also observed in the combined years for the number of secondary branches at 4WAT with plots weeded 3 times recording 0.20 while the control plot recorded 0.01. Furthermore, there was no significant ($P \geq 0.05$) difference for land preparation at 10WAT for both 2008, 2009 and in the combined years. However, weeding regime showed a highly significant ($P \leq 0.01$) variation in 2009 with plots weeded 3 times recording 16.10 numbers of secondary branches while the control plot (Zero weeding) gave 1.20 secondary branches. Plots weeded once and twice recorded 4.00 and 9.10 secondary branches at 2 and 4 WAT respectively. There was however no significant ($P \geq 0.05$) effect of weeding regimes on secondary branches in 2008 and in the combined analyses at 10WAT.

Table 2: The effects of land preparation and branches, andnumber of secondary branches of sweet pepper in 2008 and 2009 rainy seasons

Treatments	4WAT[1]			10WAT			4WAT			10WAT					
	2008	2009	Combined.	2008	2009	Combined.	2008	2009	Combined.	2008	2009	Combined.	2008	2009	Combined
Land preparation(LP)															
Ploughed	23.25	24.00	23.62	0.87	1.03	0.95	3.65	3.18	3.42	0.05	0.23	0.14	5.70	8.00	6.80
Plowed & harrowed	23.42	23.33	23.38	1.95	1.20	1.58	4.07	3.62	3.84	0.00	0.30	0.15	10.10	6.50	8.30
Raised Bed	23.33	22.75	23.04	1.05	0.75	0.90	5.98	3.85	4.92	0.03	0.23	0.13	50.60	13.10	31.80
Zero Tilled	22.42	21.75	22.08	0.83	0.48	0.66	3.32	1.87	2.59	0.00	0.03	0.02	4.20	2.80	3.50
Level of Significance	ns[2]	Ns	Ns	Ns	Ns	Ns	Ns	Ns		Ns	Ns	Ns	Ns	Ns	Ns
LSD									0.950						
Weeding Regime(WR)															
0 WAT	23.50	23.25	23.38	1.27	0.32	0.79	2.07	1.05	1.56	0.00	0.02	0.01	2.80	1.20	2.00
2 WAT	22.67	22.42	22.54	1.12	0.75	0.93	3.93	2.18	3.06	0.05	0.12	0.08	35.10	4.00	19.60
2,4 WAT	23.25	23.00	23.12	1.33		1.24	3.75	3.47	3.61	0.03	0.27	0.15	10.50	9.10	9.80
2,4,6 WAT	23.00	23.17	23.08	0.98	1.25	1.12	7.27		6.54	0.00	0.40	0.20	22.00	16.10	19.10
Level of Significance	Ns	Ns	Ns	Ns	**[4]	Ns	**	**	**	Ns	**	*[3]	ns	**	ns
LSD					0.45		0.620	1.60	0.84		0.178	0.10		4.23	
	Ns	Ns	Ns	Ns	Ns	Ns	**	Ns	Ns	Ns	Ns	Ns	ns	ns	ns
LSD							1.48								

1= Weeks After Transplanting. 2=Not Significant. 3=Significant at 5% level of probability. 4= Highly significant at 1% Level of Probability

4.2.1.3 Plant height (cm)

Table 3 presents the mean plant height of sweet pepper during the 2008 and 2009 rainy seasons. There was no significant($P \geq 0.05$) effect of land preparation on the hei05) for weeding regime at 2WAT and 4WAT in both 2008, 2009 seasons and the combined years. However, at 6WAT, there was a significant ($P \leq 0.05$) effect of weeding regime on plant height in the combined analysis, with the control plots recording 15.47 cm and the weeded 3 times recording 18.34cm. Furthermore, weeding regime showed a highly significant ($P \leq 0.01$) effect on plant height at 6WAT in 2009. Plots weeded once and twice recorded 17.15 cm and 18.37 cm respectively, while the control plots (zero weeding) recorded 15.95 cm. The mean tallest plant of 21.50 cm in that week was on plots weeded 3 times. There was also a highly significant ($P \leq 0.01$) effect of weeding regime on plant height at 8WAT and 10WAT in both 2009 and the combined years. Plots weeded 3 times recorded 29.60 cm and 40.02 cm in 2009 at 8WAT and 10WAT, respectively. The control plots recorded 16.20 cm and 26.48 cm in 2009 at 8WAT and 10WAT, respectively. There was no significant ($P \geq 0.05$) effect of weeding regime at 8WAT and 10WAT, in 2008.

4.2.1.4 Leaf count

The mean values for leaf count for sweet pepper during the 2008 and 2009 rainy seasons are presented in Table 4. A highly significant ($P \leq 0.01$) variation exist in 2008 for land preparation at 2WAT. Ploughed plots recorded 8.55 and zero tilled plots recorded 8.22. Both ploughed & harrowed plots and raised beds plots recorded at 9.12 and 9.78 respectively. However, there was no significant ($P \geq 0.05$) variation for land preparation at 2WAT in 2009 and in the combined analysis. There was also no significant ($P \geq 0.05$) difference of leaf count for land preparation at 4WAT in both 2008, 2009 and in the combined analysis. However, at 6WAT, significant ($P \leq 0.05$) effect of land preparation was recorded on leaf count in 2008, with raised beds plots recording 62.20 while the control plots (zero tilled) recording 24.70. There was also a highly significant ($P \leq 0.01$) effect of land preparation in the combined at 6WAT. Raised beds recorded the highest mean number of leaves with 55.60 and zero tilled plots had the least mean number of leaves of 21.30.

There was no significant ($P \geq 0.05$) variation for land preparation at 2, 4 and 6WAT in 2009. However, at 8WAT, significant ($P \leq 0.05$) effect of land preparation was recorded on the number of leaves in 2009. Furthermore, a highly significant ($P \leq 0.01$) effect of land preparation was recorded for leaf count in the combined analyses. Ploughed plots recorded 38.00, ploughed & harrowed plots recorded 39.40, and the highest mean leaf count was observed with raised beds plots recording 63.60. The control plots (zero Tilled) recorded 25.60 numbers of leaves.

Weeding regime did not significantly ($P \geq 0.05$) affect leaf count at both 2WAT and 4WAT in both 2008 and 2009 and the combined seasons. However, a highly significant ($P \leq 0.01$) effect of weeding regime was observed at 6WAT and 8WAT in both seasons and the combined analysis. In 2008, plots weeded 3 times recorded 47.50 and 55.50, while in 2009 and the combined years, plots weeded 3 times at 2, 4 and6WAT recorded 51.20 & 55.90 and 49.40 &55.70 at 6WAT and 8WAT, res combined analysis, at 6WAT, and 36.90 in 2008, 22.00 in 2009, and 29.50 in the combined analysis at 8WAT.

Table 3 : The effects of land preparation sweet pepper in 2008 and 2009 rainy

)

Treatments	2WAT[1]			4WAT			6WAT			8WAT			10WAT		
	2008	2009	Combined.	2008	2009	Combined.	2008	2009	Combined.	2008	2009	Combined.	2008	2009	Combined.
Land preparation(LP)															
Ploughed	11.22	14.83	13.02	12.42	16.27	14.34	14.87	19.20	17.03	19.40	34.20	26.80	18.08	23.55	20.82
Plowed & harrowed	10.72	14.92	12.82	12.23	16.47	14.35	16.88	19.38	18.13	21.33	34.48	27.91	23.08	24.03	23.56
Raised Bed	10.40	11.87	11.13	12.27	13.43	12.85	14.78	18.12	16.45	19.23	34.48	26.86	23.78	23.72	23.75
Zero Tilled	10.37	14.07	12.22	11.83	15.08	13.46	14.37	16.27	15.32	17.62	27.18	22.40	18.63	17.47	18.05
Level of Significance	Ns[2]	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns	ns	ns
LSD															
0 WAT	10.55	14.27	12.41	12.25	15.00	13.63	14.98	15.95	15.47	18.73	26.48	22.61	21.77	16.20	18.98
2 WAT	11.02	13.82	12.42	12.52	15.35	13.93	15.63	17.15	16.39	20.38	29.98	25.18	21.42	19.00	20.21
2,4 WAT	11.07	13.55	12.31	12.67	14.88	13.78	15.10	18.37	16.73	17.68	33.87	25.78	17.55	23.97	20.76
2,4,6 WAT	10.07	14.05	12.06	11.32	16.02	13.67	15.18	21.50	18.34	20.78	40.02	30.40	22.85	29.60	26.22
Level of Significance	Ns	Ns	Ns	Ns	Ns	Ns	Ns		*[4]	Ns	**	**	Ns	**	**
LSD								2.59	1.55		3.53	2.26		2.83	3.12
LP X WR	Ns	Ns	Ns	Ns	ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns	ns	ns
LSD															

1 = Weeks After Transplanting, 2 = Not Significant, , 3 = Highly significant at 1% Level of Probability 4 =Significant at 5% Level of Probability

Table 4 : Effects of Land Preparations and w during the 2008 and 2009 rainy seasons

Treatments	2WAT[1]			4WAT			6WAT			8WAT		
	2008	2009	Combined.	2008	2009	Combined.	2008	2009	Combined.	2008	2009	Combined.
Ploughed	8.55	13.48	11.02	15.13	15.42	15.28	34.00	33.60	33.80	40.10	36.00	38.00
Plowed & harrowed	9.12	12.82	10.97	15.80	15.12	15.46	36.70	34.80	35.70	41.50	37.30	39.40
Raised Bed	9.78	10.85	10.32	20.95	12.70	16.83	62.20	49.00	55.60	72.60	54.70	63.60
Zero Tilled	8.22	10.48	9.35	13.08	11.90	12.49	24.70	17.90	21.30	32.20	19.00	25.60
Level of Significance	**[2]	ns[3]	Ns	Ns	Ns	Ns	*[4]	Ns	**	*	*	**
LSD	0.44						14.94		8.87	16.82	11.71	9.13
Weeding Regime(WR)												
0WAT	9.22	12.33	10.78	16.83	13.42	15.13	30.80	20.60	25.70	36.90	22.00	29.50
2 WAT	8.95	12.07	10.51	15.53	13.93	14.73	39.10	26.60	32.80	46.60	29.00	37.80
2,4 WAT	8.67	10.98	9.83	15.63	12.90	14.27	40.20	36.80	38.50	47.40	40.10	43.70
2,4,6 WAT	8.83	12.25	10.54	16.97	14.88	15.93	47.50	51.20	49.40	55.50	55.90	55.70
Level of Significance												
LSD							6.99	10.06	5.97	8.12	9.54	6.10
LP X WR	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns	*
LSD												13.51

1 = Weeks After Transplanting, 2 = Highly significant at 1% Level of probability 3 = Not Significant, 4 =Significant at 5% Level of Probability

4.3 Interactions between land preparation and weeding regime on number of branches

Table 6 presents the interactions between of land preparation and weeding regime on number of primary branches at 10WAT in 2008. The number of primary branches at 10WAT in 2008 shows a highly significant ($P \leq 0.01$) interaction between the treatment. Raised beds plots and ploughed and harrowed plots recorded the highest mean interaction values of 8.53 and 8.27 respectively for plots weeded 3 times.

4.4 Interactions between land preparation and weeding regime on number of leaves

Table 6 also presents the interactions between of land preparation and weeding regime on number of leaves at 8WAT. The number of leaves at 8WAT had a significant ($P \leq 0.05$) interaction for the two treatments. The least value in the interaction was with zero tilled plots and zero weeded plots recording 20.60.

4.5 The Effects of land preparation and weeding regime on days to first flowering and days to 50% flowering of sweet pepper.

Table 5 presents the mean values for days to first flowering and days to 50% flowering of sweet pepper during the 2008 and 2009 rainy seasons. There were no significant ($P \geq 0.05$) effect of land preparation on days to first flowering in both seasons and the combined. However, weeding regime differ significantly ($P \leq 0.01$) in 2009 and the combined, but did not differ significantly ($P \geq 0.05$) in 2008. Days to 50% flowering was significantly ($P \leq 0.05$) different for land preparation in 2008 , with raised beds pots recording highest mean value of 26.10 days while the control plot had 8.10 days. In 2009 and the combined, there was no significant ($P \geq 0.05$) variation in days to 50% flowering for land preparation. Weeding regime noticed a highly significant ($P \leq 0.01$) variation in both the seasons and the combined. Plots weeded 3 times had 38.10 days while the control plot did not flower in the combined.

4.6 Interactions between land preparation and weeding regime on days to flowering

The interactions between of land preparation and weeding regime on days to 50% flowering are presented in Table 6. Days to 50% flowering also shows a highly significant ($P \leq 0.01$) interaction between weeding regime and

land preparation in 2008. Plots weeded 3 times at 2,4 and 6 WAT flowered in 25 days in the ploughed and harrowed plots while the zero weeded plot did not attain the 50% flowering . The longest time taken to produce 50% flowers was in the raised beds plots that were weeded twice at 2 and 4 WAT with 37.30 days. The shortest time taken was with ploughed and harrowed plots that were weeded just once at 2 WAT with 11.30days.

Table 5 : The effects of land preparation and weet pepper in 2008 and 2009 rainy seasons

Treatments	Days to first flowering			Days to 50% flowering		
	2008	2009	Combined.	2008	2009	Combined.
Land preparation(LP)						
Ploughed	23.17	32.83	28.00	14.80	31.70	23.20
Plowed & harrowed	23.42	34.67	29.04	17.50	21.00	19.20
Raised Bed						
Zero Tilled						
Level of Significance						
LSD				6.94		
Weeding regime(WR)						
0 WAT[3]	24.42	36.17	30.29	0.00	0.00	0.00
2 WAT	22.58	34.58	28.58	10.90	18.90	14.90
2,4 WAT	19.83	34.75	27.29	23.70	41.30	32.50
2,4.6 WAT	20.50	30.42	25.46	31.90	44.20	38.10
Level of Significance	Ns	**[4]	**	**	**	**
LSD		1.50	2.279	6.80	13.75	7.47
LP X WR	Ns	Ns	Ns	**	Ns	Ns
LSD				13.02		

1 = Not Significant, 2 =Significant at 5% Level of Probability, 3 = Weeks After Transplanting, 4= Highly significant at 1% level of probability

Table 6: Interactions of land prepara leaves, and da 50% flowering

					Leaves count at 8WAT, Combined				Days to 50% flowering,2008			
Treatments												2,4 &6 WAT
Ploughed	2.93	3.40	1.67	6.60	30.10	34.80	34.70	52.60	0.00	0.00	24.00	35.30
Ploughed and Harrowed	0.67	2.87	4.47	8.27	29.20	31.80	43.80	53.10	0.00	11.30	33.30	25.30
Raised bed	3.33	7.20	4.87	8.53	38.10	58.70	70.80	86.90	0.00	32.30	37.30	34.70
Zero tilled	1.33	2.27	4.00	5.67	20.60	26.00	25.80	30.20	0.00	0.00	0.00	32.30

1= No weeding, 2=weeks after transplanting, 3= Weeded at second week, 4= weeded at second and fourth week, 5= Weeded at second, fourth and sixth week

4.7 Effects of land preparation and weeding regime on fruit length, fruit diameter and stem diameter of sweet pepper.

The Mean values of fruit length, fruit diameter and stem diameter of sweet pepper during the 2008 and 2009 rainy seasons are presented in Table 7.

4.7.1 Fruit length

Fruits length in 2008 had a significant ($P \leq 0.05$) variation for land preparation, and a highly significant ($P \leq 0.01$) variation in the combined analysis. Both ploughed plots and ploughed and harrowed plots recorded 36.60 mm and 34.60 mm respectively in the combined, while raised beds plots recorded 44.30 mm as against the 18.60 mm recorded by zero tilled plots. There was no significant ($P \geq 0.05$) effect of land preparation on fruit length in 2009. However, weeding regime had a highly significant ($P \leq 0.01$) effect on fruit length in 2008, 2009 and in the combined. The highest mean values recorded was in plots weeded 3 times with 50.60 mm,70.80 mm and 60.70 mm for 2008,2009 and the combined respectively. The least mean values noticed with zero weeded plots were 11.90 mm, 0.00 mm and 6.00 mm respectively for 2008, 2009 and the combined years.

4.7.2 Fruit diameter

Furthermore, fruit diameter did not differ significantly ($P \geq 0.05$) in both 2008 and 2009 for land preparation, but differed significantly ($P \leq 0.05$) in the combined. Raised beds plots had the highest mean value of 22.92 mm, followed by the ploughed plots (18.37 mm), and ploughed and harrowed plots (16.77 mm). The control plot (zero tilled) had the lowest diameter of 11.04 mm. Weeding regime however had a highly significant ($P \leq 0.01$) effect on fruit diameter in both the seasons and in the combined analysis. The highest mean values of 37.08 mm was recorded by plots weeded 3 times in 2009 while the least mean value of 0.00 mm was observed with zero weeding in 2009.

4.7.3 Stem diameter

There was no significant ($P \geq 0.05$) difference for stem diameter apex for land preparation in both 2008, 2009 and the combined years, but a highly significant ($P \leq 0.01$) variation exist for weeding regime in respect of stem diameter apex in both 2008 and 2009 and the combined years. Plots weeded 3 times recorded 1.67 mm, 2.29 mm, and 1.98 mm for 2008, 2009 and the combined analysis respectively for stem diameter apex while the control plots (zero weeding) recorded a mean value of

1.24 mm, 1.68 mm, and 1.46 mm for 2008, 2009 and the combined years respectively. Furthermore, stem diameter at the base did not differ significantly ($P \geq 0.05$) for land preparation in 2009, but differ highly significantly ($P \leq 0.01$) in both 2008 and the combined analysis. Mean values of 4.66 mm and 4.42 mm were recorded for ploughed plots and ploughed and harrowed plots while the zero tilled plots and raised beds plots recorded 3.92 mm and 6.78 mm, respectively in 2008. Weeding regime had a highly significant ($P \leq 0.01$) effect on stem diameter base in both seasons and the combined analysis. The highest mean value of stem diameter base were noticed with plots weeded 3 times recording 6.61 mm, 7.42 mm and 7.02 mm in 2008, 2009 and the combined analysis respectively, while the control plot (zero weeding) noticed the least mean values of stem diameter base recording 3.49 mm, 4.20 mm and 3.85 mm for 2008, 2009 and the combined years respectively.

4.8 Interactions between land preparation and weeding regime on stem diameter

The interactions between of land preparation and weeding regime on stem diameter base in 2008 and the combined is presented in Table 8. There was also a highly significant ($P \leq 0.01$) interaction for land preparation and weeding regime for stem diameter base in 2008 and the combined analysis. Stem diameter (Base) in 2008 was quite high for raised bed and the ploughed plots. The least value of 4.02 mm and 3.95 mm respectively in the zero weeded plots, and a value of 9.98 mm was as highest stem diameter on plots weeded 3 times at 2, 4 and 6WAT. In the combined interaction, the stem diameter (base) equally recorded a high value of 9.18 mm, in plot weeded 3 times at 2,4 and 6WAT, while the zero tilled plot had the least stem diameter of 3.46 mm on zero weeded plot.

Table 7: The effects of land preparation and weeding regime o sweetepper in 2008 and 2009 rainy seasons

Treatments	Fruit length(mm)			Fruit diameter(mm)			Stem diameter [mm] (Apex)			Stem diameter[mm] (Base)		
	2008	2009	Combined.	2008	2009	Combined.	2008	2009	Combined	2008	2009	Combined
Land preparation(LP)												
Ploughed	32.40	40.70	36.60	15.56	21.17	18.37	1.37	2.05	1.71	4.66	6.19	5.43
Plowed & harrowed	34.40	34.80	34.60	16.20	17.35	16.77	1.46	1.79	1.62	4.42	5.46	4.94
Raised Bed	49.10	39.50	44.30	22.85	22.99	22.92	1.59	2.05	1.82	6.78	6.27	6.53
Zero Tilled	20.60	16.70	18.60	12.31	9.77	11.04	1.46	1.65	1.56	3.92	4.57	4.25
Level of Significance	*[1]	Ns[2]	**[3]	Ns	ns	*	Ns	Ns	Ns	**	ns	**
LSD	10.18		8.57			5.17				0.51		0.52
Weeding regime(WR)												
0 WAT												
2 WAT												
2,4 WAT												
2,4.6 WAT												
Level of Significance												
LSD	16.80	14.58	10.84	6.91	8.46	5.32	0.13	0.26	0.14	0.49	0.78	0.45
LP X WR	Ns	Ns	Ns	Ns	ns	Ns	Ns	Ns	Ns	**	ns	**
LSD										0.94		0.91

1 =Significant at 5% Level of Probability, 2=Not Significant, 3 = Highly significant at 1% Level of Probability

Table 8: Interactions between land preparation and weeding regime on stem diameter.

Treatments	0 WAT	2 WAT	2 and4 WAT	2,4 and 6 WAT	0 WAT	2 WAT	2 and 4 WAT	2,4 and 6 WAT
Ploughed	3.95	4.01	5.00	5.69	3.95	5.09	5.67	7.01
Ploughed and harrowed	3.14	2.89	5.83	5.81	3.76	3.55	5.67	6.78
Raised beds	4.02	6.22	6.89	9.98	4.22	5.58	7.13	9.18
Zero tilled	2.86	3.71	4.17	4.95	3.46	3.61	4.82	5.10

1= No weeding, 2=weeks after transplanting, 3= Weeded at second week, 4= weeded at second and fourth week, 5= Weeded at second, fourth and sixth week

4.9 Effects of land preparation and weeding regime on number of fruits per plant, total number of fruits per plot, fruits yield per plot and fruits yield per hectare of sweet pepper.

Mean values of the number of fruits per plant, total number of fruit per plot, yield per plot and yand 2009 rainy seasons and the combined are presented in Table 9.

4.9.1 Number of fruits per plant

There was a significant (($P \leq 0.05$) effect of land preparation on number of fruits per plot in both 2008 and 2009. There was also a highly significant ($P \leq 0.01$) effect of land preparation on the number of fruits per plot in the combined analysis. Zero tilled plots recorded the least mean values of 0.40, 0.43 and 0.42 for 2008, 2009 and the combined respectively, while raised beds plots showed the highest mean value of 1.87, 1.67 and 1.62 for 2008, 2009 and the combined respectively. Similarly, weeding regime had highly significant ($P \leq 0.01$) effects on number of fruits per plant in both seasons and the combined analysis. Highest mean values of 2.58 was recorded for plots weeded 3 times in 2009 while the least mean value of 0.00 was recorded for the zero weeded plots in 2009

4.9.2 Total number of fruits per plot

Total number of fruits per plot was not significantly ($P \geq 0.05$) different for land preparation in 2008, but was highly significant ($P \leq 0.01$) in both 2009 and the combined analysis. The lowest mean values were 2.50 (2009) and 2.12 (combined analysis). Also there was a significant ($P \leq 0.05$) effect of weeding regimes on total number of fruits per plot in 2008, and a highly significant ($P \leq 0.01$) effect in both 2009 and the combined. In 2008, plots weeded once had 2.00, while those weeded twice and thrice had 4.08 and 11.58, respectively. The least mean value in 2009 was with zero weeding recording 0.00 while plots weeded 3 times had 23.25.

4.9.3 plot (Grams)

Yield per plot was significantly ($P \leq 0.05$) affected by land preparation in 2008 and 2009, and highly significant ($P \leq 0.01$) in the combined analysis. Highest mean value was recorded for raised beds plots with 97.70 g in 2008 and 271.9g in 2009, while184.60 g was recorded for raised beds in the combined analysis. However,

weeding regime observed a highly significant ($P \leq 0.01$) effects on yield per plot in 2008, 2009 and in the combined years.

4.9.4 Yield per hectare (Tonnes)

Similarly, yield per hactare was significantly ($P \geq 0.05$) affected by land preparation in 2008 and 2009, and highly significant ($P \geq 0.01$) in the combined. The highest yield was recorded for raised beds plots in 2009 with 6.79 tonnes /hactare while the least yield was noticed in zero tilled plot with 0.36 tonnes / hactare in 2008. The combined analysis had 2.76 tonnes /hactare for ploughed plots, 1.86 tonnes/hactare for ploughed & harrowed plots, 4.62 tonnes/hactare for the raised beds plots, and 0.72 tonnes/hactare for the control plots (zero tilled). Furthermore, weeding regime had a highly significant ($P \leq 0.01$) effect on yield per hacter in both the seasons. Plots weeded 3 times had 2.77 tonnes /hactare, 11.69 tonnes /hactare and 7.23 tonnes per hactare in 2008, 2009 and the combined, respectively.

4.10 In on number of fruit per plant, total number of fruits per plot, fruits yield per plot and fruits yield per hectare of sweet pepper.

The interaction between land preparation and weeding on number of fruits per plant, total fruits per plot, yield per plot and yield per hactare of sweet pepper during the 2008 and 2009 rainy seasons are presented in Table 10 and Table 11.

4.10.1 Number of fruits per plant

There was a significant effect ($P \leq 0.05$) of both land preparation and weeding regime on number of fruits per plant. In the combined analysis, 3.27 number of fruits was recorded as the highest mean number of fruits per plant in plots weeded 3 times at 2,4 and 6WAT on the raised beds plots , while the least mean number of fruit were on zero tilled plots.

4.10.2 Number of fruit per plot

There was a highly significant effect ($P \leq 0.01$) of both land preparation and weeding regime on number of fruits per plot. The interaction effect of land preparation and weeding regime on the total number of fruits per plot is recorded with raised beds plots having 22.00 on plots weeded 3 times at 2, 4 and 6WAT, followed by the ploughed and harrowed, raising from 4.00 in plots weeded twice at 2 and 4 WAT to 13.33 in plots weeded 3 times at 2,4 and 6WAT. The least number of fruits was in zero tilled plots that

were not weeded, which did not any fruit. In 2009, zero weeded plots did not yield any fruit in all the land preparation methods, but yielded highly in plots weeded twice and 3 times with 32.33 for ploughed and 37.33 for raised beds. Ploughed and harrowed only yielded 0.67 in plots weeded once at 2WAT. The plots weeded twice at 2 and 4 WAT yielded better with 16.67 for raised beds, than the plots weeded 3 times at 2,4 and 6WAT on the ploughed and harrowed plots, which recorded 14.33. The highest in the combined was 29.67 while the least is with zero weeded plots recording 0.17 for both ploughed , and ploughed and harrowed, 0.33 for raised beds, and 0.00 for zero tilled respectively.

4.10.3 Yield per plot (Grams)

Yield per plot in 2009 and in the combined years had a highly significant ($P \leq 0.01$) interaction between land preparation and weeding regime. The yield per plot in the combined, recorded a value of 424.8 g on raised beds plots that were weeded 3 times at 2,4 and 6WAT, followed by 386.2 g on ploughed plots that were weeded 3 times. The least value was with zero tilled plots that were not weeded. Plots weeded once at 2WAT and twice at 2 and 4 WAT recorded 6.30 g and 44.5 g in the ploughed and harrowed plots. Similarly, in 2009 the highest yield per plot was recorded on raised beds plot that were weeded 3 times at 2,4 and 6WAT, while the least yield per plot was recorded on zero weeded plot in all the land preparation methods, with no yield(0.00 g).

4.10.4 Yi)

Yield per hactare in both 2009 and the combined had a highly significant ($P \leq 0.01$) interaction between the two treatments. The interaction follows the same trends with that of yield per plot. In 2009, there was no fruit obtained on all the land preparation methods that were zero weeded. However, the raised beds and ploughed plots that were weeded 3 times at 2, 4 and 6WAT recorded 16.84 tonnes/hectare and 17.63 tonnes/hectare respectively. The combined years also had a highest yield of 10.62 tonnes/hectare for raised beds that were weeded 3 times at 2,4 and 6WAT, and the least yield of 0.00 tonnes/hectare for zero tilled plots that were not weeded.

Table 9: The effects of land prepar of sweet pepper in 2008 and 2009 rainy seasons

Treatments												
Land preparation(LP)												
Ploughed	0.60	1.17	0.88	2.42	9.58	6.00	25.00	195.70	110.30	0.62	4.89	2.76
Plowed & harrowed	0.82	0.67	0.74	4.75	5.33	5.04	49.40	99.80	74.60	1.23	2.50	1.86
Raised Bed	1.87	1.67	1.62	9.08	16.50	12.79	97.70	271.50	184.60	2.44	6.79	4.62
Zero Tilled	0.40	0.43	0.42	1.75	2.50	2.12	14.40	43.50	29.00	0.36	1.09	0.72
Level of Significance	*[1]	*	**[2]	ns[3]	**	**	*	*	**	*	*	**
LSD	0.57	0.37	0.81		3.29	2.17	30.75	136.3	46.39	0.77	2.48	1.16
Weeding regime(WR)												
0WAT[4]	0.12	0.00	0.06	0.33	0.00	0.17	1.90	0.00	0.90	0.05	0.00	0.02
2 WAT	0.60	0.25	0.43	2.00	1.25	1.62	25.50	11.70	18.60	0.64	0.29	0.47
2,4 WAT	0.95	0.80	0.88	4.08	9.42	6.75	48.40	131.10	89.80	1.21	3.28	2.24
2,4.6 WAT	2.02	2.58	2.30	11.58	23.25	17.42	110.70	467.80	289.20	2.77	11.69	7.23
Level of Significance	**	**	**	**	**	**	**	**	**	**	**	**
LSD	0.41	0.45	0.30	2.41	4.02	2.28	42.54	83.70	45.71	1.06	2.09	1.14
LP X WR	Ns	Ns	*	*	**	**	Ns	**	**	Ns	**	**
LSD			0.58	5.13	7.42	4.41		165.80	98.56		4.14	2.23

1 =Significant at 5% Level of Probability, 2 = Highly significant at 1% Level of Probability 3 = Not Significant, 4 = Weeks After Transplanting,

Table 10: Interactions between land preparation and weeding regime on number o fruits per plot.

	Number of fruits /plant, combined				Total number of fruits/plot,2008				Total number of fruit/plot,2009				Total number of fruits /plot, combined			
Treatments	0[1] WAT[2]	2[3] WAT	2 &4[4] WAT	2,4 &6[5] WAT	0 WAT	2 WAT	2 &4 WAT	2,4 &6 WAT	0 WAT	2 WAT	2 &4 WAT	2,4 &6 WAT	0 WAT	2 WAT	2 &4 WAT	2,4& 6 WAT
Ploughed	0.07	0.40	0.50	2.57	0.33	0.33	2.67	6.33	0.00	1.00	5.00	32.33	0.17	0.67	3.83	19.33
Ploughed and Harrowed	0.00											15.33	0.17	1.00	4.67	14.33
Raised bed	0.07	1.10	1.93	3.27	0.67	6.00	7.67	22.00	0.00	3.00	25.67	37.33	0.33	4.50	16.67	29.67
Zero tilled	0.00	0.03	0.33	1.30	0.00	0.33	2.00	4.67	0.00	0.33	1.67	8.00	0.00	0.33	1.83	6.33

1= No weeding, 2=weeks after transplanting, 3= Weeded at second week, 4= weeded at second and fourth week, 5= Weeded at second, fourth and sixth week

Table 11: Interaction between la yield per plot and yield per hactare.

	Yield/plot(g), combined				Yield/plot(g), 2009				Yield(Tones/ha),combined				Yield(Tones/ha), 2009			
Treatments	0[1] WAT[2]	2 [3] WAT	2 &4[4] WAT	2,4 &6[5] WAT	0 WAT	2 WAT	2 &4 WAT	2,4 &6 WAT	0 WAT	2 WAT	2 &4 WAT	2,4 &6 WAT	0 WAT	2 WAT	2 &4 WAT	2,4 &6 WAT
Ploughed	1.70	5.90	47.6	386.20	0.00	10.00	68.00	705	0.04	0.15	1.19	9.65	0.00	0.25	1.70	17.63
Ploughed and harrowed	1.20	6.30	44.5	246.50	0.00	4.00	60.00	336	0.03	0.16	1.11	6.16	0.00	0.09	1.51	8.39
Raised bed	0.80	61.00	251.8	424.80	0.00	32.00	380.00	674	0.02	1.53	6.29	10.62	0.00	0.80	9.51	16.84
Zero tilled	0.00	1.20	15.2	99.40	0.00	2.00	16.00	157	0.00	0.03	0.38	2.48	0.00	0.04	0.39	3.92

1= No weeding, 2=weeks after transplanting, 3= Weeded at second week, 4= weeded at second and fourth week, 5= Weeded at second, fourth and sixth week

4.11 The effects of land preparation and weeding regime on days to weed emergence in sweet pepper.

Mean values for days to weeds emergence in sweet pepper fields during the 2008 and 2009 rainy seasons are presented in Table 12. There were no significant ($P \geq 0.05$) difference for days to weeds emergence after land preparation in both the seasons and the combined for both land preparation and weeding regime. Similarly, there was no significant ($P \geq 0.05$) effect of land preparation and weeding regime on days to weed emergence at 2WAT in 2008, 2009 and the combined years. However, at 2WAT there were highly significant ($P \leq 0.01$) effects of weeding regime on days to weeds emergence in both 2009 and the combined. Plots weeded once and twice all recorded 4.50 days while plots weeded 3 times recorded 4.58 days. The control plots were already weedy, because it was not weeded. At 4WAT, there was no significant ($P \geq 0.05$) effect of land preparation on days to weeds emergence for both the seasons and the combined analysis. However, weeding regime had a highly significant ($P \leq 0.01$) effect on days to weed emergence at 4WAT in 2008, 2009 and the combined. At 6WAT land preparation only had significant effect on days to weed emergence in 2009. Both the control plot (zero tilled) and ploughed plots recorded 0.92days while raised bed plots and ploughed and harrowed plots recorded 1.58 days and 1.25 days, respectively. Also, weeding regimes had a highly significant ($P \leq 0.01$) effect on days to weeds emergence at 6WAT in both the seasons. Plots weeded 3 times recorded 5.08 days, 4.67days, and 4.88 days for 2008, 2009 and in the combined analysis, respectively.

4.12 Interaction between land preparation and weeding regime on days to weed emergence on sweet pepper.

Table 13 presents the interactions between land preparation and weeding regime on days to weed emergence in sweet pepper fields during the 2008 and 2009 rainy seasons. There was a highly significant ($P \leq 0.01$) interaction between land preparation and weeding regime on days to weed emergence at 6WAT in 2009 and in the combined years. The interaction effect on days to weed emergence was noticed with plots weeded 3 times at 2,4 and 6WAT. Weed emerged on zero tilled and ploughed plots after 3.67 days, while the raised beds plots recorded 6.33 days. The

ploughed and harrowed had 5.00 days. Plots weeded once at 2WAT, twice at 2 and 4 WAT and zero weeded plots were already weedy at 6WAT. A similar trend was observed for the combined interactions at 6WAT. The raised beds had 5.83 days, ploughed and harrowed 5.33 days, zero tilled 3.83 days and ploughed 4.50 days all under the weeded 3 times at 2,4 and 6 WAT.

Table 12 : The effects of land preparation and weeding regimand 2009 rainy seasons

Treatments	After Land Preparation(0WAT)			2WAT[1]			4WAT			6WAT		
	2008	2009	Combined	2008	2009	Combined	2008	2009	Combined.	2008	2009	Combined.
Land preparation(LP)												
Ploughed	6.17	6.17	6.17	3.25	3.42	3.33	2.67	2.75	2.71	1.33	0.92	1.13
Plowed & harrowed	5.75											
Raised Bed	5.83											
Zero Tilled	4.67											
Level of Significance	ns[2]											
LSD												
Weeding regime(WR)												
0 WAT	5.67											
2 WAT	5.50											
2,4 WAT	5.67											
2,4.6 WAT	5.58											
Level of Significance	Ns											
LSD												
LP X WR	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns	**	**
LSD											0.41	0.51

1 = Weeks After Transplanting 2 = Not Significant 3 = Highly significant at 1% Level of Probability

Table 13: Interactions between land preparation and weeding regime on days to weed emergence

Treatments								
Ploughed								
Ploughed and Harrowed								
Raised bed	0.00	0.00	0.00	6.33	0.00	0.00	0.00	5.83
Zero tilled	0.00	0.00	0.00	3.67	0.00	0.00	0.00	3.83

1= No weeding, 2=weeks after transplanting, 3= Weeded at second week, 4= weeded at second and fourth week, 5= Weeded at second, fourth and sixth weeks

4.13 The effects of land preparation and weeding regime on weed count, and weed height in sweet pepper in 2008 and 2009 rainy seasons.

Mean values for weed count and tallest weed at harvest during the 2008 and 2009 rainy seasons are presented in Table 14.

4.13.1 Weed count

Weed count at 2WAT had a significant ($P \leq 0.05$) difference for land preparation in 2008, and a highly significant ($P \leq 0.01$) difference in 2009 and in the combined years. Similarly, weeding regime had a highly significant ($P \leq 0.01$) effect on weed count in both the seasons and the combined analysis. At 4WAT, weeds count was not significantly affected by land preparation in the two seasons, but was significant ($P \geq 0.05$) in the combined analysis. Furthermore, weeding regime was highly significant ($P \leq 0.01$) on weeds count in both 2008, 2009 and the combined. Also, at 6WAT land preparation did not have any significant effect on weeds count in both seasons. However, weeding regime had a highly significant ($P \leq 0.01$) effect on weed count in both 2008, 2009 and the combined analysis. Plots weeded 3 times had the least weeds number of 277.30 (2008), 130.50 (2009), and 178.90 (combined) while plots weeded only once recorded 422.50, 211.20, and 316.80 for 2008, 2009 and the combined, respectively.

4.13.2 Weed height

Weed height was measured at harvest, and had no significant ($P \geq 0.05$) variation as per land preparation in both the seasons and the combined years. However, weeding regime had a highly significant ($P \leq 0.01$) effect on the height of tallest weed at harvest in both the seasons and in the combined analysis. The mean tallest weed measuring 103.50 cm was observed on zero weeded plots in 2009 season while the shortest weed measuring 22.60cm was noticed on plots weeded 3 times.

4.14 Interaction between land preparation and weeding regime on weed count

Table 15 presents the interactions between land preparation and weeding regime on weed count. There was also a highly significant ($P \leq 0.01$) interaction between the treatments in respect of weeds count at 2WAT for both seasons and the combined analysis. The zero weeded plots were already weedy for all the land preparation methods. In 2009, the plots weeded twice at 2 and 4 WAT, recorded both the highest and the least weed count at 2WAT, with the least 63.30 on the raised beds

, and the highest weed count of 443.30 on the zero tilled plots. The combined interactions for weed count at 2WAT follow a similar trend with that of 2009. The zero tilled recorded the highest of 358.30 and the raised bed had the least of 52.80 all on plots weeded twice at 2 and 4 WAT.

Table 16 further presents the interaction between land preparation and weeding regime on weed count at 4WAT. A significant ($P \leq 0.05$) interaction exist between the two treatments at 4WAT in 2009 and a highly significant ($P \leq 0.01$) interaction between land preparation and weeding regime for weed count at 4WAT in the combined. At 6WAT, weeds count had a significant ($P \leq 0.05$) interaction between the two treatments. At 4WAT and 6WAT, the plots that were zero weeded were weedy for all the land preparation methods. In 2009, weed count at 4WAT had the least on raised beds that were weeded 3 times which recorded 51.00, while the highest was with zero tilled plots that were weeded 3 times. The combined interactions also had a similar trend. Weed count at 6WAT in the combined interaction gave a hig value of 389.50 on the zero tilled plots that was weeded twice at 2 and 4 WAT and the least was with raised bed that were weeded 3 times at 2,4 and 6WAT.

Table 14 : The effects of land preparation and weeding regime on w in 2008 and 2009 rainy seasons

Treatments	2WAT[1]			4WAT			6WAT			Weed height		
	2008	2009	Combined.	2008	2009	Combined.	2008	2009	Combined.	2008	2009	Combined.
Land preparation(LP)												
Ploughed	90.50	193.50	142.00	93.20	88.10	90.70	222.90	112.70	167.80	69.00	57.30	63.20
Weeding regime(WR)												
0 WAT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	84.90	103.50	94.20
2 WAT	133.10	221.90	177.50	129.40	115.70	122.50	422.50	211.20	316.80	75.20	76.30	75.80
2,4 WAT	150.90	248.20	199.50	119.20	99.30	109.20	251.40	162.40	206.90	62.30	43.30	52.80
2,4.6 WAT	151.80	212.70	182.20	137.40	114.00	125.70	227.30	130.50	178.90	51.30	22.60	37.00
Level of Significance	**	**	**	**	**	**	**	**	**	**	**	**
LSD	26.74	38.33	22.77	24.74	15.63	14.26	78.1	39.96	42.74	15.68	11.19	9.38
LP X WR	**	**	**	Ns	*	**	Ns	Ns	*	Ns	Ns	Ns
LSD	63.06	79.79	49.55		42.73	36.95			111.93			

1 = Weeks After Transplanting 2 =Significant at 5% Level of Probability ,3 = Highly significant at 1% Level of Probability, 4 = Not Significant,

Table 15: Interactions betwee regime on weed count.

	Weeds count 2 WAT,2008				Weeds count 2 WAT, 2009				Weeds count 2 WAT, combined			
Treatments	0 WAT	2 WAT	2 &4 WAT	2,4 &6 WAT	0 WAT	2 WAT	2 &4 WAT	2,4 &6 WAT	0 WAT	2 WAT	2 &4 WAT	2,4 &6 WAT
Ploughed	0.00	110.30	123.00	128.70	0.00	201.70	282.00	290.30	0.00	156.00	202.50	209.50
Ploughed and harrowed	0.00	133.70									184.50	146.50
Raised bed	0.00	49.70	42.30	69.00	0.00	135.70	63.30	81.70	0.00	92.70	52.82	75.30
Zero tilled	0.00	238.70	273.30	263.00	0.00	320.00	443.30	332.30	0.00	279.30	358.30	297.70

1= No weeding, 2=weeks after transplanting, 3= Weeded at second week, 4= weeded at second and fourth week, 5= Weeded at second, fourth and sixth week

Table 16 : I land preparation and weeding regime on weed count and weed weight.

	Weeds count 4WAT,2009				Weeds count 4WAT combined				Weeds count 6WAT, combined				Weeds weight 2WAT,2008			
Treatments	0[1] WAT[2]	2[3] WAT	2 &4[4] WAT	2,4 &6[5] WAT	0 WAT	2 WAT	2 &4 WAT	2,4 &6 WAT	0 WAT	2 WAT	2 &4 WAT	2,4 &6 WAT	0 WAT	2 WAT	2 &4 WAT	2,4 &6 WAT
Ploughed	0.00	126.70	116.70	109.00	0.00	126.50	118.70	117.50	0.00	349.00	165.20	157.00	0.00	52	47	46
Ploughed and harrowed	0.00	145.70										199.70	0.00	42	38	77
Raised bed	0.00	60.00	52.00	51.00	0.00	70.50	71.50	73.30	0.00	143.20	107.70	102.00	0.00	9	5	5
Zero tilled	0.00	130.30	111.30	145.00	0.00	130.30	118.30	141.70	0.00	389.50	310.50	257.00	0.00	723	717	859

1= No weeding, 2=weeks after transplanting, 3= Weeded at second week, 4= weeded at second and fourth week, 5= Weeded at second, fourth and sixth week

4.15 The effect of land preparation and weeding regime on weed weight of Sweet pepper during the 2008 and 2009 rainy seasons

The mean values of weed weight in sweet pepper field during the 2008 and 2009 rainy seasons are presented in Table 17. There was a highly significant ($P \leq 0.01$) variation of weed weight at 2WAT for land preparation in both seasons and the combined. Zero tilled plots gave the highest weights of 574.80 g, 729.10 g, and 651.90 g in 2008, 2009, and the combined respectively, while raised beds plots recorded the least mean weeds weight of 4.90 g, 92.30 g and 48.10 g for 2008, 2009 and the combined, respectively. Similarly, weeding regimes also had a highly significant ($P \leq 0.01$) effect on weeds weight at 2WAT in both the seasons. In the combined analysis, plots weeded 3 times recorded 318.40 g, plots weeded twice recorded 317.70 g, while plots weeded only once recorded 130.80 g. The control plot recorded 0.00 g. Weeds weight at 4WAT did not differ significantly ($P \geq 0.05$) for land preparation in both the seasons. Furthermore, at 6WAT, weed weight did not differ significantly ($P \geq 0.05$) for land preparation in both seasons. However, weeding regime had a highly significant ($P \leq 0.01$) effect on weed weights in both seasons. Plots weeded zero times had 0.00 g while plots weeded once at 2WAT, twice at 2 and 4WAT and thrice at 2, 4 and 6WAT recorded 665 g, 198 g and 185 g respectively in the combined analysis. Furthermore, at 10WAT, there was a significant ($P \leq 0.05$) difference in weeds weight for land preparation in 2008, and a highly significant ($P \leq 0.01$) difference in the combined analysis. Weeding regime had a highly significant ($P \leq 0.01$) effect on the weed weight in both the seasons. The weedy check plots, from which readings were taken at 10WAT, recorded 2278 g in 2008, 2088 g in 2009 and 2183 g in the combined analysis.

4.16 Interaction between land preparation and weeding regime on weed weights

Table 18 presents the interactions between land preparation and weeding regime on weed weight. Weed weight at 2WAT in 2008 had a highly significant ($P \leq 0.01$) interaction between land preparation and weeding regime. Wet weights of weed on raised bed plots were least in the entire weeding regime, as it reduces steadily with increasing number of weeding. The trend of 9 g in plots weeded once at 2WAT, 5 g in plots weeded twice at 2 and 4 WAT and 5 g in plots weeded 3 times at 2,4 and 6 WAT was recorded. There was also a highly significant ($P \leq 0.01$) interactions between

land preparation and weeding regime in respect of weed weight at 2WAT in both seasons and the combined analysis. In 2009, weed weight increases steadily for weeding regime. Ploughed recorded 387.6 g for plots weeded once, 418.30 g for plots weeded twice and 438.6 g for plots weeded 3 times. However, raised beds plots showed a different trend for the weeding regime. The plots weeded once recorded 269.0 g, plots weeded twice had 41.4 g, and plots weeded 3 times had 59.0 g. The highest weed weight was on zero tilled plots that were weeded 3 times which recorded 1094.4 g. A similar trend was reflected at the combined interactions. Similarly, at 10WAT, there was a significant ($P \leq 0.05$) interaction between land preparation and weeding regimes in 2009, and a highly significant ($P \leq 0.01$) interaction between the treatments in 2008 and in the combined interactions. The highest weed weight was on zero tilled plot that was not weeded, which recorded 2473 g in 2009 and 2502 g in the combined interactions. Weed weight on the plots weeded once at 2 WAT, twice at 2 and 4 WAT and 3 times at 2, 4 and 6WAT were not recorded at 10 WAT.

Table 17 : The effects of land p weight in 2008 and 2009 rainy seasons and the combined analysis

Treatments	g)											
Land preparation(LP)												
Ploughed	36.30	311.10	173.70	104.70	94.90	99.80	405	192	299	601	508	554
Plowed & harrowed	39.20	127.00	83.10	139.90	112.30	126.10	355	219	287	459	441	450
Raised Bed	4.90	92.30	48.10	60.80	38.20	49.50	222	95	159	586	521	553
Zero Tilled	574.80	729.10	651.90	88.60	82.80	85.70	369	239	304	633	618	625
Level of Significance	*[2]	**[3]	**	ns[4]	Ns	ns	Ns	Ns	Ns	*	Ns	**
LSD	249.00	27.68	111.53							68.40		67.90
Weeding regime(WR)												
0 WAT	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	2278	2088	2183
2 WAT	206.40	436.10	321.20	130.80	114.90	122.80	902	428	665	0	0	0
2,4 WAT	201.80	433.60	317.70	128.20	103.30	115.80	226	170	198	0	0	0
2,4.6 WAT	246.90	389.90	318.40	135.10	109.90	122.50	223	147	185	0	0	0
Level of Significance	**	**	**	**	**	**	**	**	**	**	**	**
LSD	81.90											
LP X WR	**											
LSD	267.30	60.71	129.84							121.7	213.80	120.40

1 = Weeks After Transplanting, 2 =Significant at 5% Level of Probability ,3 = Highly significant at 1% Level of Probability 4 = Not Significant,

Table 18 : weeding regime on weed weight

	Weeds weight 2WAT,2009				Weeds weights 2WAT Combined				Weeds weight 10WAT,2008				Weeds weight 10WAT,2009				Weeds weight 10WAT,combined			
Treatments	0[1] WAT[2]	2 [3] WAT	2 &4[4] WAT	2,4&6[5] WAT	0 WAT	2 WAT	2 &4 WAT	2,4 &6 WAT	0 WAT	2 WAT	2 &4 WAT	2,4 &6 WAT	0 WAT	2 WAT	2 &4 WAT	2,4 &6 WAT	0 WAT	2 WAT	2 &4 WAT	2,4 &6 WAT
Ploughed	0.00	387.60	418.30	438.60	0.00	220.00	232.50	242.40	2403	0.00	0.00	0.00	2032	0.00	0.00	0.00	2218	0.00	0.00	0.00
Ploughed & harrowed	0.00	190.80	180.20	137.20	0.00	116.20	109.20	107.00	1834	0.00	0.00	0.00	1764	0.00	0.00	0.00	1799	0.00	0.00	0.00
Raised bed	0.00	269.00	41.40	59.00	0.00	138.90	23.30	32.20	2342	0.00	0.00	0.00	2084	0.00	0.00	0.00	2213	0.00	0.00	0.00
Zero tilled	0.00	897.00	1094.40	924.90	0.00	809.80	905.90	892.00	2531	0.00	0.00	0.00	2473	0.00	0.00	0.00	2502	0.00	0.00	0.00

1= No weeding, 2=weeks after transplanting, 3= Weeded at second week, 4= weeded at second and fourth week, 5= Weeded at second, fourth and sixth week

4.17 Effect of land preparation and weeding regime on weeds flora population in pepper field

The weeds flora population on sweet pepper field during the 2008 and 2009 rainy seasons is presented in Table 19. The absolute frequency value of 0.42 for *Pennisetum pedicellatum* Trim. was the lowest in the 2008 weed study. While *Amaranthus spinosus* Linn. recorded the highest absolute frequency value of 7.33. The largest flora population of 5,033 with *Kyllinga squamulata* Thorn. in 2008 as against the 5,800 in 2009 with *Cyperus rotundus* Linn. . A total of 26,308 various weeds were found growing in the sweet pepper field in 2009, and 29,298 in 2008 rainy season. This leads to a highest sum dominance ratio of 1,257 and 1,596 in 2009 and 2008 respectively for *Cyperus rotundus* Linn. The lowest sum dominance ratio of 50 in 2008 was with *Ipomoea eriocarpa* R. , and 54.50 for *Aspillia bussei* O. in 2009. The relative density values ranges between 22.15% and 0.21% for *Cyperus rotundus* Linn. , and *Aspillia bussei* O. respectively in 2009, and 17.29% and 0.43% for *Cyperus rotundus* Linn. and *Penisetum pedicellatum* Trin. respectively in 2008. Similarly, relative frequency(RF) of the weeds flora population follows the same trends as *Amaranthus spinosus* Linn. recorded 10.24% in 2008 as the highest RF value and *Ipomoea eriocarpa* R. recorded the lowest RF value of 0.48% in the same year. In 2009, highest RF value of 9.77% recorded for *Cyperus rotundus* Linn. and 0.88% for *Aspillia bussei* O. as the lowest RF value in 2009. The total absolute frequency (AF) and absolute density (AD) of weeds flora stood at 80.13% and 18.64% respectively in 2009, and 71.53% and 20.76% for AF and AD respectively in 2008.

Table 19 : Weed flora distribution study in the experimental sites for the 2008 and 2009 rainy seasons

SCIENTIFIC NAME	Number of specie In all quadrants		Number of quadrants specie occur		Total. number of quadrants in all		Absolute Frequency		Relative Frequency		Absolute Density		Relative Density		Sum Dominance Ratio	
	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
Dactyloctenium aegyptium(Linn.)P.Beauv	1174	900	95	68	1404	1404	6.76	4.84	9.45	6.04	0.83	0.64	3.99	3.43	672	473.50
Amaranthus spinosus Linn	1968	2112	103	78	,,	''	7.33	5.55	10.24	6.92	1.40	1.50	6.74	8.04	849	748
Tephrosia pedicellata. Bak	1331	-	35	-	,,	''	2.49	-	3.48	-	0.94	-	4.52	-	400	-
Waltheria indica Linn	360	-	25	-	,,	''	1.78	-	2.48	-	0.25	-	1.20	-	184	-
Panicum maximum Jacq	1425	963	33	61	,,	''	2.35	4.34	3.28	5.41	1.01	0.68	4.86	3.64	650	452.50
Axonopus compressus (SW.) P. Beauv	2000	1664	76	83	,,	''	5.41	5.91	7.56	7.37	1.42	1.18	6.84	6.33	720	685
Eleusine indica Gaertn	637	-	24	-	,,	''	1.70	-	2.37	-	0.45	-	2.16	-	226.50	-
Tridax procumbens Linn	844	1197	54	82	,,	''	3.84	5.84	5.36	7.28	0.60	0.85	2.89	4.56	412.50	592
Eragrostis tenella (Linn.) P. Beauv. ex Roem & schult	1133	-	55	-	,,	''	3.91	-	5.46	-	0.80	-	3.85	-	465.50	-
Kyllinga squamulata Thorn. Ex Vahl	5033	4412	79	108	,,	''	5.62	7.69	7.85	9.59	3.58	3.14	17.24	16.84	1254.50	1321.50
Acanthospermum hispidum DC	2488	3480	63	89	,,	''	4.48	6.33	6.26	7.89	1.77	2.47	8.52	13.25	739	1057
Euphorbia hirta Linn	1297	1081	61	75	,,	''	4.34	5.34	6.06	6.66	0.92	0.76	4.43	4.07	524.5	536.50
Cyperus rotundus Linn	5051															
Ipomoea aquatic Forsk	782															
Sida rhombifolia Linn	1222															
Mimosa pudica Linn	533															
Ageratum conyzoides Linn	594	356	24	25	,,	''	1.70	1.78	2.37	2.22	0.42	0.25	2.02	1.34	219.50	178
Chrysanthellum indicum (Linn)	526	-	29	-	,,	''	2.06	-	2.87	-	0.37	-	1.78	-	232.50	--
Gomphrena celosioides Mart	397	-	26	-	,,	''	1.85	-	2.58	-	0.28	-	1.34	-	196	-
Ipomoea eriocarpa R. Br	165	-	5	-	,,	''	0.35	-	0.48	-	0.11	-	0.52	-	50	-
Physalis angulata Linn	204	-	9	-	,,	''	0.64	-	0.89	-	0.14	-	0.67	-	78	-
Pennisetum pedicellatum Trin	134	-	6	-	,,	''	0.42	-	0.58	-	0.09	-	0.43	-	50.50	-
Elipta alba (L) Hassk	-	527	-	39	-	''	-	2.77	-	3.45	-	0.37	-	1.98	-	271.50
Monechma ciliatum (Jaeq) Milne-Redhead	-	574	-	39	-	''	-	2.77	-	3.45	-	0.40	-	2.14	-	279.50
Trianthema portulacastrum Linn	-	390	-	45	-	''	-	3.20	-	3.99	-	0.27	-	1.44	-	271.50
Paspalum conjugatum Berg	-	300	-	41	-	''	-	2.92	-	3.64	-	0.21	-	1.12	-	238
Aspillia bussei O. Hoffm &Muschel	-	69	-	10	-	''	-	0.71	-	0.88	-	0.04	-	0.21	-	54.50
TOTAL	29298	26308					71.53	80.13			20.76	18.64				

CHAPTER FIVE

5.0 DISCUSSION

The performance of sweet pepper (*Capsicum annuum* L.) – variety SAMARU MILD as influenced by land preparation and weeding regime was investigated during the 2008 and 2009 rainy seasons. The non significant effect of land preparation and weeding regime on establishment count in the two seasons may be due to the vigour with which the seedlings were transplanted. Also, the aftercare given to the seedlings in the early days after transplanting could have contributed immensely in establishing the crop. This agrees with the report of Onwueme and Sinha (1999) adding that seedling vigour is an indication of the health of seedlings and the likelihood they will yield well. Similarly, the result agrees with that of Muhamman and Auwalu (2009) who reported a non-significant effect on establishment count. It was found that pepper seedlings can be raised at any time of the year provided that seedbed should be protected against rains and direct sun (Gruben and El Tahir, 2004).

The increase in the number of primary branches at 4WAT to 10WAT with weeding regimes was probably due to concentration of weeds at the different levels of weeding regimes. This allows competition to set in between the weeds and the sweet pepper plants. Pepper is a poor competitor for nutrients, and water (Tindall, 1986). The increases in the number of secondary branches at 4WAT to 10WAT were due to shade imposed on the pepper by weeds cover in the zero weeded plots. This did not allow pepper crop to make adequate use of available space to open up as well as use available nutrient and water. A similar reported by Fagbayide (1997) who observed that sustained moisture regimes (among others) enable pepper crop to produce better leave and branches between 4WAT and 8WAT. The number of leaves differed at 2WAT for land preparation in 2008, and this might not be un connected with the better soil conditions after land preparation, which remained intact for crop growth especially in the raised beds and ploughed and harrowed. This agrees with the findings of Mansoor *et al.* (2005) who reported that deep tillage effectively reduced the number of weeds (5% less) as compared to shallow tillage. The non significant increase in the number of leaves at 4WAT for both land preparation and weeding regime was probably due to the non critical period of competition for the pepper plant. Mansoor *et al.* (2005) reported that tillage practices increases moisture absorption and effectively controlled weeds, which ultimately provide favorable

environment for plant growth, better root development and attainment of optimum plant population thus ultimately increasing yield. Furthermore, it was reported by Alabi, (2006) that the number of leaves increase steadily up to 8WAT. This reveals the dramatic increase in number of leaves in both 2008 and 2009 for the raised beds and the ploughed and harrowed beds, and for plots weeded at 2 and 4 WAT and 2,4 and 6WAT. This is not un connected with land preparation type. Raised beds provide a fine tilt for pepper growth and development. Availability of moisture and aeration in the soil must have accounted for the increase in the vegetative growth of pepper in the ploughed and harrowed plots as well as in the raised bed plots.

The heights of plants remain constant at 2WAT and 4WAT, this is not unconnected with the physiological characteristic of the crop in trying to adapt to the new environment considering the variation that exist between the nursery and the permanent field. Alabi, (2006) reported that an increase in plant height from 4WAT to 12WAT may be attributed to enough rainfall which would have increased the solubility of nutrients, thus making the nutrients to be easily absorbed by the roots leading to good response. Up to 8WAT plant height continue to increase at a decreasing rate. This may be due to weed canopy cover which may probably interfere with the photosynthetic ability of pepper plant, especially on plots that were weeded only once, and the weedy check plots. This report contradicts the report of Fagbayide (1997) that there was no plant height increase beyond 10WAT. However, it agrees with the findings of NIHORT (1986) that moisture and nutrients availability will enhance increase in pepper plant height up to 12WAT in the Sudan savannah of Nigeria. The non significant effect of plant height in 2008 at 8WAT was not unconnected with the weed flora types experienced in the year in the weeded plots. These weeds are mostly annual grasses which do not have any serious canopy cover on the cultivated crop.

The dramatic increase in plant height at 10WAT in both raised beds and the weeded 3 times plots may be as a result of regular soil turning which improves the soil condition for crop growth. It also reduces crop-weed competition during the period of growth. This appears true for both seasons for weeding regime. Aliyu *et al*. (1996) described plant growth as that of the compound interest, where growth increment in early period add to the subsequent growth of the pepper plant. Since plant height and branch numbers were high in both years, more surface area was

available for photosynthesis by the pepper. Thus increasing number of fruits produced and subsequently the yield in the two years.

The non significant effect of land preparation in both the seasons on days to first flowering might also be due to the maturity and life cycle of the plant, as well as the day sensitive nature of the crop as it belongs to the night shade family. The poor cloud cover in the early days of June and July did not give enough shading to initiate reasonable flowering in the treatments. This result is in agreement with the report of Aliyu *et al.* (1996). The competitive ability of weeds flora in the less frequently weeded plots have contributed to reducing the vegetative growth of the host crop. This contradicts with the findings of Aliyu *et al.* (1996) that delayed vegetative growth due to weeds cover will delay flowering in un- weeded pepper farms. The significant effects experienced in 2009 with increased number of days to first flowering witnessed in zero weeding, also follow the same explanation as was supported by the work of Alabi, (2006) that the development of flowers started 6WAT and continued till 12WAT before a sharp decline was observed.

The diameter of the stems at the base was large for the raised beds plots, ploughed and the ploughed and harrowed plots. The highly significant effects of weeding regimes on both stem diameter at base and apex was probably due to crop-weed competition in the environment in which the plots weeded more than once had less competition for soil nutrients as compared to those weedy plots. This may be attributed to better nutritive intake by the plants as a result of available nutrients in the soils for the crops. This report agrees with the findings of Messiaen (1992), that regular weeding of pepper improves the vegetative development of the plant because of adequate supply of the needed nutrient, and reduced competition with weeds (Aliyu *et al.*1996). This tends to support the findings in this study on the highly significant growth in stem diameter at the base for plots weeded at 2 and 4 WAT and 2,4 and 6WAT in both seasons. Aliyu *et al.* (2006) further reported that pepper transplanted early in the rainy season performed better because they had access to sunshine hours and optimum temperatures. This environmental condition allowed for adequate uptake of plants nutrients from the soil by early transplant which enhances rapid growth and development.

The significant variation in the length of fruit in the first season for land preparation could be as a result of increased number of branches and leaves in the raised beds plot and the ploughed and harrowed which exposes the plant for better

photosynthetic opportunity. This is ascertained by the work of Aliyu *et al.* (1996) that enhanced photosynthetic surface as a result of leaves addition and subsequent improved physiological activities lead to more assimilates being produced and used for rapid increase in fruits sizes. Similarly, both fruit length and fruit diameter differed significantly in both seasons principally due to less competition with weeds in the environment. Weeding at 2, 4, and 6WAT was distinct in this respect.

The significant effect of number of fruits per plant and total number of fruit per plot can be related to the increase in the number of branches. Alabi, (2006) reported that the increase in the number of leaves would increase photosynthetic surfaces and the current photosynthates produced would enhance the physiological activities leading to production of more assimilates used to significantly increase fruit production, fruit sizes, and fruit diameter. The weedy check plots could not yield fruits in 2009 because of the type of weed flora experienced and weed canopy which covered the pepper thus suppressing them from normal growth. This may lead to no yield, especially as pepper is a poor competitor (Leela, 2002). Weeding done three times in a season resulted in a higher number of fruits on each plant. This is because of improved soil conditions, reduced weed-crop competition, adequate moisture supply and good soil aeration (Mansoor *et al.* 2005).

The yield of pepper per plot was significant in 2009 probably due to the increased precipitation in the later days of crop vegetative phase, and a reduced intensity of the rains during the flowering and fruiting stage. Yield of 15.13 ton ha^{-1} obtained by Alabi, (2006) was a little higher than the highest result obtained in this experiment (7.23tons ha^{-1}). This was so because of the weed population and weed flora type experienced in the experiment, as well as the problems of soil compaction in the zero tilled plots and the weedy plots. Yield per plot was significantly high in 2008, probably due to relatively low rainfall distribution during fruiting stage. This finding agreed with the report of Messiaen (1992), that pepper required very limited moisture and relative humidity during flowering and fruiting stages. However, Rasheed and Sola (2005) maintained that the relative good fruit yield was due to enhanced growth resulting from improved plant environment.

The interaction between land preparation and weeding regimes in respect of yield of sweet pepper could probably be as a result of the lower yield obtained in the zero tilled plots, and the higher yields in the plots weeded at 2, 4 and 6WAT. Similarly, the yield obtained in the raised beds plots in both seasons were relatively

high probably as a result of less weeds-crop competition, good soil aggregation, adequate pore spaces in the soil due constant weeding. Also good soil fertility status from the decomposition of weeded vegetation and conservation of adequate moisture (possibly due to the weeded vegetation covering the ground surface) could have contributed to higher yields. These conditions make up a good and favorable environment for crop growth and development. This report tend to agree with the work of Fawusi and Aiyelaagbe (1986) that vegetation cover encourages deeper roots development near surfaces of soil thus making a progressive use of moisture , encouraging optimal transpiration and making a good use of supra-optimal soil temperatures.

The non significant effect of tillage on weeds emergence after land preparation in both years, was majorly due to the turning over or disturbances of the soil thereby bringing up of dormant weeds seed from the beneath , thus exposing the new weeds seeds at the surface for possible emergence. Hence the uniformity in weeds seed germination as seen at 2WAT to 6WAT. This is in agreement with the work of Riaz *et al.* (2007) that the soil environment under conventional tillage or bed system is quite favorable for weeds emergence and growth. Furthermore, studies exhibit that the buried seeds of annual weeds undergo dormancy –non –dormancy cycle and even light does not stimulate germination. But when exposed, transition in membrane properties affects uniform germinability of even the dormant weeds seeds. Weeding regimes had effects on weed emergence from 2WAT to 6WAT due to the cumulative weeds flora population in the less frequently weeded plots and the weedy check plots.

The number of weeds in plots weeded at 2, 4, 6WAT $\geq$ 2, 4, WAT $\geq$ 2WAT $\geq$ No weeding. Similarly, the weed counts for raised beds $\leq$ ploughed and harrowed $\leq$ ploughed $\leq$ Zero tilled. These allowed most of the negative effects of weeds to be exhibited in the zero weeded plots and zero tilled plots. This agrees with the work of Hakanssons (2003**)** who reported a reduced crop yield in wheat and rice farm due to weeds infestation and poor soil tillage. The non significant number of weeds at 4WAT in both seasons was majorly due to the effect of the first weeding at 2WAT which left most of the plots with fewer weeds. Thus, the effect of cumulative number of weeds in these plots directly responded to the type of land preparation. Thus not allowing all the exposed weed seeds in the soil to fully germinate and get established in just two weeks. The significant difference which existed at 2WAT for number of

weeds counted was because the weedy check plots were really dense of weeds, and most of these weeds regenerated shortly after land preparation or after first weeding. Another reason was the favourable environmental conditions that prevail for rapid growth and development of weeds. This is in agreement with the work of Riaz *et al.* (2007) that well pulverized soil at optimum moisture condition is highly suitable for weeds emergence, exposure to light and lack of upper storey of vegetation promotes germination and growth of weeds. At 6WAT weed count was significant due to increased precipitation giving a conducive environment for a luxuriant growth of weeds especially in weedy check and weeded once.

Height of weeds at harvest was significant probably as a result of regular weeding in the weeded plots which did not allow weeds to have continuity of growth throughout the season. The height of weeds was taller in the zero tilled plots, and in the zero weeded plots probably due to non disturbance of the weeds vegetation during its period of growth. This is also in conformity with the work of Riaz *et al.* (2007), that weeds express all its growth potentials if left undisturbed in the natural ecosystem. Hence, the weedy check plots grew to maximum height, enabling them to exhibit all the growth potentials. Land preparation also influenced the height of weeds as fine tilts in raised beds, ploughed and harrowed encourages rapid plant growth, while the rough surface on ploughed plots and zero tilled plots do not favor rapid plant growth. Raised beds appear to have less weeds growth especially on the weeded three times plots. This is because of the proper agronomic measure of removing the weeds, thereby reducing weeds re - establishment after weeding. This agrees with the findings of Hakanssons (2003) that weeds equally respond to tillage practice just as those of the growing crops.

At 2WAT, the weight of weeds on wet weight basis was significantly high, probably due to weeds regeneration on the zero tilled plots. Also at the 10WAT, significant effect of weed weight was felt due to the prolific increase in the number of weeds at each weeding regime. Weed flora population tend to increase with increase in precipitation and a sustained soil moisture level. Changes in weeds specie composition occur as a consequence of tillage practice and that the diversity is as a result of weeds species and environmental alteration (Santin, *et al.*, 2008). Zero tilled plots were able to conserve moisture due to weed vegetation cover which enables the weeds there in to grow rapidly, and ultimately give a higher wet weight value as compared to the weeded plots. Organic materials that result from the weed

vegetations removed at weeding will contribute to restoring organic matter and plants nutrients, to the soil, improve soil structures and water holding capacity, ameliorate soil temperatures, control soil losses, and reduce weed pressure (Rasheed and Sola, 2005). Weeding regime significantly affect weed weight from 2WAT to 10WAT. This could probably be due weeds concentration on the weedy check plots as against the weeded plots.

Kyllinga squamulata Thorn. Ex Vahl, and *Cyperus rotundus*, all sedges were found to be predominant weeds in the two seasons. This primarily was due to the poor fertility status of the soil. Hakanssons, **(**2003) has earlier reported that sedges inhibit depleted soils. The presence of parasitic weeds such as *Eclipta alba* especially on the zero tilled and ploughed plots, indicates that these weed specie are more likely to do well under poorly drained and damp soil (Akobundu and Agyakwa, 1998). Hakanssons (2003) described a wetland from the type of vegetation that is found in the area. Semi aquatic plants such as: *Euphorbia hirta, Ipomeoa eriocarpa* R., *Paspalum conjugatum* and *Gomphrena celosioides* Linn were found in the field . However, it is most likely that in future this aggressive alien weed may become one of the problematic weeds due to its high reproductive potential, fast growth rate, allelopathic nature (Tariq *et al*., 2006) This may have contributed to the poor performance in the zero tilled, ploughed and the ploughed and harrowed as against the raised bed plots which gave the pepper plant a good moisture regime for production. *Mimosa pudica, Tephrosia pedicellata*.Bak , and *Ageratum conyzoides* all belong to *Asteraceae* and the *Leguminosae* families which are well known for their ability to improve the fertility of soils by fixing atmospheric Nitrogen. The existence of these species on the raised beds plots only is an indication of low moisture regimes on the raised beds, and which may also have contributed to the high yield , high number of leaves in the raised bed plots. It was earlier reported by Hakoomat *et al.* (2005**)** that weeds of semi aquatic species can grow well on seedbed and those found in furrow cease growth or may even die.

Waltheria indica Linn, *Acanthospermum hispidum* DC, also existed but mostly on the ploughed beds. This is an indication of the relationship between the ploughed only and the various weeds species. They are shrubs that establishes easily on rough surfaces (Hakanssons, 2003**).** Other weeds species that seem important on

the sweet pepper fields include: *Axonopus compressus*, *Dactylocterium aegyptium*, *Amaranthus spinosus*, and *Tridax procumbens*

CHAPTER SIX

6.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Summary

The effects of land preparation and weeding regime on the growth and yield of sweet pepper (*Capsicum annuum* L.) in Mubi was studied in 2008 rainy season and 2009 rainy season, at the Teaching and Research Farm of the Department of Agricultural Technology, Federal Polytechnic, Mubi. The experiment was laid out using the split plot design with three replications. Land preparation methods comprising of : Zero tillage, ploughed, ploughed and harrowed, and raised beds constituted the main factor of the experiment while weeding regime (No weeding, weeded once at 2WAT, weeded twice at 2 and 4WAT, and weeded thrice at 2,4 and 6WAT) as the sub factor. Composite soils of the experimental sites were collected and analyzed for physical and chemical properties. Data were collected on establishment count, days to weed emergence, days to first and 50% flowering, number of leaves, and number of primary and secondary branches. Others included: stem diameter at base and apex, plant height, weed count, weed weight, tallest weed at harvest, number of fruits per plant, fruit length and fruit diameter. Number of fruits per plot, fruit yield per plot and yield per hectare were also collected. The data were analyzed and means were separated using the least significant difference (LSD) method.

Land preparation did not show any significant difference ($P \geq 0.05$) on establishment count, number of primary and secondary branches, number of leaves and plant height except at 2,6,&8WAT in 2008 and 8WAT in 2009 for number of leaves. Days to first and 50% flowering were not significant ($P \geq 0.05$) except in 2008 where days to 50% flowering was highly significant with land preparation. Fruit length, fruit diameter, stem diameter at base, number of fruits per plant, yield per plot and yield per hacter were all significant ($P \leq 0.05$) in 2008, number of fruit per plant and total number of fruits per plot were highly significant in 2009. Days to weeds emergence were not significant ($P \geq 0.05$), except at 6WAT in 2009. Weeds count was only significant at 2WAT. Weeds weight was not significant ($P \geq 0.05$) except at

2WAT, and at 10WAT in 2008. Tallest weed at harvest was not significant ($P \geq 0.05$) with land preparation.

Weeding regime on the other hand were highly significant ($P \leq 0.01$) for both primary and secondary branches in both seasons. Number of leaves and plant height were both highly significant at 6WAT and 8WAT except for plant height which was not significant ($P \geq 0.05$) in 2008. Days to first flowering was not significant ($P \geq 0.05$) in 2008. All other characters measured such as : days to 50% flowering ,days to weeds emergence, weeds count, weed weight, weed height, fruit length, fruit diameter, stem diameter, number of fruits per plant, total number of fruits per plot, yield per plot and yield per hacter were all highly significant($P \leq 0.01$) for weeding regime in the two seasons.

6.2 Conclusion

Based on the results obtained from this research, it can be concluded that land preparation has a significant effect on some growth and yield characters of sweet pepper (*Capsicum annuum* L). The raised bed type produced a maximum effect in number of secondary branches at 10WAT, number of leaves, fruit length, fruit diameter, and stem diameter, number of fruits per plant, total number of fruits per plot, yield per plot and yield per hacter.

The weeded three times at 2, 4 and 6WAT equally made a significant impact in all the growth, yield and weed characters studied. Furthermore, there were no interactions between land preparation and weeding regime in almost all the growth characters except stem diameter (base) in 2008. There were significant interaction between some yield and weed characters. There was also no interaction of the factors with any of the phenological characters.

6.3 Recommendations

Based on the results, it appears that weeding of sweet pepper at 2,4 and 6WAT would result in optimum fruit yield in the study area. Growing sweet pepper on a well prepared soil such as the raised beds will also give a higher yield in the study area. Thus, a similar research should be carried out under an irrigated condition for comparisons.

REFERENCES

Abimiku, O.E. Yohanna, J.K and Azagaku E.D (2002). The effect of varying tillage method on severity of striga on growth and yield of sorghum in southern guinea savannah. *Proceeding of the 36th Annual conf. Of Agric society of Nigeria* Oct, 20-24 2002 p. 1-3

Adebayo, A.A (2004). *Mubi Region, A geographical synthesis* (1st eds) Paraclate publishers. Yola – Nigeria p. 17-25

Adigun, J.A (1984). Effects of period of weed interference and chemical weed control in rain fed and irrigated Pepper. *Unpublished M.Sc thesis A.B.U* Zaria Nigerian.

Adigun, J.A and Lagoke, S.T.O (2003). *Nigerian Journal of weed sciences vol 16 p. 23-29.*

Ahmed, H. (1991). Effect of weed growth on garlic. *Weed Abstract 39 (6): 230.*

Akinfasoye, I.A., Nmyan, D.J, and Tairu, R.M (2006). Effect of harvesting frequency on the duration, yield and quality of Pepper. In; *proceeding of 24th conference of Hort. Society of Nigeria* 17-22 Sept. Gombe.

Akinrinde, E.A. and G.O. Obigbesan (2000). Evaluation of the fertility status selected soils for crop production in five ecological zones of Nigeria. Proceedings of the 26th Annual conference of the soil science society of Nigeria, Ibadan, Nigeria. P.279-288

Akinyemi, S.O.S. and Tijani-Eniola, A.A (1997). "Effect of melon population density intercropped with plantation on weed control and intercrop productivity" *Nigeria Journal of weed science* 10: 27 -34.

Akobundu I. O., and C.W. Agyakwa (1998) A Hand book of west African Weeds 2nd Edition (Revised and expanded) IITA publication , Ibadan Nigeria.

Alabi, D. A. (2006). Effect of fertilizer phosphorous and poultry droppings treatments on growth and nutrient component of pepper (*Capsicum annum* L.) *African Journal of Biotechnology*. Volume 5 (8): 671 – 677.

Alabi, B.S and Ayeni, A.O (2004). Influence of delayed planting after land preparation on weed growth and performance of soybeans". *Nigeria Journal of weed science* 17:9-13.

Aliyu, L., Bawa, P.M., Kuchinda, N.C.,and Olarewaju, J.D. (2006). Effect of Transplanting date and poultry Manure on the growth, yield and yield components of pepper (Capsicum annuum L.) proc. of the 24th Annual conference of Hort. Soc. Of Nigeria

Aliyu , L. Yusuf, Y. and Ahmed M.K. (1996) Response of pepper (Capsicum annuum L.) to fertilizers: Growth, yield and yield components as affected by nitrogen and phosphorus levels HORTSON Conference 1-4 April 1996

Aliyu, L. (2000). The effects of organic and mineral fertilizer on growth, yield and composition of pepper. *Biological Agriculture and Horticulture 18 (1): 29-36*

Awodoyin, R.O. Simeon N. N. and S. Ogunyemi(2005). Sicklepod in improved fallow management: Distribution in natural habitat, diversity and phenology. *Muarik Bulletin **6**:35-43*

Ayub, M. Tanveer, A., Nadeem, M.A. and Tayyub, M (2003). Fodder yield and quality of sorghum as influenced by different tillage methods and seed rates *Pakistan Journal agronomy 2 (3) 179-184*.

Bankole, E. A and Ojeniyi, S.O (2005). "Cooperative effect of ridges furrows and Zero tillage on cowpea at Abeokuta and Akure, *Nigeria. Journal of soil science vol 15 p. 54-56.*

Bosland, P.W(1996). *Capsicum:* Innovative uses of an ancient in: progress in new crops (J. Jamark eds) Arlington, ASHS pres p. 479 – 487.

Bremner, J.M (1996) Nitrogen-Total. In: Sparks D.I. (Ed.), pp. 1085-1121. Methods of Soil Analysis. Part 3. Chemical Methods. 2nd edition, SSSA Book series No. 5, ASA and SSSA, Madison, WI,USA.

Chiej, J (1984). *Peppers:* Asian Vegetable Research and Development center Taiwan.

Darbie, M.G (2004). *Commercial Pepper Production southern Carolina press USA p .2.*

Encarta, (2004). *Encarta premium suite; Encyclopedia.* Microsoft cooperation seattle, USA.

Fagbayide, J.A. (1997). Growth and nutrients concentrationof pepper fruits as affected by fertilizer phosphorus. Proc. Nig. Soc. Horticult. Sci.. 15:40-42.

Fawusi, M.O.A. and I .O.O.Aiyelaagbe (1986) Growth and yield response of pepper to mulching. Boitronics 15: 25-29.

Fitzory, D.B. (2004). *Commercial Peppers production A//A:\commercial pepper production.htm.*

Gomez, A.K and Gomez, A.A (1984). *Statistical procedure for Agricultural Research* John Wiley and sons, New York pp 657.

Ghulam M . S and Mir A K (2006). Check list of noxios weeds of district Mansehra, Pakistan, *Pak. J Weed Sci. Res. 12(3): 213-219.*

Gruben, G. J. H. and El Tahir, I. M. (2004). *Capsicum annum* L. In: Grubben, G. J. H. and Denton, O. A. (Editors). Plant Resources of Tropical Africa 2. Vegetables. PROTA Foundation, Wageningen, Netherlands / Bachhuys Publishers, Leiden, Netherlands / CTA, Wageningen, Netherlands. Pp 154 – 163.

Hakanssons , S. (2003) Weeds and Weed Management on Arable Land : An Ecological Approach. CABI publishing Company,Uppsala, Sweden pp207-220.

Hakoomat A Dilbaugh, M. and Shoukat A.A (2005). Weeds control practices in cotton(Gossipium hirsutum L.) planted on bed and furrow. Pak. J weed Sci Res. 11(1-2): 43-48.

Harry S.A and Edward AK (1989*) Garlic weeds competition*. Califonia Agriculture, feb. 1989pp11-29.

Huxley, P.A. (1979). Zero tillage at Morogoro Tanzania. In R. Lal (ed) *Soil tillage and crop production* , 1ITA Ibadan pg 259-270.

Ibitoye,A. A. (2006). Laboratory Manual on basic soil Analysis. 2nd ed. 82pp. Foladeve publishihg company, Akure, Ondo State, Nigeria.

J., Alhassan Yakubu, A.I. Singh, A. and Lado, A (2007). *Nigerian Journal of weed science,* Nigeria, Vol 20 P. 15-23.

Jaiswal, P.C. (2003) soil, plant and water analysis. Kalyani Publishers Ludhiana, New Delhi –hoida, Hyderabab, India.

Jilani, M.S., Abdul, G., and Saif U. R (2003). Conventional and chemical control of weeds in five cultivars of transplanted onion (*Allium cepa* L.) Pak. J Weed Sci Res. 9 (3&4):215-224.

Joshua, S.D and N.A Gworgwor (2000). "Effect of weeding regime on crop performances in millet – cowpea intercrop performance in semi arid zone of Nigeria. *Nigerian journal of weed science 13:69-75*.

Kapeller, K. (1994). "Status of red peppers research "*Vegetable Crop Research, 23; 21-24*

Kaul, R.N and Egbo, C.O (1985). *Introduction to Agricultural Mechanization,* Macmillan publishers, London pg 71-85 ISBN 0-333-39148-9.

Kazi B.R. Abdul, H. B. Kubar, R.A. and Allah, W. J (2007) Weed spectrum Frequency and density in wheat, (*Triticum aestivum* L.) under tandojam Conditions.Pak. J. Weed Sci. Res. 13(3-4):241-246.

Kochar, S.L (1986). Tropical crops, *A textbook of Economic Botany,*. Macmillan publishers, Ltd pp 237.

Lado, A. (2004). Effect of irrigation regime and period of weed interference on growth and yield of two spring wheat varieties. *Unpublished M.Sc dissertation UDU Sokoto III PP*.

Lagoke, S.T.O (1983). Chemical weed control in field crops. *National workshop on farming system research,* Kano, Dec. 7th 1983.

Lagoke, S.T.O., Adejonwo, K. O., Sinha T.D. (1986). Herbicide evaluation for season long weed control in onion in the Nigerian Savannah in *proceeding of the 22nd conference of the Agric society of Nigeria Sept 1-3, Zaria.*

Lal,R. (1975). No tillage effect on soil properties under different crops in western Nigeria. *Soil Science Society of America proceeding 40,762-768.*

Lavabre, E.M (1991). Weed control. *The Tropical Agricultural . CTA* Macmillan press Ltd p 90.

Leela, D. (2002). Noxious weeds control methods. Kalyani publishers India P.81

Mansoor, K. K. Muhammad J.K. Muhammad, A. Said, W. and Muhammad, R.(2005) Enhancement of wheat and yield components by controlling weeds with Deep tillage practices under irrigated clay loam soil conditions. *Pak. J Sci. Res 11(3-4):41-46.*

Mansoor, K.K and Muhammad, J.K. (2005) Effects of different tillage practices on Weeds and yield of chickpea under sandy loam soil conditions. Pak. J. Weed Sci. Res. 11(3-4): 67-74.

Mark, D. (2002). Growing Inorganic chilli Pepper *Soil and health 2002 (61 96) 23.*

Messiaen,C. M (1992). Solanaceous Vegetables grown for their fruits. In :The tropicalvegetable garden CTA/Macmillan publishers pp234-245, United Kingdom.

Muhammad, A. Fazal, M. Muhammad,W. Ibni, A. K and Kawsar A (2007). Effects of Tillage on weeds and economics of fodder maise production. *Pak. J. Weed Sci. Res.13(3-4):167-175*

Muhamman, M. A. and Auwalu B. M.(2009).Seedling Performance of Sweet pepper (*Capsicum annumm* L.) as influenced by growth media and fertilizer sources in northern guinea savanna zone of Nigeria, Biological and Environmental Sciences Journal for the Tropics (BEST), Bayero University Kano Nigeria. Vol.6 (3):109-112.

Ndaeyo, N.U., Aiyelari, E.A. and Agboola, A.A. (1995). "Evaluation of different tillage practice for monocultural cowpea production in Ibadan, south western Nigeria" African soil 28. 475-488.

Nelson, D.W. and L. E. Sommers (1996). Total carbon,organic carbon,and organic matter.In: Sparks D.I.(Ed.), pp. 961-1010. Methods of Soil Analysis. Part 3. 2nd edition, SSSA Book series No. 5, ASA and SSSA, Madison, WI,USA.

NIHORT(1986), Advances in fruts and vegetable research at Nigerian institute of Horticultural Research a commemorative publication, Ibadan,p.40-43

Olafintoye, J.A (1989). "Tillage and weed control practices for upland rice on a hydromorphic soil in Guinea savannah of Nigerian *"Tropical Agric 66:43-8.*

Olarewaju, J.D. and Showemino, F.A. (2003). Response of Pepper cultivars to Nitrogen and Phosphorus fertilization. *Nigerian Journal of Horticultural Science 8: 61-65.*

Olarewaju J.D and Showemino F.A (2006). Agronomic indices of drought tolerance in sweet Pepper *proceedings 24th Hort conference 17-22 Sept.*

Onwueme, I. C. and Sinha, T. D. (1999). Field Crop Production in the Tropical AfricaTechnical Centre for Agriculture and Rural Cooperation. England p 114 – 142.

Ojeniyi S.O and Agboola A (1995). "A review of tillage requirement of food crops in Africa" *African Soil28: 259-266.*

Peet, M. (2002). Sustainable practices for vegetable production in south crop profile pepper " *NCSU, USA.*

Peet, M (2003). Sustainable Practice for vegetable production in the south North caroline state University, USA.

Peet, M. (2006). Sustainable practices for vegetable production in South Carolina Crop new profile pepper " *NCSU, USA.*

Rasheed ,O.A and Sola O. (2005). Use of sicklepod, Senna obtusfolia(L.) Irwin and Barneby , as mulch interplant in cayenne pepper, capsicum frutescens L. Production. *Emir. J. Agric. Sci. 17(1):10-22*

Riaz,A .M .,Muhammad , A. and Gul H.(2007). Wheat establishment with zero tillage For integrated weeds management *Pak. J. Weed Sci. Res 10(1-2)17-24.*

Rubin, B. (1990). Weed competition and Weed control in Alliums crops. In Rabinwitch, *H.D. and J.L. Brewster (eds) onion and allied crops vol. 2 CRC press Florida. P. 65 -80.*

Saleem, M.A., Suleiman, H. and van Kaufman, R. (1987). Tillage method for the cropping of sorghum in legume fodder banks in the sub-humid zone of Nigeria, Field Crop Research **16**, 85-94.

Santin I M ., G, Catalan, J.L. Tenorio.,and J.M. Garcia-Baudin (2008) Effect of tillage systems on weed flora composition Options mediterraneennes,serie A, Numero 69 :143-147

Shieldrick, B. and HandWang, C (1993). Particle size Distribution. In: M.R. Carter (Ed.), p.495-511. Soil Sampling and Methods of Analysis. Canadian Society of Soil Science, Lewis publishers, Ann Arbor MI.

Stroud, A. (1993). Control of Weeds. In:Rowlan J.R (eds) *Dry land farming in Africa* . Macmillan Education Ltd. P. 172 -179.

Tariq, R., Khan S. N., Arshad J. and Abdullah F.(2006). Weed flora of *Gladiolus* fields in Lahore, Pakistan *Pak. J. Weed Sci. Res. 13(3-4):247-250*.

Tekwa, I.J and Usman, B.H (2006). Estimation of soil loss by gully erosion in Mubi Adamawa state Nigerian, *Journal of the Environment 1 (1) : 35 43.*

Terry, P.J (1983). Some common crop weeds of West Africa and their control Agric Research council, weed research organization, Oxford Ox 5 IPF England.

Tindall, H.D (1983). *Commercial vegetable growing*. Oxford University press London, page 206-7 ISBN 0 19 859416x.

Tindall, H. D (1986). *Vegetables in the tropics* Longman publisher. Hong Kong page 347-352. ISBN 0-333-44383 7.

Udo, R.K. (1970). *Geographical Regions of Nigeria* (1st Eds.), Pp 195-197. Heinemann. London.

Udo, I.A Uguru, M.I and Ogbuji, R.O (2004). *Proceeding of 2nd conference for Hort society of Nigeria Kano 4-9th July.*

Uguru, M.I and Madu, E.A. (2007)." Variations observed among indigenous Pepper lines for Pepper venial mottle virus (PVMV) Tolerance".*Global journal of Agriculture science vol 6 (1) pg 15- 20*

United states Department for Agriculture (USDA), (2001). Economic research services. *USDA Agric outlook,* Dec 2001 USDA

Wirjahadja, S.O.and J.O.Pancho,(1975).Weed survey; sampling methods and vegetation analysis. *Biotrops tech. bull.4,20pp.*

Yayock, T.Y. Lombin, G. and Omlorubi J.J (1988). *Crop sciences and production in warm climates* London Macmillan pub. Ltd.

Youdeowei A., Fred O.C. Ezedima, Ochapa C. Onazi (eds) (1999). *Introductions tropical agriculture,* Longman publishers, China p.120-122.

Append of land preparation and weeding
regime on some growth characters of sweet pepper in 2008 and 2009 rainy seasons.

Source of variation	d.f[6]	Establishment Count	Number of primary branches		Number of secondary branches		Leaf count				Plant height(cm)				
			AT 4WAT	AT 10WAT	AT4WAT	AT 10WAT	2WAT[2]	4WAT	6WAT	8WAT	2WAT	4WAT	6WAT	8WAT	10WAT
2008															
LAND PREP.(A)	3	2.58^{ns}	3.31ns[3]	17.08^{ns}	0.01^{ns}	5865^{ns}	5.66**	134.30^{ns}	3098.10*	3796.71*[4]	1.86^{ns}	0.75^{ns}	15.24^{ns}	27.78^{ns}	104.60^{ns}
Error A	6	2.62	1.99	1.42	0.01	2186	0.20	16.96	223.81	283.67	3.16	1.78	9.94	54.52	112.32
WEEDING(B)	3	1.52^{ns}	0.29^{ns}	56.87^{ns}	0.01^{ns}	2376^{ns}	0.64^{ns}	6.99^{ns}	566.90**	693.89**	2.62^{ns}	4.40^{ns}	0.97^{ns}	25.09^{ns}	64.17^{ns}
AXB(W+LP)	9	1.87^{ns}	1.11^{ns}	4.81^{ns}											40.22^{ns}
ErrorB	24	1.76	0.66	0.54	0.01	1920	1.02	14.38	68.83	92.78	3.42	2.55	4.77	12.84	46.59
2009															
L/PREP.[1](A)	3	10.92^{ns}	1.20^{ns}	9.42^{ns}	0.16^{ns}	218.59^{ns}	25.83^{ns}	36.66^{ns}	1941.70^{ns}	2545.80*	24.26^{ns}	23.31^{ns}	24.55^{ns}	155.97^{ns}	119.55^{ns}
Error A	6	2.85	0.55	3.15	0.09	39.61	9.63	8.08	173.80	137.40	9.47	11.83	15.13	29.93	13.01
WEEDING(B)	3	1.69^{ns}	2.17**	50.22**	0.34**	516.53**	4.71^{ns}	8.59^{ns}	2149.80**	2614.20**	1.14^{ns}	3.12^{ns}	68.30**	403.49**	416.48**[5]
AXB(W+LP)	9									269.30^{ns}	6.54^{ns}	7.25^{ns}	11.48^{ns}	44.20^{ns}	27.81^{ns}
ErrorB	24	2.14	0.29	3.60	0.05	25.21	8.99	13.11	142.40	128.30	6.00	7.03	9.47	17.55	11.30
COMBINED															
L/PREP.(A)	3	10.96^{ns}	3.67^{ns}	22.47**	0.10^{ns}	4039.80^{ns}	14.48^{ns}	79.26^{ns}	4838.80**	6061.50**	17.29^{ns}	12.84^{ns}	33.10^{ns}	143.83^{ns}	173.29^{ns}
Error A	12	2.74	1.27	2.28											
WEEDING(B)	3	2.96^{ns}	0.95^{ns}	104.65**	0.17*	1682.70^{ns}	4.02^{ns}	11.84^{ns}	2398.70**	2918.00**	0.67^{ns}	0.45^{ns}	34.46*	252.65**	246.96**
AXB(W+LP)	9	3.33^{ns}	0.12^{ns}	6.00^{ns}	0.03^{ns}	1171.50^{ns}	6.06^{ns}	19.08^{ns}	284.10^{ns}	350.00*	8.92^{ns}	8.95^{ns}	12.73^{ns}	28.96^{ns}	13.24^{ns}
ErrorB	48	1.95	0.47	2.07	0.03	972.60	5.01	13.75	105.60	110.50	4.71	4.79	7.12	15.20	28.94

1 = Land preparation,
2 = Weeks After Transplanting,
3= Not Significant at 5%level of Probability,
4 =significant at 5% level of Probability
5=Highly significant at 1% level of Probability
6 = Degree of Freedom

Appendix 2: Me effects of land preparation and weeding regime on some phenological characters of sweet pepper in 2008 and 2009 rainy seasons

Source of variation	d.f[1]	Days to first flowering	Days to 50% flowering
2008			
L/PREP.(A)[2]	3	104.17ns[3]	665.58*[4]
Error A	6	54.94	48.33
WEEDING(B)	3	52.06ns	2369.58**[5]
L/PREP.(A)	3	49.58ns	230.30ns
Error A	6	7.91	373.10
WEEDING(B)	3	73.74**	5177.10**
AXB(W+LP)	9	1.97ns	148.90ns
ErrorB	24	3.16	266.40
COMBINED			
L/PREP.(A)	3	126.68ns	353.50ns
Error A	12	31.42	210.70
WEEDING(B)	3	100.15**	7212.30**
AXB(W+LP)	9	14.69ns	180.50ns
ErrorB	48	15.41	165.80

1= Degree of freedom, 2 = Land Preparation, 3 = Not significant 4 = significant at 5% level of Probability, 5 =Highly significant at 1% level of Probability,

Appendix 3: Mean squares of analysis of variance (ANOVA) showing the effects of land preparation and weeding regime on some fruits and stem characters of sweet pepper in 2008 and 2009 rainy seasons

Source of Variation	d.f[2]	Fruit length	Fruit diameter	Stem diameter (Apex)	Stem diameter (Base)
2008					
Land Prep.(A)[1]	3	1645.40*[3]	234.50**[4]	0.10[ns5]	19.06**
Error a	6	103.80	70.36	0.02	0.26
Error b	24	299.50	100.80	0.10	0.85
Combined					
Land Prep.	3	2783.50**	577.46*	0.31[ns]	22.08**
Error a	12	185.80	67.61	0.10	0.67
Weeding (B)	3	14995.00**	4102.26**	1.27**	48.28**
AxB(W+LP)	9	496.30[ns]	107.57[ns]	0.09[ns]	2.41**
Error b	48	348.60	84.00	0.06	0.60

1 = Land Preparation, 2 = Degree of freedom, 3 = significant at 5% level of Probability 4 =Highly significant at 1% level of Probability, 5 = Not significant,

Appendix 4: Mean squares of analysis of variance (ANOVA) showing the effects of land preparation and weeding regime on some yield characters of sweet pepper in 2008 and 2009 rainy seasons

Source of Variation	d.f[2]	Number of fruits/plant	Total number of fruit/plot	Yield/plot(g)	Yield(Tonnes/ha)
2008					
Land Prep.(A)[1]	3	5.12*	131.89[ns]	16511*	103194*
Error a	6	0.32	12.91	947	5921
Weeding (B)	3	16.30**	1372.85**	571738**	2617539**
AxB(W+LP)	9	0.64[ns]	165.30**	58441**	216141**
Error b	24	0.29	22.71	9857	38769
Combined					
Land Prep.	3	6.17**	488.82**	103648**	766831ns
Error a	12	0.23	11.89	5440	62080
Weeding (B)	3	23.15**	1464.90**	418806**	3573360**
AxB(W+LP)	9	0.83*	125.56**	34583**	365255**
Error b	48	0.26	15.44	6203	61606

1 = Land Preparation, 2 = Degree of freedom, 3 = significant at 5% level of Probability 4 =Highly significant at 1% level of Probability, 5 = Not significant,

some weed characters in 2008 and 2009 rainy seasons

Source of variation	d.f[2]	Days to weed emergence				Weed count			Weed weight				Weed height(cm)
		After Land Preparation	2WAT[3]	4WAT	6WAT	2WAT	4WAT	6WAT	2WAT	4WAT	6WAT	10WAT	At harvest
2008													
L/PREP.(A)[1]	3	5.08ns[4]	8.19ns	3.80ns	0.41ns	49027*[5]	7361.70ns	89651ns	903835*	13088ns	74348ns	70100*	11.20ns
Error A	6												
WEEDING(B)	3												
AXB(W+LP)	9												
ErrorB	24												
2009													
L/PREP.(A)	3												
Error A	6	6.62	1.19	0.34	0.06	2884	1403.60	7190	768	6472.10	16328	18604	169.40
WEEDING(B)	3	0.08ns	58.58**	102.02**	65.33**	158096**	36726.60**	97903**	534230**	36150.80**	380223**	13082364**	15314.20**
AXB(W+LP)	9	0.23ns	0.41ns	0.39ns	1.22**	15691**	1335.00*	5001ns	131416**	1655.30ns	9122ns	63961*	312.20ns
ErrorB	24	0.13	0.58	0.72	0.06	2069	344.10	2249	1509	935.40	10226	15641	176.30
Combined													
L/PREP.(A)	3	10.23ns	9.24ns	2.03ns	1.18ns	129090**	16083.40*	102095ns	1882574**	24460ns	115109ns	125420**	145.50ns
Error A	12	6.62	1.94	0.80	0.218	2696	2159.30	20112	31443	7568	29094	11646	263.20
WEEDING(B)	3	0.13ns	123.04**	227.67**	142.59**	210691**	86424.40**	414191**	611074**	87164**	1928720**	28589660**	15224.30**
AXB(W+LP)	9	0.35ns	1.13ns	0.73ns	1.18**	18167**	2259.90**	17875*	218465**	3068ns	22841ns	125420**	409.70ns
ErrorB	48	0.14	0.46	0.56	0.19	1538	603.80	5423	5482	1027	18559	10591	261.30

1 = Land Preparation, 2 = Degree of Freedom 3 = Weeks After Transplanting,, 4 = Not significant 5 = significant at 5% level of Probability, , 6 =Highly significant at 1% level of Probability, 7 = Weeding + Land Preparation.

Appendix 6: RaMubi) in 2008 and 2009 .

	Rainfall (mm)		Number of rainy days		Relative humidity (%)		Mean temperature(^{O}C)	
Months	2008	2009	2008	2009	2008	2009	2008	2009
January	-	-	-	-	77.54	64.28	25.00	25.80
February	-	-	-	-	50.39	50.32	20.43	22.70
March	-	-	-	-	49.35	46.41	25.24	31.60
April	6.70	6.50	2.00	2.00	49.36	45.37	27.76	33.80
May	72.00	96.30	7.00	7.00	63.77	70.98	25.79	35.20
June	148.20	80.30	8.00	9.00	73.00	81.80	24.00	30.60
July	212.50	153.40	13.00	12.00	70.00	83.81	23.00	29.30
August	295.20	272.00	18.00	17.00	64.00	76.77	23.00	24.80
September	103.70	109.00	10.00	11.00	68.00	65.40	23.00	22.90
October	14.00	147.00	2.00	9.00	64.00	70.31	23.00	21.70
November	-	-	-	-	74.00	66.40	25.00	20.30
December	-	-	-	-	67.00	63.80	23.00	19.60
Total	852.30	864.50	60.00	67.00	770.41	785.65	288.22	318.30
Mean	121.75	123.5	8.57	9.57	64.20	65.47	24.01	26.52

Source: Departme