

`Sudan university of Science and Technology
Collage of veterinary Medicine
Assessment of dairy Goat Welfare in Khartoum State

تقييم رفاه الماعز الحلوب في ولاية الخرطوم

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قال تعالى :

**(وإن لكم في الأنعام لعبرة نسقيكم مما في بطونه من بين فرث
ودم لبنا خالصا سائغا للشاربين)**

سورة النحل الآية (66)

الحديث

قال رسول الله صلى الله عليه وسلم : (من أعطى حظه من الرفق فقد أعطى حظه من الخير ومن
حرم حظه من الرفق فقد حرم حظه من الخير)

رواه الترمذي

Dedication

To these who are surrounding us by love and respect, (our parents), to our supervisor, our teachers and our colleagues, we dedicated this work.

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Above all ,we thank God for guidance and wisdom in the whole work , without whose support we would not make it this far .My deep thanks and respect to our supervisor : Associated Prof. Shamseldein Hassaballa Ahmed for their help, guidance and Patience to bring out this work. We would also like to appreciate all the technical and academic support for Collage of Veterinary Medicine –Sudan University of Science and Technology.

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Abstract

Welfare assessment can play multiple roles in the path to welfare improvement. By the application of AWIN welfare assessment protocol, based on resources and animal-based indicators, we affecting intensively kept dairy goats in Sudan. During February to September,2018,ninety dairy goats 'owner's fences, organized in seven localities of Khartoum state were assessed to evaluate their principles and criteria of freedom from hunger (appropriate nutrition),freedom from thirst (good drinking and absence of prolonged thirst), freedom from discomfort (good housing, comfort around resting, thermal comfort and ease movement), freedom from pain, injury and disease (By prevention, rapid diagnosis and treatment)and freedom to express normal behaviors (expression of social behavior, expression of other behavior, good human-animal response and positive emotional state). The information was collected by using questionnaire, visit, direct interviews and observations with the fences owner. The current study showed that, some freedom from hunger and thirst parameters related to absence of crowding in feeder and drinkers were registered 61.9% and 85.7% respectively and absence of prolonged hunger and thirst were 61.9% and 81.7% respectively. Freedom from discomfort parameters related to shelter structure were recorded 81%, enough area was 76.2% within fences. 47.6% and 57.1% of owners who bred dairy goats revealed that they provided cooling during summer season and their fences had play yard respectively. A few owners (23.8%) had light source in the goat fences. Health status of the animals showed that, only 42.9% of owner vaccinated their goats against epidemic diseases (Pest des patties of ruminantium -PPR-, hemorrhagic septicemia, Brucellosis). All of owner had mortality among their goat, due to accident or diseases. Most of owners (66.6%) consult the

veterinarian when their goats become sick, while others (23.8%) used traditional and herbal medicine to treat their sick goats. Half of owner (57.1%) used antiparasitic drugs (spray or injectable drugs) for controlled external parasites.

The appropriate behavior welfare for dairy goats in Khartoum state showed that, about half of goat owners their animals queuing at feeding and drinking and 80% of them their animals feeding their kids, while 81% of them their animals showed normal ruminations and ease to move, however, the majority of dairy goats owners observed good human-animal response. It is therefore concluded that, welfare assessment detect some present problems in the animal's life, housing parameters related to structure, design and micro-environment, health status of the animals and good human-animal response. In the dairy goat area, identification of the main welfare problems across countries and different production system is needed.

المستخلص

تقييم رفاه الحيوان يلعب ادوار متعددة في طريق عملية تطوير رفاه الحيوان عن طريق استخدام برتكول مؤشرات تقييم رفاه الحيوان المبني علي مؤشرات الموارد والحيوان نهدف الي تقييم المشاكل والعقبات المتعلقة برفاه الماعز الحلوب في ولاية الخرطوم (تسعون حظيرة ومزرعة للماعز الحلوب في سبعة محليات في ولاية الخرطوم تم تقييمها من ناحية التغذية الجيدة والشرب الجيد9 توفر الاكل والشرب9 والمسكن الجيد9 المريح اثناء الحركة والراحة 8درجة الحرارة المناسبة وسهولة الحركة 9والصحة الجيدة 9 خلو الحظائر من الجروح والامراض والالام الناتجة من سوء الادارة 9والسلوك المناسب السلوك الاجتماعي وعلاقة الحيوان بالانسان9 تم جمع المعلومات بواسطة استبيان صمم خصيصا لذلك وعن طريق الزيارات والمقابلات المباشرة بالاضافة الي الملاحظات .

اوضحت نتائج الدراسة ان بعض مؤشرات الاكل الجيد والشرب المتعلقة بالازدحام حول العلافات والشرابات كانت 61.9% و 85.7% علي التوالي توفر الاكل والشرب كانت 61.9% و 81.7% علي التوالي اما مؤشرات المسكن الجيد المتعلق بوجود مظلات فقد سجلت 81% توفر المساحة الكافية 76.1% . اوضحت الدراسة كذلك ان 47.6% و 57.1% من مربى الماعز الحلوب يستخدمون وسائل تبريد في موسم الصيف ولهم مساحة لرياضة الماعز كذلك بينت الدراسة ان عدد قليل 8-23 يوفرون مصدر اضاءة داخل الحظائر -اما فيما يختص الصحة الجيدة للماعز اوضحت الدراسة ان فقط 42.9% من مربى الماعز يقومون بتطعيم حيواناتهم ضد الامراض البوائية (طاعون المجترات الصغيرة والحمى المالطية والتسمم المعوي) مقابل 57.1% منهم لا يقومون بالتطعيم مطلقا 0كذلك بينت الدراسة ان كل الحظائر التي شملها الاستطلاع لهم نفوق وسط المعاز بدرجات متفاوتة خلال العام الماضي واوضحت الدراسة بان 66.6% من المربين يستشيرون الطبيب البيطري عند مرض الماعز و 14.3% لا يستشيرون الطبيب 8وبينت الدراسة عدد من المربين يستخدمون الاعشاب والادوية التقليدية في علاج حيواناتهم 0 اوضحت الدراسة بان 19% من المربين لهم ماعز بها جروح في الارجل و 4.8% يشكون من انتشار الامراض التنفسية و 61.9% لا يزيلون القرون او يقلمون الاظافر وحوالي 57.1% فقط يكافحون الديدان الخارجية وبينت الدراسة بان نصف مربى الماعز الحلوب يعانون من تكس الماعز اثناء الاكل والشرب ووجد كذلك ان 80% من الماعز ترضع صغارها وكذلك لوحظ العلاقة فيما يخص الاكل والشرب والمسكن والصحة الجيدة والسلوك المناسب في الماعز الحلوب بولاية الخرطوم واوصت الدراسة الي الحاجة لدراسة المشاكل التي تواجه رفاه الماعز الحلوب داخل ولاية الخرطوم وعموم السودان وعلى مستوى نظم الانتاج المختلفة .

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List of abbreviation

| Abbreviations | abbreviation stands for |
|---------------|--|
| AVMA | American veterinary Medical association |
| AWIN | Animal welfare indicators for goats |
| O.I.E | world Organisation for Animal Health |
| M.D | Medical-dictionary |
| F.A.W.C | Farm Animal Welfare Council |
| UDAW | Universal Declaration on Animal |
| welfare | |
| A.W.A | Animal Welfare Act |
| UK | United Kingdom |
| SPCA | Society for the Prevention of Cruelty to |
| Animals | |
| F.A.W.A.C | Farm Animal Welfare Advisory |
| Committee | |
| C.A.E | Caprine Arthritis Encephalitis (CAE) |

CHAPTER ONE

Introduction

The domestic goat is sociable, inquisitive and intelligent species, live as scavenger in the streets of town and cities, requiring minimum care and attention despite the fact that they provide many poor urban and rural families with milk and meat (Balall *et al.*,2008).Sudan has approximately 30.649.000 head of goats (Minster of Animal Resource and fisheries 2011).Behnke and osman (2012)stated that the North Sudan goats produce 51.1 liters of milk per head and total production about 1,549,979 tons for human consumption. The goat population of Khartoum state is 692,018 as reported by Ministry of agriculture, Animal Wealth and Irrigation of Khartoum state (2011). The human population of Khartoum is approximately 6 millions people. This urban area has a great demand for food. Animal welfare means how an animal is coping with the condition in which it lives. An animal is in good state of welfare if (as indicated by scientific evidence) it is healthy, comfortable, well nourished, safe able to express innate behaviour, and if it is not suffering from unpleasant states such as pain, fear or distress. Good animal welfare requires disease prevention and veterinary treatment, appropriate shelter, management, nutrition, humane handling and slaughter. Ensuring animal welfare is a human responsibility that includes consideration for all aspects of animal well-being. There are also various means of measuring animal welfare, including (but not limited to) health, productivity, behaviour and physiological response.

Farm animals welfare measures can be divided into behavioral, physiological, health (Broom and Fraser, 2010) and zoo technical (Appleby *et al.*, 2011). Behavioral measures can be assessed based on abnormal behaviour; physiological parameters can be assessed by heart

rate, respiratory rate and cortisol measurements; health indicators of the herd can be assessed by incidence and prevalence of diseases, and zoo technical indicators can be assessed by means of body conditions score, mortality and birth rate. In 2015, a protocol was released to assess welfare of lactating dairy goats in Europe, the AWIN goat (Animal Welfare Indicated for Goats), with the goal of users indicator based mainly in animal and available resources to generate data that represents the quality of life in animal (AWIN, 2015a).

The importance of animal welfare in the animal production industry is growing increasingly, not only by legal requirement but for its effects on productivity. Only if the animals are in a proper degree of comfort can achieve optimal production levels, however the assessment of animal welfare in small scale dairy goat's farms and fences is not well defined yet, (Goddard, 2013).

The objective of this study is to assess and evaluate the welfare of dairy goats raised in Khartoum state based on the five freedoms.

1-Literature Review

1-1 Khartoum state :

Is a one of eighteen states of Sudan Divided into seven localities (Khartoum (Capital, Omdurman, Bahri, Sharq an-Nil, Jabal Awliya, Om Badda, and Karari). Although it is the smallest state by area (22,142 km²), it is the most populous (5,274,321 in 2008 census). (5th Sudan population and housing census, 2009). The state lies between longitudinal 31.5 to 34°E and longitudinal 15 to 16°N. It is surrounded by River Nile state in the north-west, in the north-west by the Northern state, in the east and south east by the state of Kassala, Gedaref, Gezira and White Nile state, and in the west by North Kurd fan.

1-1-1 Climate :

The northern region of the state is mostly deserting because it receives barely any rainfall, whereas the other regions have a semi-desert climate. The weather is rainy in the fall, and cold and dry in winter. Average rainfall reaches 100-200 mm in the north-eastern areas and 200 - 300mm in the north-western areas. The temperature in summer ranges from 25 to 40°C from April to June and from 20 to 35 °C in the month of July to October. In winter, the temperature declines gradually from 25 to 15 °C between November and March.

1-2 World goats:

According to FAOSTAT (2017) the number of goats worldwide in 2014 was 1,011,251,833 animals. The main countries that raised goats were mainland China (185,675,000), India (133, 000,000), Nigeria (72,466,698), Pakistan (66,615) and Bangladesh (55,900,000). In Brazil, in 2014 the Municipal Livestock Research reported the existence of 8.851.879 goats and the Northeast region had the highest number of these animals with 91. % of the national goat herd (Ibge, 2014).

1-3 Sudanese goats

1-3-1 Classification and distribution:

Goat production is important in the Sudan because goats have been raised successfully with very limited feed resource. Goats are present in most part of Sudan innumerable crosses however four main local types existing and these are: Nubian, Desert, Nilotic and Dwarf (Tagger) goat (Mason and Maule, 1960).

Nubian goats: they are reverie found particularly in Northern Region and Khartoum state, they are also found in East Africa and Madagascar. They are unique African milk breeds producing 1-2kg milk pretty day. They are large long legged with pendulous ears and Roman nose especially in males. They are black or brown, have long silky coat and it had typical loop ears like those of the Damascus breed. (Devendra and Burns, 1970).

Desert goats: These goats belong for the arid areas. Both sexes are horned, in male being longer, twisted and projecting laterally. Ears are pendulous and moderate size. The goats are long legged and had short fine coat which is usually grey (adaptation to heat and sparse grazing of desert condition). Beards are common in male and female. Average mature body weight is 33 Kg and 66 cm in wither height in adult female. While in male live weight ranges from 40-48 Kg and wither height ranges from 69-83 cm. These goats are primarily producer of meat and skin (Devendra and Burns, 1983). **Dwarf (Tagger) goats:** They are found in the mountains and hill of the Sudan in Nuba and Angessena Mountain. Tagger is small sized animals with short legs and ears, horned and has mane and wattle. Male have beards. Colour is creamy to brown and sometimes black. They are active and well adapted to mountain climate. (Mason and Maule, 1960).

1-4 Animal welfare concepts:

Is a well being of animals, the standards of “good” animal welfare vary considerably between different contexts. These standards are under different constant review and are debated, created and revised by animal welfare groups. Legislators and academics worldwide. (Grandin, Temple, 2013). The animal welfare science uses various measures, such as longevity, disease, immunosuppression, behaviour, physiology and reproduction. (Broom, 1991).

1-5 1-4-1 History, principles and practice:

Early legislation in the western world on behalf of animals includes the Ireland parliament (Thomas Wentworth).”An act against Plowing by the Tayle, and pulling the wool off living sheep”, 1635, and the Massachusetts colony (Nathaniel Ward)”off the Brute Creatures”

One of the first national laws to protect the animals was the UK”cruelty to Animals Act 1960”

Significant progress in animal welfare did not take place until the late 20th century.

In 1965, the UK government commissioned an investigation -led by Professor Roger Brambell-into the welfare of intensively farmed animals, partly in response to concerns raised in Ruth Harrison’s 1964 book, *Animal Machine*. The committee’s guidelines recommended that animals require the freedom to “stand up, lie down, turn around, groom themselves and stretch their limbs”. The guidelines have since been elaborated upon to become known as five freedoms. (Farm Animal Welfare Council. 2009).

In the UK, the “Animal Welfare Act 2006” consolidated many different forms of animal welfare legislation.

These are different approaches to describing and defining animal welfare.

1-4-2 positive conditions -providing good animal welfare is sometimes defined by a list of positive conditions which should be provided to the animal. This approach is taken by the five freedoms and the three principles of Webster (2008).

The five freedoms are:

- Freedom from thirst and hunger-by ready access to fresh water and a diet to maintain full health and vigour.
- Freedom from discomfort-by providing an appropriate environment including shelter and a comfortable resting area
- Freedom from pain, injury and disease -by prevention or rapid diagnosis and treatment
- Freedom to express most normal behaviour -by providing sufficient space, proper facilities and company of the animal's own kind
- Freedom from fear and distress-by ensuring conditions and treatment which avoid mental suffering, (Webster, 2008).

1-4-3 High production – In the past, many have seen farm animal welfare chiefly in terms of whether the animal is producing well (Hewson, 2008).

1-4-4 Emotions in animals – Others in the field, such as ‘Duncan, (1996) and Dawkins,. (1980). Focus more on the feelings of the animal. This approach indicates the belief that animals should be considered as sentient being. Duncan wrote “Animal welfare is to do with the feelings experienced by animals: the absence of strong negative feelings, usually called suffering, and (probably) the presence of positive feelings, usually called pleasure.

1-4-5 Welfare biology – Yew-(1995) defines animal welfare in terms of welfare economics: “Welfare biology is study of living things and their

environment with respect to their welfare (defined as net happiness, or enjoyment minus suffering).

1-4-6 Dictionary Definition – In the Saunders Comprehensive veterinary Dictionary , animals welfare is defined as "the avoidance of abuse and exploration of animals by humans by maintaining appropriate standers of accommodation , feeding and general care , the prevention and treatment of disease and the assurance of freedom from harassment , and unnecessary discomfort and pain .(A.M.D,2010).

1-4-6 American Veterinary medical association (AVMA) has defined animal welfare as : "An animal is in good state of welfare if (as indicated by scientific evidence)it is healthy , comfortable , well nourished , safe , able to express innate behavior, and if it not suffering from unpleasant states such as pain, fear , and distress .

The responsible use of animals for human purposes, such companionship, food, fiber, recreation, work, education, exhibition, and research conducted for the benefit of both Humans and animals, is consistent with the veterinarian's Oath.

Decisions regarding animal care, use, and welfare shall be made by balancing scientific knowledge and professional judgment with consideration of ethical and societal values.

Animals must be provided with water, food, proper handling, health care, and an environment appropriate to their care and use, with thoughtful consideration for their species –typical biology and behavior.

Animals should be cared for in ways that minimize fear, pain, stress, and suffering.

Procedures related to animal housing, management, care, and should be continuously evaluated, and when indicated, refined or replaced.

Conservation and management of animal population should be humane, socially responsible, and scientifically prudent.

Animals shall be treated with respect and dignity throughout their lives and, when necessary, provided a humane death.

The veterinary profession shall continually strive to improve animal health and welfare through scientific research, education, collaboration, advocacy, and the development of legislation and regulations.

1-4-7 Terrestrial Animal Health code of world

Organization for Animal for Animal health defines animal welfare as "how an animal coping with the conditions in which it lives.

An animal is in a good state of welfare if (as indicated by scientific evidence) it is healthy, comfortable well nourished, safe able to express innate behavior, and if it not suffering from unpleasant states such as pain, fear, and distress. Good animal welfare

Requires disease prevention and veterinary treatment, appropriate, management, nutrition, humane, handling and humane slaughter\killing.

1-4-9 coping and attitudes:

Broom(1996) defined the welfare of animal as "It is state as regards it is attempts to cope with it is environment ". This state includes how much it is having to do to cope, the extent to it is succeeding in or failing to cope , and it is associated feeling." He states that " welfare will vary over a continuum from very good to very good very poor and studies of welfare will be most effective if a wide range of measures is used ".

1-5 goat welfare:

It is important to understand the basic needs of the goats so they can thrive well in their own environment. Manitoba Animal care Act outlines the duties for livestock owners

Including goat producers. The main duties under the act include;

- .provision of adequate water and feed.
- . Provision of adequate medical attention .

.provision of adequate space, ventilation, and sanitation.

.protection from heat and cold.

.Opportunity for exercise.

Dairy goats require special care due to their high production needs. It is necessary to keep in mind the udders vulnerability to injury and \or exposure to diseases. High nutritional or lactation should never be ignored. Avoid over milking to maintain under health. Comfort of the goats should be the first consideration while designing a milking parlour. Distress during handling and transport of goats should be minimized. Do not grasp or move goats by their fleece, hair, ears, horns and tails.

Goats should have an access to fresh water and feed during rest on long haul. Restraining should be free of sharp edged and objects. Electric pods are not recommended for directing goats. Nannies in lactation require special care to assure comfort, and avoid udder injury and mastitis subsequent to transport. Derivers are responsible for the welfare of goats during transport. Transporter must comply with federal health of Animals. The development of monitoring system is needed for ranking the welfare state of small ruminants at farm level. The assessment of welfare at farm level could be used to quantify the impact of different husbandry conditions on animals, but it could be also used for legislative requirement, as a certification system and as an advisory and management tool by farmers (Main *et al.*, 2003).

1-5-1 potential indicators of goat

1-5-1-1 welfare at farm level

The science-based assessment of small ruminant welfare should be the integration of both animal-based indicators and resource-based parameters. On-farm welfare assessment starts form the choice of proper welfare indicators: they should be simple to apply, easy to interpret and applicable (Farm Animal Welfare Council, 2005). In addition the

indicators must be valid, which means that they should be important in terms of animals welfare, and reliable, which indicates the tendency to give the same results by two or more observers. Stockmanship human-animal interactions play a principal role in sustaining the welfare and production of domestic animals (Harmsworth, 2003) . The quality of interactions with stock-people is especially relevant to small ruminants because they are quite afraid of people and little accustomed to handling, especially in meat and extensively reared breeds. A number of studies have demonstrate human-animal relationship has an impact on sheep and goat welfare, thus stockmanship can be rightfully proposed as in animal based indicator of sheep and goat welfare at farm level. The most significant influence of the shepherd on the flock is during the milking procedures and the artificial rearing of lambs and kids. In goats, a reduction in milk yield and milk let down is associated with negative interaction and fear of humans (Lyons, 1989). Reaction of animals to humans can be easily evaluated by measuring avoidance distances in small ruminants, too. Parameters such as capture time for milking and animal behavior in the waiting area and in the milk par lour (kicking and defection and urination during milking), easily detectable in field conditions of muscling and fat development. (Sevi *et al.*, 2010a, 2002). Lameness in goats may be an indicator of hard environment terrain, wetness, untrimmed hoofs, penetrating injuries, trauma, fracture, and inflammation of anatomical structures and glands (Mohammed *et al.*, 1996)..Some of management practices adopted by the shepherds can be stressful for livestock. group exchanges and relocations are routinely used to obtain uniform groups of sheep, but can result transient stress, altered cell-mediated immune responses and increased frequency of aggressive behaviors (Sevi *et al.*,2001c).Goat houses are often inadequate in terms of designs, materials and size. In addition, poor control of ambient

hygienic often observed in sheep and goat houses. The most reliable criteria to monitor the welfare of small ruminants with respect to rearing structures can be space allowance, shelters from climatic extremes, and lighting. A number of experiments provide recommendations regarding values of dimensional and micro-environment parameters to use for assuring satisfactory welfare levels in small ruminants. A stocking density of 2 m² \ animal has been recommended to sustain both production performances and health of lactating ewes (Sevi *et al.*, 1999). A volume allocation of 7 m³- animal is also required for health and good efficiency of production of the lactating ewe (Sevi *et al.*, 2001b).

Adequate ventilation rates and lighting in sheep and goat houses are recommended in the code of recommendation for the welfare of livestock that is applied in the United Kingdom. A mean ventilation rate of about 65 m³/h per ewe in summer and of 45 m³/h per ewe is required in sheep houses to sustain the performance and the welfare of lactating ewe (Sevi *et al.*, 2002, 2003). The areas where goat breeding is more diffused are characterized by hot summers so a major environmental threat to animal welfare is heat stress if flocks are not suitably sheltered against high air temperatures and solar radiation. Evidence exists that lactating ewe suffer from daily mean air temperature exceeding 30°C and THI (Temperature Humidity index) near or over 80, and even from ambient temperature peaking up to 35°C for few hours during the day (Sevi *et al.*, 2001a).
.Indicators.

Farm animals welfare measures can be divided into behavioral, physiological, health (Broom and Fraser, 2010) and zoo technical (Appleby *,et al.*, 2011) Behavioral measures can be assessed based on abnormal behaviour; physiological parameters can be assessed by heart rate, respiratory rate and cortisol measurement ; health indicators of the herd can be assessed by incidence and prevalence of diseases , and zoo

technical indicators can be assessed by means of body condition score , mortality and birth rates. In 2015, a protocol was released to assess welfare of lactating adult dairy goats in Europe, the AWIN Goat (Animal Welfare indicators for Goats), with the goal of use indicators based mainly in animals and available resources to generate data that represent the quality of life in animals and available resources to generate data that represent the quality of life in animals (AWIN, 2015a). Currently, there are no indicators to assess the degree of welfare in meat goat. Considering that Brazilian Northeast has the highest concentration of goat herd in Brazil, with specific weather and rainfall conditions , the aim of this review was to identify possible indicators to be applied in the welfare diagnosis of meat goat in this region.

1-5-1-2 selection and types of indicators for welfare assessment in meat goat

Assessment of animal welfare requires the use of several indicators that address physical and mental health, besides natural behaviour of each species (Blokhuis *et al.*, 2010). Parameters for farm animals were defined by two protocols: Welfare Quality, 2009) and animal welfare indicators (AWIN), created for sheep, dairy goats, horses ,donkeys and turkeys(AWIN PROJECT, 2015). Parameters or indicators used by AWIN and welfare Quality protocols were selected based on validity, ensuring the degree of current animal welfare; confidence, being identified by different observers, regardless of external conditions such as time of day; and feasibility, which applies to farm level (WELFAIR QUALITY, 2009; AWIN PROJECT, 2015). There are three types of indicators: animal-based, concerned about the expression of social behaviors and absence of stereotypes; and resources and management -based concerned about stocking density, housing conditions and health plants (Blokhuis *et al.*, 2010).

1-6 Goats and their Nutrition.

Goats are efficient browsers and prefer eating brushy plants along with some other woody and weedy plants found on the ranges. Goats are able to digest a large variety of fiber and roughage. The nutrient requirements of goats are determined by age, sex, breed, production system (dairy or meat), body size, climate and physiological state. Feeding strategies should be able to meet energy, protein, mineral, and vitamin needs depending on the condition of the goats. Goats do not depend on intensive feeding system except some supplemental feeding during growth, lactation, pregnancy and winter. Of course when goats are in lactation for an extended period of time (I.e., 10 months), they will require supplemental feeding on a higher plane of nutrition.

Water:-insufficient water intake well depresses a goat's performance earlier, and more severely, than any other dietary insufficiency. Adequate water is the paramount management concern. Goats should be consuming more water with high protein ration feedings.

Carbohydrate: - sugars, starches (found in grains) and fiber (cellulose) are the carbohydrates that convert into volatile fatty acids (energy) by rumen flora (beneficial bacteria). Normal goat diet (browse, Forbs, and grasses) is high in cellulose and requires digestion by rumen flora to be converted into energy. Fresh pastures and young plants may have highly digestible fiber and provide high energy compared to older plants. Higher energy levels come from lower fiber feeds. Energy is represented as total digestible energy (%TDN) in feed analysis reports. Form of hay or pasture to avoid high energy related problems. Maintain at least 12% crude in the diet. Energy requirements for different physiological stages maintenance, pregnancy, lactation and growth vary. The maintenance requirement for energy remains the same for most goats except dairy kid; they require 21% energy higher than the average. It is important to feed

higher energy rations at the time of breeding, late gestation and lactation. Lactating does have the highest energy demand. **Proteins:-**are digested and broken down into amino acids and are eventually absorbed in the small intestine. Those amino acids are building blocks for body protein (muscles). The protein requirements are higher during growth (kids) , milk synthesis (lactation) , and mohair growth . It is very important for a commercial goat operation to do cost-effective rationing as protein can be an expensive feed ingredient. Good quality hay does not need much protein supplement for goats. If the hay have about 12-13% protein content then provide 1/2 lb protein source in the form of corn , barley , or oats (with 20% protein in total.

Minerals and vitamins:- Goats need certain minerals and vitamins for their maintenance as well as proper functioning of their physiological systems. Feeding of fat soluble vitamins (A, D, E, and K) must be insured in a goat's diet due to its inability to make these vitamins. Rumen flora can make vitamin B in enough quantities needed for goat metabolism.

Feeding of calcium and phosphorus (2:1 ratio) is recommended for better structural and bone strength, while other minerals are necessary for other systems like nervous and reproductive. Minerals should be added into the feed keeping in mind the quality of forages can be high in some of the minerals and low in others. Free choice supply of loose minerals and salts always works well.

Fat: - can also be a source of energy for goats. Goats do consume some amount of fats while browsing. Supplying fats may not be a cost-effective idea for goat production, (McDonald, 2016)

CHAPTER TWO

2-Materials and Methods

2.1 study area description

The study was undertaken for five consecutive months and involved use of dairy goats and owners of goats in Khartoum state. Khartoum, the capital of Sudan, consists of three towns; Khartoum, Khartoum North (Bahri) and Omdurman.

These three towns are situated along the riverbanks where the White and Blue Nile merge from the River Nile. The city, with its annual average rainfall of 161 millimetres during July to September is situated in the arid and semiarid tropics. Ecological zone I'd between latitude 15° and 16.4° north, longitude 31° and 34.4° east (Ministry of Agriculture, Animal Wealth and Irrigation of Khartoum state, 2011). The average minimum and maximum temperatures range from 28° to 38°C during September and 16° to 31°C during January.

2.2 Questionnaire methodology and data collection:

During eight months between February and October, 2018, ninth dairy goats herds (producing milk for sale), representing large urban fences, were randomly chosen. Personal interview and questionnaire were conducted to gain insight into the farming system of dairy goats in Khartoum state, namely Khartoum, Khartoum North and Omdurman and their seven localities, (Khartoum (capital) Omdurman Bahri Sharq an - Nile Jabal Awliya Om Badda karari). The fences were selected according to the responder's desire to participate and the 90 questionnaires were filled by direct interviewing of the responding farm's owners. Observations were carried out to determine farm conditions and to identify potential problems encountered. A detailed structured questionnaire was prepared

and used to collect information from a total of ninety goat owner in one-visit interviews.

Some of the information collected during interviews was supported by observations. The questionnaire were designed to obtain personal information such as age of respondents, gender and educational background, general household characteristics, flock structure, flock management and dynamics, breeding practice, disease prevalence, production constraints and other data directly related to the research objectives such as :-Freedom from hunger and thirst (Appropriate nutrition and absence of prolong thirst), freedom from discomfort (By good housing , Comfort around resting, Thermal comfort and Ease movement),freedom from pain, injury and disease (absence of injury and disease and absence of pain and pain induced by management procedures criteria) and freedom to express normal behaviour (expression of social behaviour, expression of other behaviour, good human-animal response and positive emotional state criteria).

2.3. Statistical analysis

The data obtain were managed in Microsoft Excel (Microsoft Corporation, Redmond, WA, USA). The analysis of the data was done using statistical Package for Social Science (SPSS) computer programs (SPSS Institute Inc., Cary, NC, USA). Descriptive analyses were conducted using SPSS version 16.

Chapter Three

Results

3.1. Dairy goat owner general information and husbandry practice.

Table 1 shows goat owner general information. The results indicated that 52.5% of owners aged between 23 to 40 years, whereas 47.5% of owners aged between 41 to 75 years,. However, most of the owners (85.7%) were male, 76.2 % were married, 85.7 had other jobs and 33.3% were graduated from universities and only 14.3 were females, 14.4 % were single and 4.8 were illiterate.

Table 2 shows the methods of husbandry practiced in dairy goats in Khartoum State. The results revealed that 47.6 % of the owner possessed local breed, while 23.8% of them had cross breed. Most of goat owners (71.4%) had fence inside house while (28.6%) had fences outside the home. (95.2.8%) of the owners practiced natural insemination whereas only 4.8 used artificial insemination. most owners (71.4%) cleaned their fences and milking their goats. According to the majority of owners (100%) the goats were milked manually.

3.2. Good feeding and drinking welfare principles for dairy goats

Principles and criteria of good feeding and drinking welfare for dairy goats raised in Khartoum State _ Sudan, with respective indicators in each category are presented in Table 3 and 4. The results showed that 38.1% of owners fed the goat once per day, 52.0% of them practiced two times per day and 4.8% and 66.7 fed and offered water ad-libdium respectively. However, 47.7% and 9.5% of owners fed and offered water to the goat at morning respectively, 9.5.0% and 14.3 of them practiced afternoon feeding and drinking respectively, 14.3% of them practiced night feeding and 28% fed the goats at morning and afternoon. A 33.3% and 14.3% of goat owners observed crowding during feeding and

drinking time respectively. On the other hand, 85.7% of owners offered green fodder, 85.7% offered clean water and 33.5% of them offered mineral salts lick to the goats. However, 33.3% and 19.0% of them said their animals were suffered from prolonged Hungary and thirst respectively, while a few of them said they changed feed suddenly to goats (23.8) .However, the availability of feed to goat was 52.4%.

**Table 1 Owner dairy goats raised in Khartoum State _ Sudan,
general information**

| Principles | Criteria(owner information) | Information | % |
|---------------------------------------|-------------------------------------|----------------------|----------|
| Goat owner general information | Age | 23- 40 | 52.5 |
| | | 41- 50 | 47.5 |
| | Gender | Male | 85.7 |
| | | Female | 14.3 |
| | Educational Level | Illiterate | 4,8 |
| | | University and above | 33.3 |
| | Marriage | Married | 76.2 |
| | | Single | 14.3 |
| | Ecu patients | Divorced | 9.5 |
| | | Live stock owner | 14.3 |
| | | Other job | 85.7 |

Table 2 Methods of husbandry practiced in dairy goats rose in Khartoum State _ Sudan,

| Principles | Husbandry | Husbandry indicators | % |
|----------------------------------|-------------------------|-----------------------------|----------|
| Methods of goat husbandry | Animal house site | Inside owner house | 71.4 |
| | | Out side owner house | 28.6 |
| | Animal house cleaning | Family members | 71.4 |
| | | Worker | 28.6 |
| | Methods of Insemination | Natural | 95.2 |
| | | Artificial | 4.8 |
| | Goat's breed | Local | 47.6 |
| | | Cross | 23.8 |
| | | Local + cross | 28.6 |
| | Goat caring | Owner self | 61.9 |
| | | Owner wife | 9.5 |
| | | Labour | 9.5 |
| | Goat milking time | Morning | 76.2 |
| | | After noon | 19.0 |
| | | Night | 4.8 |
| | Method of milking | Manual | 100 |
| | | Machine | 0 |
| | Who milks the | Family members | 71.4 |

| | | | |
|--|-------------------------------|-------------------------------|------|
| | goat | | |
| | Hair coat condition | Shaving | 47.6 |
| | | Not shave | 52.4 |
| | Disbudding | Disbudding | 61.9 |
| | | Not budding | 38.1 |
| | | Use fleece and insect killer | 57.1 |
| | Trimming of claws | Trimming | 38.1 |
| | | Not trimmer (overgrown claws) | 61.9 |
| | Using flies and insect killer | Not use | 42.9 |

Table 3 - Principles and criteria of good feeding welfare for dairy goats raised in Khartoum State _ Sudan, with respective indicators in each category, according to AWIN Goat and Sheep (AWIN, 2015).

| Welfare principles | Welfare criteria | Welfare indicators | % |
|---------------------------|------------------------------|---------------------------------------|----------|
| Free from Hunger | Appropriate nutrition | Feed availability | 76.2 |
| | | Feeding once per day | 38.1 |
| | | Feeding twice per day | 52.2 |
| | | Ad-labdanum | 4.8 |
| | | Morning feeding | 47.7 |
| | | Evening feeding | 24.3 |
| | | Morning and evening feeding | 28 |
| | | Crowded at feeders | 38.1 |
| | | Absence of Prolonged hunger | 61.9 |
| | | Feeding according to production level | 38.1 |
| | | Salt lick offered | 33.3 |
| | | Gradual feed change | 76.8 |
| | | Sudden feed change | 23.8 |
| Green fodder | 85.7 | | |

Table 4 - Principles and criteria of Good drinking welfare for dairy goats raised in Khartoum State _ Sudan,, with respective indicators in each category, accord lying to AWIN Goat and Sheep (AWIN, 2015a, b).

| Welfare principles | Welfare criteria | Welfare indicators | % |
|---------------------------|------------------------------------|------------------------------|----------|
| Free from Thirst | Absence of prolonged thirst | Water availability | 66.7 |
| | | Queuing at drinking | |
| | | Source of water(public net) | 76.2 |
| | | Drinking Ad-labdanum | 66.7 |
| | | Morning drinking | 9.5 |
| | | Evening drinking | 14.4 |
| | | Morning and evening drinking | |
| | | Crowded at drinking | 14.4 |
| | | Absence of Prolonged thirst | 81.7 |

Table 5 - Principles and criteria of Good housing welfare for dairy goats raise in Khartoum State _ Sudan,, with respective indicators in each category, accord lying to AWIN Goat and Sheep (AWIN, 2015a, b).

| Welfare principles | Welfare criteria | Welfare indicators | % |
|--|-------------------------------|---|----------|
| Free from Discomfort and distress | Comfort around resting | Hard bedding | 76.2 |
| | | Soft bedding | 23.8 |
| | | Thermal stress (Panting) | 23.8 |
| | Thermal comfort | Access to shade/shelter | 81.0 |
| | | Presence of light | 23.8 |
| | | Good ventilation | 90.5 |
| | | Provision cooling at summer | 47.6 |
| | Ease of movement | Stocking density (absence of crowdedness) | 76.2 |
| | | Normal movement | 81.0 |

Table 6- Principles and criteria of Good health welfare for dairy goats raise in Khartoum State _ Sudan,, with respective indicators in each category, accord lying to AWIN Goat and Sheep (AWIN, 2015a, b).

| Welfare principles | Welfare criteria | Welfare indicators | % |
|---|---|--|------------|
| Free from pain, injury and disease | Absence of injuries | Leg injuries (led to lameness) | 19.0 |
| | | Lameness due to overgrown claws | 61.9 |
| | Disease | Severe lameness | 19.1 |
| | | Respiratory disease (pneumonia) | 4.8 |
| | | Absence of worms | 47.6 |
| | | Presence of worms | 52.4 |
| | Presence of external parasites | Consult the veterinarian | 66.6 |
| | | Not consult the veterinarian | 9.6 |
| | Methods of diagnosis and treatment | Using traditional and herbal medicine | 23.8 |
| | | Vaccination against epidemic diseases | Vaccinated |
| | Not Vaccinated | | 57.1 |

Table 7 - Principles and criteria of appropriate behaviour welfare for sheep and goats, with respective indicators in each category, according to AWIN Goat and Sheep (AWIN, 2015a, b).

| Welfare principles | Welfare criteria | Welfare indicators % | % |
|---|---------------------------------------|-------------------------------|----------|
| Free to express their normal behaviour | Expression of social behaviour | Feeding their kids | 81.0 |
| | Human-animal response | Good human-animal interaction | 66.7 |

CHAPTER FOUR

DISCUSSION:

Some two decades ago; the main objective of an animal welfare was to improve the conditions of which animals were raised, transported and slaughtered to meet their physiological and behavioral needs .The paradigm is now changing and new considerations are giving rise to animal welfare issues, especially in the field of animal production.

The results showed that most of the gender's owners were males ,and few of them were females ,also most of the owners were married, and few were single ,the results revealed that the majority of the owners had other jobs and few of them were farmers only, and some were graduated from universities ,other and very few of them were illiterates, some of the owners had local breed ,and few had cross breed ,other had two types (local and cross) breed, most of the goat's owners had fence inside the house while other their fence outside the house ,the majority of the owners practiced natural insemination whereas only few used artificial insemination, most owners cleaning their fences and milking their goats; and few hired worker , according to majority of the owners the goats were milked manually. moreover ,recent studies about welfare attitude between the veterinary students and veterinarians in Sudan revealed that most of the students (96%) think that animal welfare is an important issue in veterinary field ,some of them think that animal welfare should be taught to veterinary students,(92%) believed that animal welfare affects animal's productivity(Shadia *et al.*,2017) .

A constant supply of water for dairy goats is critical to regulating body temperature, especially in summer. principles of good feeding and drinking welfare for dairy goats in Khartoum state showed that some of owners fed their goats once per day ,and most of them practiced twice per

day ,on the other hand,(85.7%) of owners offered green fodder ,and (4.3%) only fed mixed fodder, also (100%)offered clean water and (33.5%)of them offered mineral salts lick to the goats.

The result showed that (33.3% and 19.0 %)of the goats were suffered from prolonged hunger and thirst respectively, while few of the owners changed the feed suddenly to goats.(23.8%) ,nutritional status of the goats can be measured, subjectively, by palpation of the lower back and sternum aiming to feel the amount of muscle and fats in these areas(villaquiran *et al.*,2004) .Goats with increased or decreased ECG (electrocardiograph) ,may have systemic diseases and reproductive problems. A constant supply of water for small ruminants is critical to regulating body temperature, water quality should be considered because contaminants such as bacteria, viruses, and protozoa are transmitted to animals through this vehicle, being important to assess the cleanliness of water points (AWIN, 2015).Jorgensen, *et al.*, (2007) reported That aggressive interactions increase significantly when the number of the goats per trough is higher. Meanwhile, code of welfare (2012) indicates a space of 40cm per adult goats was adequate. Sheep and goats houses are often inadequate in terms of design, materials and size is often observed in sheep and goats houses. The most important criteria to monitor the welfare of small ruminants with respect to rearing structures can be space allowance, shelters from climatic extremes, and lighting .In addition poor control of ambient hygiene. In this study about (76.2%) of the fences had sufficient area and the goats were comfortable, and (81%) of fences had shelters from heat, and (90.5%) had good ventilation inside the fences, (57.1%) of the fences has play yard, few owners (23.8) had light source in their fences. A number of experiments provide recommendations regarding values of dimensional and micro environment parameters to use for assuring satisfactory welfare levels in small ruminants. A stocking

density of 2 m² / animal has been recommended to sustain both production performances and health of lactating goats (Sevi, *et al.*, 1999). A volume allocation of 7 m³ / animal is also required for health and good efficiency of production of the lactating goats (Sevi *et al.*, 2001). Adequate ventilation rates and lighting in sheep and goats houses are recommended in the code of recommendation for the welfare of livestock that is applied in the United Kingdom. (Sevi *et al.*, 2002, 2003). Very low (10 lux) and high (1000 lux) light intensities lead to increased frequency of abnormal behaviors in Comisana lambs (Casamassima *et al.*, 1993). Studies reported that thermal neutral zone for goats are between 20 to 30°C, with critical heat stress at temperature above 33°C (Baeta and Souza, 2010).

The health status of the flock could be evaluated by scoring the body condition (BCS), checking skin and hair conditions, and detecting lameness and injuries, BCS estimated condition of muscles and fat development.

The result showed that only (42.9%) of owners vaccinated their goats (PPR “pestering doe pestis ruminants”, brucellosis) while (57.1%) of them did not vaccinate, mortality found in all the herds (accidents), (19%) of owners call veterinarian to their sick animals, while (47.6%) of them took the sick goats to the veterinary clinic and (33.4%) of goats owners did not consult the doctor, (61.9%) of the owners did not practice disbudding and trimming claws, (57.1%) of the owners controlled the external parasites. Hair coat condition parameter may indicate the existence of pathologies or diseases on animals (Berg *et al.*, 2009). Steele (1996) reported that goats are very agile but can suffer poor feet including foot rot. Lameness in goats may be an indicator of hard environmental terrain, wetness untrimmed hoofs, penetrating injuries, trauma, fracture and inflammation of anatomical structure and glands (Mohammed *et al.*,

1996). Wire and wood splinter were reported as causes of injuries in goats,(Brito *et al.*,2005) .Goats are gregarious animals and only isolate from the herd in moments before delivery (lickliter, 1985) .Animals in this situation are usually isolated mental or physically even during activities that should be synchronized (AWIN , 2015), the level of fear in animals is determined by previous human - animal interaction (Mattiello *et al.*,2010).

Human - animal interactions play a principal role in sustaining the welfare and production of domestic animal (Hemsworth, 2003) .The quality of interactions with stock - people is especially relevant to small ruminants because they are quite afraid of people and little accustomed to handling, especially meat and extensively reared breeds. A number of studies have demonstrated that human - animal interaction has an effect on sheep and goats welfare, in this study about (80.0%) of animals feeding their kids, while a (81.0%) of animals showed normal rumination and ease to move. The majority of dairy goats' owners observed good human animal interaction. Qualitative behaviour assessments seek to identify animal emotion through its behaviour expression and body posture (Wemesfelder *et al.*, 2000). Behavioral tests aiming to assess the quality of human animal interaction in large ruminants are avoidance distance from the stockman in the home, avoidance distance at the manger and approach behaviour (Waiblinger *et al.*, 2003) Reactions of animals to humans can be easily evaluated by measuring avoidance distance in small ruminants, too . Parameters such as captured time for milking and animal behaviour in the waiting area and in the milk parlour (kicking, defecation and urination during milking), easily detectable in field conditions, could represent other reliable index to evaluated animal welfare.

Conclusion:

- Most of goat`s owners are male.
- Welfare assessment detects some present problems in dairy goat welfare.
- Freedom from hunger and thirst related to absence of crowding in feeders and drinkers were observed in majority of fences and their is prolonged hunger and thirst were detected in the other.
- Freedom from discomfort related to shelter was observed.
- No light sources in majority of farm and fences.
- Cooling system during hot weather not practice in most fences.
- Vaccination against infectious diseases not practiced in some fences.
- Goats queuing at feeding and drinking.
- The majority of dairy goat`s owners observed good human animal interaction.

RECOMMENDATIONS

- Goat's fences must be adequate in terms of design, materials and size.
- Goats must be provided with natural or artificial light of appropriate intensity for minimum of nine hours each day.
- A veterinarian must be consulted if there is any significant disease or injury or if an animal health problem persists in spite of treatment.
- Goats must be cared for by a sufficient number of personnel, who collectively possess the ability, knowledge and competence necessary to maintain the health and welfare of the animals.
- Further studies are needed on the impact of management and environmental factors on goat's welfare in order to find additional and feasible measures of proven validity and reliability to be used for monitoring protocols in goat farms and fences.
- Regulations and policy should be imposing to protect animal from bad welfare.
- Identification of the main welfare problems across the countries and different production system is needed.

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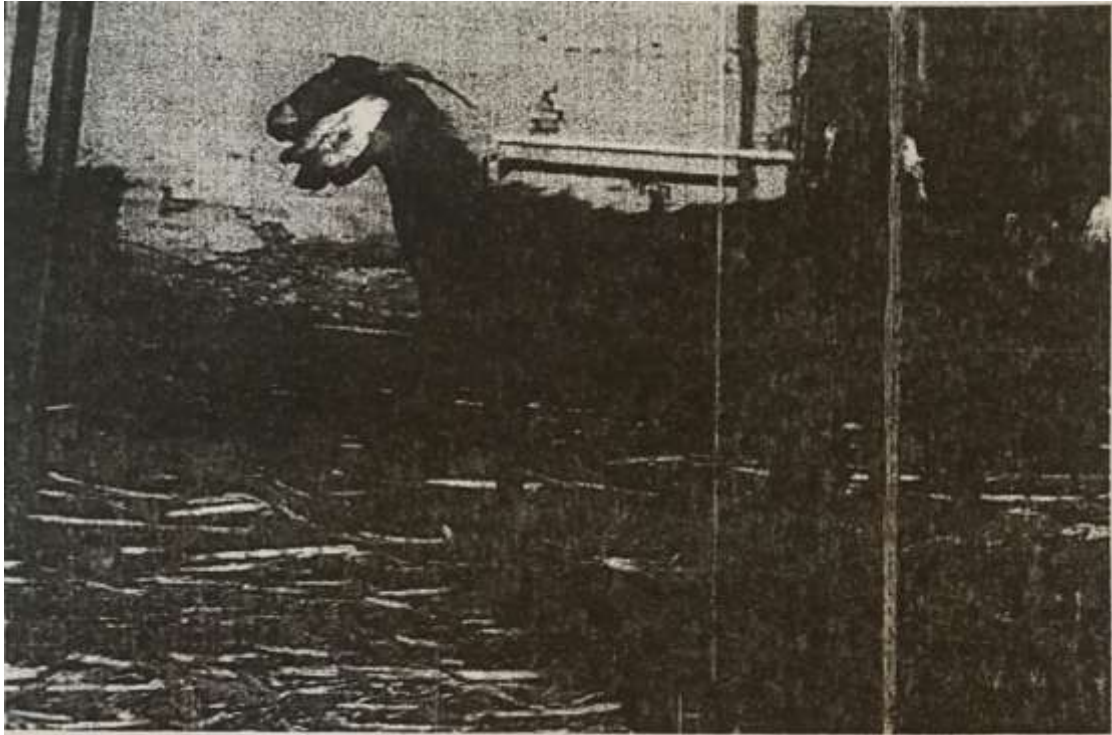
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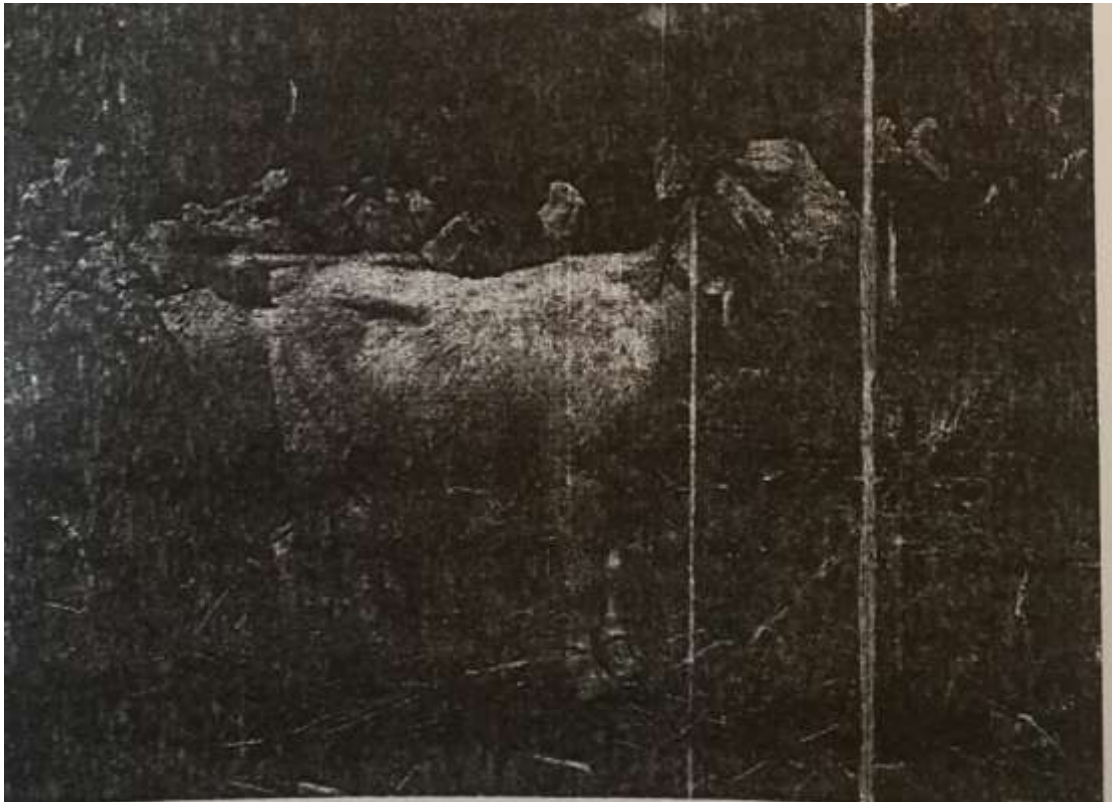
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Appendixes

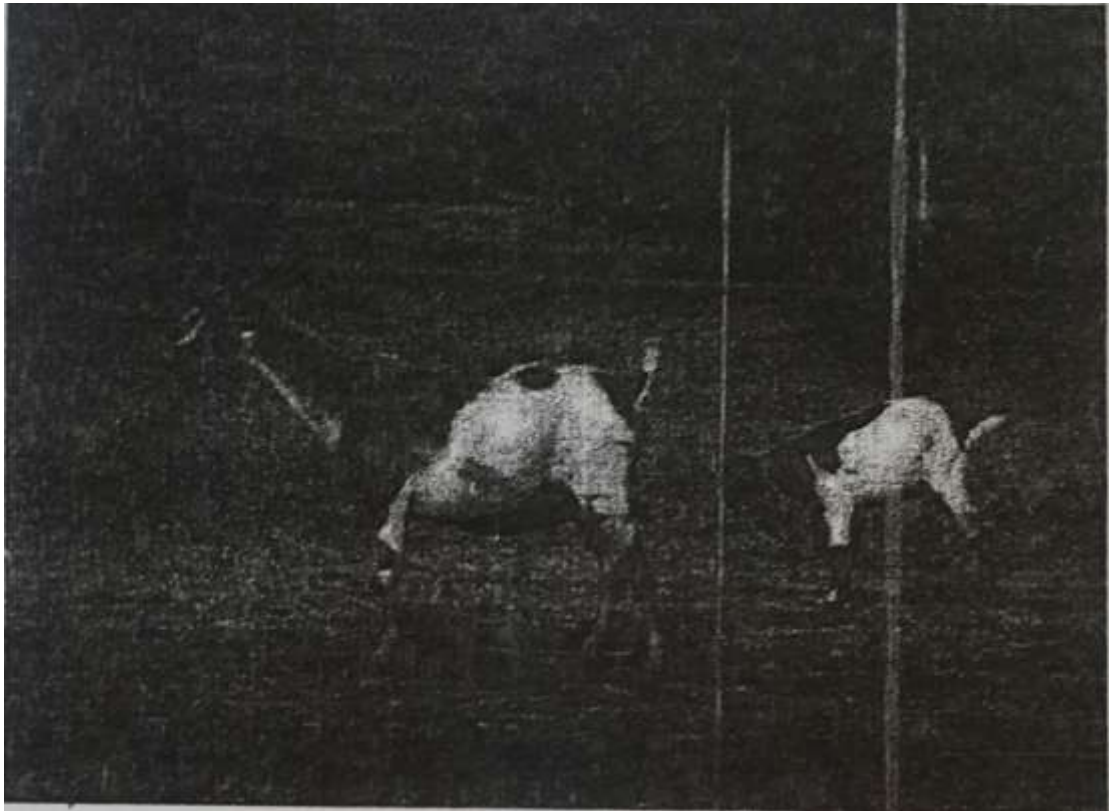
Appendix 1 Nubian goat breed



Appendix 2 Desert goat breed (alsarawi)



Appendix 3 Mountainous breed (Al.Tagar or Algabali)



بسم الله الرحمن الرحيم

استبيان حول رفاه الماعز في ولاية الخرطوم

الاعداد والإشراف: د. شمس الدين حسب الله أحمد

أخي المجيب هذا الاستبيان للدراسة فقط - نرجو تسهيل مهمة الباحث ما أمكن
ذلك (المشرف علي البحث)

اسم العداد: -----

أسئلة عامة:

1/ المحافظة: ----- 2/ المحلية ----- 3/ الحي: -----

4/ الجنس ----- 5/ العمر -----

6/ المستوى التعليمي: 1/ أساس 2/ ابتدائي 3/ متوسط 4/ ثانوى 5/ جامعي 6/ فوق الجامعي

هل لديك مهنة اخرى: 1/ نعم 2/ لا

7/ اذا كانت كانت الإجابة نعم أذكرها -----

8/ الحالة الاجتماعية: 1/ متزوج 2/ أعزب 3/ ارمل 4/ مطلق -----

2/ أسئلة عن الحيوانات:

1/ أذكر وسائل رعاية الحيوانات:

1/ داخل المنزل في حظيرة 2/ خارج المنزل في المرعي

3/ أسئلة عن الماعز:

1/ أذكر الماعز التي تمتلكها: 1/ بلدية 2/ هجين

2/ لون الماعز التي تمتلكها 1/ ابيض 2/ اسود 3/ خليط حدد -----

3/ أين تم إنشاء حظيرة الماعز 1/ في المنزل 2/ خارج المنزل (مزرعة)

4/ اذا كانت الحظيرة في المنزل - حدد مساحتها -----

5/ أذكر مساحة المنزل -----

6/ اذا كانت الحظيرة خارج المنزل أذكر مساحتها ----- 9/ أذكر

مساحة المزرعة -----

- 7/ هل الحظيرة مظلمة ----- هل يوجد بها إضاءة -----
- 8/ هل التهوية جيدة و يوجد بها جهاز تبريد في الصيف
- 10/ هل لديك شريك في الماعز: 1/ نعم 2/ لا
- 11/ اذا كانت الإجابة نعم حدد نوع الشراكة-----
- 12/ اذكر عدد المشاركات المستخدمة للقطيع -----
- 13/ اذكر نوع المادة التي تم بها تصنيع المشارب 1/ حديد 2/ ألومنيوم 3/ بلاستيك
4/ أخرى
- 14/ اذكر عدد الاكلات-----
- 15/ اذكر نوع المادة التي تم بها تصنيع الاكلات 1/ حديد 2/ ألومنيوم 3/ بلاستيك
4/ أخرى حدد-----
- 16/ من الذي يقوم برعاية القطيع: 1/ بنفسه 2/ الزوجة 3/ الزوج 4/ الذكور 5/ الأبناء
والإناث 6/ أخرى حدد-----
- 17/ من الذي يقوم بتنظيف الحظائر 1/ الأسرة 2/ استأجر عامل ---- إذا كانت
الإجابة باستأجار عامل اذكر جنس العامل -----15
- 18/ اذكر الشخص الذي يقوم بالحليب : 1/ من الأسرة 2/ من خارج الأسرة - حدد
الجنس
- 19/ طريقة الحلب 1/ يدوية 2/ آلية
- 20/ هل تترك حليب لصغار الماعز -----18/ هل ترضع الماعز صغارها

21/ الأمراض التي أصيبت الماعز وتكلفة العلاج والتفوق في السنة الماضية :

| اسم المرض | تكلفة العلاج | عدد التفوق في السنة |
|-----------|--------------|---------------------|
| | | |
| | | |
| | | |

21/ إذا أصيبت الماعز بأمراض أين يتم العلاج :

استدعاء الطبيب البيطري 2/ الذهاب إلى الطبيب البيطري في مكتبه 3/ الذهاب إلى مكتب البيطري خارج المحلية 4/ أخرى-----

22/ من أين يتم شراء الأدوية :

1/ من داخل المحلية 2/ من خارج المحلية حدد-----

23/ وسيلة جلب الدواء:

1/ عربية 2/ كارو 3/ كارو 4/ بالارجل 5/ أخرى حدد--

24/ هل يوجد شارع مسفلت بين المنزل والحظيرة :

1/ نعم 2/ لا

25/ وقت شراب الماعز :

1/ الصباح 2/ الظهر 3/ المساء 4/ طوال اليوم

26/ هل يوجد ازدحام حول المياه:

1/ لا يوجد 2/ احيانا 3/ غالبا

27/ مكونات تركيب المركبات : 1/ ردة 2/ امباز 3/ علف مصنع 4/

اخرى حدد

28 / مواعيد اعطاء العليقة 1/ الصباح 2/ الظهر 3/ المساء

29/ عدد مرات اعطاء العليقة: 1/ مرة واحدة 2/ اثنتان 3/ اكثر

30/ هل تقوم بتغيير العليقة تدريجيا -----

31/ وقت جمع الالبان : 1/ الصباح 2/ الظهيرة 3/ المساء

31/ هل تقوم بقص الشعر -----

32 / هل تقوم بتقليم الاظافر -----

33/ هل تقوم بالوشم او الكي بالنار -----

34/ هل تقوم بقطع القرون -----

35 / هل تقوم بالتطعيم ضد الامراض-----

36/ هل تعطي فيتامينات وملاح كمكملات غذائية او اثناء فترة المرض -----

37/ هل تستخدم طاردات الحشرات ومضادات الطفيليات-----

المياه:

1/ اذكر مصادر المياه :

| المصدر | المنزل للشرب | الحيوانات | الزراعة |
|-----------------------|--------------|-----------|---------|
| الترعة | | | |
| البئر | | | |
| الشبكة القومية للمياه | | | |
| النيل | | | |
| اخرى اذكر | | | |

2/ وسيلة جلب المياه:

1/ وجود ماسورة داخل المنزل 2/ تانكر 3/ كارو 4/ اخرى حدد----

3/ المسافة بين مصدر المياه والمنزل :-----كلم.