**International Journal of Innovation Scientific Research and Review**
*Vol. 05, Issue, 03, pp.4096-4100, March 2023*
*Available online at http://www.journalijisr.com*
*SJIF Impact Factor 2023: 6.599*

IJISRR

**ISSN: 2582-6131**

**Research Article**

# THE VETERINARY SERVICES DELIVERY& ITS EFFECTS ON SOME NOMADIC SHEEP PRODUCTIONMEASURES, NORTH KORDOFAN STATE, SUDAN

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**Received 03th January 2023; Accepted 04th February 2023; Published online 20th March 2023**

**ABSTRACT**

This study was carried in the period from November 2018 to April 2020 in North Kordofan state to assess theveterinary services delivery & its effects on some nomadic sheep productions measures that presented in table (1) the result showed that there were highly significant differences (P<0.001) on the maturity age, conception rate, lambing rateas compared withcontrol. The maturity age was lower (6.75 and 8.93) but conception rate, lambing rate, were higher compared with control. Conception rate (17.87 and 10.81), Lambing rate(16.0 and 7.37). The study concluded the efficiency of veterinary services delivery in nomadic sheep production.

***Keywords:*** Nomadic Sheep, Production Measures, Veterinary Services.

## INTRODUCTION

The State veterinary service was established in 1899 during the British colonial era. The service is composed of a Directorate General of Animal Resources (DGAR) under the umbrella of the State Ministry of Agriculture, Animal Resources and Irrigation (SMAARI) in Elobied town. The DGAR has also HQs in the eight localities as well as in the AUs In 2018 there were around (51) veterinarians, (95) animal protectionists and (23) technicians in public service distributed in HQs in Elobied and the localities. Livestock populations were estimated at (22.5) million head for 2010; the sheep only is (19.8)million head. Source: Livestock surveillance WSNRMP Directorate General of Animal Resources, North Kordofan State2010).The State contributes about 30% to nonpetroleum GDP. The sheep inspected and prepared for exportation via Port Sudan through the state vaccination & check centers during (2014-2017) was (1.6) million heads.In the period from (2014-2017) it was (855) thousand heads of sheep exported to other states. The animals are not allowed to leave the State to their destinations unless they were inspected, vaccinated and a health certificate issued. Meat consumption of animals legally slaughtered and inspected at the various slaughter houses and slabs of the veterinary servicefrom(2014-2017)totals is (290) thousand heads; the sheep only is 99.5 thousand heads represent (35%) of slaughtered animals. Trade in salted and tanned hides and skins were estimated at (4.5) thousand pieces for the period 2014-2017.The state herd was prophylactic ally vaccinated with doses of various vaccines as follows; Sheep was vaccinated against H.S, anthrax, sheep pox and PPR.There is (137) private veterinary pharmacies distributed over the state providing drug services (MPWR.2018).

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## MATERIALS & METHODS

This study was conducted to verify the effect of general veterinary health services (control & treatment) on sheep production under the nomadic system of management in North Kordofan, Sudan.

**Study Area:** North Kordofan State lies between latitudes 110 15" – 160 45" North longitudes 270 50" – 320 15" East. The State occupies an area about 242,000 square kilometres or about 59 million (feddan).The State is neighboured by North Darfur & West Kordofan states to the West, South Kordofan to the south, White Nile to the South East, Khartoum to the North East and Northern State to the North. Annual rainfall ranges between 0 – 500 millimeters. Soil types are distinct into:-

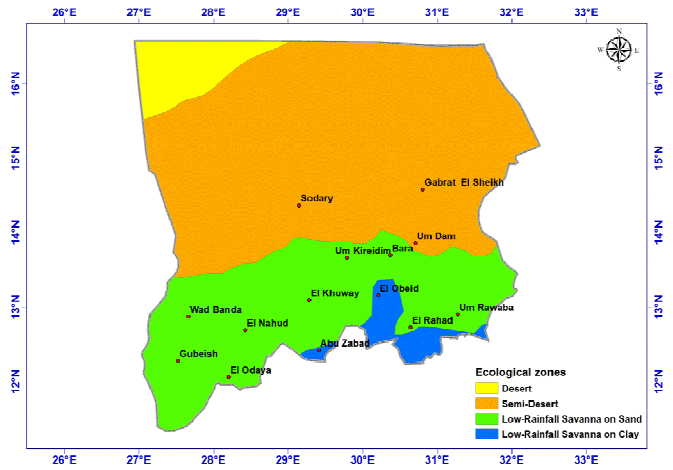
- About 55% sand land or goz
- About 20% gardud
- About 15% alluvial land
- About 10% clay land

The total rangeland area available for livestock grazing in the State estimated as 25,7 million feddan which produce 8,2 million ton of dry matter (SMAL&RD,WSRMP-NK,2012) .

There are a number of rain-fed agricultural projects in the State particularly in Sheikan and Um Ruwaba localities. There are also a number of cattle trade routes and traditional nomadic migratory routes. North Kordofan State is composed of 8 localities, namely, Sheikan, Elrahad Um Ruwaba, Bara; west Bara, Sodari, JabratElsheik and Um dmhagahmed; Each locality is subdivided into a number of administrative units (AUs).

Human population is estimated at 2.4 million of which about (79%) are involved in agriculture and animal raising.Livestock population was estimated at 22.5millon heads for (SMAL&RD, WSRMP-NK, 2012). The sheep only estimated 19 million heads.

**Figure 1:** North Kordofan, ecological zone and map of the study area




The experiment: two hundred heads of sheep (4 male&196 female) was used and the basic health and production data was collected (production status, external, internal and blood parasites treated. All animals was ear tagged with two different colors indicating two groups (control and experimental).

(i) The experimental group remains under our own supervision giving them veterinary health care.
(ii) The control group left under the supervision of his owner and managed in traditional manner but all steps of management will be recorded on the field.

For the two groups the following observations were considered and recorded every two weeks:

1 The maturity age.
2 Conception rate.
3 Lambing rate (per year).

**Samples collection and laboratory analysis:**

The samples collected during the experiment (18 moths) as follows: 300 fecal samples and 300 blood smears were taken, tick and skin scraping samples depended on their availability on the animal, but generally they were 30 samples.

**Fecal samples collection:**

By the use of disposable gloves, 15 grams of the faeces were collected from the rectum and placed in a faecal container and labeled.

**Blood smears:**

The blood was withdrawn from the jugular vein using 10 ml disposable syringes after restraining the animal by the owner, two slides of blood smears were made by putting a drop of blood onto the slide then spreading of the drop on the slide by another slide. The smears were left to dry in the air, then they were fixed with methanol, labeled and warped in a filter paper, placed in plastic bags and preserved.

**Tick samples:**

Ticks of all stages and from all parts of the animal were collected by hand or forceps placed in plain vaccutainer containing 70% alcohol (70 ml of alcohol + 30 ml of water) and labeled.

**Skin scrapings:**

The dead crusts of the lesions were removed by scalpel blade, curetting the area till blood oozed and the samples for mites were taken from the periphery of the lesion after placing a drop of oil on the slide and spread on it. After labeling all the samples collected were dispatched to the lab.

**Sample submission:**

All specimens were labeled according to the agreed on labeling scheme that would identify the specimen in the lab with the animal that gave the specimen:

1. The animal group (experimental or control).
2. Number of the sample corresponding to the animal ear tag number.
3. Type of specimen: Bs for blood smear and Fa for faecal sample; in for insect and Ss for skin scraping.Insect samples were kept in bottles or test tubes containing methanol and blood smears wrapped in filter paper and kept at room temperature. Skin scrapings were kept in bottles containing 10% glycerol saline. Faecal sample were placed in plastic bags.

## ANALYTICAL METHODS:

**Laboratory materials and methods:**
**Preparation and examination of the samples.**
**Faecal samples:**

McMaster technique was used which is composed of McMaster chamber, saturated salt solution, and round –bottomed rimed plastic tube, tea sieve and water.

1. 3 grams of faeces were dissolved in 45 ml of water in a universal bottle.
2. The content was sieved and the supernatant discarded
3. The plastic tube was filled with 15 ml of the solution, centrifuged and the supernatant. discarded
4. The tube was refilled with 15 salt solutions and the sediment suspended by inverting the tube for five to six times.
5. One chamber of the McMaster was filled by Pasteur pipette with the sediment solution, the inversion was repeated and the second chamber filled.
6. The slide was allowed to stand for 3 minutes and the eggs were counted under the ruled square, in both chambers under the microscope using low power resolution for detection of helminthes and coccidia eggs.

**Blood smears**

The fixed slides were stained with 10% Geimsa stain solution (1 ml of stain + 9 ml of distilled water) for 20 minutes.

1. The slides were washed in distilled water.
2. The smear was blotted with phosphate buffer which is composed of solution A and solution B.
3. Preparation of solution A14.2 gm of Na2 HPO4 or 17.8 gm of Na2 HPO4 were dissolved in one litter of water.Solution B was prepared by dissolving 15.6 gm of Na2 HPO4 2H2o in one litter of water.
4. 100 ml solution was prepared by mixing solutions A with B according to pH required.
5. The slide was dried and examined under the microscope by putting a drop of immersion oil and using the high resolution power for detection of blood parasites (tick borne parasite + trypanosomes)

**Ticks:**

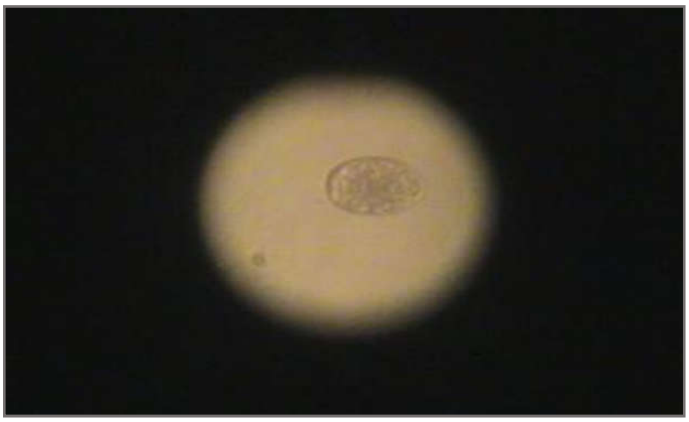
The preserved specimens were put under insect microscope in a Petri-dish and the ticks were identified into spp using Hoogostral method in 1956 for tick identification.

**Skin scraping:**

1. The crust was put on the slide and a drop of 10% of potassium peroxide added (10 grams of potassium hydroxide in 100 ml of water) and warmed without evaporation or boiling
2. A cover slip was placed and allowed to clean for 5-10 minutes
3. Examination was conducted under the medium resolution power for detection of mites

Test results of each sample were recorded.

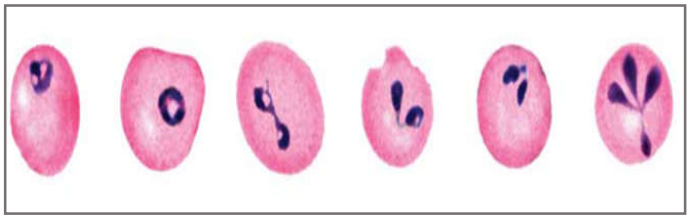
**Photograph (1)** Identification of gastrointestinal parasites (heamonchusspp)



**Photograph (2)** Identification of tick species

**Statistical analysis:**The experimental data was analyzed as a completely randomized block design. Analysis of variance test one-way and two-way (ANOVA) was used to analyze the data collected from the experiment (Snedecor, G, W and Cochran 1980).

**Photograph (3)**Identification of blood parasites (Babesiaspp)



**Results: Number and types of samples collected (preparation period 2 months), table (1):**

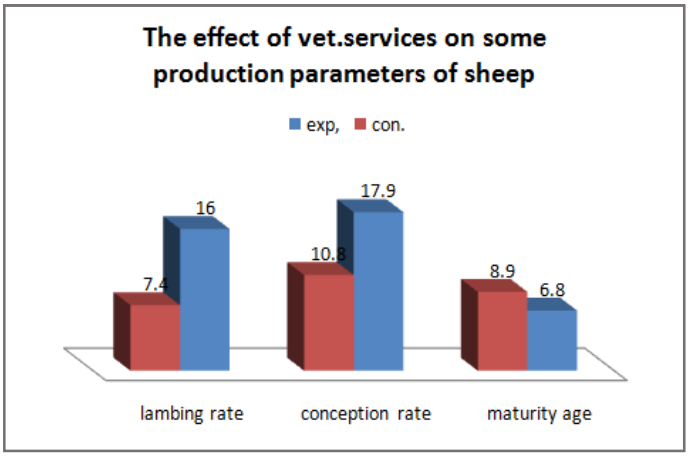
| Type of sample | No of samples | Results | Comments |
|---|---|---|---|
| Serum for Brucella | 150 | samples +ve( 4) | *Rejected &substituted by others |
| Blood smear | 150 | Anaplasmosis (21) Theileriosis (8) | *Imidole at dose rate of 1ml/25kgs<br>*Cypermethrin |
| Faecalsample | 150 | Diff.gastro. parasites eggs | *Albendazole 2.5 at dose rate of 1ml for 10 Kg<br>* Levamisole 10% at dose rate of 1ml for 10 Kg +Sulphadimidine 33.3% |
| Skin scraping<br>insect | 8 scrapes-<br>24 ticks- | -mange.<br>Lice.- | *Ivermectin 0.8 drench dose rate 1ml/4kg.Bwt |
| Others | | Blood parasites-<br>Mastitis(2cases)-<br>Pneumonia(4case)- | *Intramammary infusion Tylosin* |

After the two months of treatments and health preparations of the experimental sheep, production readings and health observations for the two groups recorded every two weeks, health care and treatments follow up given only for the experimental group for (16 moths).

**The effect of treatments and health follow up on sheep production: Table (1).**

| Parameters | Experimental | Control | significances |
|---|---|---|---|
| No of sheep | 100 | 100 | |
| Experiment period / month | 16 | 16 | |
| The maturity age /month | 6.83 ±0.93 | 8.93± 0.998 | 0.233*** |
| Conception rate/head /month | 12.1976±17.87 | 6.242±10.813 | 1.800** |
| Lambing rate/head | 16.00± 13.10 | 7.375±2.553 | 1.816*** |

Main effect of treatments on sheep production is presented in table (1) the result showed that there were highly significant differences (P<0.001) on the maturity age ,conception rate , lambing rate.as compared with control . The maturity age was lower in comparison with control (6.75 and 8.93) but conception rate, lambing rate, were higher compared with control. Conception rate(17.87 and 10.81) , Lambing rate(16.0 and 7.37).




## DISCUSSION

With regard to the effect of treatment and health follow up on sheep production, based on animal health reports and veterinary field staff observations, generally blood parasites, brucellosis, external and internal parasites were considered among the most important diseases affecting livestock. This is what is exactly found in samples collected from the experimental animals and investigated in the preparatory period of this study, (Table 1).Furthermore, the target diseases require simple field and lab.diagnostic procedures which could be met with the existing field and lab.capacities. The Sudan sheep industry is also jeopardized by diseases and most losses can be attributed to helminth parasites. Although the damage inflicted by various parasites varies between localities, nematodes are more serious in the main sheep-raising areas. Nematode infestation flares up at the very end of the dry season and the early onset of rains. Heavy casualties occur among ewes when stomach worm infestation is complicated by anaemia. Tick-borne diseases, mainly due to Rickettsia, cause considerable losses.Losses from infectious diseases are caused by sheep pox, pneumonia, and lamb dysentery. Sporadic mortality from anthrax occurs in some areas. Foot-and-mouth disease and bluetongue occur occasionally but they cause negligible losses. Pneumonia, coccidiaand Oesterusoviscause considerable losses in sheep subjected to prolonged confinement or prolonged night bedding in one spot. Sheep health has not been given as much importance as cattle health in the Sudan since the establishment of the Sudan Veterinary Service. This attitude might have been justified in the 1930s and 1940s when cattle exports constituted the major animal export earnings. However, at the present time and for the foreseeable future, the earnings from sheep exports are far greater, Mufarrih, M. E (1991). The overall disease proportions were reported higher under sedentary mixed with nomadic (33.3%) followed by transhumant (17.3%), sedentary (14.27%) and nomadic systems (WSRMP-Nk& SMAA&RD, 2010).

Early puberty and a long productive life of breeding stock are very desirable characteristics. In the open range and migratory system, where more than 80 percent of sheep are maintained, in dedicated sheep growers do not allow the milking of suckling ewes before their lambs attain the age of two months and are able to maintain their normal rate of growth on range fodder. Consequently all single and most twin ewe lambs attain puberty at the age of seven months and lamb in their 12th month(Mufarrih, M.E, 1991). In the present study the maturity age for the group which receives veterinary attention and follows up is 6.8 months and 8.9 months for the other group that left to perform naturally under supervision of its owner, table (2), also the conception rate for serviced ewes that show high significant effect of proper veterinary health services.Field-collected data on the lambing rate of Sudan Desert sheep indicate wide differences between localities presumably attributable to climatic, nutritional and management factors. Personally acquired information on migratory groups in the western Kordofan and eastern Darfur areas indicated a 150-170 percent lambing rate (Mufarrih, M. E (1991). Wilson (1981) reported the lambing rate for a nomadic flock of Sudan Desert sheep in Southern Darfur province to be 146 percent. The lambing rate of the flock during this period was 143 percent, which would suggest a promising potential productivity and shows that the Sudan Desert ewe can rear twin lambs to an acceptable weaning weight. The results of this study indicate a 160-180 percent lambing rate for the untreated and treated sheep respectively also show high significant effect of proper veterinary health services.

## CONCLUSION

- Main effect of treatments on sheep production presented in table (1) showed that there were highly significant differences($P<0.001$) on the maturity age, conception rate , lambing rate, as compared with control. The maturity age was lower in comparison with control (6.75 and 8.93) but conception rate, lambing rate. Conception rate(17.87 and 10.81) , Lambing rate (16.0 and 7.37),.
- The veterinary services according to this study,they face difficulties in animals treatment, vaccination etc,
- Farmers used to buy drugs from near markets and treat their animals by themselves or paravets if any.
- There is Lack in veterinary extension services.
- Improved veterinary services means secured animals and their products.
- Most sheep losses can be attributed to helminth parasites, nematodes are more serious in main sheep-raising areas.
- Tick and tick-borne diseases (TBD), (Rickettsia, Anaplasmosis) cause considerable losses. Losses from infectious diseases eg. sheep pox, PPR, pneumonia, and lamb dysentery. .

## RECOMMENDATIONS

- Generally blood parasites, brucellosis, external and internal parasites were considered among the most important diseases affecting livestock that, what is exactly confirmed in samples collected and investigated for the experimental animals in the preparatory period of this study (8 weeks). Surveys and monitoring of livestock diseases should be conducted in the wet season as well as in the dry season and periodically to cater for the in-between and within seasonal variations.
- Bacterial and viral diseases pose greater risk to the health of livestock in North Kordofan State, therefore, it would be useful to survey them in the future at least for serological evidence, and however, capacity of the regional lab.should be improved to handle those categories of disease.
- Furthermore, the collected sera were tested only for Brucella and can be tested for many other diseases by serology and molecular techniques at the CVRL level. It is recommended that facilities should be available in the Regional laboratory to carry out all the required tests or at least the most important ones.
- It could have also been very useful to send the sera that tested positive to Rose Bengal test to the CVRL for confirmation with Elisa as the former is a screening test which means it is of high sensitivity and even could be oversensitive with a number of false positive reactors (predictive value positive).
- The same approach should be applied to utilize the collected external parasites; whether there is the capacity to indicate presence of as much bacterial, viral, rickettsial and protozoal disease agents.

- Taxonomy will also be useful down to the species rather than the generic level in order to attempt understanding more specifically the complex relationships between the vector, disease agent and environment.

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