بسم الله الرحمن الرحيم

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The Evaluation of Some Production and Reproduction Traits of the Shami Cyprus Goats in Eastern Sudan Kassala State

تقييم بعض أثر الإنتاج والإنتاجية للماعز الشامي القبرصى في شرق السودان ولاية كسلا

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Dedication

To the soul of my father

To my Dear mother

To my brothers, sisters

To my wife and children

To my teachers who gave us happiness

in our life

To my friends and colleagues

To those who gave encourage and support

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Firstly I thank my God [Allah] for given us life, health, help and success. I wish to express my deep sincere appreciation and grateful thanks to my supervisor Ass. Prof. Dr. Ahmed Khalil Ahmed for limitless help, advising, giddiness, encouragement and assistances throughout the course of this study. His motivation and confidence in my abilities had the greatest impact on my academic progress, Without the help and advice of my Supervisor this work could not have been accomplished. Deep gratitude and appreciation to my co-advisor, Dr. Amani Abdo-Elmarof Basheer director of the Animal Production- Faculty of Agriculture and natural resources– University of Kassala for keen advice and helping I would like to extend appreciation to my specially collogue Yassin Elamin Ahmed Adam for analysis, Great thanks are extended to my friends and colleagues for their encouragement, My thanks also are going to all staff members of Animal Production Department, Faculty of Agricultural Studies Sudan University of science and technology My deepest appreciation is extended to Yasser Musa Mohammed Adam for computer program helping and repairing. Also thanks extend to those who help me direct or indirect to finish my study.

List of Contents

Title **Page No.**

List of Tables

List of Plate

Abstract

This study aimed to evaluate the performance of the Shami Cyprus goats in intensive system in Kassala State Eastern Sudan in the animal production farm of the Ministry of Agriculture, and Animal Resources, the study included the performance of the Shami Cyprus of the following (milk yield, lactation period, milk composition (Fat, Protein, Lactose, Ash and total solid) and to determine the performance on kids(the average birth weight, sex birth weight in winter and summer , twins birth weight, twins rate ,weaning weight, age at weaning and mortality percent), and reproductive performance (puberty, age and weight at the first service, age and weight at the first kidding, kidding interval, gestation length and litter size,). Body weights of the sex at different ages one year, two years and three years and Body Measurement, Ear length, height at wither, heart girth, back length, face length and neck length,

The result indicated that milk yield of the Shami Cyprus goats in winter per day was 3.16±0.82 liter 3.69±0.53 liter for the doe offer single and twins respectively while milk yield in summer per day was 2.4 ±0.8 liter, 3.4± 1.2 Kg for the doe offer single and twins respectively. The average milk yield in both seasons were 3.16±0.84 liter per day, the average milk yield throughout the lactation period was 528 – 682 liter according to the season. The lactation length it was 22٥ ± ٤.7 day 236 ± 7.54 day in the winter for the doe offer single and twins respectively and (190 ± 10.8 day), 212 ± 11.7 day in summer for the doe offer single and twins respectively and the average lactation length of the Shami Cyprus goats was 215 ±8.69 days . Milk component percentage in the winter were protein, fat, lactose, Ash and total solid were 3.71 ± 0.13,3.81 ± 0.72 , 4.63 ± 0.26 , 0.83 ± 0.03 ,12.98 ± 1.14 respectively and in summer were 3.2±0.19, 3.5±0.21, 4.06±0.3, 0.78±0.03, 11.58±0.18 respective y The overall means of birth weight of the Shami Cyprus goats were 3.96±0.39, single male kids were heavier 4.28±0.50 than female single

kid 3.86±0.40 kg), birth weight of kids born in the winter was higher significantly (P<0.01) than that kids born in summer, the twins born kids showed high significant (P<0.01) on the birth weight and the overall average means of the weaning weight of the shami Cyprus goat were 12.55 ± 1.48 kg at the age 66 days. The overall average means of the Kids mortality in this study were encountered 14.81 %. Average age at puberty was 191.88 ± 3.64 days, the age at the first service period were 273.89±3.93, days). While the weight average of the first service were 40.72±1.7 kg, gestation period were ranged 150.75±0.79 days and,147.41±0.71 days for single and twins respectively. First kidding was 427.84 ± 2.84 and weighted 51.55 ± 1.3 kg) kidding interval was 253.71 ± 9.67 days the. All over means at three different years of the body weights of the shami Cyprus goats were (64.24± 2.5 kg)(54.17 ± 3.2) for male and female respectively. The average description of body measurement with (cm) at one , two , and three years were 29.42 ± 1.12, 29.67 ± 1.69, 80.93 ± 3.55, 76.04 ± 1.99. 99.04 ± 4.29, 87.87 ± 1.29, 44.29 ± 3.18, 40.16 ± 2.02, 25.07 ± 1.94, 22.04 ± .89, 20.18 ± . 77, 21.27 ± 82, for ear length, height at wither, heart girth, back length, face length and neck length for the male and female respectively.

ملخص البحث

هدفت هذه الأطروحة لدراسة أداء الماعز المستورد (الشامي القبرصى) في شـــرق الســـودان (ولاية كسلا).حيث حفظت بمزرعة الإنتاج الحيواني التابعة لوزارة الزراعة والثروة الحيوانية والسمكية والغابات والري .واتبعت في الدراسة النظام المغلق في التربية شملت الدراسة أداء الإنتاج للماعز الشامي القبرصى للمكونات الآتية: إنتاج اللبن اليومي، طول موسم الإدرار، ومكونات اللبن (دهن، بروتين، سكر اللبن والأملاح المعدنية للبن والمواد الصلبة الكلية). كما تم تسجيل وزن المواليد - متوسط وزن المواليد الذكور والإناث في موسمي الشتاء والصيف، ووزن المواليد التوأم عند الميلاد كما تم متابعة عمر ووزن الفطام وتسجيل نسبة النفوق بين المواليد. كما تم دراسة الأداء التناسلي للماعز الشامي القبرصى وشملت (العمر عند البلوغ الوزن والعمر عند أول تلقيحه، العمر والوزن عند أول ولادة، الفترة بين الولادتين، طول فترة الحمل ونوع الميلاد) . كما تمت القياسات الاتية: وزن الجسم عند عمر سنة، سنتين وثلاثة سنوات، وقياس بعض أعضاء الجسم (طول الإذن، والارتفاع عند الغارب ومحيط الصدر، طول الطهر، طول الوجه وطول العنق).

أوضحت الدراسة بأن إنتاج اللبن هو ٣,١٦ لتر 0.53±3.69 لتر للأنثى التي أنجبت مفرد والتي أنجبت توأم في الشتاء على التوالي و٢,٤ لتر - لتر٣,٤ للأنثى التي أنجبت مفرد والتي أنجبت توأم في الصيف على التوالي ومتوسط الإنتاج في اليوم للبن ٣,١٦ لتر والإنتاج في الموسم يتراوح بين ٥٢٨- ٦٨٢ لتر وفق موسم الإنتاج ومتوسط الإنتاج في الشتاء أعلي من الصيف وإنتاج الأم التوأم أعلى من إنتاج الأم المفرد وتراوحت طول فترة الحليب في الشتاء ± 236 7.54 ، ٤ 7. ± ٢٢٥ للأنثى التي أنجبت مفرد والتي أنجبت توأم على التوالي وتراوحت طول فترة الحليب في الصيف 11.7± 212، 10.8 ± 190 للأنثى التي أنجبت مفرد والتي أنجبت توأم على التوالي ومتوسط طول فترة الإدرار 215 يوم. وأشار التحليل الكيمائي ان نسبة البروتين ٣,٢-٣,٧١ %، الدهن ٣,٨١ – ٣,٥ %، اللاكتوز ٤,٦٣ – ٤,٠٦ %، الرماد ٠,٨٣- ٠,٧٨ % والمواد الصلبة الكلية ١٢,٩٨ – ١١,٥٨ % في الشتاء والصيف على التوالي .ومتوسط الوزن عند الميلاد للماعز الشامي القبري قد بلغ ٣,٩٦ كجم، وزن الذكور والإناث في موسم الشتاء قد بلغ ٤,٤2 كجم و٣,٨٦ كجم وفى الصيف قد بلغ ٣,٨٧كجم ،٣,٤١ كجم على التوالي. ووزن المواليد التوائم ٣,٨كجم،٣,٥٠كجم في الشتاء والصيف على التوالي، أوضحت الدراسة بأن هنالك فروقات معنوية لعدد المواليد بكل ولدة، وبلغ متوسط الوزن عند الفطام ١٢,٥٥ كجم والعمر عند الفطام ٦٦ يوم. بلغت متوسط نسبة النفوق ١٤,٨١

بلغ متوسط العمر عند البلوغ ١٩١,٨ يوم، العمر عند أول تلقيحه ٢٧٣ يوم،الوزن عند أول تلقيحه ٤٠,٧٢كجم طول فترة الحمل تراوحت ١٤٧ – ١٥٠ يوم، العمر عند أول ولادة ٤٢٧ يوم، وزن الأم عند أول ولادة ٥١,٥٥ كجم ، الفترة بين الولادتين ٢٥٣ يوم،، متوسط وزن الجسم ٦٤,٢٤ كجم ٥٤,١٧ كجم للذكور والإناث على التوالي، ويتم التناسل فى فصل الخريف والشتاء ومتوسط القياس بالسنتمتر عند عمر سنة، سنتين وثلاثة سنوات بلغ٢٩,٤٢- ٢٩,٦٧ ٨٠,٩٣- ٧٦,٠٤، ٩٩,٠٤- ٨٧,٧ ،٤٤,٢٩-٤٠,١٦,٢٥,٠٧-٢١,٢٧-٢٢,٠٤,٢٠,١٨ طول الأذن، والارتفاع عند الغارب، محيط الصدر، طول الظهر،طول، الوجه وطول العنق لكل من الذكور والإناث علي التوالي.

CHAPTER ONE

INTRODUCTION

Goats, like cattle, play an important role in the livelihood of rural people families whom owned small ruminants for provision of milk, meat in communal farming systems. The recognition of the importance of goats is developed as results of the capacity, that goats can service under marginal conditions unfavorable for cattle and sheep. It's preferred diet is largely ignored by other animals, and therefore contribute substantially to the solution of food problems in many arid and semi arid areas, where hunger and malnutrition are prevalent. Goats thus play an important socio–economic role in rural areas, which includes some of the most resource poor farmers in Africa. These animals are prolific and require low inputs for a moderate level of production, reach maturity early and are profitable to keep (Devendra & Burns, 1970).

According to FAO (2008). goats population are about 861.9 million in world , 291.1 million in Africa and 43.104 million in the Sudan. Most population of goats is mainly composed of Nubian and rest are Desert, and mountain (Taggar) breeds (A.O.A.D, 1990).The tropical goats are kept for meat production and rarely milked as most goats in tropical countries (Ohiokpehai, 2003) The performance is one of the main determinants of productivity and reproductive of the goat and it will be applied to the breeding of animals for milk and meat production (O'shea, 1983). The high performance rates are essential for profit in production, and reproduction of a species is central to its evolutionary survival. It can be argued that successful and efficient reproduction is a Key of production of domestic animals (Murphy,1991). Indigenous goats are more common in the communal areas and constitute a valuable genetic resource because of their ability to adapt to harsh climatic conditions, to better utilize the limited and often Poor quality

food resource (Murphy,1991). while the shami goats which had been imported recently from Cyprus are mostly found on limitted commercially owned farms and it,s seasonal polyestrous breed that is considered to be the most important goat breed in Middle East due to their milk production.

The uses data on the Shami Cyprus Goats accumulated over Years in the farm of the Ministry of Agriculture and Animal Resources in the Eastern Sudan Kassala, with the of examination various reproductive, performance and milk yield in the new environmental.

The objectives of this study is to investigate and to establish basic parameters of the performance of the Shami Cyprus Goats under intensive rearing system in the Eastern Sudan Kassala. The performance evaluated under Eastern Sudan (Kassala) management and environmental factor the traits study were : .

i. Conception and kidding rate.

ii. Milk yield and composition

iii. Determine the % fat, protein, lactose and Ash .

iv. Litter size.

v. Kid's performance (Birth weight-Sex ratio-.

vi. Gestation period

vii. Mortality rate

viii. Age and weight at (1st service and 1st kidding).

ix. Kidding interval

x. Body measurement include – highest at wither- - Year length — circumferences and girth

CHAPTER TWO

LITERATURE REVIEW

2.1. Goats Classification and systems

Goats are the most versatile domestic animals in adaptation to arid, humid, tropical, cold ,desert and mountain conditions and they thought to have been the first animal to be domesticated by Sumerians, for economic purposes. (Gall, 1991; Quartermain, 1991; Silanikove, 2000). Goats are belong to the sub-family Caprini of the family Bovidae in the sub-order Ruminantia of the sub-order Artiodactyla They are typical cloven-hoofed ruminants of relatively small size(Zenuer, 1967). Goats play an important role in agricultural operation provide valuable food of animal origin like ,meat ,milk products, industrial raw material like skin ,fibers and manures (Faruque *et al*. ,2002). Also plays a potential role in the subsistence economy of Sudan where they are generally raised by poor farmers and distressed women, an integral component of farming in the Sudan, support a large section of landless and marginal farmers (Singh *et al*., 2000). In economically depressed areas, also plays an important social role by fixing the population and maintaining traditions and furthermore to multifunctional (Calatravaand Sayadi,2003).

The population of goats in Sudan is estimated by 31 million (M.A.R, 2014). About 88% of the world's goat population is located in Asia and Africa and mostly (80%) in the tropics and sub-tropics. In Sub-Saharan Africa most of the goats are located in arid and semi-arid agro-ecological zones. (Hatziminaoglou and Boyazoglu 2004).

2.1.2. Sudanese goat types

The main types of goat in the Sudan are Nubian, Sudan desert, Nilotic dwarf and Taggari. In addition, some of their mixed crossed with Sannen, Toggenburg and Anglo-Nubian were also found since the importation of exotic breeds in 1976 (Ageeb,1992).

2.1. 2. 1. Nubian goats

Nubian goat is distinctive breed, belongs to the general Nubian group. is referred as “local breed” and it is found in North Eastern Africa and Mediterranean coastal belt. It is the only African breed specialized for milk production. In the Sudan, the Nubian goat, among other indigenous goats is the only acknowledged dairy goat (Hassan and El-Derani, 1990). It's represents about 50% of the total goats’ population in the Sudan and they were predominately found in the urban areas of the northern part of the country. It is widely distributed north of 12º N mainly in the River environments (FAO., 1991). Phenotypically it is allied to Egyptian Zariabi, Eriterian Shokri and Syrian Damascus (Devendra and McLeroy, 1982). It is considered an improved dairy goat under local conditions and well adapted to harsh environments. It originated in the Sudan, and is widely distributed in Africa (French, 1970). characterized by fairly proportioned body size with small to medium size. Both sexes carry horns. The legs are long stronger with height of withers of 70-80 cm ,and well proportioned .The udder is large and well shaped Ears are long (25 cm), broad and pendulous, especially lop with black colour Beard usually absent.. Colour generally black, other colours from dark chocolate ,the mature weight of 50-70 kg for males and 40-60 kg for females (ELNaim, 1979; Kiwuwa, 1986;AOAD,1990).Although the principle value of the breed is for milk, production Milk yields arranges in the order of 1 to 2 Kg daily and 120 to 140 kg daily annually in two lactations (Devendra and Burns, 1970). surplus kids are suitable for meat production (Mason and Maule, 1960, and Devendra and Burns, 1970).

2.1. 2.2. Desert goat

The desert goats is located in the Northern Sudan and is possibly allied to the Shukria goat of western Eritrea, although the latter is probably a much better milk producer, more closely related to the Nubian. The Desert goat estimated to represent about 17% of the Sudanese goat population. It is probable that the so-called Zaghawa goat that found in Darfur and western Kordofan with a black colour variant of the Sudan Desert type. The main area Desert goat is dry areas of the Sudan, generally to the north of 12°N but north of 10°. The breed is well-adapted to heat and spares grazing of desert conditions that can thrive well in the desert environmental conditions (Gaili *et.al*., 1972).

They are better producers for meat and skin (Devevndra and Burns, 1983).Moreover, Babiker *et al* (1990) found that Desert goats produce high quality meat than Desert sheep with tender and juicy.

Wilson (1976) describes sedentary herds in Western Sudan. area, its large size hight at wither 65-85 cm with weight 40-60 kg for male and 32.7 ± 5.22 kg for female. Puberty was at 5.87 month in males and 5.54 month in females. Mean age at first kidding was 10.44 ± 0.19 months and kidding interval was 265.25 ± 3.99 days (Mohammed and El-imam, 2007). Forehead flat, fine, profile, straight and slightly dished. Beards in both sexes, very bushy in males. Males may have a mane to the shoulders or extending the whole length of the back, mane occasionally present in females. Neck rather short. Chest shallow and often pinched. Withers prominent (male 69-83 cm; female 65.5 ± 3.73 cm). Back short and straight. Croup very weak and sharply sloping with tail set low. Legs long and poorly boned. Colour variable from white to black, Grey are common but many mixed colours black back stripe in dark colours and grey in light colour Coat usually short and fine except for mane (Mohammed and El-imam, 2007).

2.1. 2. 3.Taggari (*Mountain*) Goats

They were mainly located in mountains and hills, they were found in Nuba mountain (Southern Kordofan state), Ingessana mountain (Blue Nile state) and Red sea mountains (Red sea state) at Toker and Halaib district (AODA,1990). The male is beard and maned, both sexes are horned straight. The coat is short with black lines extend a long the face from the base of the horns to the nostrils .The most common colour is dark brown or grey brown (ELNaim, 1979; Muffarrah, 1995). Due to their small size and short legs they are very active and well adapted to the topographical and climatic conditions prevailing in the area as well as to vegetation which dominates the predominately mountainous rangeland (Muffarrah, 1995). characterized by very short ears carried horizontally, short neck and legs with live weight ranges 20 -30 kg .Age of puberty was 7.43 months in males and 8.04 month in females, age at first service was 6.87 months in male and 7.78 month in female. Age at first kidding was 13.1 month with kidding interval of 245.4 days(ELimam *et al*, 2007).The dressing percentage were 44.96 and 53.54 in males and 43.94 and 52.39 in female (ELimam *et al*, 2007).

2.2. Damascus Goat

The Damascus goat, also known as the Shami, is a native breed of Syria and other Near East countries. It was imported into Cyprus some 70 years ago to be raised as a pure breed no cross breed was done . For over40 years it has been improved through genetic selection for milk and meat. The Damascus goat was one of the breed's that the Technical Consultation of FAO/UNEB on Animal Genetic Resources; Conservation and Management agreed should be given a high priority due to its qualities, (Mavrogenis, (2006).

2. 2. 1. Appearance and Features of the Damascus Goats

The Damascus goat has a reddish brown coat colour consisting mostly of long hair. White spots on the body, legs and face, although not very common, may

appear on the animal. The black coat colour is extremely rare and may appear as a result of the presence of a recessive gene in the population. The ears are long and pendulous measuring between 27 cm and 32 cm in length. measuring 78 cm at withers heart girth of 97 cm to 99 cm It is a rather large breed, live weight is 55-65 kg and 70-90 kg for dose and bucks, respectively (Keskin,2002).. The head is long with a Roman nose and the presence of horns in both sexes is associated with inter-sexuality. The breed carries wattles,(Hancock and Louca, 1975) Epstein and Herz,(1964) reported that this breed is ancestor of some Indian dairy goat breeds and the Kilis goat, a Turkish dairy breed.

2. 2. 2 Main Management Systems of the Damascus Goats

This improved breed, that lives and performs in Cyprus, requires an improved management and feeding environment to express its full genetic potential. Extensive grazing is not practiced and watering facilities are available only during the short grazing hours allowed. The goat can be managed in small or large-size herds. Housing, feeding and other necessary facilities are available. The most common herd size is 200 to 300 goats, but herds of 500 does or more are not rare. The breed is considered as one of the best dual-purpose breeds of the Middle East under semi-intensive or intensive production systems, combining high prolificacy with high milk production. Because of these qualities, its potential for high output and its nutrition requirements during the various phases of the production cycle, the Damascus goat has been extensively studied. Management and feeding systems, such as suckling regimes, weaning regimes (age of kids at weaning, continuous or partial suckling, etc.), energy and protein requirements of the doe and the kid and fattening practices have also been investigated. The very nature of the production system in which the particular breed performs (semi-intensive to intensive) indicates that natural vegetation and seasonal variation, although important during certain parts of the production cycle, do not play a

significant role in the management and nutrition of the breed. With regard to management practices, it is important to note that weaning of kids can be practiced at birth (zero suckling) or at six to seven weeks post partum without serious adverse effects on the growth of the kids. The digestible nitrogen requirements for maintenance of a 65 kg goat (dry, non-pregnant) are estimated at 1.75 kg per kg metabolic body weight. The daily energy requirements for maintenance are similar to those of the Chios sheep, i.e., 15.7 MJ of ME during pregnancy, (Hadjipanayiotou 1987).

2. 2. 3. Damascus goats production

Mavrogenis A.P.*et al* (2006) thought that, under the semi-intensive system of production, the breed's performance is moderately high. Birth weights are high and range from 3.5 kg to 5.5 kg depending on the type of birth and the sex. The nutrition requirements for growth before and after weaning have been extensively studied. Kid carcasses are less fatty than lamb carcasses, when they are compared at similar slaughter weights or similar slaughter ages. The dressing percentage of kid carcasses at 55% maturity is 50.3% (120 days of age) with a lean content of 55% and a fat content of 26.8% in the best and neck cuts. According to Khazaal K. 2009, in Lebanon, Shami goats which are raised and bred randomly by farmers have a large variation in their performance. As a result, many farmers are turning toward famous dairy European breeds. The performance (Milkproduction, twinning and growth rate) of Shami and Saanen was studied for three years under local environmental condition. Average milk yield (from 0-300days of lactation) was slightly higher in Shami goats (450+-102.7 kg) compared to Saanen 445+-110kg). Average twining rate was also higher in Shami goats (1.75 kid/goat) compared to Saanen (1.08kid/goat). Body weight of Shami goats ranged from 67.4+-9.3 kg at parturition to 64.8+-10.4 kg after 270 days where as that of Saanen goats ranged from 51.5+-9.3 kg to 51.2 +-6.6 kg. Average daily growth (g/day)of kids after 270 days was higher from Shami kids(males

132+-31.2, female 108+-2.5) as compered to Saanen kids(male 117.5+_27.2) female 98.6+-25.5). Overall Shami goats have a milk production potential similar to that can be considered a dual purpose breed. Apparently, Shami goats seem to adapt well to the environmental condition (climate, diseases and nutrition) of Lebanese and Mediterranean climate. Thus there is potential to exploit the genetic productivity trait of this breed to enhance milk and meat production in Mediterranean countries.

2. 2. 3. The Potential of Damascus goats and Milk Production

The Damascus goat is considered a dual-purpose animal (meat and milk). It is milked principally following weaning, but also during the suckling period, since a large quantity of milk remains in the udder without being utilized by the suckling kids. The practice in Cyprus herds is that only two kids are allowed to suckle as a routine practice. All extra kids from large litters are transferred to artificial rearing units. Total milk production, including milk produced until weaning, ranges between 350 kg and 650 kg per goat per lactation. The quantity of milk produced until weaning including that suckled by the kid(s), is 190 kg to 240 kg, depending on the length of the suckling period (35 or 70 days). Milk production for commercial purposes is high (200 kg to 350 kg per goat per lactation) depending on the management system and the level of feeding. Lactation extents from five to nine months following weaning, although lactations of up to a year are not rare. The fat and protein content of the milk are characteristic for high yielding breeds, ranging from 3.8% to 4.5% for fat and from 4.0% to 4.8% for protein Mavrogenis A.P. (2006).

The milking goat responds positively to high protein diets with increased milk output and longer maintenance of lactation at a high level. Machine milking is progressively replacing hand milking. The practice of twice daily milking can be interrupted for a few days (mostly weekends) and once-a-day milking does

not seriously affect total milk production. Most morphological traits of the udder can also be genetically manipulated.Mavrogenis *et al*., (1989).

2. 2. 3.2. production trait and milk yield of Damascus goat

The Damascus goat breed is kept in the Middle East region and service as a dual purpose animal for production of milk and meat. In attempting to improve goat productivity, certain trait such litter size and litter weight at birth and at weaning and milk yield after weaning must be given particular attention. These characteristics are influenced by various factor among which year and season of kidding, age and/or parity of the goat have a significant effect. Furthermore, the number of kids born and number of kids suckled affect milk production after weaning. Papachirestoforou,c. and Mavrogenis, A. P (2000)

2. 2 .4. Reproduction Characteristics of Damascus goat

Referring to Mavrogenis A.P.*et al* (2006).The Damascus goat is considered as a seasonal breeder. The breeding season starts in late August and extends through mid-December. Age at first overt oestrus occurs between 220 and 270 days of age depending on the season of birth of the kids. Live weights at those ages(mating) range from 42 kg to 54 kg depending on the type of birth. This characteristic allows for the early breeding of kids and the initiation of the productive life at the young age of 13 to 16 months. The reproductive activity of the goat is restored 43±9 days following parturition. Fertility is medium to high (80% to 90%), a characteristic of most goat breeds with high milk production. The prolificacy of the breed is among the highest in the region averaging 1.80 kids per doe kidding. The presence of horns is associated with inter-sexuality and sex ratio is distorted

2.3 General Performance of the Goats

2. 3. 1. General Production of milk

2. 3. 1.1. Milk yield

Milk starts to be secreted at and after parturition and it's one of the most important factor in dairy goat production. there is evidence that on live weight basis the goat is a much more efficient milk producer than the other species, and globally goat production yields 60% of its value as milk, 35% as meat and 5% as skin (Devendra and Mcleroy, 1988; Malau-Aduli et. al., 2001). Milk yield of goats is affected by many factors such as: plane of nutrition, doe body weight, litter size, lactation length, dry period, persistency and season of kidding.

2. 3. 1.1.1. Factors affecting milk yield

2. 3. 1.1.1.1. Nutrition

Supplementation of the nutrition affects the daily milk yield and the production will rapidly rise in early lactation which reached the peak between 50 and 70 days, and dry matter intake will not reach the peak till 75 to 100 days. Therefore female do not able to consume enough nutrients to meet her needs for producing greater levels of milk, to compensate for this lack of energy intake, fat reserves are metabolized to provide the energy necessary to accommodate higher milk production (Hadjipanayiotou *et. al*., 1988; Susmel and Cuzzit, 1988). Leclerc (2000) reported that, energy seemed to be the limited factor for milk yield. The pre-natal and post-natal nutrition of the doe influences milk yield, milk composition and persistency, and is known to have major affects on the growth of kids (Ali *et. al*., 1991).

2. 3. 1.1.1. 2. Litter size

The greater milk yield was recorded for goats rearing multiple kids so, the effect of litter size was significantly with highest value of daily milk yield found in goats with three and more kids (Ciappesoni *et. al*., 2004).

Generally, mothers of twins gave more milk yield than mothers of singles and mother of triplets gave more milk yield than mothers of twins. Moreover, it was suggested that multiple fetuses led to a higher lactogenic activity, thus causing higher yields post-partum (Williams, 1993).

2. 3. 1.1.1. 3. Season

Season of kidding significantly ($p<0.001$) influenced milk yield and most kidding occurred in winter (55%) and in spring(40%) and milk yield was affected by prolificacy (Crepaldi *et al,* 1999). Mavrogenis and papachistoforou, (2000) reported season of parturition significantly ($p<0.001$) affected milk production of chios sheep and Damascus goats studied in Cyprus The reduction in milk production during exposure to heat, or during the summer, cannot be attributed solely to a fall in feed intake or forage quality. The effect of heat on physiological mechanisms related to lactation is also of importance, mainly, the low level of thyroxin during the summer (Haffez, 1968).

2. 3. 1.1.1. 4. body weight of the doe

heavy body weight plus large Size of the animal has been shown to have a significant effect on the lactation of goats. Milk production in dairy goats is positively correlated with the weight of the lactating doe. Gamal and Elkhidir (1993) found that milk production of Sudanese goats is influenced by the weight of the doe up to 40 kg of live weight.

2. 3. 1.2. Lactation length

Lactation length had a significant influence on the total milk yield. Papachristoforou and Mavrogenis (2000) revealed that, the lactation length was longer for lactation third, fourth and fifth compared with lactation second, sixth and first. Moreover EL-Abide and Abu Nikhaila,(2010) reported the Sudanese Nubian goat lactation length was (181.12±51.36 days) .

2. 3. 1.2.1. Factors affecting lactation length (LL)

2. 3. 1.2.1. 1. Parity

A study on performance of Toggenburg dairy goats under smallholder production systems reported lactation length (LL) was significantly affected by parity, (LL) was longest for dose in their 3rd parity (296 days) and shortest for first parity (201 days) (Ahuya *et al,* (2009). Parity influenced ($p<0.01$) lactation length of Maltese goat, and days in milking ranging between 244 day for goats in their first parity to 257 day for goats in their 4th parity (Carnicella *et al,* 2008).

2. 3. 1.2.1.2. Litter size (prolificacy)

Prolificacy did not significantly affect lactation length (Crepaldi *et al*, 1999), and type of birth (twins or single) was found not significantly effect on litter size for Toggenburg goats (Ahuya *et al,* 2009).In addition litter size of different goat breeds were found not significantly affect lactation length (Montaldo *et al*,1995), also litter size of Nubian (Goonewardene *et al,* 1999).

2. 3. 1.2.1.3. Herd-year

Study on Alpine goat reported that lactation length was influenced by herd-year($p<0.01$) with partial (R^2 0.55) (Crepaldi et al, 1999). Chios sheep and

Damascus goats were affected significantly ($p<0.01$) by year (Mavrogenis and Papachristoforou, 2000).

2. 3. 1.2.1.4. Season

In study of Alpine goat the season of kidding is significantly ($p<0.01$) with partial (R^2 0.06) affect lactation length (Crepaldi *et al*, 1999). Study on Togggenburg goat reported lactation length (LL) was significantly affected by year season of kidding and parity (Ahuya *et al,* 2009). Sudanese Nubian goat lactation length was affected significantly by season of kidding (EL-Abid and Nikhaila,2010).

2. 3. 1.2.1.5. Breed

Utilization of Alpine, Saanen and Toggenburg sires in crosses with local Mexican goats improve lactation length, their crosses had greater milk production and lactation length then Grenadine and Nubian crosses or local dose (Montaldo *et al*, 1995).

2. 3. 1.2.1.6. Dry period

Dry period is period which extended from the end of lactation to the following parturition. This period should be at least 6 – 8 weeks to allow the doe to build up enough reserves for coming lactation and to provide nutrients for the fetus (Kudouda, 1985). Salama *et. al*. (2005) reported that pregnancy reduced milk yield from week to after conceiving onwards, extended lactation did not significantly decrease milk yield, but increase milk components.

2. 3. 1.2.1.7. Persistency of lactation on milk production

Persistency of lactation means the ability of the lactation goat to maintain a high milk secretion throughout the lactation period. Working of Gonales and Marting (1988) revealed that, the peak of daily milk production was obtained between 5th and 11th week of lactation. Min *et al* (2005) reported that, the

persistency for Alpine goats fed zero concentrate was lower. Napoleone and Gillet (1990) reviewed that, maximum daily milk yield in a flock of goats was observed in the first to second month of lactation. Gamal and Elkhidir (1993) working with Sudanese Nubian goats reported that, the peak of daily milk production was in the second month of lactation.

2. 3. 1.2.1.8. Management

Alpine goats were studied to evaluate performance of the breed. The results showed that, milk yield is primarily influenced by the factor hert-year ($p<0.01$) which mainly reflects the different management systems, such as feeding and milking techniques (Crepaldi *et al*,1999). Years were significantly ($p< 0.01$) effects milk yield of chios sheep and Damascus goats studied in Cyprus (Mavrogenis and Papachristoforou, 2000).

2. 3. 1.2. Milk Composition

Milk composition and quality are important attributes that determine the nutritive value and consumer acceptability. Goat milk contains more fat and ash than cow milk. However, as infant food it is nearly as high in vitamin B6 and twice in vitamin B12 as human milk. They also reported that vitamin A in goat milk exists exclusively in its true form and not as carotenoid pigments. Goats' milk exhibits wide variation which is encountered within and among breeds. This variation reflects differences in genetic, age, stage and season of lactation, feeding standards, technique of yield estimation, number of kids suckling and parity (Banda *et al*, 1992).

2. 3. 1.2.1 Milk fat

Fat content of goats range from 2.7 to 5.9%,in general this range is comparable to that of cows (Parakash and Jennes,1968).This variation in fat content has been reported to be influenced by different factors include

2. 3. 1.2.1.1 Factors affecting milk fat

2. 3. 1.2.1.1 .1 Breeds

Breeds contribute to influence in fact content of the goat milk ELNaim (1979) reported that, Sudanese Nubian goats milk composition was 3.6% fat, 3.4%, protein, 4.67% lactose, 0.82% ash and 12.5%total solids.. While, Baruah et. al. (2000) revealed that, the percentage of fat of Assam local goats range from 6.58 ± 0.09 to 5.87 ± 0.08 and overall mean levels of fat was 6.8% for local Malawi goats.

2. 3. 1.2.1.1.2. Age

Milk fat content increase due to increasing age of does, 23.4% of total variation. Statistically, significant differences in the fat contents depending on lactation number levels were observed. Ciappesoni *et. al*. (2004) reported that, first lactation goats had a significantly lower fat content than goats in second and fourth further lactations. Moreover, Papachristoforou and Mavrogenis (2000) reported that, milk fat percentage in third to sixth lactation was higher than that in second and first lactation.

2. 3. 1.2.1.1.3. Nutrition

Nutritional status of the lactating doe and the composition of the diet affect significantly the fat content of goat's milk. Morand-Fehr *et. al.* (2000) observed that, milk fat percentage in goats even fed on Mediterranean rangeland can be lower than protein percentage because of low availability of vegetation especially in summer and reduced ingestion of fiber. Min et. al. (2005) reported that, the average percentage of milk fat was lower in goats giving zero concentrate (2.9%) compared with other groups giving concentrate (3.1%). Schmidely et. al. (1999) confirmed that, increasing the level of energy intake in dairy goats improved their milk yield and decreased the milk fat percentage. While, Hussein et. al. (1996) reported that, with less

yielding goats an increase in energy increased sometime milk yields and fat percentage. Spruzz and Selegoska (2006) worked on goats given supplemented diets and found that, supplemented diets increased milk yield by 12.64% and fat content to 3.2%.

2. 3. 1.2.1.1 .4. Stage of lactation

Stage of lactation had a marked influence on milk fat content. Knowles and Watkins (1983) reported that, the milk fat percent reaches the maximum values about second months from kidding and decrease to minimum values in fourth month and rises again. Arkinosoynu *et. al.* (1975) worked on West African Dwarf goats and reported that, there was a significant fall in milk fat content with advancement of lactation.

2. 3. 1.2.2. Milk protein

Protein content of goat's milk show a small variation range between 2.3 to 3.7%, this variation may be due to the interaction of the factors which affect of milk production and chemical composition. Spruzz and Selegoska (2006) reported that, goat supplemented with wheat bran and grazing pasture and hay increased protein, fat and sugar contents of goat's milk on 13.3%, 22.8% and 1.1% respectively. Tambajong *et. al*. (2000) demonstrated that, milk protein content dropped slightly until the end of the fourth week of lactation. Min *et. al.* (2005) reported that, average milk concentration of protein, fat and lactose decreased as lactation progressed, except for fat in the second year and tended to increase toward the end of lactation. Highest protein contents were observed in goats with single litter size and lowest fat contents in does with three and more kids (Ciappesoni *et. al*., 2004).protein in Damascus shami goats in Sudan condition were about 3.42% and total solid 13.08% Mhamoud *et. al* (2012).

2. 3. 1.2.3. Milk total solids

Total Solids (TS), Solid-Not-Fat (SNF) and ash contents of goat's milk show a little variation within and in between breeds of goats. El Gallad et. al. (1998) reported that, all milk constitutes were negatively correlated to the amount of milk secreted by the dairy goats, and increase with increased energy content of the diet. Baruah et. al. (2000) reported that, the milk total solids ranged between 15.77 ± 0.18 to 14.92 ± 0.23 and the overall mean for total solids, solids-not-fat, lactose and ash were 17.4%, 10.6%, 4.7% and 0.88% respectively

2. 3. 2. Factors affecting productive Performance of kids

The reproductive performance in goats is known as the number of kids weaned per doe per year and it was influenced by some factors as fertility, and survival rate (Pinkerton *et al* 1990), and also it's one of the main determinants of productivity of goats (O'Shea, 1983), to a certain environmental condition (Hossain *et al*,2004). The level of reproductive performance is dependent on the interaction of genetic and environmental factors (Greyling, 2000). Generally the reproductive and productive traits are directly related so, that , the age at first kidding, kidding interval and the size of the offspring can influence the lactation period, milk production by lactation, lifetime milk production and , mainly the number of animals available for replacement and selling, and also allows greater selection pressure (Ribeiro *et al*, 2000).

2. 3. 2. 1. Birth weight

Birth weight is an important factor in production. It is influenced by environmental condition, genetic, sex, type of birth, condition before breeding and season of birth. Darokhan and Tomar (1983) reported that, birth weight is one of the traits that have no direct economic values but permit early selection by its high association with growth and production in later ages. The

average birth weight of crossbred Sannen and Nubian kids was 3.56 Kg for the range of 4.8 – 2.0 kg (El Zubeir and Abd El Gadir, 2005). kids born as twin had lower birth weight and slower early growth rate than those born as single, but had a higher post-weaning growth rate. In general, males were all significantly heavier than females, and the effect of birth month suggests planning the kidding season would improve production efficiency (Wenzhong Liu *et al*, 2005).

Study on Black Bengal goat showed the effect of region, birth type and sex were significant ($p<0.01$) on the birth weight, single kids showed the highest weight at birth following by twins and triplets, while birth weight of kids varied according to sex, male kids had higher birth weight than females (0.93±0.02kg) (Husain et al, 1996). Study of the reproductive performance of South African indigenous (Boer and Nguni) goats was reported that mean kid birth weight (2.7± 0.5 kg), in addition male and crossbred kids were significantly ($p<0.01$), heavier than female and pure Boer goat kids, respectively. The mean birth weights for singles, twins, triplets and quadruplets were significantly ($p<0.01$), different from each other (Lehloenya *et al*, 2005) Alama (1987) noted that the birth weight of single and twin Gezira sub-ecotype were 4.2 and 3.2 Kg respectively. Sex of kid also influences weight at birth and males were heavier than females (Khan, 1979; Darkokhan and Tomar, 1983; Lebbie and Manzini, 1989; Karua, 1989 and Nefzaoui et. al., 1995). The birth weight of Jamnapari goats was studied by Khan (1979) and showed that, birth weight of Jamnapari ranged between 2.20 and 4.80 kg for males and between 1.40 and 4.00 Kg for females.

2. 3. 2. 1. 1. Effect of breed on birth weight

The breed is the one of the important factor affected the birth weight Adeney reported that different in birth weight between different breeds were high significant this was supported by the findings of (Bala *et al*,1986).

2. 3. 2. 1. 2. Effect of doe weight on birth weight

The weight of the doe is plays an important role on kid birth weights. The size, weight and health status of the doe is important factors which may affect birth weight of kids (Hossain *et al*, 2003); this could be attributed to the fact that the heavier doe have larger consuming capacity to consume more feed and thus provide more nutrients to foetus, and hence results in the production of heavier offspring. Findings of Amoah *et al* (1996) revealed that, the mating weights improve the birth weight of the offspring, and there was significant decrease in birth weight as litter size increased. Finding of Devendre (1990) revealed that the dam's weight influence litter size, and does which are heaviest at kidding tend to produce larger litters.

2. 3. 2. 1. 3. Effect type of the birth on birth weight

The type of birth is considered as one of the most important factors influencing birth weight in goats (Das *et al*, 1996; Kosum *et al*, 2004). Type of birth affected birth weight where 1.21, 1.15, 1.01 and 0.85 kg for single, twin, triplets and quadruplets, and he concluded that, birth weight decrease with increase in litter size (Tuah *et al* ,1992). Generally the birth weight decreased with increase in litter size, the effect of birth type was persistent from birth to yearling age (Husain *et al*, 1996; Gubartalla *et al*, 2002). Faiz *et al* (1994) found that, there was increase in birth weight of single than twins and triplets, and this may be due to attributed to limitation of the uterine environment for twin and triplet, as the number of fetuses increase, the number of caruncles attached to each fetus decrease, thus reducing the feed supply to the fetus and hence reduction in the birth weight of the kids .

2. 3. 2. 1.4. Effect of sex of kids on birth weight

The sex of the kids had been considered as one of the factors which affect birth weight. (Wilson,1987, Abassa,1995).In Nubian goats male kids were significantly heavier at birth compared with female animals (Abu Nikhaila ,

ELHag, 2003). Male kids were born heavier than female 3.2+0.08 vs 2.6+0.08 kg for Tswana goat (Madibela *et al*, 2002).Results of Kochapakdee *et al* (2002) working with native Thai and their crosses with Anglo-Nubian goats showed that male kids were significantly heavier at birth compared with female animals and single kids were also significantly heavier at birth compared with multiple kids.

Study of Ageeb (1992) on Baggara goats in South Kordofan revealed that, the birth weight were heavier in males than the females . The birth weights of the twins in local Malawi goats for male's kids were 1.95+0.26 and 1.7+0.24 kg for female kids (Karua and Banda, 1992). Findings of Silva *et al* (1998) showed that kid birth weight of the Alpine dairy goats was varied 3.3-4.5 kg with males, 2.5-3.7 kg with females, and single. Generally several authors and researchers have shown that males are usually heavier at birth than females, and this attributed to the male sex hormone secretion from gonads which had some anabolic effect during pre-natal life (Abu Nikhaila and EL Hag, 2003).

2. 3. 2. 1. 5. Effect of season of birth weight

Season of the birth is the one of the most important factor which significantly affected kidding rate (Barding *et al*, 2000).Prasad *et al* (1972) reported that, the effect of season on litter size was evident, and they found higher twinning percentages in winter as compared with summer., and the authors concluded that the seasonal variation appeared to be an indirect effect due to better pasture condition in pre-winter period. Webb and Mamabolo (2004) reported that, the highest kidding rate of goats were attained in autumn 96%. Brading *et al* (2000) found that, months within season had a significant influence on kidding as November has the highest frequency (29.27%).

2. 3. 2. 1. 6. Effect of nutrition on birth weight

The nutrition is the one of the major factor influence the growth of the animal. Robison *et al* (1999) pointed out that, nutrition during foetal growth and

indeed during early-and- mid- pregnancy could impact of development changes that affect size, viability and health of neonatal growth. Malau-Aduli *et al* (2004) demonstrated that, supplementation with concentrate and crop residues increased birth weight and live weight gain of kids. Increased level of dietary energy supplementation resulted in higher supply of nutrients to the fetus and reflected higher weight (Hossain *et al*, 2003). high protein significantly increase live weight gain in goats, (Kabir *et al*, 2002).

Findings of Gubartalla *et al* (2002) revealed that the kids of Sudanese Nubian goats born to Sorghum fed group maintained heavier birth weight compared with the other group. The weight at birth was higher (0.71 vs 0.55 kg) in goats given the concentrate supplement than those of control goats. Cooper *et al* (1996) reported that, the live weight of indigenous Malawi kids from supplemented does were consistently heavier than those of unsupplemented animals. Generally most of the farmer rear goats with tethering as well as traditional system of grazing without any supplementation, this system of production cause reduced growth of the doe and kid and poor reproductive performance (Hossain *et al*, 2003).

2. 3. 2. 2. Litter Size

Litter size it is one of the most important factors influencing the birth weight in goats and its known as a doe yields multiple kids in one kidding (Steele, 1996). The reproduction rate increased progressively with the advance in birth type (Sodiq *et al*, 2003).Webb and Mamabolo(2004) found that the litter size of South African indigenous goats was 1.7 kids per doe, also Alexandre *et al* (1999) showed that, the litter size at birth ,during suckling and weaning were 2.25,2.05 and 1.95 kids respectively. Findings of Karua (1989) who studied the litter size of Malawi indigenous goats revealed that, the litter size was 1.35+0.5 and 1.33+0.5 in village and ranch systems conditions. Shalaby *et al* (2000) reported that litter size at birth was 1.47. Devendre (1990)

demonstrated that, the litter size is affected by body weight, birth type, size, season and level of nutrition.

2. 3. 2. 2. 1. Effect of doe body weight on Litter size

The live weight of the doe had direct affect on litter size, and it was the ability to improve the body condition or live weight of the doe at mating could improve ovulation rate and There is a significant relationship between weight at mating and litter size of does (Amoah and Gelaye, 1990). Demonstrated of Amoah *et al* (1996) revealed that increase in the mating weight significantly improved the litter size of does,. Another researcher Zygoyiannis *et al* (1989) reported that live weight loss during pregnancy affect litter size. Dams kidding multiples were heavier than those kidding singles (Karua, 1989, Devendre, 1990).

2. 3. 2. 2. 2. Effect of nutrition on Litter size

Agood nutrition with a good body weight will improve litter size (Sachdeva *et al*, 1973), The high energy diet seems to be associated with a greater proportion of multiple births,. Ikwuegbu and Ofodile (1994) reported that, the litter size were 1.6+0.6 and 1.5+0.5 for kids grazed forage legume and natural pasture grazing respectively, and were significantly affected by parity. Peacock (1985) reported that the low of twining rate may be due to nutritional stress limits the number of foetuses that the animals in communal areas can carry to term, on the other side.

2. 3. 2. 2.3. Effect of type of birth on Litter size

The type of birth is the most important source of variation affecting litter size (Mourad *et al*, 2000).The effect of the type of birth was highly substantial in goats (Awemu *et al*, 1999).

2. 3. 2. 2. 4 Effect of season of birth on Litter size

Season of the birth is the major factor affecting litter size, which is lower during the dry season (Alexandre *et al*, 1999). The litter sizes increased with parity, and were influenced by season (Majele-Sibanda *et al*, 2000). Environmental circumstances affect the number of ovaries ovulating and undergoing conception, and also the number of young born, born a live and weaned (Drobnic *et al*, 1999).Findings of Karua (1989) and Ndlovu (1992) revealed that, litter size were largest during the cool dry season (May-Aug) and smallest in the hot dry season (Sep-Nov),the twining rate was lower due to nutritional stress limits.

2.3. 3.Kid's Mortality

A major influence on population size is mortality, which begins even in egg stage. Mortality can be expressed as the probability of dying [death rate] Also complemented of the mortality rate in the probability of living [survive rate] because the number of survival is more important to the population than the number of dying. [Smith,1980]. Mortality rate among lambs is a major factor to determine the production of the herd and management efficiency. There are many factors affecting kids mortality such as diseases, inadequate nutrition, mismanagement and other individual characters of the kid. Usually kids have higher mortality rates than adult goat. Khan (1979) for Jamnapari goats of India showed that, the pre-weaning mortality was higher in the kids having low birth weight and the mortalities were 8.49%, 14.92% and 10% for pre-weaning, post-weaning and adult respectively. Awgichew *et al* (1989) reported that, pre-weaning mortality was higher in multiple born than single born kids (10% vs 11%).Working of Madibela *et al* (2002) revealed that survival rate were 91.9% vs 93.9% for multiples and singles kids. Nair (1979) found a mortality rate of 5.06%, 6.05% for Malabari adult males and females respectively, under normal conditions then the mortality rates increased to 32.73%, 11.16% for males and females due to outbreak of viral

pneumonia. Mukasa -Mugerwa *et al* (1986) reported mortality rates was 11.1% and 12.0% for males and females respectively. Working of Madibela *et al* (2002) revealed that survival rate were 91.9% vs 93.9% for multiples and singles kids.

2.3.4. Reproductive Performance

2.3.4. 1. Puberty

Puberty is defined as the stage or time at which generative organs become functioning and female or male is sexually mature (Robberts, 1971, Arthur and Ahunu, 1989). And It is known as the point of sexual development at which the animal becomes capable of reproduction (first ovulation in the female and first spermatozoa in the ejaculate of the male. Mukasa-Mugerwa and Lahlou- Kassi (1995) reported that, puberty affects production through age at first lambing, so, early maturing females known to have a relatively long and fruitful reproductive life (Abassa, 1995).

In the extensive system and uncontrolled conditions, the first kidding frequently occurs at 10 - 12 months, early physiological maturity is closely related to growth rate, and within breed differences are generally due to variation in feeding, management and disease (Devendre, 1990).The working of Hossain *et al* (2004) revealed that, the mean age at first heat mean was 209+32.25 days and body weight at puberty 8.08+1.28 kg, age at first kidding 401.5+32.08 days. Song *et al* (2000) reported that, age at the first estrus in the Korean native goat's doe is 141.24+18.17 days, and age of first pregnancy is 8+2.7 months and first kidding was 10-12 months, some tropical goats can produce their first kid when they are only 11 to 14 months old while others do not kid until they are over two years of age(Singh and Singh,1974) Badawy *et al*.(1971) found that young doe which had been born as singles . The onset of puberty is related to body weight which in turn depends on the level of

nutrition, age, type of birth, season of birth, kid contact with a buck and temperature variation (Walkdem-Brown and Bocquier, 2000).

2.3.4..1.1. Effect of season of birth in puberty

Season of birth has a significant impact on the timing of puberty in both the doe ling and bucking. The seasonal effects in the form of changing nutrient supply or changing photoperiod, in their natural habitats, modify the timing of puberty with those animals falling to achieve puberty in one season having to wait another 12 months for the appropriate nutritional and /or photoperiodic cues to trigger it's expression (Adam and Robinson,1994) and for kids that are well nourished this can be as young as 13 months but if nutrition during the growing phase is poor it can be as old as 36 months (Robinson *et al* , 2006).

The mean body weight at first oestrus for Boer goat kids born in January and August were 31.1 and 27.4 kg respectively (Greyling, 1996). Kids weaned in April (during the normal breeding season) exhibited oestrus significantly earlier than those weaned in December, this phenomenon can not be a scribed to a higher seasons, the level of nutrition or the ram effect it would seem as if season of birth is the main cue for the onset of puberty (Greyling, 1996).

2.3.4.12. Effect of age in puberty

One of the important factors of goat performance and productivity is the age at puberty (Odubote, 1992, Abassa, 1995). The age at puberty depend on nutrition, season of birth, and location but rearing system did not affect age at puberty (Hossain *et al*, 2004). Sakurai *et al* (2004) reported that, the average age at onset of puberty was 27+0.9 weeks in Shiba female goat, with average body weight of 12.2 + 0.5 kg. Faruque *et al* (2002) reported that, the highest age at puberty was observed in Black Bengal x Jamunapari breed (301.94 +18.47 days) and the lowest in random Black Bengal breeds (250.28 +15.67 days) with overall mean of 267.61 +9.96 days. Song *et al* (2001) found age of the first estrus in Korean native goat does is 141.24 + 18.17 days and age at

first pregnancy is 8.0 + 2.7 months., also Hossain *et al* (2004) found that, the mean age at first heat was 209 + 32.25 day with average body weight at puberty of 8.08 + 1.28 kg. Karua (1989) reported that, age at first conception was 10.6 + 1.9 month in village and 12.5 + 3.1 in ranch system. Hossain *et al*. (2004) and Benerjee (2004) reported that the average age of puberty was 196.5±7.5 days and 200 days respectively.

Greyling (1996) reported that ,age at first estrus for Boer female goats was 197.9 +29.6 and 203.5 + 40.3 days for kid weaned in December given high energy and in April for low energy were 155.8 + 54.8, 153.3 + 33.3 for high and low level of energy respectively.

2.3.4..1.3. Effect of nutrition in puberty

Nutrition plays an important role in determine of reproductive performance, and effect on puberty especially the level of energy supplies have a great impact on age of puberty and also on the age at first kidding, Increase in feeding level in goats reduced the age and increase the live weight at first estrus (Malau-Aduli *et al*, 2003). The nutrient supply to animals can influence their reproductive processes (Rastogi *et al*, 2006).

Walkdem-Brown and Bocquier (2000) and Robinson *et al* (2006) reported that, puberty will occur with adequate nutrition, and inadequate nutrition during the growing periods retards growth and delays puberty in the young doe. Non-supplemented Savanna Brown does at pasture were found to be cyclic at age of 219 days with body weight close to 10 kg (Fasonya *et al*,1992).The supplemented does first exhibited oestrus at 172 days and weight of 15.2 kg compared with 202 days and 15.4 kg for the grazing goes. The age at successful service in molasses fed group was lower than that of sorghum group (9.1+0.26 vs 11.1+0.85) (Gubartalla *et al*, 2002). Generally nutritionally induced body weight loss influences the secretion of ovarian steroids and eventually induces ovarian quiescence (Tanaka *et al*, 2004).

2.3.4.14. Effect of buck in puberty

The presence of male goats within the flock may provide stimulation of endogenous mechanism leading to the initiation of estrus cycles in the pre-pubertal kid ,and it is known that the presence of the male does modify the timing of the first oesturs of the breeding season in a dult female goats (Ott *et al*, 1980).

Usually in tropics zone ,natural mating in goats occurs with the male that run freely with females all year round or during the once-a-year breeding season (Alexandre *et al*, 2000).

2.3.4.15. Effect of body weight in puberty

One of the factor affected the reproductive performance is the body weight of the female .It is generally considered that female may be mated when they reached 50% of their adult body weight, and this weight can be attained at varying ages according to diet composition (Walkdem-Brown and Bocquier, 2000. Hossain *et al* (2004) reported that, young female attained puberty at an average age and weight of 209+32.25days and8.08+1.2kg. Mukasa-Mugerwa and Lahlou-Kassi (1995) working on Menz sheep of Ethiopian highlands found that, the puberty onset can be enhanced by weaning weight averaging about 8.6 +0.1 kg.

٢.3. ٥ Gestation Period

It is the period extending from the date of conception and fertilization of one or more ova after successful mating to that of delivery. Its duration ranged between 145 and 155 days for both sheep and goats (Mukasa-Mugerwa *et al*., 1988). For tropical goats it is reported to be less by 3–5 days which may be attributed to either genetic or environmental factors. Devendra and Mcleroy (1987) studied the gestation periods in several breeds of goats in the tropics

and reported that gestation periods ranged between 144 to 153 days with average 146 days.

٢.3. ٥ .١ . Factor affecting gestation period

There several factors affecting the gestation periods of goats include genetical and or/ or environmental factors, such as breed, size of goat, sex of kids, litter size, order of birth, ambient temperature and time of year.

٢.3. ٥ .١ .1 Breed

Many workers (Elnaim 1979, Jubartalla, 1998 and Elabeid, 2002) studied the gestation periods of Sudanese Nubian goats. Elnaim, (1979) reported that the gestation period was 146.5 ± 1 days, while Jubartalla (1998) reported that gestation periods ranged between 143–149 days. Also, Elabeid (2002) was agree with other workers and reported that, gestation periods averaged 148.57 ± 3.6 days. Badawy *et. al*. (1971) studied the gestation periods in Egyptian Baladi goats and reported that the gestation period was 148.81 days.

2.3.5.1.2 sex kids

Ageeb (1992) studied the effect of sex of kids on gestation periods of Baggara goats and observed that, the sex of kids had significantly effect on gestation. Obviously, when does bearing female kids had longer gestation period (147 ± 2.9 days) than does bearing male kids (146 ± 1.3 days). On the other hand, El-naim (1979) and Kudouda (1985) studied Sudanese Nubian goats and Mishra et. al. (1979) studied Indian Sirohi goats and reported that sex of kid had no significant effect on gestation period.

2.3.5.1.3. Age at first kidding

Age at first kidding is important because of its effect on the gestation period and the economics of goat production; this means that where goats kid for the first time at an early age there is a greater population turnover (Devendre,

1990). In semi-arid zone, most does tend to produce their first kids between 303.7 and 487 days of age (Abassa, 1995). Bhoite *et al* (1995) found that, farm, year, season and breed had effects on age at first kidding. Alexandre *et al* (2000) found that, the age at first kidding averaged about 17.2+3.1 month for Creole goats. Age at first lambing varied with weaning season and post-weaning nutrition, factors which also affected puberty onset resulting in a strong relationship between two characters (Mukasa-Mugerwa and Lahlou-Kassi, 1995).

Faruque *et al* (2002) reported that, the age at first kidding was 411.59+11.38 day with a range of 397.42+11.29 to 413.71+32.1 days, and he demonstrated that, the variation of age at first kidding is partly environmental and partly genetic in nature, Alexandre *et al* (2000) showed that, different means of age at first kidding from year to year due to differences in growth rate of female goats between years. Ribeiro *et al* (2000) reported that, the mean age at first kidding was 402.28+19.14 day (13.14) months.

2.3.5.1.4. Litter size (type of birth)

Kudouda (1985), who reported that gestation period was not affected by type of birth for Barbari and Sudanese Nubian goats respectively. While Khan et.al. (1982) used 107 gestation records of Jamunapari breed in India. They reported that the mean value of the gestation length was 147.9 ± 0.327 days and observed one day difference in gestation period length between single and twin.

2.3.5.1.5 Season of kidding

Mishra et. al. (1979) reported that the Sirrohi and Criollo Anglo-Nubian goats reported that season of kidding had no significant effect on gestation period.

2.3.6. Kidding Interval

kidding interval is the period between two consecutive , and it's composed of serviced period kidding to conception and gestation period. The gestation period of most indigenous tropical goat breed is not known with accuracy (Wilson,1976). This is a useful comparison of fertility and productivity between breeds. A regular kidding is known to be economical in terms of production and breeding efficiency. Wilson (1976) reported that, the kidding interval of Southern Darfur goats averaged 238 ± 41 days.

2.3.6..1. Factors affecting kidding interval

The length of the kidding interval is mostly affected by the service period and varies with breed, level of nutrition, age of the dam and season.

2.3.6. 1.2. Breed

Ndlovu (1992) reported that, the kidding interval of the Zimbabwean Small East African goats seem to range from 213 to 270 days. Ageeb (1992) reported that, the kidding interval of Baggara breed was 234.1 ± 28.9 days. Riberio *et al* (2000) demonstrated that, the kidding interval of Saanen goats in Brazil varied from 172 to 757 days with means of 328.49 + 36.71 days (10.95 months).

2.3.6. 1..2. Level of nutrition

The level of nutrition were affected kidding interval and had been studied by many workers. Singh and Sengar (1970) reported that, the kidding interval of Jamnapari does was shorter when fed on high and medium energy feeds compared to does on lower energy diet. Sachdeva *et. al.* (1973) studied the effect of plane of nutrition on reproductive performance of Barbari and Jamnapari goats. They found that the kidding intervals were (242days) Jubartalla (1998) studied the effect of feeding Molasses based ration and sorghum based ration to Sudanese Nubian goats and reported that, the kidding

interval was 271 ± 27 for sorghum fed group and longer compared to the molasses fed group 251 ± 41 days

2.3.6. 1.3. Season of kidding

Kidding interval was affected by seasons and had been studied by many workers. Haumesser (1975) reported that, year and season of kidding had a significant effect on interval 235.71 days in the monsoon season Vs. 271.39 and 278.22 days in summer and winter respectively. Cabello *et. al.* (1991) claimed that in Anglo-Nubian goats, season of kidding significantly affected kidding interval 214.9 days for female kidding in the rainy season Vs. 246.3 in the dry season.

2.3.6. 1.4. Effect of postpartum period on kidding interval

The postpartum period on kidding interval, it considered as an important trait which contribute to the productive efficiency, and the short or long cycles neither affected the reproductive efficiency of the goat, and it's varies widely (40-170 days) (Walkden-Brown *et al*, 1997, Greyling, 2000).

The most variable component of the kidding interval is the period between kidding and the first postpartum estrus, referred to as postpartum or lactation anestrous.

Adnan *et al* (1991) reported that, the duration of postpartum anoestrus is an important factor influencing the kidding interval. Avarity of genetic, environmental and husbandry factors may act on the postpartum animals to influence ovarian activity postpartum, these include, nutrition, body weight, suckling, season, climate (environment), disease, endocrine status, uterine involution (Peters, 1991; Elsheikh and Yagoub, 2006).

2.4. Growth and Development

Growth is the increase in size and change in body composition. Toylor (1995) stated that growth is an increase in body weight until mature size is reached. The time at which maximum growth rate is attained varies in different species and is of great economic importance as it determines the time of profitable gain. Das *et al* (1996) reported that the genetic and environmental factors are known to affect growth rate, among the later are, age of the doe, year and season of birth sex of kids ,type of birth, level of nutrition, management and health programme. Growth rate can be effectively divided into two period, they were pre-weaning average daily gain, and post-weaning daily gain (Edey, 1983).

2.4. 1. Pre-weaning growth

The pre-weaning growth period is characterized by high growth rate compared to the post-weaning growth rate. A high pre-weaning average daily gain reflects the genetic potential for the growing animal and mothering ability of the doe (Das *et al*,1996; Alexandre *et al*, 2002).The major factors affecting the pre-weaning growth rate genotype, birth weight, milk production and litter size (Edey,1983), sex, nutrition, maturing rate (Boggs and Merkel,1993 ; Sswannyana *et al* ,2004).

The growth rate of kids influenced by the type of ration offered to their dams during lactation, the more milk a kid has available, the faster and larger it grows, thus a single kid grows better than an individual twin and kids with a mother with lots of milk grow more quickly(Steele,1996).

The type of birth had significant influenced on the body weight gain of the kids and thus the growth rate (Abu Nikhaila and EL Hag, 2003).Working of Madibela *et al* (2002) on Tswana goat revealed that, the average daily gain was 104+4.3 vs 69.8+2.8 g/day different between singles and multiples kids, after birth single kids grew faster than twins kids. The effect of sex on growth

rate, demonstrated by Das and Sendalo (1992) that, single born kids were heavier than twins at all ages of weight recording. Mohgoub and Lodge (1998) showed that, the pre-weaning daily gain was 120 and 105 g/day for Oman Batina male and female kids respectively. Sexana *et al* (1990) reported that, the growth rate in pre-weaning was slightly higher in twins and male than female, but the differences were not significant.

Season and year of birth had significant effect on pre-weaning rates (Kosum *et al*,2004).Season of birth plays an important role in growth performance indirectly through its influence on the dam's nutrition and hence amount of milk available to the unweaned lambs (Das. 1993).

2.4. 2. Weaning weight

Weaning is the time when the kids and their mother are separated, (Steele, 1996).According to Das and Sendalo (1993) weaning weight is an excellent indicator of productivity because it reflects both litter size mothering ability and milking ability. The study of Kosum *et al* (2004) revealed that, the weaning weight was changed from 13.56 to 17.19 kg with average of 15 kg, and the effect of year of birth, type of birth and birth weight on weaning were significantly.

Das *et al* (1996) reported that, the weaning weight average of 11.14+0.15 kg, and he concluded that, the body weight at weaning were significantly affected by breed and kid sex. Working of Karua and Banda (1994) revealed that, the 12 week weight and weaning weight at 17 weeks were 8.2+0.4 and 10.7+0.62 kg for the Small East African local Malawi goats and 11.4+1.5 kg and 19.2+2.39 kg for the Saanen crosses.

Type of birth had the greatest influence on weaning weight, Nicoll (1985) working with Angora goats in Zealand stated that, the single reared kids were significantly heavier at weaning .A similar results obtained by Saxena *et al* (1990) and Madibela *et al* (2002) who reported that, kid which were singles

grew faster 104+4.3 vs 69.8+2.8 g/day and were heavier 15.8+0.6 vs 10.5+0.4 kg at weaning than those reared as multiples. The weaning weight of singles might be because dams with more than one kid could not provide sufficient nutrition during pre-weaning period to each kid, and higher birth weight of singles had carry-over effect till weaning.

The effect of sex of the kids on weaning weight was observed by Saxena *et al* (1990), he found that males were significantly heavier than female at weaning in Jamunapari goats Season of birth had significant influence on birth and weaning weight (Das and Sendalo, 1992).

2.4. 3. Post-weaning growth

The early post-natal phase of growth in goats is a critical stage because this is the stage when there is little maternal protection and the kid is exposed to environmental stress which limits rate of growth (Das *et al*,1996).The post-weaning growth period is characterized by a decrease in growth rate ,and the kids start depend on their self to meet their nutrients requirements .The post natal growth of the animal is affected by many factors as breed, type and sex of the kids, plane of nutrition and season of birth(Wilson,1986, Das and Sendo, 1992).

Mavrogenis *et al* (1984) reported that, the post weaning growth rate was similar in all kids, regardless of type of birth and dam lactation number, indicating that differences in early perinatal growth (until weaning) are caused to a considerable extent by maternal factors, the size of litter, the availability of milk, the number of individuals suckling, and their vitality and aggressiveness.

The average daily live weight gain was highest (52.96 g) in goats fed high energy diet and lowest (37.77 g) in goats fed low energy diet (Shahjalal *et al*, 1992).The average daily gain for the Malaysian indigenous goats, kids fed the improved diet was significant higher for all age groups(3-6 and 6-12

months)as compared with kids suckling their dams, (30.6±16.7, 15.2±9.85 g) and (20±8.62 , 11.8±6.60 g) respectively (Adnan *et al*,1991).

Male were significantly heavier and grew faster from weaning onwards, their differences increased from 16 to 72 weeks of age implying that sex effect are more pounced with age after puberty (Das and Sendalo, 1992). In post-weaning period the influence of season is related to its effect on the quality and quaintly of pasture available to the weaned kids ((Wilson, 1986; Das *et al*, 1996).

CHAPTER THREE

MATERIAL AND METHOD

The experiment was conducted during the period extending from 2011 - 2014, to assess the effect of the season on the performance of the Shami (Cyprus) Goats

3.1. Farm Location and description

The study farm located in Eastern Sudan (Kassala State) the farm is belonging to the Ministry of Agriculture and Animal Resources. It was lied in the Western part of Kassala Town, and it was been establish in 1964, the area of the farm is about 20 Fadden, five Fadden for cultivate of alfalfa (Medicago Sativa) for the animals in the farm. The farm consist of animal's feed, dairy animals and others, Beef, poultry Artificial Insemination unit and Shami Cyprus Goats unit.

3.2. Experimental animals

Three hundred and sixty of Shami Cyprus goats consisting of males and females were imported from Cyprus to Sudan by air to Khartoum and then immediately transported to Kassala in January 2011.The three hundred goats were pregnant in seven and nine weeks the males kept with the females in the farm in the ratio of 1: 25.

3.3 Animal housing

The stall was constructed to protect the animals against temperature, storm ,climates condition and predators. Adequate ventilation was ensured plus feeding equipment’s and free access to drinking water, Six pens were equipped the three biggest for the mature animals in different physiological and production status, the rest of the pens are provided for kids and younger animals.

3.4 Feeding system

The animals were fed on dry alfalfa (*Medicago Sativa*), depending on age and physiological stage; the animals were also offered 0.5-1.5 kg of concentrate mixture consisting of nut ground cake, sorghum seed, wheat bran, limestone and salt in the table blow. The concentrate offered once daily constantly while the dry alfalfa was offered twice after milking. Clean water was freely available.

Table: Ingredients formulation write the table in separate page

	Item	**Percent**
1	Sorghum seed(feterita)	33%
2	Wheat bran	33%
3	Ground nut cake	33%
4	Limestone	0.5%
5	Salt	0.5%
	Total	100%
	M.E.	12 MJ
	Protein	25 %

3.5. Data collection

The collection of information relied on farm records.

3.6. productive traits and breeding program

During experiment period bucks were allowed to stay with females, where close observations changes in behavior and appearance of estrus cycle signs, the post-partum anestrus for female gestation period, kidding interval, litter size and puberty were recorded.

3.6.1. Kids and does growth

The kids were weighed immediately following delivery at their birth weight and recorded then weighed at definite intervals up to weaning from second to third month of age according to their weight (pre-weaning, weaning and post-weaning). Kid's mortality also was recorded. On the other hand, goat's female milk yield, lactation length, were recorded.

3.7. Health and disease control

Vaccination against the major prevailing epidemic diseases internal and external parasites, controlled in good way.

3.8. Milk system

For milking purposes there was (Milk shed) and the animals are milked by hand once daily in the morning and then measuring by milking cup, this program is going on till weaning after that the does milked twice a day.

3.8.1. Milk composition

Five liters of fresh milk samples were collected from different lactated goats and kept cooled to be analysed at milk laboratory of Animal Production Research Centre (Kuku) in Khartoum.

3.8.1.1 Determination of milk Fat content

Fat content were determined using Gerber method according to (Marshal 1993) ten ml of sulfuric acid (specific gravity 1.82 at 15.5C) were measured into a Gerber butyrometer. From a well mixed sample at 24C, a sample of milk was withdrawn using 10.94 ml pipette. Milk was allowed to drain into the butyro meter slowly at first to prevent a violent reaction with the acid then the pipette was permitted to drain normally. One ml of amyl alcohol (sp.g. 0.814 at 15.5c) was added and the lock stopper was inserted securely. With the stopper end up, the butyreometer was grasped at the graduated column and shaken until the crude was completely digested. Holding the butyrometor at the stopper and neck was inverted five times to mix the acid remaining in the bulb with the contents. The butyro meters were then placed in a rack and centrifuged at 1100rpm for four minutes.

The butyrometer was placed in the water- bath 65c, leaving only the bulb exposed, for five minutes. the straight line at the bottom of the fat column was pushed gently upwards so that it coincided with nearest whole percent graduation mark .the scale at the bottom of the meniscus at the top of the fat column was read promptly to the nearest 0.05% graduation the lower reading was subtracted from the upper reading and the differences was recorded as fat content.

3.8.1.2 Determination of milk protein content

Total Nitrogen was determined using Kjeldahal method (Marshal,1993) ten ml of milk sample were weighted into Kjeldahal digestion flask.25 ml of sulfuric acid (sp.g.1.84,nitrogen-free) was added to the flask. Two tablets of Kjeldahal catalyst (each tablet contain 1 gram of Na2So4 and equivalent of 1 gram Hg) .the flask was placed on a heater for three hours or until the solution become clear. The flask was then cooled to room temperature and the solution diluted to 100 ml by graduate pipette using distilled water. Five ml of the

sample was transferred to distillator and then 10 ml of 40% sodium hydroxide (Na OH) were added. The distillate was received in a conical flask containing 25 ml of boric acid and bromocresol green plus methylene blue as indicator, until the volume reached 75 ml, the sample was then titrated with N/10 HCL. The acid consumed was then measured.

The protein content was calculated as follows:

$$\text{Crude protein (\%)} = \frac{T \times N \times 0.014 \times 20 \times 6.38}{\text{Weight of Sample}} \times 100$$

Where:

T = titrate volume

N = normality of the HCL

3.8.1.3 Determination of milk ash content

Ash was determined by gravimetric method (Marshal, 1993). The principle of the method is to burn all organic matter at a temperature of 540-550 C .Ten grams of milk were weighted accurately into a dry clean pre-weighted crucible. The sample was burned in a muffle furnace regulated at 550C for 1.5 hr. Then cooled .the crucibles were removed and placed in a desccater to cool and weighed. Then the ash content was calculated accordingly to the following formula:

$$\text{Ash (\%)} = \frac{\text{Weight of residue}}{\text{Weight of the sample}} \times 100$$

3.8.1.4 Total solid content

The total solid content was determined by gravimeteric method as follows: the required number of trays of aluminum drying dishes were placed into a desiccators from the oven (100 C^o) using fresh phosphorus pentoxide as desiccant. When cool, the numbered dishes were removed singly from the desiccators and weighed. One gram of milk sample was added into the dish

and reweighed accurately. The dishes were tilted to give an even covering of milk on the base and transferred to the hot plate surface (137 C^o). When the milk has dried and just started to brown the dish was removed from the hot plate,, placed on its appropriate position on the tray and placed in the oven (100 C^o) for 1½ to 2 hours. The tray was then removed to a desiccator with fresh phosphorus pentoxide, cooled and the dishes reweighed. The total solid was calculated from the following equation:

Wt. of (dish +sample) – Wt. of dish = Wt. of milk sample.

Wt. of (dish + dried sample) – Wt. of dish = Wt. of solid material

$$\text{Total solids \%} = \frac{Wt.of\ solid\ material}{Wt.of\ milk\ sample} \times 100$$

3.9. Live Animal Measurements and Weight

The animal measurement and weight done according to (Owen *et al*., 1977and Singh *et al*., 1979).The measurement included: heights at withers, neck length, heart girth, face length, ear length and back length. Electronic weighing balance were used for birth weight, weaning weight, weight at first service and weight at different ages males and females.

3.10. Statistical Analysis

The Statistical Package for Social Sciences statistical computer software (SPSS for windows release version, 10.5). was used to analyze the data by Independent – samples T test. The analysis data were described by mean, standard deviation and Std.Error

CHAPTER FOUR

RESULT

4.1. Productive performance

The data in table (1) show that the milk yield of the Shami Cyprus goats in the two seasons winter and summer In the winter the yield per day was 3.16±0.82 liter, 3.69±0.53liter for the single and twins does respectively, while milk yield in summer per day was 2.4 ±0.8 liter, 3.4± 1.2 liter for the single and twins does respectively showed high significant(P<0.01). The average milk yield in both seasons was 3.16 ±0.84liter per day. The milk yield in the winter higher than in the summer. The result showed that the does producing twins yields more milk than the doe produce single showed high significant(P<0.01).. The milk yield through the lactation period was range (528–682 liter) according to the season.

Table 1: The effect of the seasons and litter size on milk yield

Season	Variable	N	Means + SD	S. E	Significance
Winter	Single	49	3.16±0.82 liter/day	0.09	*
	Twins	68	3.69±0.53 liter /day	0.12	
Summer	Single	24	2.4 ±0.8 liter /day	0.13	*
	Twins	67	3.4± 1.2 liter /day	0.17	
Total average	-	208	3.16±0.84 liter /day	0.13	

** = P<0.01

* = P<0.05

Sig = significant

4.1.2 Lactation length

The lactation length of the Shami Cyprus goats in table (2), revealed the lactation length and it was 225 ± 2.7 day, 236 ± 3.7 day in the winter for the single does and twin does respectively and 190 ± 10.8/day, 212 ± 11.7 days in summer for the single does and twins does respectively. The average lactation length of the Shami Cyprus goats in the Farm was 215 ±8.69.

Table 2: Lactation length of the shami Cyprus goats according to the type of the birth

Season	Variable	N	Means + S D	S. E	Significance
Winter	**Single**	**54**	**225.91 ±4.73**	**0.64**	
	Twins	**79**	**236.15 ±7.54**	**0.83**	**
Summer	**Single**	**24**	**190 ± 10.8/day**	**2.09**	
	Twins	**67**	**212 ± 11.7/day**	**1.4**	**
Total Average	**-**	**208**	**215 ±8.69/day**	**1.04**	**

** = P<0.01

* = P<0.05

Sig = significant

4.1.3 Milk components

The data in table (3) show the milk component percentage of the Shami Cyprus goats in the two seasons (winter and summer). The component percentage of protein, fat, lactose, Ash and total solid for the winter as follow: 3.71 ± 0.13, 3.81 ± 0.72, 4.63 ± 0.26, 0.83 ± 0.03 12.98 ± 1.14 respectively and the percentage of summer were 3.2±0.19, 3.5±0.21, 4.06±0.3, 0.78±0.03, 11.58±0.18 respectively.

Table (3) Milk component percentage of the shami Cyprus goats in Winter and Summer

Variable	Components	N	Means + S D	S. E	**Significance**
Winter	Protein	20	3.7 ± 0.13	0.44	*
Summer	Protein	20	3.2 ±0.19	0.04	
Winter	Fat	20	3.81 ± 0.72	0.22	*
Summer	Fat	20	3.5 ±0.21	0.05	
Winter	Lactose	20	4.63 ± 0.26	0.08	*
Summer	Lactose	20	4.06 ±0.3	0.06	
Winter	Ash	20	0.83 ± 0.03	0.10	*
Summer	Ash	20	0.78±0.03	0.01	
Winter	Total solide	20	12.98 ± 1.14	0.84	**
Summer	Total solide	20	11.58±0.18	0.05	

4.1.4 Kids birth weight

The result of data at birth weight of the shami Cyprus kids were affected by different season. The result were revealed in Table (4) showing the birth weight 4.50 ±0.40 - 3, 86 ±0.30 kg ,in the winter for the single and twins respectively while in summer 4.01±0.35 kg - 3.50±0.33 kg for the single and twins respectively. The overall means of the birth weight of the shami Cyprus kids were 3.96±0.39 (Kg)

Table 3: Kids Birth weight in different seasons of Shami goats

Season	Birth number	N	Mean ± SD	S. E	Significance
Winter	Single	103	4.50 ±0.40(kg)	0.062	**
	Twins	149	3.86 ±0.30(kg)	0.044	
Summer	Single	55	4.01±0.35(kg)	0.079	**
	Twins	140	3.50±0.33(kg)	0.048	
Total average	-	447	3.96±0.39 (Kg)	0.029	**

** = P<0.01

* = P<0.05

Sig = significant

4.1.5 Kids sex birth weight in different seasons.

4.1.5.1 Birth sex weight in winter

The result in table (5) showed that the sex birth weight of the kids born in the winter were highly significant ($p<0.01$), effected on birth weight. Single male kids heavier (4.28±0.50) than female single kids (3.86±0.40) kg, while in twins male and twins female, showed high significant($P<0.01$) on the birth weight and also the male twins weight 3.87±0.35kg heavier than the female twins, kids 3.41±0.33kg.

Table 4: Sex birth weight at different seasons

Seasons	Sex	N	Mean ± SD	S.E	Significance
Winter	**Male**	**125**	**4.28±0.50(kg)**	**0.2610**	
	Female	**129**	**3.86±0.40(kg)**	**0.1824**	**
Summer	**Male**	**98**	**3.87±0.35(kg)**	**0.1770**	
	Female	**106**	**3.41±0.33(kg)**	**0.6551**	**
Total average	**-**	**458**	**3.85±0.39**	**0.3188**	**

**=P<0.01

* = P<0.05

Sig= significant

4.1.5.2 Birth sex weight in summer

The result in table (5) showed that the birth sex weight in summer highly significant ($p< 0.01$) effected by climate. The means value of single male kids and single female were (3.87±0.35)kg,(3.41±0.33)kg respectively The birth weight of kids were heavier in single born kids than females born kids .

In table (6) the birth weight of kids in the winter was higher significantly ($P<0.01$) and heavier than that kids born in summer, this might be referred to the good environmental condition which led the doe consume a large amount of food in the winter. The birth sex weight of kids in winter and summer were (4.07±0.48 kg) , (3.63±0.41kg) respectively.

Table 5: Birth weight in different seasons of Shami goat

Seasons	N	Mean ± SD	SE	Significance
Winter	**254**	**4.07±0.48(kg)**	**0.043474**	
Summer	**204**	**3.63±0.41(kg)**	**0.044833**	**
Overall average	**458**	**3.85±0.39**	**0.029189**	**

**=P<0.01

* = P<0.05

Sig= significant

4.1.6. Weaning

4.1.6.1. Weaning weight

The weaning weight of the shami Cyprus goats were showed in table (8). The result indicated that the weaning weight of the (shami) Cyprus goats kid was significant (P<0.01) and the weight was (12.80 ± 1.85 kg), (12.34 ± 1.00 kg) for the male and female respectively. The overall average means of the weaning weight were (12.55 ± 1.48 kg).

Table 6: Weaning weight of the shami kids goats:

Parameter	N	Mean + S D	S.E	Significance
Male	**198**	**12.80 ± 1.85 (kg)**	**.13148**	
Female	**221**	**12.34 ± 1.00 (kg)**	**.06763**	*
Overall average	**419**	**12.55 ± 1.48 (kg)**	**.07242**	*

** = P<0.01

* = P<0.05

Sig = significant

4.1.6.2. Weaning age

The weaning age of shami Cyprus goats in winter and summer were found in table (9), they were not significant (P>0.01) in winter and summer for the males and females. The males weaned faster (66 days) than the females 67 days in the winter, while in summer the male (68 days) and female69 days.

Table 7: Age at weaning in different seasons and sex of Shami goat

Season	Sex	N	Mean ± SD	S.E	Significance
Winter	Male	120	66.12 ±6.15 (day)	0.22638	NS
	Female	129	67.63 ±1.18 (day)	0.09564	
Summer	Male	96	68.30±9.75 (day)	0.31869	NS
	Female	105	69.68±1.04 (day)	0.099524	

NS = not significant

4.2. Kids Mortality percent

The data in table (10)showed kid's mortality percent of the shami Cyprus goats in winter and summer. In winter the mortality was (10.0 ± 3.65 %) (13.29 ± 2.26%) for single and twins respectively, and in summer it was (16.92 ± 4.8) and (18.31 ± 1.7%) for single and twins respectively. The overall mortality rate percent means was (14.81 ± 2.8 %).The number mortality kid's in summer high than in winter.

Table 8: Kids Mortality percent

Seasons	Variable	N	Means + S D	S E	Significance
Winter	Single	103	10.0 ± 3.65 %	0.93	**
	Twins	149	13.29 ± 2.26 %	0.49	
Summer	Single	55	16.92 ± 4.8	1.20	**
	Twins	140	18.31 ± 1.7 %	0.44	
Overall	Litter size	447	14.81 ± 2.8 %	0.70	**

** = P<0.01

* = P<0.05

Sig = significant

4.3. Reproductive Performance

4.3.1. Puberty age

The data in table (11) monitored the puberty of the Shami Cyprus goats in both seasons winter and summer (191.08 ± 2.91days), (192.86 ± 4.19 days) respectively. the average age at puberty of female Shami Cyprus goats was (191.88 ± 3.64 days). The result indicated that female Shami Cyprus goats were significant (P<0.01) in both seasons winter and summer.

Table 9: Puberty age

Season	N	Mean ±SD	S.E	Significance
Winter	**122**	**191.08 ± 2.91/days**	**0.263**	
Summer	**100**	**192.86 ± 4.19/days**	**0.419**	*
Total	**222**	**191.88 ± 3.64/days**	**0.245**	*

** = P<0.01

* = P<0.05

Sig = significant

4.3.2. First service

4.3.2.1. Age at first service

The data pertinent to the age at the first service period of the shami Cyprus female goat in both seasons winter and summer is presented in Table (12) and it was 270.88±3.84 days in winter while in summer was 276.89±3.93 The average age of the first service period was 273.89±3.93,days. The results indicated that the age of the first service period was not significant (P>0.05).

Table 10: Age at first service of the shami Cyprus goats

Season	N	Mean ±SD	S.E	Significance
Winter	**100**	**270.88±3.84(day)**	**0.38**	
Summer	**122**	**276.89±3.93(day)**	**0.35**	**NS**
Total average	**222**	**273.89±3.93,day**	**0.37**	**NS**

** = P<0.01

* = P<0.05

Sig = significant

4.3.2.2. Weight at first service

The average means weight at the first service of the shami Cyprus female goat were presented in table (13) for the both seasons winter and summer in winter was40.90 ±1.93 (kg), in summer was 40.55 ±1.47 (kg) and the average means was (40.72±1.7 kg).

Table 11: Weight at first service of the shami Cyprus goats

Season	**N**	**Mean ±SD**	**S.E**	**Significance**
Winter	124	40.90 ±1.93 (kg)	0.17	**
Summer	100	40.55 ±1.47 (kg)	0.15	
Total average	224	(kg) 40.72 ± *1. 7*	0.16	**

** = P<0.01

* = P<0.05

Sig = significant

4.3.3. Gestation Period

The average gestation period of the shami Cyprus goats were presented in Table (14) the value means were 150.75±0.79 (days) and,147.41±0.71(days) for the doe produces single and twins respectively. The result indicated that the doe produces single and twins was showed high significant (P< 0.01). The single gestation period was longer than twins gestation period.

Table 12: Gestation period of the shami Cyprus goats)

Litter size	N	Means + S D	*S. E*	Significance
Single	**32**	**150.75±0.79(days)**	**0.13**	*
Twins	**48**	**147.41±0.71(days)**	**0.1**	

** = P<0.01

* = P<0.05

Sig = significant

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4.3.4 Kidding interval

The data analysis of kidding interval of the shami Cyprus goats were presented in table (15) in both seasons in the Winter was 252.47 ±9.60 days, 253.66 ±7.64 days for single and twins respectively, while in Summer was 253.63±13.40 days, 256.09±8.04 days for single and twins respectively and the average mean value of the kidding interval was 253.71 ± 9.67 days the result indicated that the kidding interval of the shami goats were significant (P<0.05).

Table 13: Kidding interval of the shami Cyprus goats

Season	Variable	N	Means + S D	S E	Significance
Winter	Single	48	252.47 ±9.60 days	1.38	*
	Twins	67	253.66 ±7.64 days	0.93	
Summer	Single	25	253.63±13.40 days	1.68	*
	Twins	67	256.09±8.04 days	0.98	
Total average	.	207	253.71 ± 9.67 days	1.11	*

** = P<0.01

* = P<0.05

Sig = significant

4.3.5.First kidding

4.3.5.1. Age at first kidding

Age at the first kidding of the shami Cyprus goats was showed in table (16) the result indicated that the age at first kidding of the shami goats in the winter per days was 425.70 ±3.99, 428.10 ±3.73 for both single and twins respectively and was not significant while the age in Summer per days was 427.39 ±1.86, 430.18 ± 1.79 respectively, they was significant (P<0.01) .The average age at first kidding of the shami Cyprus goats in the two seasons Winter and Summer was 427.84 ± 2.84days.

Table 14: Age at first Kidding of the shami Cyprus goats

Seasons	Variable	N	Means + S D	S E	Significance
Winter	Single	48	425.70 ±3.99 days	0.56	NS
	Twins	67	428.10 ±3.73 days	0.44	
Summer	Single	54	427.39 ±1.86 days	0.25	*
	Twins	79	430.18 ± 1.79 days	0.20	
Average	.	248	427.84 ± 2.84 days	0.36	NS

** = P<0.01

* = P<0.05

Sig = significant

4.3.5.2. Weight at first kidding

Weight at the first kidding of the shami Cyprus goats were showed in table (17) the result indicated that the weight of the shami goats in the winter were 51.90 ±1.25 kg, 51.65 ±1.35 kg for both single and twins respectively and was significant p<0.05 in both seasons while the weight in Summer were 51.52±1.34 kg,51.13±1.27kgrespectively, single and twins the single weight was heavier than twins weight and the total average weight of the shami Cyprus goats in litter size and both seasons were 51.55 ± 1.3 kg.

Table 15: Weight at first Kidding of the shami Cyprus goats

Season	Variable	N	Means + SD	S E	Significance
Winter	**Single**	**48**	**51.90 ±1.25 (kg)**	**0.18**	**
	Twins	**67**	**51.65 ±1.35 (kg)**	**0.16**	
Summer	**Single**	**25**	**51.52±1.34 (kg)**	**0.26**	*
	Twins	**67**	**51.13±1.27 (kg)**	**0.15**	
Average season	**-**	**207**	**51.55 ± 1.3 (kg)**	**0.18**	*

** = P<0.01

* = P<0.05

Sig = significant

4.4. Body weight

The data in table (18) pertinent body weights at the age of first, second and third year for males and females of the shami Cyprus goats The result showed that body weight of sex Shami Cyprus goats were high significant (P>0.01).The weight of sex increased with age being higher with 52.80 ± 2.062 kg, 48.38 ± 2.328 kg, 66.79 ± 1.29 kg 55.32 ± 2.14 kg, 73.12 ± 4.10 kg, 58.89 ± 6.86 kg at first, second and third year for males and females respectively and all over means at three different years of the body weights of the shami Cyprus goats were 64.24± 2.5 kg, 54.17 ± 3.2kg for male and female respectively.

Table 16: Body weight of the Shami Cyprus goats in different ages

Age at	Sex	N	Mean ± SD	SE	Significance
One year	Male	25	52.80 ± 2.062 kg	0.287193	**
	Female	113	48.38 ± 2.328 kg	0.143534	
two years	Male	28	66.79 ± 1.29 kg	0.214642	**
	Female	105	55.32 ± 2.14 kg	0.142762	
Three years	Male	26	73.12 ± 4.10 kg	0.397105	
	Female	80	58.89 ± 6.86 kg	0.292831	**
Over all	Male	79	64.24± 2.5 kg	0.177893	
Over all	Female	298	54.17 ± 3.2 kg	0.103624	**

4.4 Body measurements of males and females in different ages

4.4.1. Body measurements at age of one year

The Description of body measurement of the shami Cyprus goat in(cm) were be seen in the age at one year for males and females and should be recorded. And it found in table (19) with(cm) was 28.12 ± 1.900, 29.09 ± 1.815, 77.44 ± 3.14, 75.53 ± 4.162,88.40 ± 2.901, 76.80 ± 6.24,42.20 ± 3.92,39.21 ± 1.97 (24.24 ± 2.90, 22.73 ± 7.99 and 19.28 ± .891, 20.67 ± 6.73.for ear length, height at wither, heart girth, back length, face length and neck length for the male and female respectively

Table 17: External body measurement at the age of one years

Variables	Sex	N	Mean± SD (cm)	Minimum	Maximum	Significance
ear length	Male	25	28.12±1.900	33	26	*
	Female	113	29.09±1.815	34	24	
height at wither	Male	25	77.44± 3.14	86	73	**
	Female	113	75.53±4.162	90	68	
heart girth	Male	25	88.40±2.901	94	84	*
	Female	113	76.80± 6.24	95	68	
back length	Male	25	42.20± 3.92	46	37	**
	Female	113	39.21±1.97	45	35	
face length	Male	25	24.24± 2.90	34	21	NS
	Female	113	22.73±7.99	212	19	
neck length	Male	25	19.28±8.91	21	18	NS
	Female	113	20.67± 6.73	91	18	

4.4.2. Body measurements at age of two years

The Description of body measurement of the shami Cyprus goat in were be seen in table (20) at the age at two years for males and females and should be recorded with(cm) was 29.42 ± 1.12, 29.67 ± 1.69, 80.93 ± 3.55, 76.04 ± 1.99, 99.04 ± 4.29, 87.87 ± 1.29, 44.29 ± 3.18, 40.16 ± 2.02,25.07 ± 1.94, 22.04 ± .89, 20.18 ± . 7721.27 ± 82 for ear length, height at wither, heart girth, back length, face length and neck length for the male and female respectively.

Table 18: External body measurement at the age of the age of two years

Variables	Sex	N	Mean ± SD	Mnimum	Maximum	Significance
ear length	Male	28	29.42±1.12	27.50	31.50	
	Female	104	29.67±1.69	26.50	34.50	NS
height at wither	Male	28	80.93±3.55	74	92	
	Female	105	76.04±1.99	71	79	**
heart girth	Male	28	99.04±4.29	92	107	
	Female	104	87.87±1.29	85	91	**
back length	Male	28	44.29±3.18	38	47	
	Female	105	40.16±2.02	36	46	**
face length	Male	28	25.07±1.94	23	28	
	Female	105	22.04 ± .89	21	24	*
neck length	Male	28	20.18± . 77	19	22	
	Female	105	21.27 ± 82	20	25	*

*=P<0.05 NS = non significant **=P<0.01

4.4.3. Body measurements at age of three years

Description of body measurement of the shami Cyprus goat at the age of three years with(cm) was be taken 29.65 ± 2.12, 30.06 ± 1.68**,** 81.81 ± 4.03**,** 77.94 ± 2.25**,**105.73 ± 4.80**,** 95.16 ± 3.12**,** 45.81 ± 5.22**,** 40.19 ± 1.30**,** 26.04 ± 2.46**,** 23.46 ± 1.51**,** 20.96 ± 1.15**,** 22.52 ± 1.47**.** for ear length, height at wither, heart girth, back length, face length and neck length for the male and female respectively

Table 19: Measurement at the age of three years

Variables	Sex	N	Mean± SD	Mnimum	Maximum	Significance
ear length	**Male**	**26**	**29.65±2.12**	**32**	**20**	
	Female	**80**	**30.06±1.68**	**33**	**26**	**NS**
height at wither	**Male**	**26**	**81.81±4.03**	**88**	**75**	
	Female	**80**	**77.94±2.25**	**84**	**72**	**
heart girth	**Male**	**26**	**105.73±4.80**	**113**	**98**	
	Female	**80**	**95.16 ± 3.12**	**100**	**88**	**
back length	**Male**	**26**	**45.81± 5.22**	**55**	**40**	
	Female	**80**	**40.19± 1.30**	**43**	**37**	**
face length	**Male**	**26**	**26.04± 2.46**	**30**	**22**	
	Female	**80**	**23.46± 1.51**	**26**	**20**	*
neck length	**Male**	**26**	**20.96 ± 1.15**	**23**	**19**	
	Female	**80**	**22.52 ± 1.47**	**25**	**20**	*

*=P<0.05 **=P<0.01

the average means body measurement (cm) was 29.42 ± 1.12**,** 29.67 ± 1.69**,** 80.93 ± 3.55**,** 76.04 ± 1.99**,** 99.04 ± 4.29**,** 87.87 ± 1.29**,** 44.29 ± 3.18**,** 40.16 ± 2.02**,**25.07 ± 1.94**,** 22.04 ± .89**,** 20.18 ± **.** 7721.27 ± 82for ear length, height at wither, heart girth, back length, face length and neck length.

CHAPTER FIVE

DISCUSSION

The milk yield found in this study was in range between (528 – 682 liter) this was agreed with the findings of Louca *et al*., 1975. The result in this study showed the milk yield of the does in the winter was high than in the summer and this was on line with A.P. Mavrogenis *et al*, (2006) The result showed that the doe produces twins yields milk more than the doe produces single and this was similar with (Ciappesoni *et. al*., 2004) and (Williams, 1993).

The average lactation length in This work was agreed with. Papachristoforou and Mavrogenis (2000) and lower than finding of (Ahuya *et al*, (2009) and higher than the lactation length of Sudanese Nubian goats was investigated by (Elnaim, 1979; Kudouda, 1985,Khalaffalla and Sulieman, 1990). Moreover higher than EL-Abide and Abu Nikhaila,(2010).

The data of milk protein content of the shami Cyprus goats in this study was agreed with the findings of Mahmoud, N. M. A.;(2012) and ELNaim (1979) .

The milk fat content in this study was agreed with (Parakash and Jennes, (1968) and on line with El-naim (1979) and higher than Spruzz and Selegoska (2006) and was agreed with Min et. al. (2005). Lower than, Baruah et. al. (2000).And the lactose and ash agree with ELNaim (1979)

The total solid in this study was agreed with an ELNaim (1979) and slightly lower than the results obtained by Baruah et. al. (2000).

The overall average means of sex birth weight of shami Cyprus kids of this study was similar with Mavrogenis A.P.*et al* (2006). The result obtain from El Zubeir and Abd El Gadir, (2005) and Alama (1987) in Gezira sub-

ecotype also was agreed with the result obtain in this study. And compatible with Silva *et al* (1998) on the kid birth weight of the Alpine dairy goats.

Through this study we observed that single male kids was heavier than female single kids. This result was agreed with (Madibela *et al*, (2002) and favorable with Kochapakdee *et al* (2002),who working on native Thai Goats.

The average mortality rate in this study was due to many factors such as diseases, heat stress, inadequate nutrition and mismanagement. These results were on line with Madibela *et al* (2002).

The average age at puberty of female kids of shami Cyprus goats was on line with, Hossain *et al*(2004) and Greyling (1996),who they observed that the age at first estrus for Boer female goats

The average age and the weight at first service of the shami Cyprus female goat was on line A.P.*et al* (with Mavrogenis 2006).

The gestation period in study was favorable with (Mukasa-Mugerwa *et al*., 1988), and was agreed with Devendra and Mcleroy (1987).

The overall average of kidding interval of the shami Cyprus goats in this study was compatible with Kudouda (1985) and Jubartalla (1998) who worked on Sudanese Nubian goats and and higher than Cabello et. al. (1991).

The average age at first kidding of the shami Cyprus goats in this study was agreed with. Song *et al* (2000),and (Abassa, 1995).Who reported that, some tropical goats can produce their first kid when they are only 11 to 14 months old .

The average Weight at the first kidding of the shami Cyprus goats the result was agreed with the finding of Mavrogenis A.P.*et al* (2006), who worked on comparative between sanean and Damascus goats .

The average body weights of the shami Cyprus goats was on line with the (Keskin,2002), and was agreed with finding of (ElNaim,1979 Kiwuwa,1986,AOAD,1990).

The average Description on the body measurement of the shami Cyprus goat in this study was agreed by finding of (Keskin,2002), and favorable with (ELNaim,1979; Kiwuwa,1986; AOAD, 1990),worked on Nubian goat.

Conclusion and Recommendations

From Results of this study we can concluded that:

- Dairy farming using shami Cyprus goats for profit is not very hard to do, If given proper attention, are simple to manage even by children, can live healthily.
- They don't need much feed because they eat a variety of forage, that sheep can't reach They are also very resistant to heat and drought.
- The shami Cyprus goat had revealed a better performance that ensure its contribution in increasing social economic benefits for local societies as well as its tolerance to harsh conditions, easy to adapt.

On the result of this study we can also he recommended the following :

- Using the shami Cyprus males for mating and inseminate the local goats for increasing the quantity and quality of milk.
- If this type of the breed has been nourished well they can produce a high quantity of milk might reached more than (4.5Kg) per day according to Northern State (Dongola) experiment .
- Grading up the awareness of local communities for rearing and adopting this type of breed.

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Appendices

Plate 1: Milk production from the shami Cyprus goat

Plate 2: Female shami Cyprus goat

Plate 3: Kids artificial suckling

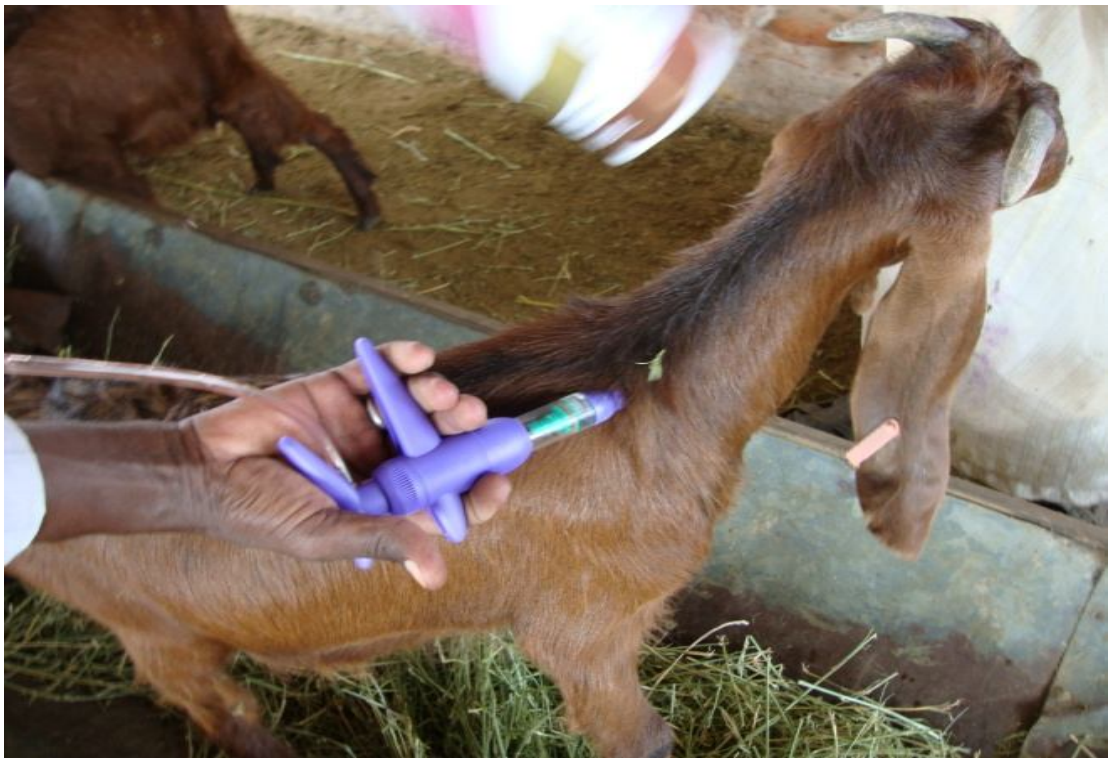

Plate 4: Vaccination against the major prevailing epidemic diseases

Plate 5: Internal and external parasites control

Plate 6: Weight of kids

Plate 7: Male shami Cyprus goat

Plate 8: Body Measurement at different age