Sudan University of Science and Technology
College of Graduate Studies

Some Field Practices of the Sheep Owners' Towards Management and Sheep Rearing in River Nile State-Sudan

بعض الممارسات الحقلية لمربّي الضأن تجاه إدارة ورعاية الضأن في ولاية نهر النيل- السودان

A dissertation submitted for partial requirement for the degree of Master of Science (M.Sc.) in Animal Production in tropics

By:

Elwalid AbdElrahman Elhassan Mohamed

B.Sc., (University of Gezira, 1999)

Supervisor:

Dr. Abubakr Sayed Ali Mustafa

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الإستهـــلال

قــال تعالـــــي:

(والإنعام خلقها لكم فيها دفء ومنافع ومنها تأكلون (5) ولكم فيها جمال حين تريحون وحين تسرحون (6)

صدق الله العظيم

"سورة النحل "

إهـــــداء

إلي أمــي وأبـــي ....

إلــي أخـــواتـــي .....

إلـــي زوجتـــي.....

إلـــي أبنـــائـــي.....

إلـــي روح أخـــي حســـــن الملك....

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My deeply thanks to my wife Fatima Mohammed for her valuable help and support.

Abstract

The study was conducted in southern part of River Nile State in northern Sudan. A total of 75 sheep owners from different households were interviewed individually using a detailed structured questionnaire on personal household information, herd formation, rearing systems and flock feeding, flock management including practiced productive and reproductive traits and production. The study aims to evaluate perception of sheep owners' towards adopted rearing system, productive and reproductive traits. The obtained data were summarized in form of descriptive tabular and graphs. Also analysis of variance ANOVA followed by least significant difference (LSD). The results revealed that more than 65% of sheep owners had above 15 years of experience in rearing their animals and about 80% of them were either illiterate or had basic or "Khalwa" education. Also, it revealed that all respondents reared sheep followed by goat in the second rank. Northern riverine wool sheep (NRWS) is the most abundant sheep type in the study area. About 69% of sheep owners adopted open range system and semi sedentary and depend mainly on natural range and different concentrates in feeding their animals. The results showed significant differences ($P<0.05$) in weaning age and ram production age among NRWS, Ashgar and Abrag sheep subtypes record the highest value in most studied productive and reproductive traits. It also showed that wet summer was the most lamping season (89%) of sheep followed by winter. The major priority selection criteria of ewes and rams were size – feature while the main culling criterion was overage for both ewes and rams and low productivity arises in the second rank of culling criteria in ewes, where less sexual comes in the second rank in rams. The respondents showed that rams at different age group were higher in price among different age groups followed by ewes, lambs and yearlings. The peak time of price raising was wet summer. Internal and external

parasites were come at the first rank among frequent diseases in adult's sheep and lamb followed by nutritional diseases and unspecific diarrhea in adults sheep and lambs respectively; also they showed that the main production handicaps of sheep production in the study area were feed shortage, diseases and security. The study conclude that few numbers of other desert sheep subtypes were found in the study area, sheep owners could inseminate their sheep twice a year based onbody condition and availability of feed.

الخلاصة

أُجريت الدراسة في الجزء الجنوبي من ولاية نهر النيل بشمال السودان. تم جمع معلومات من 75 مربي ضأن بإستخدام إستبانة مصممة ومفصلة عن طريق المقابلة الفردية شملت المعلومات الشخصية لمربيي الضأن، تكوين القطيع، نظام الرعاية وتغذية القطيع، إدارة القطيع وتشمل الصفات الإنتاجية و التناسلية التي يمارسها المربين. هدفت الدراسة لتقييم مفهوم مربيي الضأن تجاه نظم الرعاية،والصفات الإنتاجية والتناسلية التي يمارسها المربيين. تم تلخيص وعرض نتائج البيانات في شكل جداول وصفية، رسوم بيانية ومجموعات الإستجابة العديدة. كما أُستُخدِم تحليل التباين متبوعاً بإختبار أقل فرق معنوي (LSD). أثبتت النتائج أن أكثر من 65% من مربيي الضان لهم خبرة اكثر من 15 سنة في تربية الضأن وحوالي 80% منهم إما أميين أو نالوا تعليم أساسي أو خلوة. أيضاً ثبت أن المستبينين يرعون الضأن بشكل أساسي والماعز في المرتبة الثانية. الأغنام النهرية الشمالية ذات الصوف هي أكثر الأنواع تواجداًفي منطقة الدراسة. حوالي 69% من مربيي الضأن يعتمدون النظام الرعوي المفتوح و النظام شبه المستقر ويعتمدون بصورة أساسيةعلى المرعى الطبيعي ومختلف المركزات في تغذية حيواناتهم. أظهرت النتائج وجود فروق معنوية ($P<0.05$) في عمر الفطام والعمر الإنتاجي للكبش بين الأغنام النهرية الشمالية ذات الصوف، الأشقر والأبرق وسجل الضأن الأشقر أعلى نتائج في معظم الصفات الإنتاجية والتناسلية التي تم دراستها. أيضاً أظهرت النتائج أن الصيف الرطب (الخريف) هو أكثر الفصول من حيث معدل الولادات يليه فصل الشتاء. أكثر معايير إختيار النعاج والكباش كان حجم وشكل الحيوان بينما كان كبر السن هو المعيار الأساسي في إستبعاد النعاج و الكباش معاً وتأتي قلة الإنتاجية في المرتبة الثانية من معايير إستبعاد النعاج والضعف الجنسي في المقام الثاني من معايير عزل الكباش. أوضح المستبينون أن الكباش بمختلف أعمارها كانت الأعلى سعراً من بين المجموعات العمرية تليها النعاج، الحملان و الحوليات. أكثر الأوقات التي يرتفع فيها سعر البيع ف الصيف الرطب. أتت الطفيليات الداخلية والخارجية في المرتبة الأولى بين الأمراض الأكثر شيوعاً وسط الضأن البالغ والحملان يليها أمراض التغذية وأعراض الإسهال في الضأن البالغ والحملان على التوالي أيضاً أظهرت النتائج أن نقص العلف، الأمراض والأمن من أهم معيقات إنتاج الضأن بمنطقة الدراسة. خلصت الدراسة إلى وجود أعداد قليلة من الأنواع الأخرى للضأن الصحراوي بمنطقة الدراسة. يمكن لمربيي الضأن أن يلقحوا حيواناتهم مرتين بالسنة إعتماداً الحالة الجسمانية وتوفر العلف.

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Chapter one
1. Introduction

Sudan own large numbers of livestock and agricultural products where it is the backbone of it economy, so this section needs more development to increase the national income. The total population of livestock in Sudan population is about 108.2 million head. River Nile State own about 2.55 million head of livestock, sheep represents about 42.1% of total livestock numbers (MARFR, 2018). Sheep is reared under traditional nomadic pastoralist system involving seasonal migratory movements searching for pasture and water, it usually bred beside other livestock species particularly goat, traditional system lacking of modern scientific procedures, Hence it exposed to many stresses factors such as long trekking, heat, shortage in water supply, and dearth and low nutritive quality of pasture especially during dry season.

Range lands in Sudan are characterized by several plant species due to various reasons such as the action and interaction of soil, climate، topography and prevalent human activities. In spite of degradation due to overgrazing, drought, fire and desertification, they still provide 82.6% of the livestock feed (Daragge and Fadl ELMula, 1994).Several research studies reported that extensive-open range-system was the dominant animal production system. Also, it were pointed to many constrains faced sheep production such as lack of water, feed shortage, diseases and less extension services.

The objective of this study was to study the productive and reproductive practices that adopted by shepherds and sheep owners in River Nile State.

Chapter two

2. Literature review

2.1. Sheep population and distribution:

The Sheep population of Sudan at the end of the year 2017 represents more than37.7% of the livestock of the country (MARFR, 2018). Desert sheep is one of important pure ecotypes it resembles 65% to 75% of the total sheep population (ElHag and Mukhtar, 2001 and Sulieman *et al*., 1990). Desert sheep are distributed across the low rainfall savannah, semi-desert and desert zones. These animals are well adapted to arid and semiarid conditions and can thrive with water scarcity, low quality range grasses and high ambient temperature (Mufarrih, 1991).

2.2. Classifications of Sheep:

Devendra and Mcleroy, (1987) and EL-Khashab, (1997) mentioned that there are many criteria to classify sheep such as tail, coat and purpose of production type, according to the production type sheep are classified into four groups

2.2.1. Wool sheep type:

This type is characterized by producing good quality of wool such as Merino. This breed has been adapted to Australia for nearly two centuries. Merino sheep is well favourable to produce excellent quality of wool in semi-arid areas (Carles, 1983).

2.2.2. Milk sheep type:

This type is categorized by producing milk as Italian Lacoune breed, it remarkable for its milking capacity with average yield of 211 Litters in 165 days of lactation.

2.2.3. Meat sheep type:

This breed is known by meat production such as Oxford and Suffolk with mature males weighing (100-130) kg, whereas female weigh (70 -90 kg) (Ibrahim, 1999).

2.2.4. Dual purpose sheep:

This type is famous as being adapted to different environmental conditions, Also this type is described with such a breed has low productivity compared with the other type. Caloia and Mondero is representative of this type, both are characterized by producing meat, milk and wool (Carles, 1983).

2.3. Sheep in Africa:

Payne (1990) reported that, there are four different groups of sheep breed in Africa. Definitely not all indigenous breeds can be precisely categorized as belonging to these four groups as there are differences within and between groups due to environmental effects and inter breeding ,these groups are :

2.3.1.Thin-tail hairy sheep:

This type was first brought into Africa possibly some 7.000 years ago. It is likely that they were introduced by Hamitic pastoralist migrating from western Asia. Today there are two separate groups of thin tail hairy breeds namely, the semi-arid savanna type such as Fulani, Twareg and Sudanese desert breed.

2.3.2. Thin-tail coarse wool breed:

This type is found in Sudan and Chad such as Meidob and Zaghawa breeds.

2.3.3. Fat-tail coarse wool sheep:

It was introduced in to Africa some 3.000 years ago. Probably introduced via straits of Bab El-Mandob .They were

2.3.4. Fat-rumped sheep:

They are found in north and the east Africa, such as black head Somalia.

2.4. Classification of Sudanese sheep

Sheep provide meat for local consumption in addition to their share in national income through the export. Sheep are also reared for milk production. The breeds of sheep in the Sudan and South Sudan were classified into five basic types and three mixed ecotypes according to tail size (Mason and Maule, 1960), the basic types includes:

(1) Sudan desert sheep which include (Butana Gezira, Watish, Hamari, Kababish, Meidob, North River wooled, and Beja).

(2) Sudan Nilotic sheep which include (Dinka, Shilluk, Nuba mountains and Mangala).

(3) Arid upland and this is the Zaghawa sheep.

(4) Arid Equatorial sheep which is the Taposa and finally.

(5) Western African Fulani (fellata and M'Bororo), (Mcleroy, 1961).

2.5. Sudanese desert sheep origin

Sudan Desert sheep is the most common type in the country, Sudan Desert sheep and its hybrids comprise more than 80% of the national sheep flock. Sudan Desert sheep and its crosses are supposed to be a progeny of a sheep of Egyptian origin (*Ovis aries*var.longipes) (Devendra and Mcleroy, 1982). Also they stated that Sudan Desert sheep are spread north of latitude 12◦N, extending into Eritrea and westward into Chad. Mufarrih (1991) had another assumption supposed that Desert sheep have probably an origin from cross breeding between sheep of Arab tribes that have arrived to Sudan through western boarder and the sheep of northern Fulani tribes, (*Balani*and *Ouda*), in the Lake Chad basin. This assumption was

supported by the fact that Fulani sheep are long-legged and long-tailed sheep. Also, Williamson and Payne, (1965) reported that it has been forced out of Egypt by the entry of fat-tailed and cross wool sheep (Mufarrih, 1991). The similarity of management practices, environmental habitat and many body features such as the shape of the head and face, body length, coat texture, thicker tail and fuller rump between Sudan Desert sheep and Fulani sheep could support the hypotheses that said that Sudan Desert sheep might be attributed to partial inheritance from their Arab ancestors Mufarrih, (1991).

2.6. Sheep production systems:

Sudanese sheep owners locally name *Ghanama* adopted one of three production systems including: pastoral (open – range) system, agricultural system and agro-pastoral system. The most common elements through these systems are environment (climate, nutrients required, vegetation areas, food competition and man) and sheep type. The interaction of these different components participates in made up the production systems and the variation within these components that produce the vast diversity of production systems (Carles, 1983).

Wilson (1991) found two major types of livestock production systems in Africa. The traditional system (pastoral, agro-pastoral, agricultural and urban) and the modern system (ranching, feedlot, station and dairy farm) differ basically in that the farmer in the traditional system uses mainly land and labour while the modern system has large capital requirements and generally a lesser requirement for one or other of the remaining factors. Traditional systems are defined as the dependency degree of the household or the family on livestock or livestock products in providing food or for household income. Also, it defined as the relationship between type of agriculture activities and livestock production type. The important sides of management within a system are the distance and movement period of (transhumance) (El Dierani, 1995).

2.6.1. Pastoral system:

In this system livestock participate in more than 50% of total household income or more than 20% of gross household food energy. Including transport value, sales or exchange of manure and revenue from any other major functions. Pastoral are divided into three sub systems, the first is characterized with little or no agriculture activity, also movement for long distances searching for pasture and water. The second pastoral sub system is practiced by Fulani groups of West Africa and cattle breeder in which livestock production is depend on dry land or cultivated rain land where different livestock species are equal importance. The third pastoral sub system found in South Sudan republic practiced by Nilotic tribes it described with large irrigated areas (El-Dierani, 1995).

2.6.2. Agricultural system:

In this system 10-50% of revenues are derived from livestock or livestock products. Livestock is almost sedentary or it moved to short and restricted distances. There are three main subsystems connected with the agricultural system: Rain fed subsistence agriculture, rain fed cash cropping and large- scale permanent irrigation of cash crops (El-Dierani, 1995).

2.6.3. Agro-pastoral system:

Is the system in which profit from livestock amounts to less than 10% of the total. In the dry land 70% of small ruminants are found in pure pastoral system and 30% in agro-pastoral system. While it is reverse in semi-arid zone the where 70% of small ruminant in the agro-pastoral system. In the extra humid areas a small percentage being found in the agriculture and urban systems while most small ruminants are in the agro pastoral system(El-Dierani, 1995).

2.7. Factors affecting sheep production

2.7.1. Management factors

The management system has many effects on the production features of the Sudan Desert sheep El-Hag *et al*., (2001). Many researchers reported that mortality rates in breeding dams were significantly higher in nomadic one than sedentary flock, while ewes lambed under sedentary system had lower lambs birth weights than those lambed in nomadic system (3.38 vs.4.08 kg) and lambs body weight at 30 days of age (8.05 vs. 9.42 kg), whereas lambs weights from 60-150 days of age were not different in the two systems. In contrast, in other study, Wilson (1976) reported that death rates between sedentary and migratory flocks of Southern Darfur were not differing. The mortality rate was almost same in both systems.

2.7.2. Nutrition

Enhancing live weight at mating had an effect on ovulation and litter size (West *et al*., 1991; Nawaz and Meyer 1991). Moreover, Njoya *et al*. (2005) noted that, protein complementary additions to ewes browsing low quality pasture improved their body weight, body condition score and reproductive performance. Also Muskasa-Mugerwa and Lalhou-Kassi (1995) reported that sufficient nutrition is important on the reproductive trait in ewes in Ethiopia furthermore, Stephenson and Bird (1992) pointing out a valuable response in productivity of supplemented ewes eating low quality grass in Australia.

During the late gestation period pregnant ewes received feed supplementation with balanced and adequate energy and protein to support developing of embryonic and fetal growth, maintain physiological requirements of the animal, mammary gland growth, colostrum and milk production (Oeak*et al*., 2005). Eighty percent of fetal growth arises through the last 60 days of pregnancy and it is due to 35% significant increase in nutrient requirements of the ewes

(Dawson *et al*., 1999). Thus, lamb survival is related to nutrition of ewes during late gestation (60 days) (Binns*et al*., 2002).

The capability of nutrition during mating time to change ovulation and lambing rates of ewes in several breeds is well recognised (O'Callaghan and Boland, 1999). In a study on some British breeds, Rhind*et al*. (1989) mentioned that decreasing in ovulation rate prior mating time resulted from low animals feed intake, in addition, ova wastage rate occurs due to lower feed intake after mating time. On the other hand, Landau and Molle(1997) stated that numerous Mediterranean breeds of sheep, a short period of feed flushing before mating definitely affected ovulation. In the same issue Lassoued*et al*. (2004) reported that higher rates of feeding before and through mating time were related to improve reproductive performance in accordance with the literature reported for several sheep breeds. Lambing rates were affected by the dietary treatment. Emam and Malik, (2009) reported that the most additional feeds were cotton seed cake, groundnut hulls and sorghum grains.

2.7.3. Animal factors

2.7.3.1. Breed

Animal breed and genotype had significantly affected the birth weight, daily weight gain and 90 day weights of the animal (Cochran *et al*., 1984 and Hassen *et al*., 2002.), besides, Boujenane and kansari, (2002) mentioned that lamb weight and survival to 70 days differed depending on genetic composition of lamb. They also found that effects of breed were significant for fecundity, number of lambs born alive, litter size at weaning, litter weight weaning per ewe joined and lamb weight at 60 days.

2.7.3.2. Age of dam

Age of dam had significant effects on many reproductive traits such as birth weight, prolificacy, twining rate and litter size (Tauh and Baah, 1985; Ali *et al*., 1999).In more details Al-Shorepy and Notter (1996) noted average fertility of 0.59 for third lambing and older ewes, 0.45 for second lambing ewes, 0.18 for 19 months old ewes and 0.11 for yearlings old ewes. Likewise, Boujenane (2002) reported that dam age had significant effect on birth weight and 90 days.

2.7.3.3. Type of birth

Analla *et al*., (1998) reported that birth type had noticeable effect on birth weight and consequent live weights as 30, 60 and 90 days, so that, single lambs were heavier than twin lambs, additionally, growth rate of single lambs was faster than twins (Macit *et al*., 2001). Moreover Tuah and Baah, (1985) found that weaning weight, pre-weaning growth rate were influenced by birth type, similar findings were obtained by Cloete *et al*. (2007) in crossing Dorper ewes with Ile de France, Merino Land sheep and SA Mutton Merino rams. Also Dimsoski*et al*., (1999) noted that single lambs had higher daily gain than twins in the pre-weaning period. Mortality rate of single born lambs was lower than twins (Nawaz and Meyer, 1991).

2.7.3.4. Sex of lamb

Both sexes of lambs almost had the same weights at birth, 30 and 90 days of age, but it differ in late stages (El-Hag *et al*., 2001 and Hassen *et al*., 2002). These results are in contrast to Analla *et al*. (1998) and Boujenane, (2002) who found that male birth weights were heavier than those of the female and these results are applicable for 30 and 90 days. Also Cloete *et al*. (2007) mentioned that birth weight of male was higher than female lambs. Several researchers have found significant differences in body weight between male and female lambs at entirely

ages (Bichard and Cooper, 1966; Gjedrem, 1967 and Mavrogenis 1996[a,b]). Moreover Ali *et al*. (1999) stated that male lambs were heavier than females at birth, weaning and 6 months of age. However, (Rastogi 2001; Boujenane and Kansari 2002) noted that sex of lamb was not an important source of variation.

2.7.4. Breeding season

Lambing season significantly affected the prolificacy and twinning rate, birth weight and on consequent live weights and survival age of lambs (El-Hag *et al*., 2001; Rastogi, 2001; Hassen *et al*., 2002; Boujenane and Kansari 2002; Tuah and Baah, (1985). Lambs born in rainy season had the highest birth weight (3.83 kg), while those born in the early dry season (3.52 kg) were higher than those born in late dry season (3.17 kg), hence the lamb weight at 30 days of age and growth from 90-150 days were higher in lamb born in the rainy season. Moreover, El-Hag *et al*. (2001) reported that breeding season had significant effects on desert sheep reproductive performance. The rainy season recorded higher lambing and mortality rates numbers of serviced ewes than in the late dry season.

El-Hag *et al*., (2001) Reported that the weights and mortality rate of lambs born under the nomadic system and those born during the rainy season were higher comparing to other rearing system and season. Mortality rate of lambs are an essential constituent of total flock Death (Wilson, 1976). About 30 % of mortality rate was to the age of six months, while, half of the deaths lambs happening in the first four weeks and deaths were rare during the late dry season., moreover, higher records of serviced ewes were noted in the late dry season however, higher lambing and mortality rates occurred during the rainy season (El-Hag *et al*., 2001).

In study of seasonal effects on birth weight (BWT) on prolific Assaf flock kept under intensive management, BWT of born lambs on April (4.6 kg) was significantly differs from BWT of born lambs on September (3.8 kg).BWT was

inversely affected by day length among the early stage of gestation, while it was directly related with rate of changes in day length during the latter stages of gestation (Gootwine and Rozov, 2006).

2.7.5. Climatic factors

Both genetic and environmental factors and the interaction between them could effect on birth weight of lambs. Along with the environmental factors, season was also found to have an effect on birth weight with lambs born in the rainy season being smaller than spring-born lambs. Ewes pregnant in the summer season could have lower food intake, and increase heat load (Shelton and Huston, 1968) which is high during the hot season then it influences the birth weight. Furthermore, seasonal variation in gestation length (Jenkin and Young, 2004) may also be related to seasonal variation in BWT.

2.7.6. Disease factors

Makawi, (1999) stated that infectious diseases were divided into three main groups; specific genital diseases, non-specific genital, and general infectious diseases. The main reasons of reduced productivity in sheep are the infectious reproduction diseases, and it is generally categorized into these mainly affecting the venereal tract of rams and those mainly affecting ewes causing abortion and pre-natal lamb mortality (Rahaley, 1984). Higher rate of gastro-intestinal and respiratory disease problems noted during the dry season for lactating ewes in transhumant sheep comparing to dry open, were probably a reflection of the greater nutritional stress experienced by lactating animal (Cook and Fadlalla, 1987).

2.8. Sheep marketing

Sudanese sheep is considered as one of red meat sources for local consumption and export, about 5.4million heads of live sheep were exported (MARFR, 2016). Animal resources sector and especially sheep play a vital role in Sudanese people live as source of food, income by providing food, profits and supply soil with natural manure. Also, it provides the country with hard currencies. Many factors participate in determination of sheep price such as season (Elrasheed *et al*., 2010), taxes (Elrasheed *et al*. 2008), transportation fees, production cost beside distance from production to consumption areas of sheep and veterinary charge (Faki and Taha, 2007 and Emam and Malik, 2011). In spite of low cost of sheep production due to use of traditional production system, the prices of Sudanese sheep are high compare to international prices (Elrasheed *et al*., 2010). Rams are the most preferred group in the market followed by ewes (Dahab *et al*., 2014).

Chapter three
3. Material and methods

3.1: Study area:

The study was carried out from June to October 2018 in southern part of River Nile State in northern Sudan. It located in desert zone between the latitude 16-22° North and longitude 32-35° East (Fig. 1). There are three discrete seasons in the year, based on rainfall and temperature. Winter (November-February), dry summer (March-June) and wet summer (July-October).

Source: Wikipedia.org/wiki/River_Nile_(state)

3.2. Questionnaire (survey study):

A total of 75 sheep owners from different households were questioned individually using a structured questionnaire (appendix 1) on personal household information, herd formation, rearing systems and flock feeding,flock management including practiced productive and reproductive traits and production constrains.

3.4. Statistical analysis:

The obtained data were summarized in form of descriptive tabular and graphs. Also, analysis of variance ANOVA followed by least significant difference (LSD) was used, the statistical significance was set at a p-value of ≤0.05 using SPSS statistics for Windows program, Version 16.

Chapter four

4. Results and discussion

4.1. Personal information of sheep owners:

The results of age groups of sheep owners (table 1) showed that more than 70% were above 35 years old while about 29% of them were less than 35 years old, and the experience of sheep owners as seen in (figure 1) showed more than 65% of respondents had more than 15 years of experience and 34.7% of them had less than 15 years of experience, it seems to be that rearing sheep is life manner of them. These findings were in line with those of to Hamed *et al*., (2017). Figure (2) records that most of sheep owners (76.7%) were either illiterate or had a basic or "Khalwa" education whereas few of them had higher educational level (2%), the educational level could be affected by the nomadic nature. These results were agreed with those found by Ishag and Ahmed (2011) and Osman *et al*., (2015[a]). Also the results showed that the respondents were mainly animal breeders beside (94.7%) other activities (table 2) such as farming and public sector employee. These results were disagreed with those of Hamed *et al*., (2017) who study some characteristics of sheep production in Gadarif State which characterize as agricultural state; hence farming activities comes at first rank.

Table 1. Age groups of sheep owners

Age group (years)	n	%
Less than 35	22	29.3
35-50	29	38.7
More than 50	24	32.0
Total	75	100.0

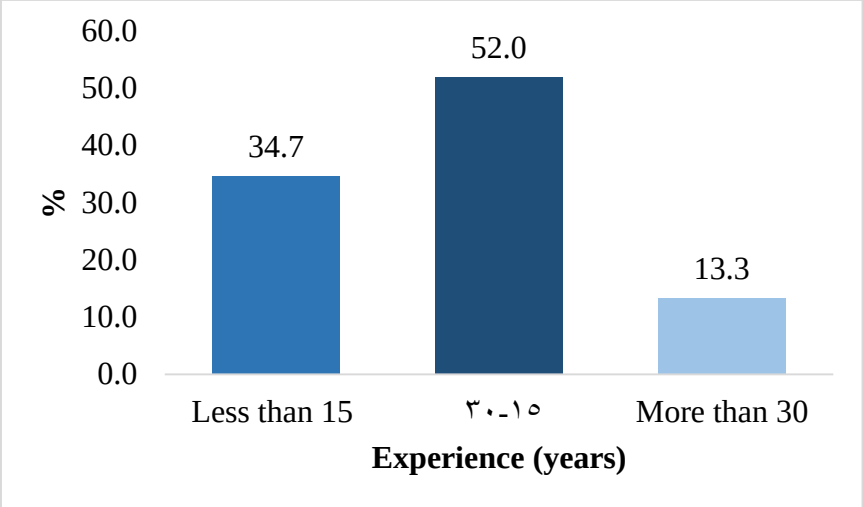

Figure 1. Experience of sheep owners

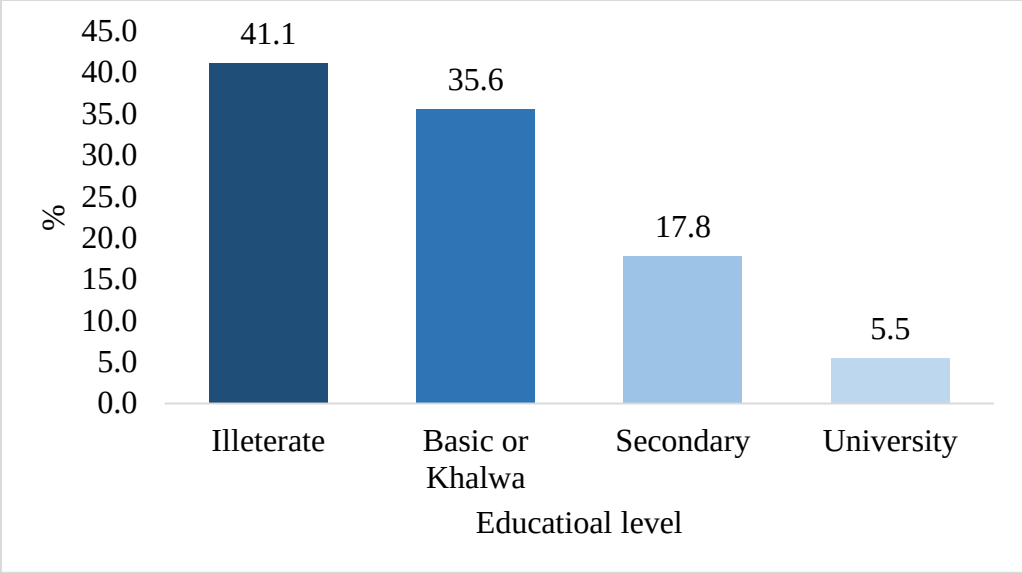

Figure 2. Educational level of respondents

Table 2. Occupation of sheep owners (N=75)

Occupy	n	%	responses %
Animal breeder	71	69.6	94.7
Farmer	26	25.5	34.7
Private sector	5	4.9	6.7
Total	102	100.0	136.0

4.2. Herd formation and sheep subtypes in the study area:

The questionnaire survey revealed that the respondents reared mainly sheep with other livestock species (table.3) particularly goat at the first rank (49.3%). These could be attributed to similarity between sheep and goat and nomadic people need a source of milk such as goat. These findings are agreed to Ishag and Ahmed (2011) and Hamed *et al*., (2017). From figure 3. Northern riverine wool sheep (NRWS) were the most abundant sheep ecotype in the study area followed by Ashgar subtype, this might be because of River Nile State a part of NRWS home-land.

Table 3. Herd composition (n=75)

Herd	n	%	responses %
Sheep	75	55.1	100.0
Goat	37	27.2	49.3
Cattle	21	15.4	28.0
Camel	3	2.2	4.0
Total	136	100.0	181.3

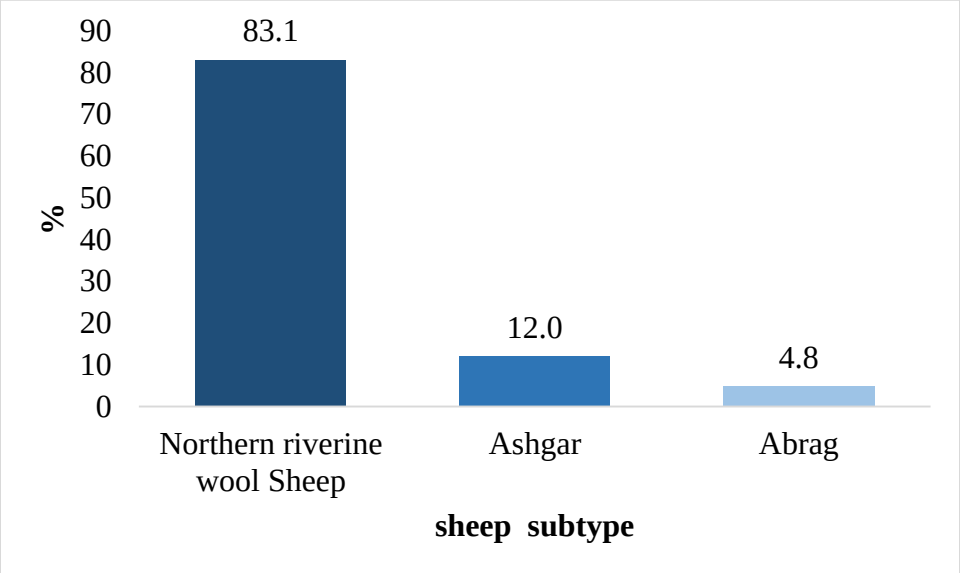

Figure 3. Percentage of different sheep subtypes in the study area

4.3. Rearing systems and flock feeding:

Figure 4, showed that 37.2% of sheep owners adopted the open range system followed by 31.9% who espoused semi sedentary system with little difference of those practiced on sedentary system 30.9%, these could be due to narrow area of pastures and lack of water source particularly by the end of rainy season in River Nile State which push sheep owners to adopt other rearing systems. Similar finding were found by El Hassan (1994); Osman *et al*., (2015[b]); Elobied, (2015). Also, the obtained results from the interviewers showed that all of them were dependent basically on the natural range followed by different concentrates feedstuffs such as feterita, wheat bran and groundnut cake on feeding their animals beside Bersim as main cultivated forage in River Nile State (Table.4). The data of most preferable plants by sheep in the study area showed in appendix (2). These results were agreed with those of Osman *et al*., (2015[b]); Elobied, (2015) and Hamed *et al*., (2017).

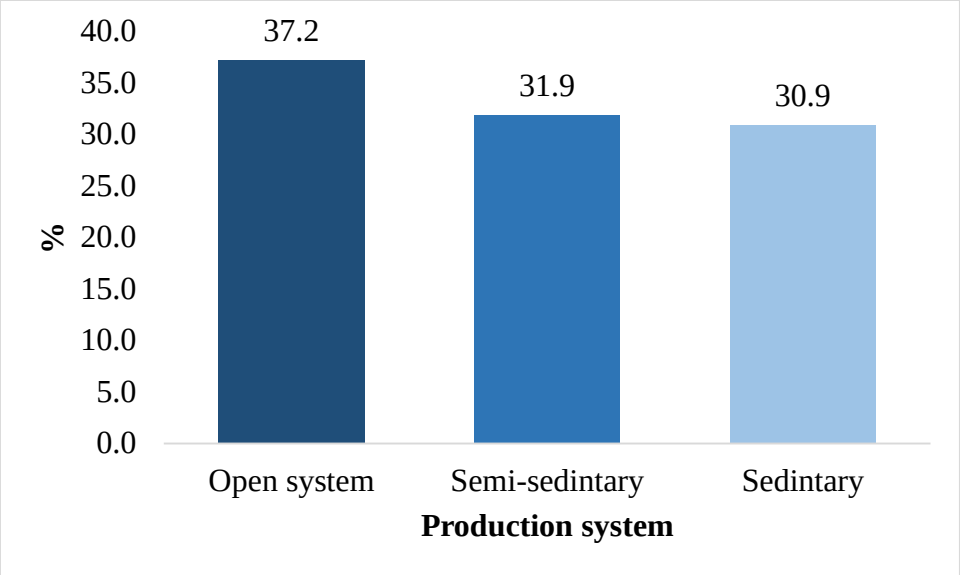

Figure 4. Management systems in the study area

Table 4. Feeding systems of sheep types in the study area (n=75)

Type of nutrition	n	%	responses %
Natural range	75	36.2	100.0
Different concentrates feed	60	29.0	80.0
Bersim	39	18.8	52.0
By-products	33	15.9	44.0
Total	207	100	276

4.3. Productive and reproductive traits:

The data of studied productive and reproductive traits (table 6) showed significant differences ($P<0.05$) in weaning age and ram production age, Ashgar showed the highest values in most studied productive and reproductive traits. Similar outcomes were found by Sulieman *et al*., (1990) for most studied productive and reproductive traits mainly weaning age which ranged from 3.67 to 4 months. Around 71% of interviewers bred their ram inside the flock compare to 28.8% of them who purchased or borrow the rams from outside the flock (figure 5). On the other hand, the majority of sheep owners 94.4% did not borrow their ram to other flock (figure 6), it ought to be, they proud of inheriting their animals (rams) from their ancestors neither than crossing with different subtypes. Table (7) revealed that wet summer was the most lamping season (89%) of sheep followed by winter (37%), it seems to be the sheep owners flushed their ewes with additional feedstuffs at the beginning of winter and in wet summer (autumn) to reach season of abundant pasture and feeds.

Table 6. Effect of sheep subtypes on productive and reproductive traits in study area

productive and reproductive traits	NRWS	Ashgar	Abrag	Sig.
Birth weight (kg)	2.25±0.53	2.57±0.53	2.43±0.53	NS
Weaning weight (kg)	8.51±2.62[b]	11.43±2.07[a]	9.57±1.27[ab]	*
Mature weight for ram/ewe (kg)	15.92±3.51	18.86±4.71	16.14±3.44	NS
Weaning age (months)	3.68±1.21	3.71±0.76	4.29±1.38	NS
Mature age for ram/ewe (months)	6.85±1.39	5.71±0.95	6.71±1.70	NS
Age at first lambing (months)	11.80±1.85	11.43±0.53	11.29±0.49	NS
Ram production age (year)	5.77±1.70[b]	6.73±1.11[ab]	7.29±1.25[a]	*
Ewe production age (year)	6.43±1.64	6.00±0.58	7.14±0.90	NS

NS=No significant differences, *=Significant at P<0.05

Different superscript letters within the same row are significant difference at P<0.05

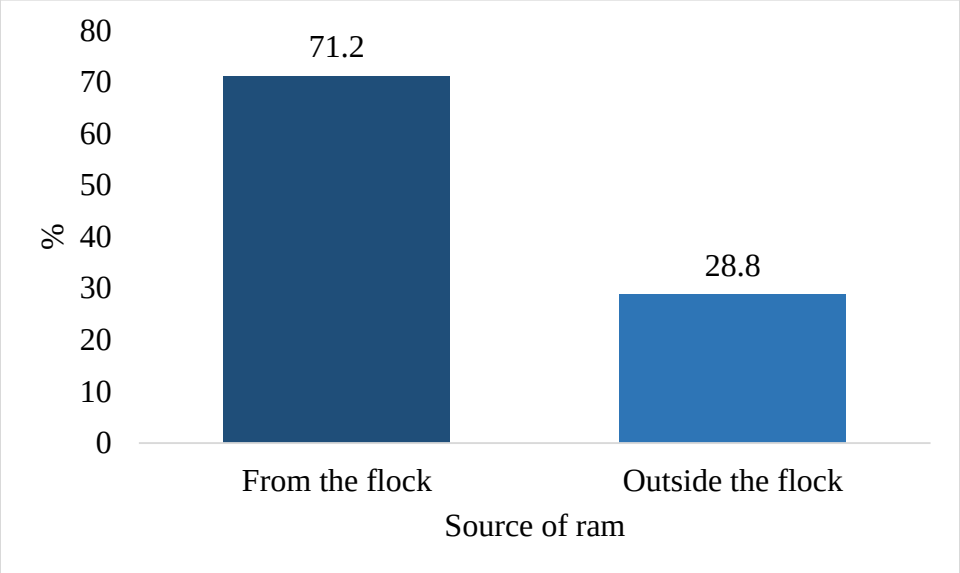

Figure 5. Source of ram in the flocks

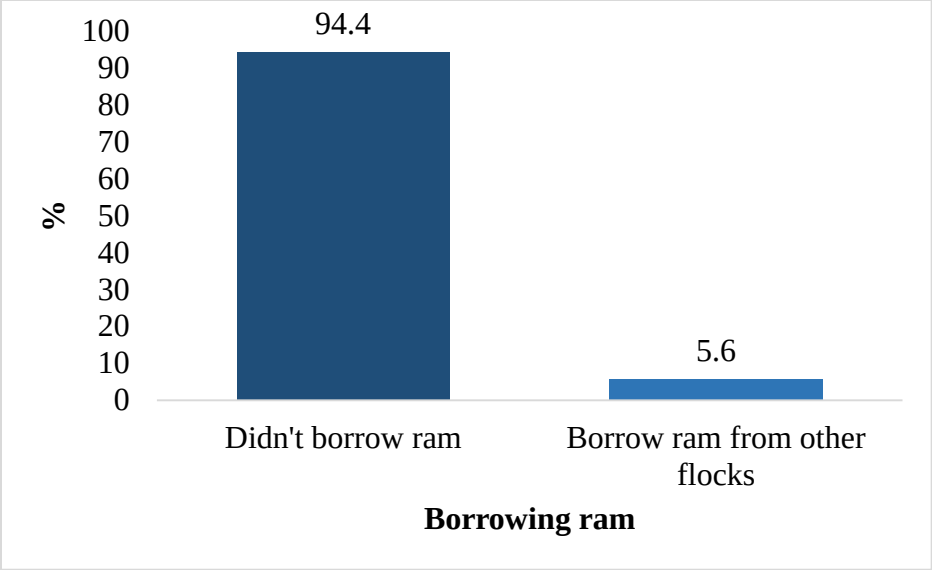

Figure 6. Borrowing ram from other flocks

Table 7. Lamping time of the studied sheep (N=75)

Lamping time	n	%	responses %
Wet summer	65	69.1	89.0
Winter	27	28.7	37.0
Dry summer	2	2.1	2.7
Total	94	100.0	128.8

4.4. Selection and culling criteria of ewes and rams:

The results of selection criteria of ewes practiced by sheep owner (table 8) indicated that size and feature was the major criterion (98.6%) while maturity age was the lowest selected criterion (27%). In the rams feature comes at the first rank followed by its physical growth and pedigree of the ram comes in the last rank (table 9). This could be due to sheep owners tend to select rams for their size and body conformation. These findings were in harmony with those of Adamu, (2005) who reported that sheep owners favoured certain subtype than other due to its size and feature. On the other hand, the obtained results of the culling criteria of ewes and rams (table 10) showed that sheep owners culled their animals due to overage criterion in both ewes and rams, also low productivity comes in the second rank of culling criteria in ewes, where less sexual comes in the second rank in rams.

Table 8. Ewes selection criteria (N=75)

Criterion	n	%	responses %
Size and feature	73	42.2	98.6
Colour	54	31.2	73.0
Twining rate	26	15.0	35.1
Maturity age	20	11.6	27.0
Total	173	100.0	233.8

Table 9. Selection criteria of rams (N=75)

Criterion	n	%	responses %
Feature	66	35.9	88.0
Sheep subtype	54	29.3	72.0
Growth	40	21.7	53.3
Pedigree	24	13.0	32.0
Total	184	100.0	245.3

Table 10. Culling criteria of ewes and rams (N=75)

	Ewes			Rams		
Criterion	n	%	responses %	n	%	responses %
Disease	3	2.3	4.1	6	5.0	8.2
Overage	65	49.2	89.0	69	57.5	94.5
Sterility	19	14.4	26.0	-	-	-
Weakness	14	10.6	19.2	16	13.3	21.9
Low productivity	31	23.5	42.5	-	-	-
Less sexual	-	-	-	29	24.2	39.7
Total	132	100.0	180.8	120	100.0	164.4

4.5. Marketing of Sheep:

The results of studied sheep different group prices (table 11) revealed that more than 1.5 year rams record the highest prices (6452.05 SDG) and the lowest group prices were yearlings (3130.82 SDG). On the other hand the sheep prices (table 12) were increased in wet summer (94.3%) and the prices were declined in winter (4.3%) this might be due to availability of good pasture in wet summer. These results were agreed with those of Elrasheed *et al*., (2010) who found the sheep prices affected by several factors including season.

Table 11.Avrage prices of sheep at different physiological age

physiological age	Price (SDG)	
	Min. – Max.	**Average**
Lambs	1600 – 5500	3296.67
Yearlings	1700 – 5000	3130.82
1 – 1.5 year rams	3500 – 6000	4557.53
More than 1.5 year rams	5000 – 8000	6452.05
Ewes	2000 – 6000	3666.44

One Dollar=29 SDG

Table 12. Time of sheep prices raising (n=75)

Price raising time	**n**	**%**	**responses %**
Wet summer	66	86.8	94.3
Dry summer	7	9.2	10.0
Winter	3	3.9	4.3
Total	76	100.0	108.6

4.6. Most frequent diseases among adults and lamb of the studied sheep subtypes

Table 13 shows that internal and external parasites were at first rank of the most frequent diseases among adult sheep followed by nutritional diseases. While, unspecific diarrhea comes in the last rank. Moreover, table 14 revealed that internal and external parasites represent the most frequent diseases in lambs (66.2%) followed by unspecific diarrhea symptoms (46.2%) and pneumonia (41.5%), while viral diseases recorded the lowest value (23.1%). These results were in accordance with those of Bale *et al*., (1982) and Brisibe *et al*., (1996), Shehu *et al*., (1999) and Maiga, (1992), who found different types of bacterial diseases such as brucellosis and several respiratory diseases and lameness. Furthermore, two-thirds of interviewers mentioned that lambs less than six months of age were the most infected sheep group compare to one third of animals more than six months of age (figure 7). The obtained results from the interviewers showed that 49.3% of them vaccinate their animals at outbreak compare to 11% of them did not vaccinate their animals (figure 8).

Table 13. Most frequent diseases among adults sheep (n=75)

Disease type	n	%	responses %
Internal and external parasites	57	29.8	76.0
Nutritional diseases	41	21.5	54.7
Bacterial Diseases	40	20.9	53.3
Viral diseases	33	17.3	44.0
Pneumonia	12	6.3	16.0
Unspecific diarrhea	8	4.2	10.7
Total	191	100.0	254.7

Table 14. Most frequent diseases among lambs (n=75)

Disease type	n	%	responses %
Internal and external	43	37.4	66.2
Unspecific diarrhea	30	26.1	46.2
Pneumonia	27	23.5	41.5
Viral diseases	15	13.0	23.1
Total	115	100.0	176.9

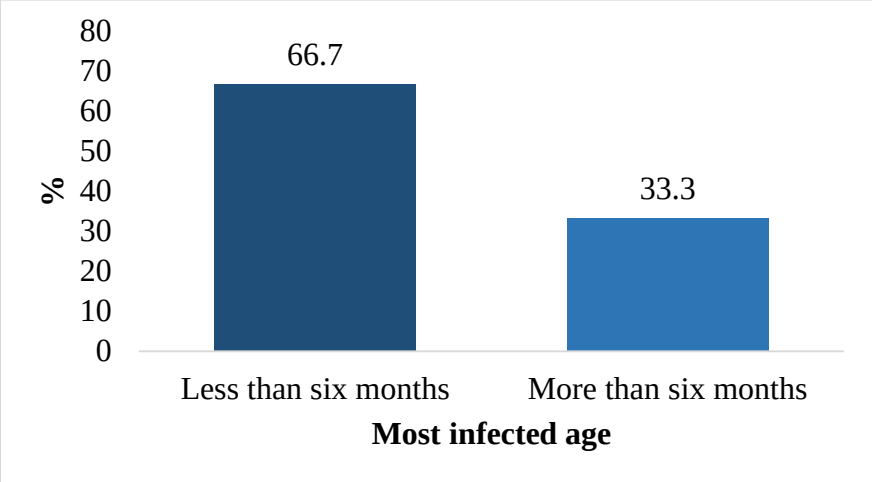

Figure 7.Most infected sheep age

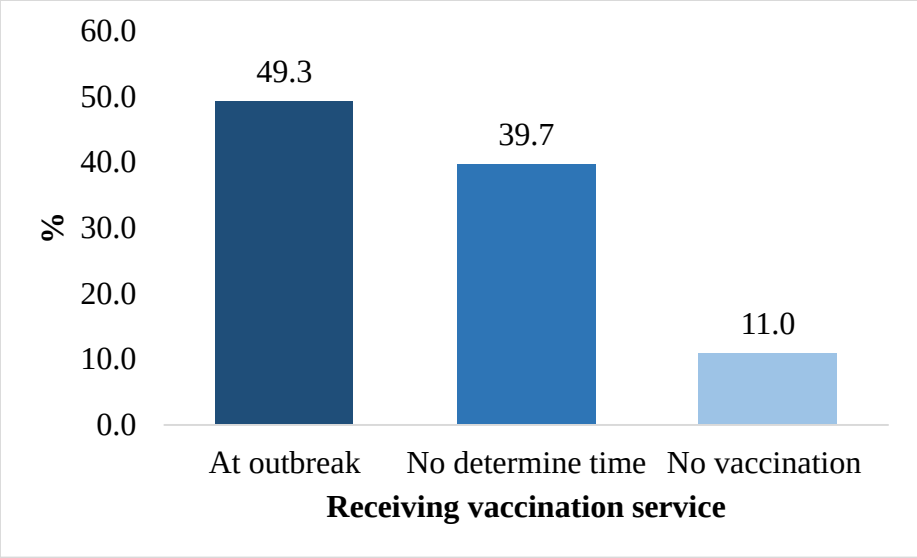

Figure 8. Vaccination service time

4.8. Production constraints:

The questionnaire survey revealed that feed shortage, diseases and security (particularly robbing) respectively were the most frequent among production constrains of sheep flowed by existence of predators while lack of water comes at the lowest rank (Table 15). These results are in line with those of Elrasheed *et al*., (2010) who found that the main handicaps in rearing sheep were diseases, lack of water and shortage in feed.

Table 15. Main sheep production constrains (n=75)

Constrains	n	%	responses %
Feed shortage	58	25.3	79.5
Diseases	44	19.2	60.3
Security	35	15.3	47.9
Predators	31	13.5	42.5
Lack of extension services	24	10.5	32.9
Lack of labour	19	8.3	26.0
Lack of water	18	7.9	24.7
Total	229	100.0	313.7

Conclusion and recommendations

This study conclude that:

- Few numbers of other desert sheep subtypes were found in the study area beside northern riverine wool sheep.
- Sheep owners could inseminate their sheep twice a year based on body condition and availability of feed.
- Lack of feed, diseases and security were main production constrains of sheep production in the study area.

The study recommended that:

- As River Nile state is a part of northern riverine wool sheep further studies in wool production and it's uses should be done.
- More attention and care efforts should gave to sheep owners and their animals to improve sheep production conditions including range management, diseases awareness, extension and veterinary services.

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Appendices

Appendix 2. Preferable plants by sheep in the study area

Local name	Scientific name	n	%	Cases %
Hantot	*Ipmeacordofano*	64	25.9	85.3
Sharaia	*Dactvlocteniumscindcum*	37	15.0	49.3
Gobash	Arisidafuniculata	31	12.6	41.3
Khodra(Molukhia)	*Corchorus depressus*	21	8.5	28.0
Tarpa	*Boerhaviaerecta/rebens*	19	7.7	25.3
Nageila(Najila)	*Cynododondactylon*	13	5.3	17.3
Sitaih	*Iotusgracinii*	11	4.5	14.7
Seada	*Cyperusesculentus/acumindle*	10	4.0	13.3
Difra	*Echinochloacolona*	10	4.0	13.3
Damblap	*Ischemaischamoides*	6	2.4	8.0
Luba	*Vigna spp*	6	2.4	8.0
Tabas	*Panicum turgidurn*	6	2.4	8.0
Laplap	Lablab purpurens	5	2.0	6.7
Gotom	*Tribulus terrestris*	4	1.6	5.3
Sarba		2	0.8	2.7
Berseem	*Medicago sativa (Indigoferahochstetteri)*	2	0.8	2.7
Total		247	100.0	329.3

بسم الله الرحمن الرحيم

جامعة السودان للعلوم والتكنلوجيا

كلية الدراسات العليا والبحث العلمى

إستبيان عن بعض الصفات الانتاجية و التناسلية فالضان بولاية نهر النيل

التاريخ / / 20 رقم الاستبيان:.....

(1) معلومات شخصية:-

1) المنطقة: ..... المحلية:.....
2) العمر؟.....
3) المهنة؟ 1-مربى حيوانات ( ) 2- مزارع ( ) 3- بالقطاع الحكومى ( ) 4- قطاع خاص ( )
4) عدد سنوات الخبرة فى التربية ؟( )
5) المستوى التعليمى للمربى؟
1/أمى ( ) 2/ خلوة أبتدائى ( ) 3/ ثانوى ( ) 4/ جامعى ( ) 5/ فوق الجامعى ( )

(2) تكوين القطيع:-

1- ماهى أنواع الحيونات التى تربيها؟

ضأن	ماعز	أبقار	حمير	دواجن

2- ما نوع الضان الذى تربيه؟ 1/الأشقر( ) 2/النهرية ذات الصوف
3/ أخرى .....

3-كم يبلغ العمر الانتاجى للنعجة بالسنة ( ) للكبش ( )

(3) نظم تربية وتغذية القطيع:-

1) نظم التربية؟
1/ النظام المستقر ( ) 2/ النظام شبه مستقر ( ) 3/ النظام الرعوى المفتوح ( )

2)نظم التغذية؟ على ماذا تتغذى حيواناتك؟

1- مراعى طبيعية ( ) بقايا ممشاريع زراعية ( ) إضافات غذائية ( ) اخرى .....

2-ماهو نوع الاضافات التى تقدمها ؟.....

3- إذا كنت لآ تقدم إضافات ما هى الاسباب؟.....

4-متى تقدم إضافات لقطيعك غذائية؟ 1/فى الجفاف ( ) 2/ بداية الخريف ( ) 3- الاثنين معا ( ) 4/ اخرى .....

5-إذا كانت الحيوانات تتغذى على المرعى فما هى انواع النباتات التى ترعاها وتفضلها؟

1/..... 4/.....

2/..... 5/.....

3/..... 6/ .....

(4)الصفات التناسلية :-

1-العمر عند أول ولادة ( )

2-الوزن بالكيلوجرام 1/وزن الميلاد ( ) 2/وزن الفطام ( ) 3/وزن البلوغ ( )

3- 1/العمر عند الفطام /شهر ( ) 2/العمر عند البلوغ/شهر( )

4-عدد المواليد/نعجة خلال فترة انتاجها( )

5-اى شهور السنة تكثر الولادات ( )

6-ماهى معايير الاختيار للنعجة ؟

1/الحجم والمظهر( ) 2/لون الجسم ( ) 3/التوأمية ( )4/ عمر النضج الجنسى ( )

7-ماهى معايير اختيار الكبش؟

1/المظهر ( ) 2/لون الجسم ( ) 3/النمو() 4/القرون ()5/ النسب ( ) 6/ القدرة على التحمل و التكيف( )

(5) معلومات عن الفحل:-

1-هل لديك أكثر من فحل بالقطيع ؟ 1/نعم ( ) 2/ لا( ) عدد الفحول = ( )

2- ماهو مصدر الفحل؟ 1/ من خارج القطيع ( ) 2/من داخل القطيع ( )

3-هل تسمح بإستخدام الفحل في تلقيح أنواع أخري غير نوعه1/ نعم 2 ( )/ لا ( )

5-هل تعيير الكبش لقطيع اخر مجاور 1/ نعم 2( )/ لا ( )

(6) تسويق الضان بالمنطقة :-

1-ماهو سعر تسويقالاتى بالجنيه؟

1/سعر الحمل ( ) 2/سعر الحوليات ( ) 3/ سعر الكبش( ) 4/سعر النعجة ( )

متي يرتفع سعر الضأن؟ 1/ الخريف ( ) 2/ الصيف ( ) 3/ الشتاء ( ) 4/ أخرى: .....

(7) التخلص والاستبعاد:-

1-هل تتخلص من النعاج بالقطيع ؟1/نعم( ) 2/ لا( )

2-ماهو سبب النخلص من النعاج؟1/ مرض ( ) 2/كبر السن ( ) 3/ العقم( ) 4/الضعف العام ( )5/قلة الانتاج ( ) 6/ أخرى .....

3-ماهو سبب التخلص من الكبش؟ 1/المرض ( ) 2/كبر السن( ) 3/ الضعف العام ( ) 4/ضعف القدرة الجنسية ( )

5/القرون الضعيفة أو الشاذة( ) 6/ أخرى .....

(8) الصحة العامة بالقطيع:-

1/الامراض العامة؟

امراض الحيوانات البالغة ؟	امراض الحملان ؟
-1	-1
-2	-2
-3	-3
-4	-4
-5	-5

2/العلاج والوقاية من الامراض:-

1-العلاج بالادوية ( ) 2-العلاج بالادوية+التحصينات ( ) 3-العلاج بالادوية البلدية ( )

2/ماهى اكثر الاعمار اصابة ؟ حملان اقل من 6 شهور ( )حملان اكبر من 6 شهور( ) ذكوربالغة ( ) اناث بالغة ( )

3-فى أي الاعمار يكثر معدل النفوق؟ حملان اقل من 6 شهور ( ) حملان اكبر من 6 شهور ( )ذكور بالغة ( ) اناث بالغة ( )

4-هل تتلقى خدمات التطعيم لقطيك؟ نعم ( ) لا ( )

5-متى تقدم خدمات التطعيم؟عند اندلاع الامراض ( ) فى اى وقت اثناء السنة ( ) اخرى .....

6-مامصدر الادوية والتطعيم ؟حكومى( )منظمات غير حكومية( ) قطاع بيطرى خاص ( )

اخرى .....

(9) معوقات الانتاج:-

ماهى معوقات الانتاج على مستوى قطيعك؟

الامراض ( ) شح الغذاء والمرعى ( ) شح الماء ( ) شح العمالة ( ) المفترسات ( )

انعدام الخدمات الارشادية ( ) انعدام الامن ( )