# WORK-RELATED INJURIES AND PARASITISM IN DRAUGHT CATTLE IN RURAL COMMUNITIES AROUND ZARIA, NIGERIA

BY

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ZARIA, NIGERIA

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# DECLARATION

I hereby declare that this dissertation was written by me and it is the record of my own work. It has not been presented before in any previous application for a Doctor of Philosophy degree. References used in literature have been duly acknowledged.

Kwem Bakau Kadima Sign----------

(Student)

# CERTIFICATION

This dissertation entitled "Work-related injuries and parasitism in draught cattle in rural communities around Zaria, Nigeria" submitted by Kwem B. Kadima, meets the regulation governing the award of the degree of Doctor of Philosophy, Ahmadu Bello University, Zaria, and it is approved for it contribution to knowledge and literary presentation.

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# DEDICATION

TO:

The Great **“I AM”**

Without whose love and providence I would not have done this project, And All God’s children who love me immeasurably.

AND

TO, MAMAN JULIE;

My dear mother who waited long enough for me to defend this work, Mama, rest in the peace of the lord.

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Finally, but very importantly I appreciate the support of the Kadima's family, especially Dr. H.E. Kadima who encouraged me into academia. God bless you all, Amen.

# ABSTRACT:

To examine the health and management problems in relationship to work in draught cattle, Three hundred and forty three (343) draught cattle were surveyed and examined in seven locations around Zaria, Kaduna State. Planned visits were made to these villages and an interview method was used for data collection from the owners of each animal, while detailed examination of each work bull identified was done. Blood and fecal samples were also collected from each examined animal for laboratory examination for hemo and gastrointestinal parasites respectively. The animals surveyed were in two groups, those that were resting from active ploughing, but occasionally used for transportation and those that were actively involved in ploughing. The common health problems of draught cattle and the treatments given to the animals were recorded. The work-related traumatic injuries encountered by work bulls and their handlers and the medical help seeking pattern were also recorded.

The management practices in the villages were basically the extensive and semi-extensive management systems. In the extensive system work bulls were allowed to graze only natural pasture, while the semi-intensive systems allowed them to graze natural pasture with little supplementation during the evenings.

Clinical signs of disease were observed in 50.78% of the sampled population, while 49.27% were apparently healthy. Those clinically sick were significantly ($P<0.05$) younger than the apparently healthy cattle, and these also significantly ($P<0.05$) affected their working hours per day and consequently, the work output. A low prevalence of trypanosomosis (2.79%), and high prevalence of helminth infection (73.49%) and work-related injuries (50.72%) during the wet and dry season was recorded. The helminths egg

output was significantly ($P<0.05$) increased in relation to feed supplementation and the seasons.

The hematological changes for trypanosome-infected cattle showed significant ($P<0.05$) decreases in the PCV, HB, WBC and eosinophils values, while the helminth-infected ones showed significant ($P<0.05$) decreases in the RBC count, lymphocytes and eosinophils values. The serum electrolyte changes for helminths-infected bulls at wet and dry season showed decreased anion gap (18-20mmol/l), significant ($P<0.05$) increase in bilirubin values and significant ($P<0.05$) decreased value of serum glucose.

Injuries were observed on bulls during the wet and the dry season, and there was significant ($P<0.05$) relationship between the age and working hours of these bulls to the occurrence of injury. Most of the injuries were as a result of poor harness and whip (43.18%), implements and rough terrain (36.36%). The interpersonal injuries caused by fights amongst bulls were less common. Majority of work bull owners sought for treatment for these injured animals, basically through direct purchases of drugs from markets or use of herbs (65.34%), only 3.03% visited any veterinary establishment. More than half (50.35%) the number of handlers suffered injuries, and children between the ages 10-15 were the most injured (71.23%).

This study also identified the need for developing an effective health programme necessary for improving productivity in these communities, taking into considerations constraints of poor management practices, inadequate feed at dry season, diseases, working conditions and material deprivations such as inaccessible and effective health and veterinary services to these communities. There is need to increase farmers awareness on the effect of sub-clinical disease on production and improve the safety consciousness of farmers.

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## QUESTIONA1RE

A. ANIMAL DATA

i. Owners Name and Address----------

ii. Species----------breed----------age------

iii. Weight----------T----------P----------R----------

iv. Castrate-------yes/no.

B. WORK EXPERIENCE AND OUTPUT

i. How long has the animal been working (seasons)? ----------

ii. How many days a week does it work? ----------

iii. How many hours a day does it work? ----------

iv. What size of farm does the animal cover daily? 1hectare----------2hectares----------

v. Does the animal show reluctance to work at any certain time? Yes/No----------

vi. If yes above how regular? Once/week----------twice/week----------several time/week----------

vii. What do you think is responsible for above----------

viii. Does the animal some times have any injuries? ---------
Frequently ----------occasionally----------

ix. What types of injuries are encountered by the animal?---------
---
---

x. Are these injuries connected with animals' reluctance to work? Yes/no----------
---

xi. What other activity is the animal involved in post cropping season? ----------
---

C. HANDLER AT WORK:

i. Name----------age----------sex----------
---

ii. Any history of injury caused by animal on handler? Yes/no---
---
---

iii. When? (season) ----------What type?----------
---
---

iv. Location of injury----------
---

v. Management of injury by handler----------
---

D. FEEDS AND FEEDING:

i. What type of feed do you give your animals? ----------
---
---

ii. Do you use feed supplements? Yes/no----------
---

iii. What type of feed supplements are used?----------
---
---

iv. Any lost of appetite? Yes/ no----------
---

v. Any diarrhea? ----------When----------

vi. Is reluctance to work associated with diarrhea? ----------
---
---

E. MEDICAL HISTORY;

i. What are the traditional methods of medication used for (a) injuries----------
---(b) Diarrhea----------
---(c) loss of appetite----------
---
---

ii. Do you seek or receive any Veterinary attention/advice? -- Yes.----------No-
---

iii. What type of advice? ----------Or------
----------attention----------
---

iv. Any records of vaccination? Yes/no ----------
---

v. What type of vaccination.----------

vi.

vii. ----

# APPENDIX III

## A. HEMATOLOGICAL DATA OF WORK BULLS DURING THE RESTING PERIOD

| S/nO. | PCV | HB | RBC | WBC | NEUT% | LYMP% | EOSI% | MONO% | NEUT X10³ |
|---|---|---|---|---|---|---|---|---|---|
| NJ1 | 29 | 10 | 5 | 14.6 | 35 | 40 | 22 | 3 | 4526 |
| NJ2 | 23 | 7.8 | 4.3 | 10.8 | 16 | 72 | 10 | 2 | 1404 |
| NJ3 | 28 | 9.3 | 4.7 | 7.6 | 14 | 73 | 11 | 2 | 1092 |
| NJ4 | 28 | 9.3 | 4.7 | 7 | 25 | 53 | 19 | 3 | 1610 |
| NJ5 | 20 | 6.8 | 3.9 | 7.4 | 24 | 68 | 7 | 1 | 1430 |
| NJ6 | 30 | 10 | 5.4 | 9.2 | 35 | 47 | 16 | 2 | 3036 |
| NJ7 | 29 | 10 | 4.9 | 13.2 | 16 | 69 | 13 | 2 | 1716 |
| NJ8 | 30 | 10 | 6.1 | 9.4 | 33 | 50 | 16 | 1 | 3102 |
| NJ9 | 26 | 7 | 4.1 | 8.5 | 21 | 54 | 22 | 3 | 1785 |
| NJ10 | 35 | 11.6 | 6.1 | 11.2 | 32 | 47 | 19 | 2 | 3360 |
| NJ11 | 27 | 9 | 5.1 | 8 | 19 | 64 | 16 | 1 | 1520 |
| NJ12 | 30 | 10 | 5.3 | 8.6 | 14 | 73 | 11 | 2 | 1204 |
| NJ13 | 30 | 10 | 5.1 | 9.8 | 35 | 43 | 20 | 2 | 3332 |
| NJ14 | 27 | 9 | 4.2 | 12.2 | 23 | 61 | 15 | 1 | 2440 |
| NJ15 | 29 | 9.6 | 5.1 | 10.3 | 19 | 63 | 16 | 2 | 1854 |
| NJ16 | 27 | 9 | 4 | 10.7 | 17 | 70 | 12 | 1 | 1605 |
| NJ17 | 29 | 9.6 | 5.2 | 11.1 | 25 | 62 | 11 | 2 | 2553 |
| NJ18 | 31 | 10.3 | 4.9 | 11.8 | 26 | 49 | 22 | 3 | 2700 |
| NJ19 | 26 | 8.6 | 3.8 | 7.9 | 10 | 77 | 12 | 1 | 790 |
| NJ20 | 33 | 11 | 6.7 | 8.8 | 25 | 64 | 10 | 1 | 2112 |
| NJ21 | 30 | 10 | 6.1 | 9.8 | 20 | 65 | 14 | 1 | 1960 |
| NJ22 | 34 | 11.3 | 5.6 | 12.3 | 24 | 60 | 15 | 1 | 2706 |
| NJ23 | 35 | 11.6 | 6.1 | 13.8 | 17 | 70 | 10 | 3 | 1932 |
| NJ24 | 31 | 10.3 | 5.3 | 15.1 | 14 | 65 | 18 | 3 | 1812 |
| NJ25 | 34 | 11.3 | 6.4 | 12 | 17 | 68 | 14 | 1 | 1800 |
| NJ26 | 40 | 13.3 | 7.2 | 14.3 | 18 | 70 | 11 | 1 | 2431 |

| S/nO. | PCV% | HB | RBC | WBC | NEUT% | LYMP% | EOSI% | MONO% | NEUT X10³ |
|---|---|---|---|---|---|---|---|---|---|
| NJ28 | 28 | 9.3 | 4.6 | 11.6 | 24 | 73 | 1 | 2 | 2436 |
| NJ29 | 35 | 11.6 | 7.1 | 10 | 17 | 58 | 24 | 1 | 1700 |
| NJ30 | 31 | 10.3 | 6.1 | 10.9 | 21 | 69 | 10 | 0 | 2180 |
| NJ31 | 37 | 12.3 | 7.1 | 10.5 | 15 | 73 | 10 | 2 | 1575 |
| NJ32 | 35 | 11.6 | 6.3 | 13.2 | 23 | 60 | 15 | 2 | 2772 |
| NJ33 | 33 | 11 | 5 | 12.4 | 30 | 50 | 16 | 4 | 3472 |
| NJ34 | 27 | 9 | 4.2 | 12.8 | 25 | 53 | 20 | 2 | 3072 |
| NJ35 | 31 | 10.3 | 5.4 | 15.2 | 18 | 70 | 9 | 3 | 2432 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| NJ36 | 37 | 12.3 | 6.8 | 14.4 | 21 | 64 | 14 | 1 | 2880 |
| NJ37 | 31 | 10.3 | 5.1 | 13.4 | 23 | 66 | 7 | 2 | 2948 |
| NJ38 | 34 | 11.3 | 6.1 | 10.2 | 13 | 65 | 20 | 2 | 1326 |
| NJ39 | 34 | 11.3 | 4.1 | 11.5 | 43 | 51 | 3 | 3 | 4600 |
| NJ40 | 31 | 10.3 | 4.9 | 14.2 | 14 | 80 | 4 | 2 | 1988 |
| NJ41 | 30 | 10 | 4.2 | 9.6 | 17 | 53 | 25 | 5 | 1632 |
| NJ42 | 18 | 6 | 3.1 | 11.5 | 23 | 62 | 14 | 1 | 2300 |
| NJ43 | 30 | 10 | 4.8 | 12 | 20 | 60 | 17 | 3 | 2160 |
| NJ44 | 36 | 12 | 5 | 12.2 | 19 | 66 | 23 | 2 | 2318 |
| NJ45 | 32 | 10.8 | 4.6 | 18.3 | 14 | 60 | 21 | 5 | 2196 |
| NJ46 | 26 | 8.6 | 3.9 | 11.5 | 22 | 50 | 25 | 3 | 0 |
| SG1 | 39 | 13 | 7.1 | 19.6 | 20 | 71 | 8 | 1 | 3136 |
| SG2 | 28 | 9.3 | 4.4 | 12 | 25 | 69 | 5 | 0 | 2760 |
| SG3 | 30 | 10 | 4.7 | 9.2 | 10 | 86 | 4 | 0 | 920 |
| SG4 | 32 | 10.8 | 4.8 | 10.2 | 26 | 66 | 6 | 2 | 2448 |
| SG5 | 36 | 12 | 5.6 | 5.6 | 33 | 58 | 9 | 0 | 1680 |
| SG6 | 35 | 11.8 | 5.3 | 12 | 11 | 81 | 5 | 3 | 1320 |
| SG7 | 42 | 14 | 6.8 | 17 | 19 | 76 | 4 | 1 | 2890 |
| SG8 | 31 | 10.3 | 4.5 | 9.3 | 19 | 70 | 9 | 2 | 1674 |
| AG1 | 29 | 9.6 | 5.2 | 12.4 | 19 | 74 | 6 | 1 | 2356 |
| AG2 | 27 | 9 | 6.3 | 10.7 | 14 | 80 | 1 | 5 | 1498 |
| AG3 | 34 | 11.3 | 5.2 | 11.9 | 34 | 62 | 1 | 3 | 4046 |
| AG4 | 33 | 11 | 5.4 | 10.6 | 32 | 65 | 0 | 3 | 3392 |
| **S/nO.** | **PCV%** | **HB** | **RBC** | **WBC** | **NEUT%** | **LYMP%** | **EOSI%** | **MONO%** | **NEUT X10³** |
| AG6 | 30 | 10 | 6.3 | 13.1 | 19 | 72 | 8 | 1 | 2489 |
| AG7 | 28 | 9.3 | 5.2 | 15.2 | 36 | 50 | 12 | 2 | 5472 |
| AG8 | 33 | 11 | 5.3 | 12.9 | 20 | 63 | 13 | 4 | 2580 |
| AG9 | 31 | 10.3 | 6.2 | 10.1 | 31 | 60 | 8 | 1 | 3131 |
| AG10 | 37 | 12.3 | 8.1 | 11.6 | 20 | 66 | 12 | 2 | 2320 |
| AG11 | 41 | 14 | 7.2 | 14 | 40 | 51 | 6 | 3 | 5720 |
| AG12 | 34 | 11.3 | 6.4 | 8.3 | 23 | 72 | 4 | 1 | 1909 |
| AG13 | 32 | 10.8 | 5.2 | 9.6 | 27 | 68 | 4 | 1 | 2592 |
| AG14 | 29 | 10 | 4.1 | 6.8 | 29 | 66 | 3 | 2 | 1972 |
| AG15 | 36 | 12 | 5.8 | 7.2 | 18 | 79 | 3 | 0 | 1296 |
| AG16 | 28 | 9.3 | 4.6 | 10.2 | 15 | 82 | 2 | 1 | 1530 |
| AG17 | 34 | 11.3 | 5.2 | 9.1 | 33 | 60 | 5 | 2 | 3003 |
| AG18 | 41 | 14 | 6.1 | 11.8 | 25 | 72 | 2 | 1 | 2950 |
| AG19 | 38 | 13 | 5.3 | 13.7 | 29 | 68 | 3 | 0 | 3973 |
| PH1 | 33 | 11 | 6.5 | 15.8 | 20 | 66 | 10 | 2 | 3160 |
| PH2 | 39 | 13 | 7.1 | 12.3 | 21 | 73 | 4 | 2 | 2583 |
| PH3 | 34 | 11.3 | 5.3 | 9.7 | 27 | 66 | 6 | 1 | 2619 |
| PH4 | 41 | 14 | 8.1 | 14.7 | 26 | 67 | 6 | 1 | 3822 |
| PH5 | 43 | 14.3 | 7.2 | 13.1 | 18 | 77 | 14 | 1 | 2358 |
| PH6 | 38 | 13 | 6.1 | 10.8 | 30 | 62 | 8 | 0 | 3240 |
| PH7 | 42 | 14 | 7.2 | 13.1 | 15 | 80 | 3 | 2 | 1965 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| PH8 | 35 | 11.8 | 5.2 | 13.5 | 18 | 76 | 5 | 1 | 2295 |
| PH9 | 37 | 12.3 | 5.2 | 11.1 | 21 | 70 | 8 | 1 | 2331 |
| PH10 | 33 | 11 | 6.1 | 17.3 | 25 | 70 | 4 | 1 | 3806 |
| PH11 | 29 | 9.8 | 4.3 | 10.5 | 27 | 62 | 10 | 1 | 2625 |
| PH12 | 30 | 10 | 5.1 | 7.4 | 32 | 60 | 7 | 1 | 2220 |
| PH13 | 41 | 14 | 7.1 | 15.6 | 32 | 61 | 5 | 2 | 4368 |
| PH14 | 34 | 11.3 | 5.2 | 9.5 | 27 | 56 | 15 | 2 | 2565 |
| PH15 | 30 | 10 | 5.2 | 15.1 | 30 | 64 | 6 | 0 | 4077 |
| PH16 | 33 | 11 | 5.1 | 11.4 | 32 | 60 | 7 | 1 | 3420 |
| PH17 | 35 | 12 | 6.3 | 10.2 | 21 | 66 | 12 | 1 | 2142 |
| **S/nO.** | **PCV%** | **HB** | **RBC** | **WBC** | **NEUT%** | **LYMP%** | **EOSI%** | **MONO%** | **NEUT X10³** |
| PH19 | 38 | 12.8 | 8.1 | 17 | 30 | 61 | 7 | 2 | 4590 |
| PH21 | 33 | 11 | 6.1 | 9.8 | 25 | 62 | 12 | 1 | 2156 |
| YS1 | 36 | 12 | 8.1 | 16.8 | 23 | 66 | 11 | 0 | 3360 |
| YS2 | 31 | 10.3 | 6.9 | 7.5 | 27 | 65 | 6 | 2 | 2025 |
| YS3 | 33 | 11 | 6.6 | 15.4 | 33 | 49 | 17 | 1 | 4620 |
| YS4 | 39 | 13 | 8.8 | 13.1 | 22 | 67 | 10 | 1 | 2620 |
| YS5 | 34 | 11.3 | 5.4 | 10.8 | 24 | 60 | 13 | 3 | 2376 |
| YS6 | 40 | 13.3 | 6.9 | 6.8 | 14 | 61 | 23 | 2 | 952 |
| YS7 | 49 | 16.3 | 7.9 | 9.2 | 30 | 55 | 13 | 2 | 2760 |
| YS8 | 40 | 13.3 | 6.8 | 8.6 | 22 | 62 | 14 | 2 | 1892 |
| YS9 | 30 | 10 | 4.7 | 10.4 | 21 | 60 | 17 | 2 | 2080 |
| YDS1 | 38 | 13 | 7.2 | 13.7 | 32 | 51 | 15 | 2 | 2740 |
| YDS2 | 32 | 10.8 | 5.4 | 12.1 | 27 | 67 | 6 | 0 | 2904 |
| YDS3 | 40 | 13.3 | 8.1 | 7.3 | 23 | 68 | 8 | 1 | 1606 |
| YDS4 | 34 | 11.3 | 6.1 | 15.4 | 33 | 53 | 13 | 1 | 4620 |
| YDS5 | 35 | 11.6 | 6.2 | 14.5 | 27 | 46 | 25 | 2 | 3625 |
| YDS6 | 41 | 13.6 | 7.2 | 9.5 | 18 | 73 | 6 | 3 | 1710 |
| YDS7 | 26 | 9 | 8.1 | 13.8 | 24 | 68 | 7 | 1 | 3036 |
| YDS8 | 30 | 10 | 4.7 | 11.6 | 21 | 69 | 8 | 2 | 2320 |
| YDS9 | 31 | 10.3 | 5.2 | 29.1 | 22 | 70 | 7 | 1 | 5529 |
| YDS10 | 35 | 11.6 | 5.1 | 10.7 | 26 | 67 | 4 | 3 | 2461 |
| YDS11 | 37 | 12.3 | 4.9 | 11.5 | 27 | 60 | 12 | 1 | 2990 |
| YDS12 | 35 | 11.6 | 5.2 | 10.5 | 30 | 50 | 17 | 3 | 2940 |
| YDS13 | 35 | 11.8 | 4.2 | 11.4 | 22 | 57 | 19 | 2 | 2280 |
| YDS14 | 36 | 12 | 5.8 | 10 | 17 | 70 | 11 | 2 | 1500 |
| YDS15 | 40 | 13.3 | 6.4 | 9.6 | 44 | 45 | 10 | 1 | 3840 |
| YDS16 | 15 | 5 | 2.1 | 6.2 | 20 | 72 | 7 | 1 | 1054 |
| YDS17 | 21 | 7 | 4.4 | 11.4 | 20 | 68 | 10 | 2 | 2052 |
| YDS18 | 31 | 10.3 | 5.2 | 4.4 | 13 | 81 | 5 | 1 | 572 |
| YDS19 | 33 | 11 | 5.3 | 13 | 15 | 64 | 19 | 2 | 1950 |
| YDS21 | 32 | 10.6 | 5.8 | 7.8 | 13 | 76 | 9 | 2 | 858 |
| YDS22 | 32 | 10.6 | 5.1 | 3.9 | 27 | 64 | 8 | 1 | 1053 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| YDS23 | 32 | 10.6 | 5.1 | 8.3 | 33 | 60 | 5 | 2 | 2490 |
| YDS24 | 31 | 10.3 | 5.1 | 10.5 | 19 | 66 | 14 | 1 | 1995 |

## B. HEMATOLOGICAL DATA OF WORK BULLS DURING THE WORKING PERIOD

| S/nO. | PCV% | HB | RBC | WBC | NEUT% | LYMP% | EOSI% | MONO% | NEUT X10³ | LYM X10 |
|---|---|---|---|---|---|---|---|---|---|---|
| NJ2 | 28 | 9.3 | 7.6 | 9.8 | 40 | 52 | 8 | 0 | 3920 | 5 |
| NJ3 | 28 | 9.3 | 7.8 | 15 | 38 | 51 | 8 | 3 | 5700 | 7 |
| NJ4 | 27 | 9 | 6.9 | 8.9 | 32 | 56 | 10 | 2 | 2848 | 4 |
| NJ5 | 35 | 11.6 | 8.8 | 10.1 | 36 | 50 | 13 | 1 | 3636 | 5 |
| NJ6 | 31 | 10.3 | 8.2 | 12.4 | 34 | 49 | 14 | 3 | 4216 | 6 |
| NJ7 | 30 | 10 | 7.8 | 6.8 | 40 | 56 | 2 | 2 | 2720 | 3 |
| NJ8 | 26 | 8.6 | 6.4 | 10.1 | 39 | 56 | 4 | 1 | 3939 | 5 |
| NJ10 | 23 | 7.6 | 6.5 | 7.3 | 40 | 55 | 3 | 0 | 2920 | 4 |
| NJ11 | 35 | 11.6 | 9 | 11 | 38 | 58 | 3 | 0 | 4180 | 6 |
| NJ16 | 27 | 9 | 7 | 12 | 36 | 50 | 11 | 3 | 4320 | 6 |
| NJ19 | 32 | 10.6 | 8.1 | 14.3 | 38 | 55 | 5 | 2 | 5434 | 7 |
| NJ20 | 28 | 9.3 | 7.3 | 7 | 40 | 54 | 5 | 1 | 2800 | 3 |
| NJ21 | 30 | 10 | 7.8 | 12.2 | 35 | 55 | 7 | 6 | 4270 | 6 |
| NJ22 | 34 | 11.3 | 8.5 | 7.8 | 30 | 58 | 8 | 4 | 2340 | 4 |
| NJ24 | 27 | 9 | 7.4 | 11.4 | 38 | 49 | 12 | 1 | 4332 | 5 |
| NJ25 | 27 | 9 | 7.8 | 14.3 | 35 | 50 | 14 | 1 | 5005 | 7 |
| NJ26 | 30 | 10 | 8.7 | 12.1 | 40 | 50 | 8 | 2 | 4840 | 6 |
| BE1 | 33 | 11 | 8.1 | 7 | 16 | 83 | 1 | 0 | 980 | 5 |
| BE2 | 32 | 10.6 | 7.8 | 6.6 | 16 | 76 | 6 | 1 | 1122 | 5 |
| BE3 | 31 | 11.3 | 7.4 | 6.9 | 29 | 67 | 4 | 0 | 2001 | 4 |
| BE4 | 30 | 10.6 | 8.3 | 7.2 | 30 | 65 | 4 | 1 | 2160 | 4 |

| S/nO. | PCV% | HB | RBC | WBC | NEUT% | LYMP% | EOSI% | MONO% | NEUT X10³ | LYM X10 |
|---|---|---|---|---|---|---|---|---|---|---|
| BE6 | 34 | 9.3 | 6 | 8.1 | 23 | 73 | 3 | 1 | 1782 | 5 |
| BE7 | 34 | 11.3 | 7.9 | 7.1 | 33 | 63 | 3 | 1 | 2272 | 4 |
| BE8 | 39 | 13 | 8.9 | 6.4 | 24 | 74 | 2 | 0 | 1536 | 4 |
| BE9 | 43 | 14.3 | 10.2 | 7.2 | 31 | 67 | 2 | 0 | 2232 | 4 |
| BE10 | 42 | 14 | 9.9 | 8.9 | 31 | 67 | 2 | 0 | 2759 | 5 |
| BE12 | 32 | 10.6 | 7.6 | 7.1 | 27 | 66 | 6 | 1 | 1846 | 4 |
| BE13 | 33 | 11 | 7.5 | 7 | 34 | 65 | 0 | 0 | 2450 | 4 |
| BE14 | 34 | 11.3 | 6.9 | 6.9 | 33 | 63 | 4 | 1 | 2135 | 4 |
| BE15 | 33 | 11 | 7 | 9.4 | 31 | 66 | 3 | 0 | 2914 | 5 |
| BE16 | 36 | 12 | 8.2 | 9.1 | 24 | 72 | 3 | 1 | 2184 | 6 |
| BE17 | 33 | 11 | 7.4 | 10.1 | 31 | 66 | 2 | 1 | 2929 | 6 |
| BE18 | 33 | 11 | 7.9 | 6.8 | 21 | 76 | 2 | 1 | 1428 | 5 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| BE19 | 36 | 12 | 8.1 | 7.7 | 24 | 71 | 4 | 1 | 1848 | 5 |
| BE20 | 28 | 9.3 | 6.9 | 8.1 | 18 | 79 | 2 | 1 | 1468 | 6 |
| BE21 | 34 | 11.3 | 7.1 | 7.3 | 17 | 80 | 2 | 1 | 1241 | 5 |
| BE22 | 29 | 9.6 | 7 | 10.1 | 23 | 72 | 2 | 1 | 2323 | 7 |
| BE23 | 34 | 11.3 | 8 | 7.4 | 19 | 72 | 7 | 2 | 1332 | 5 |
| BE24 | 32 | 10.6 | 8.2 | 10.2 | 46 | 55 | 4 | 5 | 2550 | 6 |
| BE25 | 36 | 12 | 7.3 | 9.3 | 28 | 66 | 5 | 1 | 2511 | 6 |
| BE26 | 37 | 12.3 | 8.4 | 11.6 | 30 | 63 | 2 | 5 | 2900 | 7 |
| BE27 | 30 | 10 | 7.1 | 7.6 | 40 | 54 | 5 | 1 | 2944 | 4 |
| BE28 | 30 | 10 | 6.9 | 6.9 | 33 | 62 | 5 | 0 | 2208 | 4 |
| BE29 | 33 | 11 | 7.4 | 7.8 | 35 | 60 | 4 | 1 | 2730 | 4 |
| BE30 | 29 | 9.6 | 7 | 7.4 | 32 | 66 | 2 | 1 | 2220 | 4 |
| BE31 | 46 | 15.3 | 11.2 | 9.9 | 29 | 68 | 3 | 0 | 2871 | 6 |
| BE32 | 34 | 11.3 | 7.8 | 11.6 | 34 | 53 | 6 | 7 | 3480 | 7 |
| BE33 | 46 | 15.3 | 10 | 12.1 | 23 | 71 | 5 | 1 | 2783 | 8 |
| BY13 | 29 | 9.8 | 4 | 9.3 | 28 | 65 | 6 | 1 | 2604 | 6 |
| BY14 | 37 | 10.6 | 6.1 | 7.4 | 29 | 65 | 5 | 1 | 2146 | 4 |
| BY15 | 32 | 10.6 | 4.1 | 8.9 | 31 | 65 | 4 | 0 | 2759 | 5 |
| BY16 | 28 | 9.3 | 3.3 | 6.4 | 34 | 62 | 3 | 1 | 2176 | 3 |

| **S/nO.** | **PCV%** | **HB** | **RBC** | **WBC** | **NEUT%** | **LYMP%** | **EOSI%** | **MONO%** | **NEUT X10³** | **LYM X10** |
|---|---|---|---|---|---|---|---|---|---|---|
| BY18 | 35 | 11.3 | 5.2 | 10.2 | 27 | 68 | 4 | 2 | 2652 | 6 |
| BY19 | 46 | 15.3 | 7.4 | 7.5 | 25 | 67 | 6 | 2 | 1875 | 5 |
| BY20 | 34 | 11.3 | 4.1 | 7.6 | 30 | 65 | 5 | 0 | 2280 | 4 |
| BY21 | 33 | 11 | 4.2 | 6.4 | 26 | 70 | 3 | 1 | 1664 | 4 |
| BY23 | 32 | 10.6 | 4.1 | 8.9 | 26 | 71 | 3 | 0 | 2314 | 6 |
| BY24 | 38 | 12.8 | 6.4 | 7 | 29 | 67 | 3 | 1 | 2030 | 4 |
| BY25 | 32 | 10.6 | 4.1 | 9.1 | 32 | 64 | 3 | 1 | 2912 | 5 |
| BY26 | 33 | 11 | 4.2 | 8.6 | 21 | 77 | 1 | 1 | 1806 | 6 |
| BY27 | 34 | 11.3 | 4.2 | 6.2 | 27 | 68 | 5 | 0 | 1674 | 4 |
| BY28 | 25 | 11.6 | 4.3 | 5.8 | 22 | 76 | 2 | 0 | 1218 | 4 |
| BY29 | 35 | 11.6 | 5.1 | 9.1 | 23 | 65 | 12 | 0 | 2092 | 5 |
| BY30 | 31 | 11.3 | 4.3 | 8.7 | 33 | 63 | 4 | 0 | 2697 | 5 |
| BY31 | 36 | 12 | 5.3 | 7.8 | 20 | 77 | 3 | 0 | 1482 | 6 |
| BY32 | 28 | 9.3 | 3.7 | 6.9 | 21 | 76 | 3 | 0 | 1449 | 5 |
| BY33 | 30 | 10 | 5 | 10 | 45 | 50 | 4 | 1 | 4400 | 5 |
| BJ17 | 37 | 12.3 | 6.1 | 7.2 | 15 | 81 | 3 | 1 | 1080 | 5 |
| BJ18 | 31 | 10.3 | 5.84 | 8.4 | 18 | 73 | 9 | 0 | 1512 | 6 |
| BJ19 | 35 | 11.7 | 6.9 | 8 | 23 | 68 | 9 | 0 | 1840 | 5 |
| BJ20 | 34 | 11.3 | 6.9 | 6.9 | 25 | 66 | 8 | 1 | 1725 | 4 |
| BJ21 | 44 | 14.7 | 7.1 | 7.3 | 20 | 80 | 0 | 0 | 1460 | 5 |
| BJ22 | 33 | 11 | 6.9 | 6.3 | 30 | 67 | 3 | 0 | 1890 | 4 |
| BJ23 | 36 | 12 | 6.4 | 9.2 | 32 | 66 | 2 | 0 | 2944 | 6 |
| BJ24 | 37 | 12.3 | 10.1 | 10.5 | 16 | 76 | 7 | 1 | 1575 | 7 |
| BJ25 | 35 | 11.7 | 7.4 | 11.4 | 21 | 69 | 10 | 0 | 2394 | 7 |
| BJ26 | 42 | 14 | 7.12 | 10 | 19 | 71 | 10 | 0 | 1900 | 7 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| BJ28 | 31 | 10.3 | 6.9 | 8.6 | 23 | 61 | 15 | 1 | 1978 | 7 |
| BJ30 | 31 | 10.3 | 6.6 | 12.1 | 19 | 78 | 3 | 0 | 2299 | 9 |
| BJ31 | 38 | 12.7 | 7.2 | 11.3 | 10 | 80 | 9 | 1 | 1130 | 9 |
| BJ32 | 32 | 10.7 | 5.32 | 9.9 | 24 | 62 | 13 | 1 | 2376 | 6 |
| BJ33 | 38 | 12.7 | 3.86 | 6.8 | 26 | 61 | 12 | 1 | 1768 | 4 |
| SN1 | 38 | 12.6 | 5.6 | 8 | 42 | 48 | 7 | 3 | 3360 | 3 |

| S/nO. | PCV% | HB | RBC | WBC | NEUT% | LYMP% | EOSI% | MONO% | NEUT X10³ | LYM X10 |
|---|---|---|---|---|---|---|---|---|---|---|
| SN3 | 27 | 9 | 6.4 | 9.2 | 40 | 50 | 8 | 2 | 3680 | 4 |
| SN6 | 36 | 12 | 9 | 9.9 | 38 | 53 | 6 | 3 | 3762 | 5 |
| SN7 | 30 | 10 | 8.1 | 8 | 46 | 48 | 4 | 2 | 3680 | 3 |
| SN9 | 31 | 10.3 | 8.1 | 9.9 | 40 | 50 | 9 | 1 | 3960 | 4 |
| SN10 | 37 | 12.3 | 9.4 | 11.4 | 38 | 54 | 4 | 4 | 4332 | 6 |
| SN11 | 33 | 9.3 | 8.3 | 8 | 40 | 48 | 8 | 4 | 2400 | 3 |
| SN12 | 28 | 11.3 | 6.9 | 7.9 | 42 | 51 | 5 | 2 | 3318 | 4 |
| SN13 | 34 | 10.6 | 8.3 | 8.6 | 40 | 52 | 7 | 1 | 3440 | 4 |
| SN14 | 32 | 10.8 | 8.7 | 7.4 | 45 | 45 | 8 | 2 | 3330 | 3 |
| SN15 | 31 | 9.6 | 7.9 | 7.8 | 39 | 56 | 4 | 1 | 3042 | 4 |
| SN16 | 29 | 9.6 | 6.9 | 8.4 | 40 | 53 | 6 | 1 | 3360 | 4 |
| SN17 | 29 | 9.6 | 7 | 12.3 | 32 | 62 | 3 | 3 | 3936 | 7 |
| SN18 | 34 | 11.3 | 8.8 | 9.1 | 44 | 52 | 5 | 1 | 4004 | 4 |
| SN19 | 29 | 9.6 | 6.9 | 7.9 | 40 | 52 | 5 | 3 | 3160 | 4 |
| SN20 | 34 | 11.3 | 8.1 | 9.6 | 36 | 55 | 5 | 4 | 3456 | 5 |
| SN23 | 39 | 13 | 9.8 | 6.9 | 39 | 51 | 7 | 3 | 3075 | 3 |
| SN24 | 37 | 12.3 | 9.3 | 11.7 | 32 | 60 | 6 | 2 | 3744 | 7 |
| SN25 | 30 | 10 | 8.4 | 10.1 | 39 | 56 | 2 | 4 | 3939 | 5 |
| SN26 | 34 | 11.3 | 8 | 8.2 | 40 | 52 | 5 | 3 | 3280 | 4 |
| MG1 | 30 | 10 | 7.2 | 8.6 | 22 | 75 | 3 | 0 | 1892 | 6 |
| MG2 | 25 | 8.3 | 5.6 | 7.8 | 30 | 60 | 9 | 1 | 2340 | 4 |
| MG3 | 30 | 10 | 6.9 | 4.7 | 16 | 82 | 1 | 0 | 752 | 3 |
| MG4 | 30 | 10 | 6.1 | 7.3 | 14 | 77 | 9 | 0 | 1022 | 5 |
| MG5 | 32 | 10.6 | 7.2 | 7 | 42 | 53 | 4 | 1 | 2940 | 3 |
| MG6 | 30 | 10 | 6.6 | 2.6 | 26 | 73 | 1 | 1 | 676 | 1 |
| MG7 | 37 | 12.3 | 8.1 | 7.3 | 24 | 71 | 4 | 0 | 1752 | 5 |
| MG8 | 21 | 7 | 5.6 | 6.1 | 31 | 62 | 3 | 2 | 1891 | 3 |
| MG9 | 37 | 12.3 | 6.9 | 8.3 | 22 | 70 | 7 | 1 | 1826 | 5 |
| MG10 | 25 | 8.3 | 6 | 4.5 | 27 | 72 | 2 | 1 | 1215 | 3 |
| MG11 | 33 | 11 | 7.3 | 7 | 18 | 78 | 4 | 1 | 1260 | 5 |
| MG12 | 26 | 13 | 5.6 | 6.1 | 23 | 73 | 2 | 1 | 1403 | 4 |

| S/nO. | PCV% | HB | RBC | WBC | NEUT% | LYMP% | EOSI% | MONO% | NEUT X10³ | LYM X10 |
|---|---|---|---|---|---|---|---|---|---|---|
| MG14 | 35 | 11.6 | 8.2 | 6.2 | 21 | 77 | 2 | 0 | 1302 | 4 |
| MG15 | 33 | 11 | 5.8 | 8.6 | 18 | 82 | 0 | 1 | 1548 | 7 |
| DYS1 | 38 | 12.6 | 6.8 | 7.4 | 40 | 52 | 5 | 3 | 2960 | 3 |
| DYS3 | 35 | 11 | 6.1 | 6.6 | 35 | 50 | 7 | 8 | 2310 | 3 |
| DYS5 | 34 | 11.3 | 5.8 | 5.3 | 39 | 55 | 4 | 2 | 2067 | 2 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| DYS6 | 39 | 13 | 7.2 | 7 | 36 | 54 | 7 | 3 | 2520 | 3 |
| DYS7 | 28 | 9.3 | 6 | 6.9 | 30 | 50 | 13 | 7 | 2070 | 3 |
| DYS8 | 36 | 12 | 6.4 | 8.7 | 28 | 58 | 11 | 3 | 2436 | 5 |
| DYS9 | 34 | 11.3 | 6.9 | 9.1 | 36 | 50 | 9 | 5 | 3276 | 4 |
| DYS10 | 42 | 14 | 9.8 | 10 | 29 | 51 | 9 | 6 | 2900 | 5 |
| DYS11 | 30 | 10 | 6.7 | 6.3 | 39 | 50 | 7 | 4 | 2457 | 3 |
| DYS12 | 40 | 13.3 | 8 | 6.8 | 36 | 55 | 5 | 4 | 2448 | 3 |
| DYS13 | 33 | 11 | 7.1 | 7.4 | 40 | 52 | 5 | 3 | 2960 | 3 |
| DYS14 | 35 | 11.6 | 7.6 | 6.8 | 31 | 56 | 10 | 3 | 2108 | 3 |
| DYS15 | 37 | 12.3 | 8.1 | 7.2 | 39 | 52 | 5 | 4 | 2808 | 3 |
| DYS16 | 33 | 11 | 7 | 8.1 | 41 | 50 | 7 | 2 | 3321 | 4 |
| PH1 | 44 | 14.6 | 9.3 | 7.6 | 23 | 65 | 9 | 3 | 1748 | 4 |
| PH2 | 42 | 14 | 8.6 | 8 | 36 | 57 | 13 | 4 | 2880 | 4 |
| PH3 | 28 | 9.3 | 5.8 | 7.9 | 39 | 55 | 5 | 1 | 3081 | 4 |
| PH4 | 36 | 12 | 8 | 10.4 | 28 | 60 | 10 | 2 | 2912 | 6 |
| PH5 | 33 | 11 | 6.2 | 7.8 | 30 | 61 | 8 | 1 | 2340 | 4 |
| PH6 | 35 | 11.6 | 7.8 | 12.1 | 36 | 60 | 4 | 0 | 4358 | 7 |
| PH7 | 36 | 12 | 8.2 | 10 | 38 | 55 | 5 | 2 | 3800 | 5 |
| PH8 | 32 | 10.6 | 7.4 | 11.3 | 42 | 51 | 5 | 1 | 4746 | 5 |
| PH9 | 34 | 11.3 | 6.7 | 7.4 | 40 | 50 | 7 | 3 | 2960 | 4 |
| PH10 | 39 | 13 | 7.2 | 6.7 | 30 | 55 | 11 | 4 | 2010 | 3 |
| PH11 | 35 | 11.6 | 6.6 | 8.4 | 36 | 58 | 4 | 2 | 3024 | 4 |
| PH12 | 37 | 12.3 | 7.2 | 6.9 | 40 | 55 | 5 | 0 | 2760 | 3 |
| PH13 | 34 | 11.3 | 6.9 | 13.1 | 24 | 68 | 6 | 2 | 3144 | 8 |
| YS1 | 34 | 11.2 | 7.3 | 13.6 | 35 | 60 | 3 | 2 | 4760 | 8 |
| YS2 | 35 | 12 | 7.2 | 10.2 | 23 | 64 | 12 | 1 | 2346 | 6 |

| **S/nO.** | **PCV%** | **HB** | **RBC** | **WBC** | **NEUT%** | **LYMP%** | **EOSI%** | **MONO%** | **NEUT X10³** | **LYM X10** |
|---|---|---|---|---|---|---|---|---|---|---|
| YS6 | 33 | 11 | 6.8 | 12.7 | 45 | 50 | 4 | 1 | 5715 | 6 |
| YS7 | 26 | 8.6 | 5 | 10.2 | 23 | 64 | 12 | 1 | 2346 | 6 |
| TZ1 | 33 | 11 | 8.4 | 10 | 36 | 50 | 8 | 6 | 3600 | 5 |
| TZ2 | 38 | 12.6 | 7.8 | 8.3 | 40 | 55 | 3 | 2 | 3320 | 4 |
| TZ3 | 45 | 15 | 7.4 | 6.9 | 38 | 60 | 2 | 0 | 2622 | 4 |
| TZ4 | 28 | 9.3 | 6.3 | 6.4 | 40 | 52 | 4 | 4 | 2560 | 3 |
| TZ5 | 33 | 11 | 7.5 | 7.8 | 26 | 66 | 5 | 3 | 2028 | 5 |
| TZ6 | 38 | 12.8 | 8.5 | 6.9 | 39 | 58 | 2 | 1 | 2691 | 4 |
| TZ7 | 36 | 12 | 8.2 | 7 | 40 | 55 | 3 | 2 | 2800 | 3 |
| TZ8 | 42 | 14 | 9.6 | 8.2 | 40 | 50 | 6 | 4 | 3280 | 4 |
| TZ9 | 35 | 11.8 | 8.7 | 11 | 42 | 54 | 2 | 2 | 4620 | 5 |
| TZ10 | 42 | 14 | 10.1 | 9 | 58 | 36 | 4 | 2 | 5220 | 3 |
| TZ11 | 30 | 10 | 8 | 7.6 | 50 | 36 | 10 | 4 | 3800 | 2 |
| TZ12 | 38 | 12.6 | 8.8 | 10.4 | 45 | 50 | 3 | 2 | 4680 | 5 |
| TZ13 | 39 | 13 | 7.9 | 11.5 | 40 | 55 | 4 | 1 | 4600 | 6 |
| TZ14 | 36 | 12 | 7.4 | 9.9 | 32 | 61 | 3 | 4 | 3168 | 6 |
| TZ15 | 32 | 11 | 7.3 | 7.8 | 36 | 59 | 3 | 2 | 2808 | 4 |
| TZ16 | 35 | 11.5 | 8.7 | 11.3 | 40 | 51 | 7 | 2 | 4520 | 5 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| TZ17 | 38 | 12.6 | 9.1 | 7.9 | 36 | 59 | 4 | 1 | 2844 | 4 |
| TZ18 | 36 | 12 | 7.4 | 8.6 | 24 | 60 | 12 | 4 | 2064 | 5 |
| TZ19 | 41 | 13.8 | 9.8 | 7.3 | 28 | 58 | 9 | 5 | 2044 | 4 |
| TZ20 | 35 | 11.6 | 7.3 | 7.8 | 32 | 60 | 6 | 2 | 2496 | 4 |
| TZ21 | 36 | 12 | 7.8 | 8 | 29 | 65 | 5 | 1 | 2320 | 5 |
| TZ22 | 38 | 12.6 | 8.3 | 8.7 | 34 | 58 | 7 | 1 | 2958 | 5 |
| ZTZ1 | 39 | 13 | 7.1 | 7.9 | 38 | 60 | 2 | 0 | 3002 | 4 |
| ZTZ2 | 41 | 13.6 | 8.4 | 7.4 | 48 | 50 | 9 | 1 | 3552 | 3 |
| ZTZ3 | 31 | 10.3 | 6.5 | 6 | 41 | 52 | 5 | 2 | 2460 | 3 |
| ZTZ5 | 37 | 12.3 | 7 | 8.8 | 42 | 54 | 4 | 0 | 3696 | 4 |
| ZTZ6 | 48 | 16 | 8.7 | 11.7 | 39 | 54 | 6 | 1 | 4563 | 6 |
| BY1 | 35 | 11.9 | 7.71 | 9.3 | 32 | 49 | 16 | 3 | 2976 | 4 |

| **S/nO.** | **PCV%** | **HB** | **RBC** | **WBC** | **NEUT%** | **LYMP%** | **EOSI%** | **MONO%** | **NEUT X10³** | **LYM X10** |
|---|---|---|---|---|---|---|---|---|---|---|
| BY3 | 29 | 9.6 | 4.13 | 13.1 | 27 | 59 | 11 | 0 | 3537 | 7 |
| BY4 | 33 | 11 | 4.92 | 14.6 | 27 | 48 | 20 | 5 | 3969 | 7 |
| BY5 | 32 | 10.8 | 5.12 | 11.5 | 27 | 47 | 24 | 2 | 3105 | 5 |
| BY6 | 43 | 14.3 | 8.21 | 15.1 | 18 | 72 | 5 | 5 | 2718 | 10 |
| BY7 | 35 | 11.8 | 6.33 | 13.2 | 27 | 58 | 16 | 2 | 3564 | 7 |
| BY8 | 37 | 12.3 | 6.07 | 11.6 | 25 | 53 | 20 | 2 | 2900 | 6 |
| BY9 | 33 | 11 | 4.92 | 13.2 | 28 | 59 | 12 | 1 | 3696 | 7 |
| BY10 | 35 | 11.6 | 5.01 | 8.9 | 27 | 55 | 16 | 2 | 2403 | 4 |
| BY11 | 32 | 10.6 | 5.22 | 10.3 | 43 | 42 | 13 | 2 | 4429 | 4 |
| BY12 | 31 | 10.3 | 5.03 | 9.2 | 36 | 47 | 16 | 1 | 3312 | 4 |
| BY13 | 25 | 8.3 | 4 | 14.8 | 15 | 54 | 30 | 1 | 2220 | 7 |
| BY14 | 33 | 11 | 6.9 | 8.1 | 18 | 64 | 16 | 2 | 1440 | 5 |
| BY15 | 34 | 11.3 | 5.71 | 12.2 | 15 | 69 | 13 | 3 | 1830 | 8 |
| BY16 | 31 | 10.3 | 4.78 | 9.3 | 28 | 62 | 9 | 1 | 2604 | 5 |
| BY17 | 31 | 10.3 | 5.64 | 7.1 | 21 | 68 | 10 | 1 | 1491 | 4 |
| BY18 | 28 | 9.3 | 3.92 | 16.6 | 28 | 57 | 12 | 3 | 4648 | 9 |

# CHAPTER ONE

## 1.0 INTRODUCTION

### 1.1 **BACKGROUND:**

Animals provide 75-90% of draught power for agriculture and transportation in large areas of the world's developing countries (Blood and Radostits, 1985; Gefu and Otchere, 1994). In Africa, significant attempt has since been made to use draft power to improve agricultural production through the integration of livestock into the cropping system (Starkey, 1986).

In Nigeria, cattle as a source of draught power was first demonstrated in 1922 (Alkali, 1969) and the number of farmers owning work animals has been on the increase since then. The dwindling economy of most developing countries has made it very difficult for most farmers to have the required capital to purchase mechanical tractor power and necessary implements needed for modern mechanized agriculture (Bogoro *et al.,* 1994). It seems, therefore, that draught animal power will likely remain an essential part of agriculture and transportation in the developing countries such as Nigeria for a long time unless the economy improves.

In West Africa, draught animal research has largely been geared towards the output of labour, crop protection and also the potential constraints in utilization of traction techniques (Otchere *et al.*, 1986). This means, then, that the emphasis on equipment, agronomic practices and socio-economic gains of animal traction has been the focus of most research, rather than the animal itself. However it has been noted that to a large extent the viability of any technology in draught animal research is dependent greatly on the health status of the animals (Bogoro *et al.,* 1994).However, the health and

physical fitness of draught animal has received little attention in draught power research, largely due to few number of veterinarians and animal health scientists involved in farming research, thus leaving most animals to chance or traditional health practices, resulting in the low output and even death of sick animals (Starkey, 1985).

## 1.2 **JUSTIFICATION:**

The manpower of the animal traction projects, especially at the senior technical level is grossly inadequate to monitor and service the needs of farmers relating to animal health and management, and this has resulted in the weak link between animal traction projects, veterinary departments and those concerned with extension in the field of husbandry (Starkey, 1986). Therefore to improve productivity, the health of draught animals should form an integral part of farming research, thus giving the ultimate user of traction technology priority for the technology to be adaptable, useful and ultimately increase productivity to the level desired by the farmer. Indeed the benefits associated with draught animal power are substantial and worthwhile. Draught animals in addition to their biological function in the agricultural system, often have social and cultural benefits (Gefu, 1992), where work animals are seen as symbols of achievement and greatness of their owners in the community (Gefu, 1992). However, infectious diseases of livestock constitute a major constraint to livestock production in the tropics (Jawara, 1990), thus affecting the economic development of the farmer and the agricultural sectors of the tropical nations.

Stueland and Gunderson (2002) reported that livestock rearing and the use of animals expose both the animals and the handlers to wide range of injuries and illnesses, thus apart from infectious diseases of livestock, draught animals suffer physical injuries and accident. The chances of accidental injuries are reported to exist in virtually all environments in

which man lives and work (Schelp, 1988). This means that draught animal power has associated risk of diseases and injuries both to animal and to the handlers, therefore to reduce this risk, improve productivity and for an effective health control and management of draught animals, the knowledge of the relationship between the animal, environment and the handlers should be considered of public health importance.

## 1.3 **AIM AND OBJECTIVES:**

The health of draught animals and their handlers is an area of concern, necessary to meet the maximum objective of draught animal research and productivity. This research therefore is aimed at addressing the clinical pathological changes associated with the health status and physical fitness of draft animals necessary to making a diagnosis, and the risk associated with the handling of these animals by owners or ploughmen in order to assist the farmers achieve maximum efficiency and yield thereby benefiting the society ultimately. Indeed draught animals and the society will benefit greatly from improved quality and hygiene of food, public health and increase awareness of welfare of animal and man (Grossklaus, 1987), the reason for this study.

The research therefore had the following aims.

- To identify and clinically diagnose the common parasitism of draught cattle in rural communities around Zaria
- To identify the medical help-seeking pattern of draught cattle handlers for their sick animals.
- To identify common work-related injury risk associated with ploughing and handling of draught cattle.

- To develop an effective diseases control measures for work bulls and injury intervention measure for draught animal handlers in the selected villages under study.

# CHAPTER TWO

## 2.0 LITERATURE REVIEW

2:1:0 GENERAL PRINCIPLES AND BENEFITS OF DRAUGHT ANIMAL POWER;

Draught animal technology has been an integral part of agricultural farming in developing countries for few decades now and the use of draught animal power for soil tillage has long been a major theme of agricultural development programs in the semi-arid region of West Africa. The rationale for animal traction utilization ranges from increasing agricultural productivity to relieving the drudgery in farm work (William, 1997). It was noted that even though draught animals reduced substantially the number of hours that the farmer has to spend on cultivation of land, thus replacing hard labor for farmers (Lawrence and Pearson, 1990), it may not reduce the human toil to the same degree as mechanical power (FAO, 1972).

Livestock forms an important part of agriculture in developing countries either as source of food themselves or as beast of burden to ease human hard labour in farming and also as source of transportation (Chantalakhana and Bunyavejchewin, 1994). In 50 developing countries that contain half of the total human population of the world, there is heavy dependence on draft animal as a source of energy and these animals are used for agricultural operations in 52% of the cultivated areas of the world, as well as for hauling 25 million tones of carts (Ramaswamy, 1998). In Nigeria, draught animal farming was first introduced in 1922 (Alkali, 1969) and the number has

since been on the increase due to the dwindling economy that has made it almost impossible for most farmers to have capital to purchase mechanical power.

One of the most important needs of humans is dependable food supply (ILCA 1990), the rapid growth of the human and livestock population in the sub-Saharan Africa is creating an unprecedented increase in food and feed demands. These population pressures on a fixed land base are likely to promote severe competition for resources and drive agriculture progressively towards intensification (Smith *et al.,* 1997). However the benefits of draught animals are said to be substantial and worthwhile (Williamson *et al.*, 1988), the farmer finds it within his purchasing limit than mechanical power traction and these animals also provide manure, meat and money, during and after their work life respectively (Tukur and Maigandi*,* 1999). In addition to the important biologic functions performed by draft animal in agricultural systems, they also have significant social and cultural values, where farmers that can afford to keep a pair or more are recognized and respected by others for their high economic and social status in that society (Gefu, 1987).

Most farmers perceive the veterinarian as a primary provider of clinical services (Goodger and Ruppanner, 1982), to be called upon when the animals are critically ill with an expectation of instant cure of the animal (Kudi, 1998). To achieve the ever present goal of controlling animal diseases and managing animal health for efficient production, the veterinarian is required to provide the most economical methods of management, diagnosis and treatment of sick and injured animals.

**2:2:0 PRINCIPLES OF DRAUGHT ANIMAL MANAGEMENT:**

The cattle industry is one of man's most valuable resources and provides farmers with the most efficient means of utilizing forages grown on millions

of hectares of forests, rangelands and pastures (Koch and Algeo, 1983). Draught cattle, apart from their function in ploughing and transportation, form a major part of the beef industry in most developing countries especially in Nigeria where work bulls are sold at the end of their working season (ILCA, 1990).

The beef cattle farms are not a rigidly compartmentalized industry. It is comprised of a continuous range of more and more intensified farming activities in the developed countries (Blood and Radostits, 1985), while in the developing countries the beef cattle producers operate on a low input, low realization basis, not wanting to increase management efforts in their operations (Blaxter, 1979).

It was observed that livestock kept or produced in smallholder farming systems are an important component of the agricultural economy in the developing world; their roles to the farmer vary widely from providing draught power for crop production, or transportation, or market sales or peri-urban and urban feeders, and dairy system (McDormett *et al.*, 1999). And a number of characteristics are identified that distinguish the smallholder systems of the developing world from the commercialized systems of the developed countries, including the multiple objectives of the farmer, lower capacity to bear risk at house hold levels, poor infrastructure, markets and access to information at the community levels (McDermott *et al.,* 1999).

It seems then that a set of unique conditions and features characterize the smallholder system and these need to be put into consideration when assessing the strategies involved for managing animal health in smallholder systems and evaluating opportunities for improving disease control strategies. It is note worthy that in crop farming system using draught cattle, the livestock activity is an integrated component of crop production and this must be reflected in the approach used to evaluate draught animal health

(McDermott *et al.,* 1999). Therefore, there is need for continuous development of analytical approaches and decision-support tools for disease control strategies adapted to the special characteristics of the draught animal power system. Another very important factor in the area of animal power system for consideration is the ability of the veterinarian to provide the health and production advice to farmers. This can limit the extent to which cattle farmers will utilize the services available (Blood, 1979). Most veterinarians are involved in general animal health practices (Blood, 1979) and are not always available to spend the time necessary to evaluate draught cattle. Thus, draught cattle health will best be addressed by a veterinarian who is specialized and remains involved in draught animal research and not necessarily a Government-employed veterinarian, one other major factor that affects the practicability of draught cattle health service is the seasonality of the work. It may be very difficult for the veterinarian to provide planned health services to many farmers at the same time throughout the year. The latter, therefore, requires the services of many specialist veterinarians working at the same time during the relevant season, and these call into question the economic significance of such practices, in view of the economic environment in which the village farmers operate draught power system in the developing world. Therefore the variable economic importance of draught animals, the small size of most herds, has made it difficult to plan and provide economical health services to these farmers in the developing countries.

Draught animal farmers often considered their animals as a secondary enterprise source of beef. When there is a family need for money or the animal is sick or injured, then they are sold or salvaged. However making farmers aware of the economic importance of measuring productivity and health can encourage the introduction of a beef herd health programme. The above notwithstanding, an adequately well planned survey of the health status of work bulls such as envisaged in this study can provide the

framework along which economical health services can be provided for farmers in developing countries.

### 2:2:1 MANAGEMENT AND HEALTH PROBLEMS OF DRAUGHT ANIMALS.

A large number of problems, ranging from management to infectious diseases affect draught animals' health and productivity, and their control must be considered in any animal health programme. Diseases have been seen to adversely affect the productivity of draught animals (Pearson *et al.,* 1999), and the working conditions greatly exacerbate diseases also in these animals (Ramaswamy, *et al*, 1998).

Several factors have slowed down the progress towards the widespread adoption of effective health and management techniques by farmers and the delivery and marketing of health techniques by veterinarians to the farmers (Blood and Radostits, 1989). This means then that the control and prevention of diseases will not only be influenced by the standard of husbandry, but veterinary inputs through prophylaxis, and treatment. Ramaswamy (1998) noted that application of improved technology and better management (through good feeding and health services, and improved agricultural implements and carts) could considerably improve the welfare of these animals. Thus, the factors that can affect the health and management programme for draught animal are the availability and quality food supply, the level of hygiene, the prevalence of diseases in that area, the value of the animal to the farmer and diagnostic services available to the veterinarian there.

#### 2:2:1:1 HEALTH PROBLEMS OF DRAUGHT CATTLE:

Problems affecting draught animal power include infectious and non-infectious diseases, management factors and the health delivery system in developing countries.

**2:2:2:1 INFECTIOUS DISEASES OF DRAUGHT ANIMALS*:***

Infectious diseases of livestock constitute a major constraint to livestock production and economic development of the farmer and the agricultural sector of the Nigerian nation. This is because the tropical climate is extremely conducive for the propagation of the pathogens and consequently the environment is rife with diseases and their vectors (Jawara, 1990). The Nigerian climatic environment and the predominance of livestock diseases support this observation by Jawara, (1990).

The common infectious diseases of cattle that cause problems leading to low productivity, and mortality are pneumonia, foot-and-mouth disease (FMD), brucellosis, dermatophilosis, and contagious bovine pleuropneumonia (CBPP) amongst many others (Blood and Radostits, 1989). These diseases can cause considerable suffering and pain and major economic loses (Bida, 1973; Nuru and Dennis, 1976; Pullan, 1979; Biggs, 1985; Ogunsusi, 1985; Maina, 1986). Infectious diseases of the respiratory and digestive tracts are endemic in most livestock farms and account for a large portion of the veterinary disease control activities (Ajayi, 1995).

Epidemics of infectious diseases in food animals seem to be occurring with increasing frequency in the pass ten years in Nigeria (Voh *et al.*, 1993). These epidemics may be associated with the increase livestock production, a greater opportunity for the spread of infectious agents from infected to susceptible host, and the management and control policies (Bendixen, 1988; Martin *et al.,* 1988), and perhaps inadequate veterinary inputs. Epidemics of certain diseases may be difficult to diagnose and expensive to either treat or

control (Biggs, 1985). The sudden and unexpected epidemics can cause large losses, anxiety to the farmer and loss of confidence in the attending veterinarian (Kudi, 1998; Blood and Radostits, 1989)

The diagnosis of clinical disease is easier than that of sub-clinical disease, but even when diagnosis can be made relatively easily in some cases, the clinical management can be frustrating especially when the response is slow with high rate of mortality (Kudi, 1998). The specific diagnosis for sub-clinical disease is a major problem for the control and management of livestock diseases (Martin, 1984). This is because it is difficult to identify infected animals that incidentally could be carriers and sampling the necessary proportion in the herd for laboratory diagnosis is, therefore, made more difficult. This is relevant because testing and interpretation of results correctly is very important to making an accurate diagnosis (Martin, 1984; Hencook *et al.*, 1988; Blood and Radostits, 1989).

The strategies for disease prevention and control are a collective responsibility of the farmer, the veterinarian and the draught animal researcher (Barton *et al.,* 1988; Williamson *et al.*, 1988; Blood and Radostits, 1989). While farmers need to be educated on the importance of the various risk factors associated with clinical and sub-clinical diseases, and their effects on productivity by the veterinarian and the animal scientist, it is important for the draught animal researcher to involve veterinarian and the animal scientist in the draught animal research (Blood and Radostits, 1985; Martin *et al.*, 1987; Prescott, 1991). Many infectious diseases and injuries on draught animals could be controlled effectively and economically if the farmer would adopt good hygiene, quality feeding and the use of proper harnesses and other agricultural implements (Alkali, 1969; Ramaswamy, 1998).

In Nigeria there is indiscriminate use of anti-microbial agents in food animals (Ladan, 1995). This is so, because the drug regulatory body is not enforcing and controlling the sales of these drugs to the public. Thus, the use of these drugs by farmers, Fulanis and unqualified livestock sector workers (Ibrahim, 1986) is causing the increased resistance to anti-microbial agents among Nigerian livestock (Kudi, 1998).

**2:2:2:1a: DERMATOPHILOSIS.**

Dermatophilosis is an exudative cutaneous disease of domestic and wild animals and to a lesser extent man, caused by the actinomycete, *Dermatophilus congoleses* (Bida, 1973). Among domestic animals, cattle, sheep, goats and horses are susceptible (Von Saceghem, 1915; Bida, 1973; Abdullahi, 1982; Saidu, 1986). The organism survives in nature under dry conditions and in scabs as a mycelium, though few zoospores could be seen. The mycelium is the predominant form in skin lesion on susceptible host. It is very antigenic though antibodies produced against it are not protective (Bida, 1975; Richard *et al*, 1976). It is also resistant to desiccation being viable up to 42 months as zoospore in scabs (Oppong, 1976).

The disease is more prevalent during the rainy season when predisposing factors like ticks, wetness, tree branches and arthropods are most abundant (Steward, 1972). It has been shown that the disease is transmitted from one animal to the other through body contact in animals that have broken skin due to trauma from reeds or tick bites (LeRiche, 1967). The pathology caused in cattle in Nigeria is well documented (Bida, 1973; Oduye, 1976). Dermatophilosis has been reported to be of great economic importance due to the damage to skin and hides, loss of condition and losses in productivity. The exert extent to which these losses affect livestock production are yet to be determined (Saidu, 1986; Lloyd, 1987).

The disease in cattle is characterized by thick horny crusts on the neck, body or back of udder and may extend to the legs and the ventral surface of the body. In some cases itching is reported causing the scalp to fall of leaving slightly bleeding area (Blood and Radostits., 1985). Since the disease is more prevalent during the wet season (period of active ploughing) and with its characteristic lesions on the neck and body (areas of the harness), draught animals infected with this condition may be unthrifty and show reluctance to work.

**2:2:2:1b: FOOT AND MOUTH DISEASE [FMD].**

This viral infection affects all cloven-footed animals (Blood and Radostits, 1989). It is characterized by the formation of vesicles and erosions of the tongue, nose, lips and other mucus membranes of the mouth and the skin between the hooves and the coronary band above the hoof (Biggs, 1985). FMD has been reported to be wide spread in Nigeria (Jawara, 1990), and its importance stems from losses that could result from mortality, loss of condition, depressed growth and the cost of control and eradication (BVA Trust project, 1982; Biggs, 1985).The economic looses resulting from the above conditions could run into millions of naira (Ajayi, 1995; Ladan, 1995). FMD spreads very fast both through inhalation and by ingestion in cattle, the movement of an infected animal from herd to herd or the movement of an infected object could result in an outbreak of the disease.

The effect of the disease in Nigerian livestock has been described as mild with low mortality resulting from it, and this has made most livestock owners, especially the Fulani to see it as a transient nuisance. Even though the disease is said to be mild and transient, the situation in study area are the sequels probably due to endocrine damage are chronic syndromes of dypsnea, anemia and lack of tolerance of heat (Blood *et al.,* 1985). Thus an

affected work animal though recovered from the condition may suffer exhaustion and would not work efficiently.

**2:2:2:1C: CONTAGIOUS BOVINE PLEUROPNEUMONIA [CBPP].**

CBPP is an acute highly infectious disease of cattle caused by *Mycoplasma mycoides,* the disease is characterized by marked pulmonary edema, proliferation of interstitial tissues in the lungs and diffused pneumonia and sero-fibrinous pleurisies (Blood and Radostits, 1989). The disease is wide spread in Africa, particularly, in the semi-arid regions along the southern border of the Sahara, extending from Somalia in the east to Senegal in the west (Osiyemi, 1981).

The survey of CBPP in Nigeria shows that in the past years the country has sustained great losses in outbreaks (Osiyemi, 1981). The disease is of great economic importance not only because of direct losses but indirect losses from interruption of movement and sales of livestock hide production, restriction of external trade and the cost of veterinary surveys (Ajayi, 1995). The economic importance of CBPP caused the first national campaign for its control and eradication named Joint Project 28 (JP28) launched in 1973. Since then the control has been through removal of clinical cases and the annual vaccination of apparently healthy animals (Onoviran, 1978; Osiyemi, 1981).

CBPP recovered animals may be clinically normal, but an inactive sequester in the lungs with a necrotic center is sufficient to produce a toxemia, causing unthriftiness and mild respiratory distress on exercise (Blood *et al.,* 1985). Hence, in affected countries enormous losses are experienced each year from the deaths of animals and the loss of production during convalesce. Infected draught animals cannot work effectively due to respiratory distress on exercise.

**2:2:2:1d: TRYPANOSOMOSIS:**

Trypanosomosis is a protozoan disease of wild and domesticated animals and man, caused by parasites of the genus *Trypanosoma*. It is in nature transmitted by tsetse fly, and biting flies or by coitus in equine venereal trypanosomosis. The disease is widespread in the world were ever the vector and susceptible host is found.

In Africa, the disease is a major cause of economic losses resulting from deaths and/or stunted growth, debilitation, poor production, infertility and premature births (Ilemobade and Balogun., 1981; O'Hara and Gambo, 1987; Sekoni, 1992; Oga'a *et al.,* 1993). This has limited the number of cattle in Africa to about 20 million, whereas the carrying capacity is about 140-200 million; consequently, Africa produces seventy times less animal protein per hectare than Europe due to the disease (Service, 1992).
In Nigeria only about a fifth of its total land area of 920,000km$^2$ is free of tsetse flies, leading to over-grazing and the high infection rates of 70% in cattle (Yesufu and Mshelbwala, 1973; David-West, 1987). Trypanosomosis causes constraints of production of milk, meat, and animal traction across much of sub-Saharan Africa (Swallow and Wouldyalew., 1994). There is evidence that stress which can arise from work, poor nutrition, and other concurrent diseases, pregnancy and lactation increase susceptibility to trypanosomosis (MacLennan, 1970). Also 20% mortality of draught donkeys was postulated to be trypanosomosis as the main cause (Sowe *et al.,* 1990)

Trypanosomosis and its associated factors even though have not been quantified seem to constitute an additional constraint on the use of draught power in the tsetse zones where cattle are particularly exposed to the tsetse-transmitted disease. And this is understandable since anemia is the main

pathology of the disease, and anemia will cause reduced carrying capacity of red blood cells of the animal.

**2:2:2:1e: BABESIOSIS:**

Babesiosis is an important tick borne protozoan disease of animals. In cattle the disease is caused by *Babesia bovis*, and it is characterised by fever, intravascular hemolysis causing syndromes of anemia, hemoglobinuria and hemoglobinemia (Blood *et at*, 1985). Indeed babesiosis has been listed among the four major tick-borne diseases along with trypanosomosis as the most important constraints to health and improved productivity of livestock in sub-saharan Africa (Young *et al*, 1988)

Susceptibility to this disease decrease with the age of the animal, in enzootic environments such as Nigeria, strong natural immunity occurs to infected animals. However, severe disease may occur in such immune cases when they are exposed to some stress such as starvation, concurrent disease and hard labour (Blood *et at*, 1985). Hence, Bell-Sakyi et al, (2004) in recent report, noted that domestic animals in the sub-saharan Africa infected with wide variety of vector-borne hemoparasites result in a state of pre-immunity in which the host becomes the long-term, often an asymptomatic carrier serving as a source of infection for ticks and insect vectors.

**2:2:2:2: NON- INFECTIOUS CONDITIONS OF DRAUGHT ANIMALS*:***

**2:2:2:2a: ECTOPARASITISM:**

In many countries of the world, ectoparasitic infestations are of major importance in animals (Blood, 1979). These external parasites infestations of ticks, mites and fleas cause physical injuries and in addition some serve as vectors of many viral, ricketsial, bacterial and protozoan diseases of cattle

(Fabiyi, 1984). They also have marked effect on the production of meat (Jawara, 1990), and cause damage to hides and skin (ILCA, 1990).

Heavy infestation with ticks can cause direct losses, since many ticks are active bloodsuckers and may cause death from anemia (Blood *et al.,* 1985), also some species cause tick paralysis, and a heavy load can cause sufficient trouble by worrying the animal, interfering with feeding which may lead to loss of production and weight gain (Turner and Short, 1972). The occurrence of and significance of tick borne parasites amongst livestock especially cattle in Nigeria have been reported (EEC, ABU/RUU project report 1989). These tick-borne diseases include babesiosis (Red water fever), anaplasmosis, and cowdriosis (Fabiyi, 1984). Indeed, ticks themselves causes considerable losses both directly through damage to attachment sites and reduced live weight gain, and indirectly through the cost of tick control and disease treatments including tick-associated bacterial skin disease dermatophilosis (McCosker, 1979)

Animals infested by fleas and mites suffer severe pruritis and irritation leading to loss of hair, mutilation and loss of weight due to the animals' inability to eat, in addition to also serving as vectors for infectious diseases (Blood *et al.,* 1985). This means then that draught animals infested with ectoparasites will suffer loss of condition due to irritation and lack of feeding and anemia, thus weakness and inefficiency.

**2:2:2:2b: HELMINTHOSIS:**

Helminths infestation has been of great economic importance world wide affecting all animal species and the damage caused on infected hosts range from organic lesions via anemia, disturbances of ion balance, gastric and enteric dysfunction to major interference with hormonal processes and the immune system. It is reported that the disease causes a rather gradual deterioration of animal performance and does not show dramatic clinical

symptoms especially in mature cattle, except in young ones that exhibit gastrointestinal disorder and severe anemia (Okaeme and Ogwu, 1984).

The consequence of worm infestations has been noticed in developmental disorders such as stunted growth, poor quality wool, inferior carcass grades and sterility due to poor performance (Ogunsusi, 1979; Mohammed *et al.*, 1989; Istifanus *et al.*, 1990; Georgi and Georgi, 1990). Also it has been noticed that gastrointestinal helminthosis is direct reflection of environmental contamination (Bianchin and Honer, 1987), meaning that animals raised in a contaminated environment could have heavy gastro parasitism leading to substantial losses in production or even acute clinical symptoms and death (Morley and Donald, 1980).

**2:2:2:2c: ACCIDENTS AND INJURIES*:***

Accidents and injuries can be seen as outcome of complex phenomena with multi-factorial genesis. These terms have often been used interchangeably; however interdisciplinary groups have scientifically addressed these two words in an attempt to differentiate them. WHO (1989) at the first world conference on accidents and injury prevention defined accident as an event that results or could result in an injury. While the Melbourne Declaration, (1996) sees Injury as a threat to health in every country of the world, indeed in many low-income countries; injuries are rapidly becoming one of the leading causes of death and disability, but are yet to be recognized as public health problems (Mock *et al.*, 1995).

In Africa, it has been estimated that 100 deaths per 100000 inhabitants occur each year due to injuries (Nordberg, 1994), and the incidences of

specific injuries such as motor accident and occupational injuries are much higher in some developing countries than in developed ones (Melbourne Declaration, 1996). Smith and Falk (1987) and the National Committee on Injury Prevention and Control (1989) have reported that in developing countries epidemiological studies have begun to identify the causes of injuries, but unfortunately much less is known about the incidences and the causes of injuries in these countries or about the group at high risk for injuries (Wang'ombe, 1995). Only two countries in African continent have reported injury data to WHO in the 10 years period ending 1987 (Smith and Falk, 1987), suggesting that valid up-to-date data on the incidences of injuries are lacking in developing countries and these dataset are necessary to asses the nature and extent of injuries in a population, to identify groups that are most at risk for specific injuries and to establish priority for the intervention and for the allocation of appropriate resources for the injury control programme (Forjouh and Gyebe-Ofosu, 1993)

On the other hand, livestock rearing and the use of animals involve a wide variety of activities amongst which is draught power. These activities have been noticed to expose both the animals and their handlers to a wide range of injuries and illnesses (Stueland and Gunderson, 2002). These injuries and illnesses are also said to be very much dependent on the type of livestock, the peculiar behavior of the animal and the methods of handling these animals (Stueland and Gunderson, 2002). The injuries on the draught animals has been associated with the fact that most of these animals undergo unimaginable suffering in immeasurable ways, such as excessive straining, stresses of overloading, beating, whipping, and poor harnessing causing callosity and neck injuries (Ramaswamy, 1998). There is practically very little effort to stop the brutality and cruelty on draught animals, hence majority of sores that are found on the back are caused primarily by unsuitable harness design, poor fitting and bad maintenance as also other subsidiary factor (Hovell, 1998).

Therefore a study designed for the survey of the health status of work bulls will be incomplete without the component on injuries inflicted on the animals, whatever the source or cause. Also, a simultaneous study of the injuries inflicted on the handlers could give some incite into the public health significance of draught animal power application in developing countries.

**2:2:3:0 MANAGEMENT PRACTICES IN DRAUGHT ANIMAL POWER:**

The management practices of farming system are closely related to the purpose for which the livestock are kept. Draught animals are mostly used for ploughing at start of rainy season. This start of work usually coincides with time of nutritional stressing, for example in Nigeria (Macfarlane and Bunn, 1988: Kudi, 1998), combinations of nutritional stress and work lead to a depressed immune response of the working animals resulting in an increased susceptibility of the animals to many diseases (Stephens, 1980). Also Pearson *et al.* (1996) reported that a large number of problems, including infectious diseases, affecting draught animals and hence adversely affecting their productivity.

Most farmers are reported to make efforts to prevent the acute diseases while the sub-clinical diseases are unchecked (Pearson *et al.* 1996). This may imply that most farmers are fully aware of the economic consequences of clinical disease in animals but are not fully appreciative of sub-clinical disease (BVA Trust project, 1982), and these sub-clinical diseases may not kill these animals, but can cause severe reduction in productivity (Pearson *et al.*, 1996). Farmers will usually pass such infected animals as poor performance or simply failure of the animal to reach predetermined objective, but Ramaswamy, (1998) reported that the working conditions of these animals also exacerbate diseases in draught animals,

**2:2:3:1 STRESS FACTOR IN MANAGEMENT:**

The term stress has attracted much attention. Selye (1974) described his general adoption syndrome and proposed that, stress is a non-specific response of organism to a challenge or demand made to it, but Archer (1979) defines stress as the prolonged inability to remove sources of potential danger leading to activation of systems beyond their range of maximum efficiency. However, Scott, (1981) said stress denotes the different types of environmental conditions that are adverse to the well being of the animal. Eubank (1992) said stress was all factors of the environment, which can damage or disturb an animal, that is, it was the response to a challenge or the inability to cope with environmental demands.

Eubank's statement was particularly true of draught animals in the developing countries that are subjected to hard labour on farm (ploughing, produce haulage and milling) under harsh environmental conditions (Campbell and Hogan, 1985). The work output of draught animals is therefore limited by many stress factors inherent in the traditional management practices applied by the farmers.

In Nigeria, farmers utilize locally available cattle breed (Zebu) for traction. Their most important task amongst others is ploughing at the onset of the rainy season which also coincides with the period of greatest nutritional stress (Macfarlane and Bunn, 1988). This combination of stressors in work bulls in addition to a depressed immune response in working animals as a result of increased secretion of corticosteroid hormones (Stephens, 1980) causes an increasing susceptibility of work bulls to many disease conditions. It seems then that stress in draught animals could cause drastic changes in the body function as the animal over-exerts its body system. However, work stress in draught animals may follow the general adoption syndrome which states that 'stress though deleterious to the general productivity of an animal is, on the one hand an important instrument of training and harnessing, co-existing with life and complete elimination of its effects on the body is only possible after death' (Ayo *et al.,* 1996). It is therefore pertinent and reasonable to surmise that the most important stressors in work animals are: overwork, poor nutrition at period of work, use of poorly designed harnesses, animal diseases and the very high ambient temperatures of our environments.

**2:2:3:2: ETHNO-VETERINARY PRACTICES IN MANAGEMENT:**

The pastoral communities of the world over, has had a strong tradition of utilizing local plants and herbs as part of the management practices for the well being of their animals, and these traditional knowledge and practices of animal health and husbandry spans hundreds of years and the reasons for these practices are varied. In Nigeria it has been argued that the Fulani's who own most of the cattle have resorted to traditional treatment of livestock diseases using local herbs due to high cost of orthodox medicine (Gefu and Otchere, 1994).However, Nuru (2000) argued that only a few older generation of pastoralist actually use traditional medicine solely to compliment modern

orthodox medicine due to the recent economic hardship faced in the country and also the need for cultural identity and pride of the livestock producing groups.

The use of herbs by all classes of animal producers has long been recognized, Nwude (1997) reported that herdsmen, village elders and all those who keep animals have been known to recognize and use herbs in the treatment of animal diseases, the use of herbs for diseases varies and has been researched into by scientists. Most of these treatments are against parasitism (Ibrahim *et al.,* 1984), bacterial and viral conditions (Nwude and Ibrahim, 1980; Dalzeil, 1997: Atawodi, 2000; Ibrahim, 1986). So also is the use of herbs for the treatment of trypanosomosis amongst herdsmen (Nok *et al.*, 1995; Bodley *et al.*, 1995; Takalal *et al.,* 1995; Freiburghaus *et al,* 1996), and the use preparations against ectoparasites in man and animals in Nigeria and other countries (Okolo and Unaigwe, 1984; Dalziel *et al*, 1996; Hirudker *et al* 1997). The traditional wound care, dehorning, obstetrics, bone setting amongst other ethno- veterinary procedures also were reported (Nwude, 1997).

One can then surmise that traditional medicine or the use of herbal remedies has been in practice since the dawn of mankind and herbs as the product of nature have the gained easy acceptability and blend easily with the socio-cultural life style of pastoralist benefiting both man and animals.

## 2:4:0 HEAMATOLOGY AND SERUM BIOCHEMITRY OF DRAUGHT ANIMALS

The blood picture of work bulls under the traditional mixed farming systems is of interest in view of their seasonal use to provide mobile work energy for cultivation and transportation (Thomas *et al.,* 1990). The hematological

parameters of many breeds of cattle in Nigeria have been determined (Oduye and Fasanmi, 1971; Saror and Coles, 1973a,1973b; Akerejola *et al.*, 1980; Gbodi and Chechet, 1981; Oyedipe *et al.*, 1984; Gbodi *et al.*, 1989). Many of these parameters are influenced by many factors such as age, breed, sex, seasons, lactation, pregnancy and diseases (Schalm *et al.,* 1975). However, for work bulls few studies have been carried out on the hemogram and serum biochemical levels to establish effect of stress, from exercise, work and other related factors. Blood and serum biochemical parameters are also necessary in clinical practice for an effective diagnosis of a disease and detection of deviations from normal values suggestive of abnormal condition (Blood and Radostits, 1989).

In most animal species excitation, apprehension and exercise dramatically increase values for total red blood cells (RBC), packed cell volume (PCV), and hemoglobin (HB) levels. This is particularly true of the horse following strenuous exercise (Schalm *et al.*, 1975; Coles 1986; Adeyefa *et al.,* 1987).

Gartner *et al.,* (1969) indicated that the increase in PCV that occurred with handling of animals reduced when animals become conditioned to the environment and the handling procedures. Alteration in leukocyte count could be the consequence of normal physiological responses or due to a disease condition. If in the process of blood sample collection the animal is mishandled or caused to exercise violently the total leukocytes count may be increased and the number of neutrophils will be greater than normal as cells move from the marginal pool into the circulation pool, while pathological increase in leukocyte count could show an increase in segmented neutrophilic granulocytes (Coles, 1986). It has been noted that an increase in leukocytes count alone is of little value in making clinical diagnosis unless it corresponds with the clinical condition of the patient observed (Lording and Friend, 1991). That is, the disease and the leukocyte count must be considered together for any useful interpretation of results.

Serum creatinine kinase, albumin, total protein and blood glucose were reported to significantly increase in racehorses in Nigeria (Adeyefa *et al.*, 1987). While Mohammed, (1998) reported that significant increases in blood urea nitrogen, and total protein levels occurred immediately after ridging in work bulls, while the serum bicarbonate and potassium levels were decreased significantly, and slight increases in the sodium, phosphates and albumin also after ridging. In draught buffalos and cattle of India, it was reported that the hemoglobin concentration (Hb), packed cell volume (PCV) and plasma bicarbonate increased significantly following wet and dry season ploughing (Anil and Thomas, 1994).

Increases in blood lactic and pyruvic acids, creatinine, bicarbonate and urea, with decreases in serum potassium, total proteins and cholesterol following exercise were earlier reported in male buffalos (Narrinder *et al.,* 1980). From the above reports the hematological and biochemical levels did not change beyond physiological limits and post exercise recovery was fast, about 0.5-1.0 hours except for blood lactic acid that returned to normal in 2.0- 3.0 hours (Bhatnagar and Upadhyay, 1991).

It is therefore highly suggestive from the above that a thorough investigation or the survey of the health status of work bulls, among village farmers must include an in-depth study of their blood and fecal samples in combination with thorough clinical examination of the work bulls, necessary to making diagnosis.

# CHAPTER THREE

# 3:0 MATERIALS AND METHODS

## 3:1 THE STUDY AREA:

The study area was Zaria and its environs (appendix 1) and draught cattle in the villages within these area used for traction were surveyed. These villages were accessible by motor bikes or cars, and owners of work bulls willing to participate by including their animals in the project were interviewed and a minimal token benefits or rewards such as free treatment of any diagnosed disease condition of the work bulls was used as incentives to encourage participation.

## 3:2:0 FIELD WORK:

The field work took place during the months of November 2001 – March 2002, when the draught cattle were apparently resting from vigorous farming activities and the months of June - September 2002 when the animals were actively involved in farming activities

## 3:2:1: STUDY DESIGN:

The cross sectional design was used for this study. Eight locations [Ungwa Najude, Ungwa Sauni, Yandaka, Yansarki, Panhauya, Biye, Mile Goma and Tashar Zomo] were visited and an open ended questionnaire was administered to farmers owning draught cattle (appendix 2).Information on

the animal profile, working history, feeds and feeding, handlers' history and the health management practices were collected.

Initial field visits were made to these villages in the months of November 2001, when the animals were resting and the owners were also available for their consent to be sought. Subsequently, two visits were made December2001- March 2002 and in June- September 2002 (active farming period). The first visits in a period were made to administer the questionnaire on the animal owners and handlers, to carry out physical examination of the animals and collect blood and fecal samples for laboratory analyses. The second visits were made to verify the information obtained in the first visits, and to institute therapy for any disease conditions diagnosed.

**3:3:0 DATA COLLECTION FROM QUESTIONNAIRE ADMINISTRATION:**

Data collection from the owners of each draught cattle was on the work experience, working hours and the estimated work output and also the type of feeds and feeding methods that are employed by owners, the common health conditions of these animals and the traditional way of handling these problems. The handlers were interviewed and socio-demographic characteristics such as age, gender of injured person; activity-involving handlers such as feeding or grazing the animal, harnessing the animals or ploughing were collected. Any medical help and the type received for the handler's injury were included in the questionnaire. Data were collected by the researcher filling-in most of the questionnaire, since the handlers and animal owners were not educated.

**3:4:0 DATA COLLECTION BY PHYSICAL EXAMINATION OF DRAUGHT CATTLE**

The animals were restrained by the farmers for detailed physical examination and clinical data collection. The breed, age, body weight, rectal temperature, pulse and respiratory rate were obtained. Each animal was checked for the sex, castration status for the male animals was also checked. The animals were also examined for any ectoparasites and injuries. Blood and fecal samples were collected for laboratory analyses

Ageing of the animals was done by examination of teeth for erupted permanent incisors only (Akerejola and Ojo, 1976), while the body weight was based on the heart girth and body length of animals (Williamson and Payne 1978). The body temperature of each animal was measured using clinical thermometer. The injuries observed were classified based on it's location on the body of the animal. Also the owners were asked about the cause of injuries and how these injuries were managed.

**3:5:0 SAMPLES COLLECTION AND LABORATORY ANALYSIS**

**3:5:1 FECAL SAMPLE COLLECTION AND ANALYSES*:***

Fecal samples were collected from the rectum of three hundred and forty three [343] draught cattle using clean cellophane bags and transported on ice to the Helminthology Laboratory for analysis. All the fecal samples were examined by floatation and sedimentation techniques (Soulsby, 1986) and the eggs of nematodes, trematodes and cestodes were identified.

**3:5:2 BLOOD SAMPLE COLLECTION AND ANALYSES:**

Blood sample (2ml) was collected from each animal by jugular venipucture with a 10ml sterile disposable syringe and sterile (19G1½in) needle, and put into plastic bottles containing ethylene diamine tetra acetic acid (EDTA) as anticoagulant. After gentle mixing, the samples were preserved in ice packs and transported to the Clinical Pathology Laboratory for analyses.

Blood samples were examined for hemoparasites Anaplasma, Babesia and trypanosomes using wet mounts, thin and thick blood smears and buffy coat examinations. The Packed Cell Volume (PCV) was determined by microhematocrit method, while the Hemoglobin concentration (Hb), Red Blood Cell count (RBC), White Blood Cell count (WBC) and differential leukocyte counts were done using the standard methods (Schalm *et al.*, 1975). Estimation of total plasma protein was by the hand refractometer using the plasma.

**3:5:3 SERUM SAMPLES COLLECTION AND ANALYSES**:

Blood samples (8ml) was collected from each animal by jugular venipucture, and put in clean plastic bottles without any anticoagulant using a 10ml sterile disposable syringe and sterile (19G1½in) needle. The samples were transported to the laboratory on ice packs. Serum was harvested from the clotted blood by centrifugation at 2000g for15min and immediately stored in a $-20^0$c refrigerator prior to analysis

Serum sodium ($Na^+$) and potassium ($K^+$) concentrations were analyzed using flame photometry, while serum chloride ($Cl^-$) values were determined by the method of Schales and Schales (1941) as reported by Coles (1986). Serum bicarbonate ($HC0_3^-$) was analyzed by tetrimetric method, while serum albumin was by biurette method; serum glucose was analyzed by oxidation method and serum bilirubin (BIL) was by the method of Jendrassik et al, (1938); serum enzyme aspartate aminotranferase (AST) was by the Reitman and Frankel method (1957) all as outlined by Cheesbrough (1991). The serum urea nitrogen (BUN) was analyzed using the diacetyl monoxime method outlined by Strove and Makarova (1989).

**3:4:0 STATISTICAL ANALYSIS:**

Clinical data are shown as both mean and standard deviation. The prevalence of helminth infection was expressed as percentage positive samples by the number of samples collected. Helminths prevalence and the differences in helminths egg output (epg) were analyzed by chi-square test and nonparametric one way analysis of variance respectively, while t-test was used to asses the difference in the mean hematological and serum biochemical values of the two groups with significant levels at $p<0.05$. The anion gap defined as the difference between $(Na^{+}+ K^{+}) - (Cl^{-}+HC0_3^{-})$ by Coles, (1986) was used to evaluate the level of electrolyte changes and values less than or greater than 20-22mmol/l were considered to be of significance. In the injury survey amongst the handlers of work bulls the demographic data shown as percentage prevalence and chi-square significant test was used to determine the correlation coefficient between work and incidence of injury observed in the animals and handlers:

# CHAPTER FOUR

# 4:0 RESULTS

## 4:1:0 NUMBER OF DRAUGHT CATTLE AND MANAGEMENT PRACTICES IN VILLAGES SURVEYED

The total number of bulls and cows sampled during the resting period of December -March was one hundred and thirty nine animals (139), while two hundred and four (204) animals were sampled during the working period of June-September (Table 4:1) The ratios of the animals per farmer for the two periods were 2.48 (139/56) and 2.62 (204/78) for resting and working periods respectively. Female animals were noticed to be used for ploughing in some of the villages and more were seen during the working period 4.41% (9/204) than during resting period 2.87% (4/139) see figure 4:1

The draught animal management system in all the villages visited within the study area was made up of two types of practices namely, semi-intensive and extensive types. Fewer numbers of farmers practiced semi-intensive management system during the wet season; allowing the animals to graze in-between work and confining them in the owners' compounds or under some near by tree at night fall, and give feed supplements such as crop residue and / or cottonseed cake and salt licks. While during the dry season most farmers were noticed to keep farm residues for these animals (Table 4:2). The farmers practicing extensive management allowed all animals to graze natural pasture without giving any feed supplementation, this form of management was most common during the dry season were animals were

doing minimal work and so were allowed to graze the wet lands. Also the wet season extensive farming took advantage of abundant pasture and so allowed animals to graze only in between work.

**TABLE 4:1**

**LOCATION, MANAGEMENT PRACTICES AND SIZE OF DRAUGHT CATTLE SURVEYED AT WET (JUN-SEPT) AND DRY (NOV-MARCH) PERIODS**

| S/No | Location | Management Practices | Dry Season | No. Owners | Wet Season | No. Owners |
|---|---|---|---|---|---|---|
| 1 | Ungwar Najude (NJ) | Semi-intensive/ Extensive | 46 | 15 | 27 | 14 |
| 2 | Sauni (SN) | Semi-intensive | 7 | 3 | 26 | 15 |
| 3 | Yandaka (YD) | Semi-intensive | 28 | 9 | 16 | 6 |
| 4 | Yansarki (YS) | Semi-intensive | 23 | 12 | 7 | 3 |
| 5 | Biye (BY) | Semi-intensive/ Extensive | 18 | 7 | 71 | 27 |
| 6 | Tashar Zomo (ZT) | Semi-intensive/ Extensive | 8 | 5 | 44 | 19 |
| 7 | Panhauya (PH) | Semi-intensive | 9 | 4 | 13 | 6 |
| **Total** | | | **139** | **56** | **204** | **90** |

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FIGURE 4:1 AGE DISTRIBUTION OF WORK BULLS DURING THE DRY AND WET SEASONS

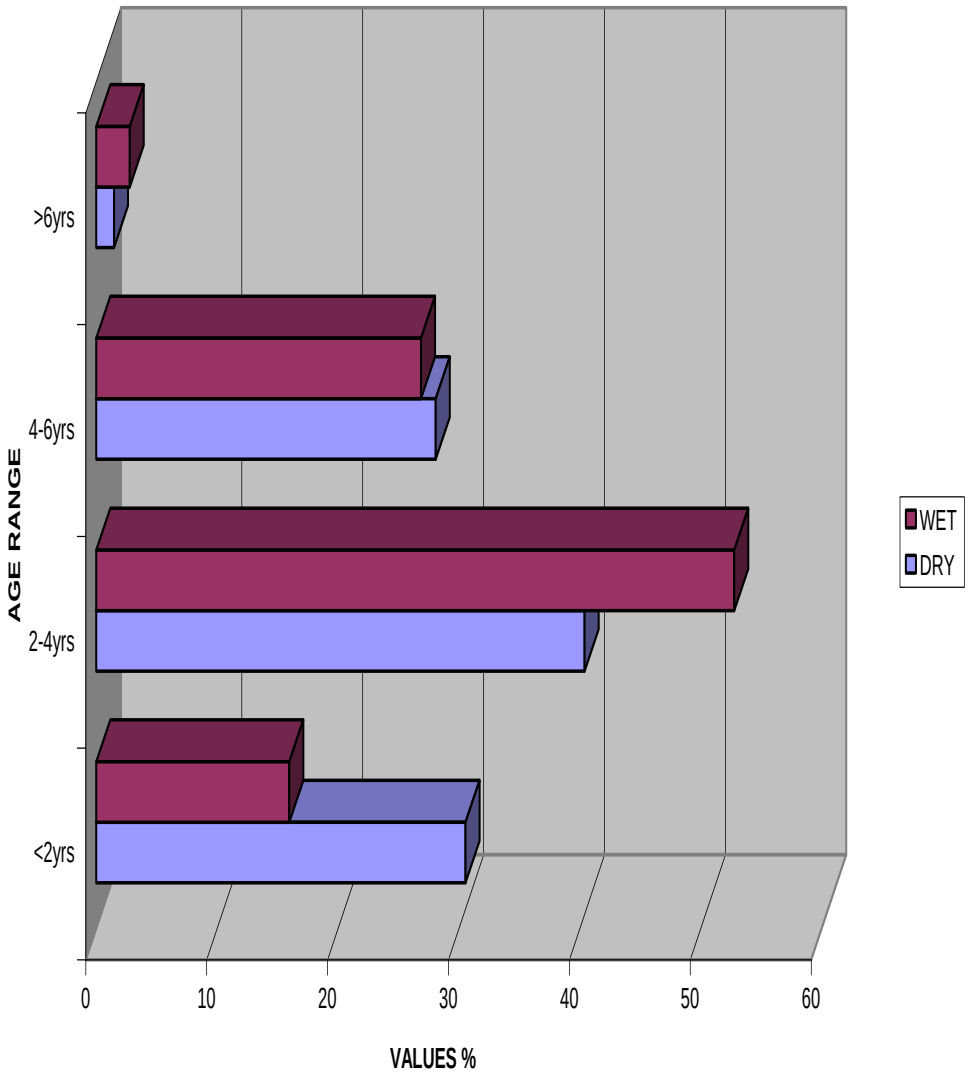


**TABLE 4:2**

**COMMON HEALTH PROBLEMS OF DRAUGHT CATTLE IDENTIFIED DURING SURVEY AND HOW THE OWNERS MANAGED THESE PROBLEMS:**

| s/no | Health Problems | WET PERIOD (n=139) | | DRY PERIOD (n=203) | | Owners Management Practices |
|---|---|---|---|---|---|---|
| | | No Sick | % sick | No Sick | % sick | |
| 1. | injuries | 30 | 21.58% | 27 | 13.30% | Penicillin injections by quacks<br>Use of engine oil on wounds<br>Herbal mixtures (lalle) |
| 2 | diarrhea | 13 | 9.35% | 33 | 16.26% | Drenched with Madachi (K*haya senegalensis)*<br>Antihelminthics purchased from market |
| 3 | Bloat | 2 | 1.44% | 0 | 0 | Drenched with palm oil |
| 4 | Respiratory disease | 4 | 2.88% | 6 | 2.96% | Oxytetracycline injections by quacks |
| 5 | Skin Lessons (kirchi) | 3 | 2.16% | 5 | 2.46% | Oxytetracycline/penicillin injection by the farmer<br>Use of palm oil on wounds |
| 6. | Mixed condition | 27 | 19.42% | 19 | 9.36% | Manual removal of ticks<br>Hot potash on animal stall<br>Oxytetracycline injection by quacks |
| 7 | **Total** | **79** | **56.83%** | **90** | **44.33%** | |

Their sources of water varied, from streams, ponds, and wells to boreholes. There were no observed housing facilities for these working animals. Farmers with large number of animals were seen to keep them in groups under large trees between compounds, or behind their houses (Plate 1). More

animals (75.5%) received feed supplements during the dry season while the remaining 24.5% were never given any feed supplements but left to graze freely the farmlands and wetlands. However, during the wet season fewer animals (36.3%), received feed supplement while most animals (63.7%) were not supplemented but allowed only to graze in-between working hours and more (9.8%) farmers gave groundnuts hay and or cakes at that time , while during the resting period more (17.27%) farmers used more of mixed supplements (Table 4:2).

### 4.2.0 HEALTH PROBLEMS IDENTIFIED DURING THE SURVEY:

The common health conditions seen during the survey were diarrhea, injuries (trauma), skin problems, respiratory problems, bloat and a combination of ectoparasites with any of these problems. More problems were seen during the dry season (64.75%) than during the wet period (38.72%). The major problems seen were diarrhea, injuries and mixed infections during both periods (Table 4:3). The physical parameters of the apparently healthy draught cattle as compare to those clinically sick showed significant ($p<0.05$) changes in the age, weight, working hours and work output, while the clinically sick animals were older animals and seasoned workers on the farm, working for significantly ($P<0.05$) more hours than the apparently healthy ones (Table 4:4). The variation in the body weight of the clinically sick cattle shows that the animals with diarrhea had significantly ($P<0.05$) lower weight than those with injuries, other lesions and mixed conditions. The body temperatures of those injured and with mixed conditions were significantly ($P<0.05$) higher than those with diarrhea and other conditions.

**TABLES 4:3**

**COMMON FEED SUPLLEMENTS (FD-SPD) USED BY DRAUGHT CATTLE OWNERS DURING THE DRY AND WET PERIODS:**

| S/NO | COMMON FEED SUPLLEMENTS (FD-SPD) | DRY PERIOD (N=139) | | WET PERIOD (N=204) | |
|---|---|---|---|---|---|
| | | No. receiving FD-SPD | %receiving FD-SPD | No. receiving FD-SPD | %receiving FD-SPD |
| 1. | Corn, Sorghum, and Rice Bran | 30 | 28.57% | 18 | 8.82% |
| 2. | Cotton Seed Cake | 10 | 9.52% | 4 | 1.96% |
| 3. | Groundnuts Cake and Hay | 12 | 11.43% | 20 | 9.80% |
| 4. | Cowpea/soybeans Husk / Hay | 13 | 12.38% | 7 | 3.43% |
| 5. | Potash/Salt Licks and table salts | 16 | 15.23% | 10 | 4.90% |
| 6. | Mixed Feeds of any two groups above | 24 | 22.86% | 15 | 7.35% |
| | Total | 105 | 75.54% | 74 | 36.27% |

**TABLE 4:4**

**MEAN (X ± SD) CHANGES OF THE PHYSICAL PARAMETERS OF CLINICALLY SICK DRAUGHT CATTLE AS COMPARE TO THOSE APPARENTLY HEALTHY;**

| s/no | Physical Parameters | Apparently Healthy Cattle (N=169) | Clinically Sick Cattle (N=174) | P value |
|---|---|---|---|---|
| 1 | Age (yrs) | 3.88 ±2.05 | 3.36 ± 1.59 | **0.0012*** |
| 2 | Weight (kg) | 268.6 ±57.3 | 253.7 ±71.3 | **0.0340*** |
| 3 | Body temperature ($T^{o}$) | 37.81 ±2.99 | 37.90 ±1.96 | 0.7776 |
| 4 | Working days/week | 3.88 ± 2.06 | 4.16 ±1.72 | 0.1809 |
| 5 | Working Hrs/day | 5.57 ±1.72 | 5.08 ±1.79 | **0.0117*** |
| 6 | Work output /day | 1.71 ± 0.74 | 1.43 ± 0.87 | **0.0034*** |
| 7 | Working season | 2.15 ±1.07 | 1.77 ±0.99 | **0.0007*** |

***significant at P<0.05**

Indeed the animals having diarrhea seemed to have work significantly ($P<0.05$) less day per week, less hours per day and consequently less output as compared to those animals injured or having mixed conditions.(Table 4:5).

**4:3:0 BLOOD SAMPLE ANALYSES RESULTS:**

A total of three hundred and twenty two (322) blood samples were examined during the wet and dry seasons for hemoparasites, with only 2.79% (9/322) being positive for trypanosomosis (Table 4:6).The physical parameters of the infected animals showed a non-significant ($P>0.05$) lower values in the weight, the body temperatures, the amount of time spend to work and the work out put of the infected cattle, compared to those not infected (Table 4:7). The hematological parameters showed significant ($P<0.05$) lower values of the total packed cell volume, hemoglobin concentration, and total red blood count, between the infected animals and those not infected. While the absolute white blood cell count showed significant ($P<0.05$) increased in neutrophils count and eosinophils count (Table 4:8). The serum biochemistry showed significant ($P<0.05$) higher values of blood urea nitrogen (BUN) and aspartate amino tranferase (AST) of the infected as compared with those of the non infected animals (Table 4:9).

**4:4:0 RESULTS OF FECAL SAMPLE ANALYSES:**

The fecal samples analyzed showed that 80.47% (276/343) of animals sampled were infested with helminths, out of which 26.93%(94/343) were pure strongyles infections, 11.37%(39/343) were fluke infections, and 37.61%(129/343) were having mixed infestations and only 3.79% had coccidian infections (Table 4:6) The physical parameters the helminth infected cattle revealed significant ($P<0.05$) increase in the body temperature, significant ($P<0.05$) decreases in the work days per week and consequently the work output as compared to those not infected (Table 4:8).

**TABLE 4:5**

**THE EFFECT OF HEALTH PROBLEMS IDENTIFIED ON THE MEAN VALUES OF THE PHYSICAL PARAMETERS OF THE DRAUGHT CATTLE SURVEYED.**

| | Health Problems | Mean Weight (kg) | Mean temp $^{o}C$ | Mean Age (yrs) | Mean Working Days/Wk | Mean Working Hours/Day | Mean work 0utput/hrs (hectares) |
|---|---|---|---|---|---|---|---|
| 1 | Injuries (N=57) | 283.9 ± 46.7 | 38.1 ±0.52 | 3.98 ± 1.25 | 4.25 ± 2.02 | 5.95 ± 1.75 | 1.95 ± 0.83 |
| 2 | Diarrhea (N=46 | 257.4 ± 59.9 | 37.9 ±0.75 | 3.88 ± 1.35 | 3.26 ± 1.19 | 5.01 ± 1.80 | 1.54 ± 0.71 |
| 3 | Mixed (N=46) | 268.5 ±57.7 | 38.1 ±0.71 | 3.79 ±1.14 | 4.38 ±2.09 | 5.62 ±1.62 | 1.57 ± 0.62 |
| 4 | Other Lesions (N=19) | 268.3 ± 51.1 | 35.8 ± 8.95 | 3.94 ± 0.73 | 3.11 ± 1.97 | 5.89 ± 1.13 | 1.86 ± 0.59 |
| | P Value | **0.0044*** | **0.0294*** | 0.889 | **0.0095*** | **0.0349*** | **0.0169*** |

***significant at P<0.05**

**TABLE 4:6**

**RESULTS OF LABORATORY EXAMINATION OF BLOOD AND FECAL SAMPLES OF DRAUGHT CATTLE SURVEYED AT BOTH SEASONS**

| S/No | PARASITES SEEN | NUMBER EXAMINED | NUMBER POSITIVE | PREVALENCE RATE |
|---|---|---|---|---|
| **1.** | Trypanosomes | 322 | 9 | 2.79% |
| **2.** | Strongyles | 343 | 94 | 26.93% |
| **3** | Flukes | 343 | 39 | 11.37% |
| **4** | Coccidia | 343 | 13 | 3.79% |
| **5** | Mixed Infection | 343 | 129 | 37.61% |

**TABLE 4:7**

**EFFECT OF TRYPANOSOMOSIS( TRYPS) AND HELMINTHOSIS (HELTH) ON THE PHYSICAL PARAMETERS (PH-PAR) OF DRAUGHT CATTLE SURVEYED AT BOTH SEASONS:**

| S/No | MEAN PH-PAR | Tryps (N=9) | No.-ve (N=67) | P Value | Helth (N=276) | No.-ve (N=67) | P Value |
|---|---|---|---|---|---|---|---|
| 1 | Weight (kg) | 264.3 ± 53.2 | 262.5 ± 51.1 | 0.9317 | 259.4 ± 68.54 | 262. 5 ±51.05 | 0.7270 |
| 2 | Body temperature ($^oC$) | 37.94 ± 0.55 | 37.38 ± 4.67 | 0.7521 | 38.07 ± 0.56 | 37.38 ±4.67 | **0.0169*** |
| 3 | Age(yrs) | 3.43 ± 1.09 | 3.90 ± 1.50 | 0.4203 | 3.52 ± 1.42 | 3.90 ± 1.50 | 0.0551 |
| 4 | Working season/ | 1.57 ± 0.78 | 2.25 ± 1.19 | 0.1461 | 1.88 ± 0.99 | 2.25 ± 1.19 | **0.0095*** |
| 5 | Workdays per week | 3.14 ± 2.4 | 3.48 ± 1.84 | 0.6585 | 4.11 ± 1.86 | 3.48 ± 1.84 | **0.0135*** |
| 6 | Working hours per day | 4.14 ± 2.12 | 5.54 ± 1.36 | **0.0198*** | 5.26 ± 1.83 | 5.54 ±1.36 | 0.2943 |
| 7 | Work output (hectares) | 1.29 ± 0.95 | 1.79 ± 0.69 | 0.0802 | 1.52 ± 0.87 | 1.79 ± 0.69 | **0.0130*** |

*** Significant at P<0.05**

**TABLE 4:8**

**EFFECT OF TRYPANOSOMOSIS AND HELMINTHOSIS ON THE HEAMATOLOGY OF DI**

| S/No | BLOOD PARAMETERS | TRYPANOSOMOSIS Positive Samples (N=9) | Negative Sample (N=64) | P Value | HELMINTHOSIS Positive Samples (N=256) |
|---|---|---|---|---|---|
| 1 | PCV% | 22.22 ±3.83 | 34.46 ±4.75 | **0.0001*** | 3317 ±4.74 |
| 2 | HB gm% | 7.81 ±1.91 | 11.50 ±1.60 | **0.0001*** | 11.06 ±1.58 |
| 3 | RBC X $10^6$ /µl | 3.62 ±1.42 | 6.58 ±1.47 | **0.0001*** | 6.58 ±1.57 |
| 4 | WBC X $10^3$ /µl | 10.21 ±3.38 | 10.45 ±2.97 | 0.8252 | 10.09 ±2.35 |
| 5 | Neutrophils X $10^3$ /µl | 1965 ±703.8 | 2792 ±2140 | **0.0253*** | 2660 ±1046 |
| 6 | Lymphocytes X $10^3$ /µl | 6560 ±1990 | 6428 ±2140 | 0.8627 | 5983 ±2088 |
| 7 | Eosinophils X$10^3$ /µl | 1416 ±1407 | 966 ±745 | **0.0001*** | 844.6 ±563.9 |
| 8 | Monocytes X $10^3$ /µl | 152.7 ±100.5 | 185 ±115.5 | 0.1441 | 169.6 ±155.3 |
| 9 | Total Proteins (g/dl) | 7.91 ±0.89 | 7.74 ±1.34 | 0.4295 | 7.51 ±0.93 |

***Significant at P<0.05**

**TABLE 4:9**

**EFFECT OF TRYPANOSMOSIS AND HELMINTHOSIS ON THE SERUM BIOCHEMICAL PARAMETERS OF DRAUGHT CATTLE:**

| S/No | MEAN SERUM PARAMETERS | TRYPANOSOMOSIS | HELMINTHS | NEGATIVE SAMPLES | P VALUE |
|---|---|---|---|---|---|
| 1 | Sodium($Na^+$) mmol/l | 139.6 ±2.46 | 137.3 ±7.29 | 137.5 ± 6.29 | 0.6260 |
| 2 | Potassium($K^+$) mmol/l | 3.94 ±0.87 | 4.25 ±0.62 | 4.19± 0.64 | 0.4335 |
| 3 | Chloride($Cl^-$) mmol/l | 98.67 ±1.23 | 98.24 ± 4.6 | 97.1± 5.77 | 0.4190 |
| 4 | Bicarbonate ($HCO_3^-$) mmol/l | 23.67 ±2.45 | 25.45 ± 2.83 | 24.56 ±2.47 | 0.0662 |
| 5 | Glucose (Glu) mmol/l | 2.86 ±0.89 | 2.99 ±0.77 | 2.92 ±0.57 | 0.7205 |
| 6 | Blood Urea Nitrogen(BUN) mmol/l | 4.03 ±1.33 | 2.89 ±1.30 | 2.75 ±1.24 | **0.0139*** |
| 7 | Total proteins (TP) g/dl | 6.59 ±0.37 | 6.91 ± 0.61 | 6.69 ± 0.67 | 0.2072 |
| 8 | Albumin(Alb) g/dl | 2.99 ±3.21 | 3.23 ±0.42 | 3.21 ±0.41 | 0.2753 |
| 9 | (AST)Aspartate Amino tranferase i.u | 35.81 ±6.42 | 25.64 ± 6.15 | 27.9 ±7.23 | **0.0006*** |
| 10 | Bilirubin (Bil) µmol/l | 7.48 ±1.56 | 12.20 ± 2.55 | 12.64 ±3.17 | **0.0001*** |

**Significant at p<0.05**

The hematology showed non significant (P>0.05) changes, except the lymphocyte counts that was significantly less in the infected as compared to that of non-infected cattle. From the information given by the owners of the animals sampled, the number of field hours worked by these animals was in categories of 1-3hours/day, 4-6hours/day and >6hours/day. For animals working more than 3hours/day there was a break or two breaks in-between the hours of work.

The effect of helminthosis on the hematological parameters showed non significant (P<0.05) decreases of PCV, RBC, and WBC, but a significant (p<0.05) decreased value of the absolute lymphocyte counts (Table 4:8). The mean changes in the physical parameters of helminths infected draught cattle (Table 4:9) showed a significant (P<0.05) variation in the values of work season per animal with the animals having flukes, Coccidia and mixed infections having worked for about a season or two While those with strongyles infection or not infected have worked for more than two seasons. The work output was significantly (P<0.05) lower in all groups as compare to those not infected (Table 4:10). The hematology of the different groups showed a significantly (P<0.05) variation in RBC count due to higher values in those animals with flukes, but a significantly (P<0.05) lower lymphocyte counts for those infected with Coccidia. The significant (P<0.05) levels of eosinophils were due to lower values in those infected with flukes, coccidia and mixed infections (Table 4:11)

**TABLE 4:10**

**EFFECT OF STRONGYLE, FLUKES, COCCIDIA, AND MIXED INFECTION ON THE PHYSICAL PARAMETERS OF DRAUGHT CATTLE SAMPLED.**

| s/no | MEAN PHYSICAL PARAMETERS | Strongyles (N=94) | Flukes (N=39) | Coccidia (N=13) | Mixed (N=129) | Helminth negative (N=34) | P Value |
|---|---|---|---|---|---|---|---|
| 1 | Weight (kg) | 258.42 ±63.12 | 278.71 ±69.60 | 232.54 ±79.90 | 262.57 ±70.77 | 262.57 ±51.03 | 0.2154 |
| 2 | Body temperature($^{o}$c) | 37.97 ±0.58 | 38.05 ±0.57 | 38.15 ±0.74 | 38.14 ±0.53 | 37.38 ±4.64 | 0.2025 |
| 3 | Age (yrs) | 3.62 ±1.29 | 3.73 ±1.48 | 2.75 ±1.28 | 3.48 ±1.50 | 3.90 ±1.50 | 0.0828 |
| 4 | Working season | 2.07 ±1.07 | 1.97 ±1.04 | 1.50 ±0.79 | 1.76 ±0.95 | 2.25 ±1.49 | **0.0091*** |
| 5 | Workdays per week | 3.27 ±1.99 | 4.87 ±1.62 | 4.50 ±1.62 | 4.43 ±1.63 | 3.47 ±1.85 | **0.0001*** |
| 6 | Working hours per day | 5.03 ±1.82 | 5.56 ±1.82 | 4.50 ±1.78 | 5.39 ±1.82 | 5.57 ±1.36 | 0.1413 |
| 7 | Work output (hectares) | 1.68 ±0.92 | 1.74 ±0.86 | 1.08 ±0.73 | 1.38 ±0.72 | 1.79 ±0.69 | **0.0005*** |
| 8 | Helminth egg output per gram feces (EPG) | 403 ±571 | 369 ±467 | 175 ±259 | 844 ±726 | 0 | **0.0001*** |

*Significance at P<0.05

**TABLE 4:11**

**EFFECT OF STRONGYLE, FLUKES, COCCIDIA, AND MIXED INFECTION ON THE HEAMATOLOGY OF DRAUGHT CATTLE SAMPLED.**

| s/no | MEAN BLOOD PARAMETERS | Strongyles (N=94) | Flukes (N=39) | Coccidia (N=13) | Mixed Infection (N=129) | Helminth negative (N=34) | P Value |
|---|---|---|---|---|---|---|---|
| 1 | PCV% | 32.27 ±5.09 | 34.42 ±4.23 | 34.42 ±3.32 | 33.38 ±5.01 | 34.47 ±4.85 | 0.0517 |
| 2 | HB gm% | 10.75 ±1.68 | 11.36 ±1.45 | 11.34 ±1.13 | 11.17 ±1.67 | 11.51 ±1.64 | 0.0616 |
| 3 | RBC x $10^6$ /µl | 5.89 ±1.46 | 7.32 ±1.36 | 6.43 ±1.78 | 6.91 ±1.63 | 6.53 ±1.46 | **0.0001*** |
| 4 | WBC x $10^3$ /µl | 10.49 ±3.52 | 12.01 ±16.71 | 8.48 ±2.25 | 9.25 ±2.91 | 10.60 ±2.94 | 0.1534 |
| 5 | Neutrophils X $10^3$ /µl | 2560 ±1045 | 2620 ±732 | 2750 ±1231 | 2783 ±1149 | 2790 ±998 | 0.5586 |
| 6 | Lymphocytes X $10^3$ /µl | 6567 ±2538 | 5960 ±2209 | 5070 ±1479 | 5614 ±2016 | 6505 ±2154 | **0.0072*** |
| 7 | Eosinophils X $10^3$ /µl | 1168 ±871 | 658 ±759 | 457 ±197 | 667 ±514 | 1032 ±739 | **0.0001*** |
| 8 | Monocytes X $10^3$ /µl | 171 ±138 | 201 ±218 | 201 ±192 | 157 ±159 | 187 ±116 | 0.5048 |
| 9 | Total Proteins (g/dl) | 7.64 ±1.12 | 7.72 ±0.84 | 7.34 ±0.72 | 7.49 ±0.83 | 7.81 ±1.04 | 0.2314 |

***Significance at P<0.05**

**4:5:0 EFFECT OF FEEDING SUPLEMENT ON DRAUGHT CATTLE;**

In relation to the feeding regiment, more farmers during the resting period supplemented the feeding of their animals in addition to allowing them to scavenge for food all day long. On the other hand the working bulls were hardly supplemented but rather allowed to graze all day after work for those working 1-3 hrs, and in-between working hours for animals working more than 3hours a day.

The helminths egg output in the two groups was higher in the non supplemented bulls than the bulls that received supplementary feeding, and this high output was significant ($p<0.05$) during the wet season (Table 4:12). The effect of feed supplementation on hematology showed significant ($P<0.05$) lower values of RBC and AST for animals not given any form of feed supplement during the wet and dry seasons, as well as lower values of blood proteins at both seasons was also lower, with wet season showing significant ($P<0.05$) changes (Table 4:12).

**4:6:0 INJURIES ON WORK BULLS:**

A total of three hundred and twenty-four (343) draught cattle were examined for any work related injuries during the dry period when animals were occasionally used for transportation and during the wet period when the animals are actively ploughing. A total of 86 (68.25%) injury cases were recorded during the dry season and 90(40.18%) cases during wet season when the animals were actively ploughing (Table 4:13).

Most of the injured animals were males (98.86%), with a mean age of 3.78years, with ages between 3-4yrs (52.27%) having suffered most injuries. This age group also formed 69.88% of those working for more than 4-

8hrs/day. There was significant ($P<0.05$) relationship between the working hours and incidence of injuries on the working bulls. These injuries took place on the farm (57.95%), at transportation (28.41%) and due to fights amongst animals (13.64%). The location of the injuries on the body of the animals was seen to be related to cause of injury (plates 2, 3 and 4). Wounds due to poor harnessing and whip were highest 43.18% (76/176) followed by injuries on the leg area due implements and rough terrains 36.36% (64/176) (Table 4:13).

**TABLE 4:12**

**EFFECT OF FEED SUPPLEMENT (FD-SPLD) ON THE HEAMATOLOGY OF DRAUGHT CATTLE DURING THE WET AND DRY SEASON**

| S/No | BLOOD PARAMETERS | DRY SEASON | | | WET SEASON | | |
|---|---|---|---|---|---|---|---|
| | | FD-SLPD | NOT-SLPD | P Value | FD-SLPD | NOT-SLPD | P Value |
| 1 | PCV% | 32.81 ±3.30 | 32.08 ±4.73 | 0.5442 | 34.10 ±4.65 | 33.46 ±4.66 | 0.3722 |
| 2 | HB gm% | 10.94 ±1.81 | 10.70 ±1.59 | 0.5621 | 11.42 ±1.52 | 11.14 ±1.54 | 0.2341 |
| 3 | RBC x $10^6$ /µl | 5.68 ±1.66 | 4.96 ±1.19 | **0.0051*** | 7.45 ±1.41 | 6.93 ±1.39 | **0.0161*** |
| 4 | WBC x $10^3$ /µl | 11.42 ±2.54 | 11.10 ±3.68 | 0.6094 | 8.49 ±2.35 | 8.97 ±2.23 | 0.1768 |
| 5 | Neutrophils X $10^3$ /µl | 2630 ±1000 | 2584 ±1174 | 0.8437 | 2578 ±1064 | 2832 ±1056 | 0.1178 |
| 6 | Lymphocytes x $10^3$ /µl | 7374 ±2043 | 6869 ±2467 | 0.3040 | 5237 ±1585 | 5369 ±1458 | 0.5660 |
| 7 | Eosinophils x$10^3$ /µl | 1192 ±719.8 | 1417 ±958.2 | **0.0001*** | 512.1 ±563.9 | 676.7 ±622.4 | 0.0764 |
| 8 | Monocytes X $10^3$ /µl | 190 ±124.7 | 228 ±187.7 | 0.2369 | 143.5 ±152.3 | 163.9 ±167.4 | 0.4134 |
| 9 | Total Proteins (g/dl) | 7.91 ±0.89 | 7.41 ±1.34 | **0.0317*** | 7.51 ±0.86 | 7.55 ±0.95 | 0.7533 |
| 10 | EPG | 251.1 ±250.7 | 289.5 ±207.9 | 0.6032 | 256.4 ±224.5 | 368.9 ±309.4 | **0.0363*** |

***Significance at P<0.05**

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**TABLE 4:13**

**SOCIO-DEMOGRAPHIC AND TRAUMATIC INJURY CHARACTERISTICS IN DRAUGHT CATTLE DURING THE WET AND DRY SEASONS:**

| S/NO. | CHARACTERISTICS | WET SEASON | | DRY SEASON | | TOTAL |
|---|---|---|---|---|---|---|
| | | NO. | % | NO. | % | % |
| **A** | **Sex** | | | | | |
| | Male | 89 | 98.89 | 83 | 96.51 | 97.73 |
| | Female | 1 | 1.11 | 3 | 3.49 | 2.27 |
| **B** | **Age group** | | | | | |
| | 1-2yrs | 12 | 13.33 | 10 | 11.62 | 12.50 |
| | 3-4yrs | 50 | 55.56 | 42 | 48.84 | 52.27 |
| | >4yrs | 28 | 31.11 | 34 | 39.53 | 35.23 |
| **C** | **Work hours/day** | | | | | |
| | 1-3hrs | 10 | 11.11 | 4 | 4.65 | 7.95 |
| | 4-6hrs | 67 | 74.44 | 56 | 65.12 | 69.89 |
| | >6hrs | 13 | 14.44 | 26 | 30.23 | 22.16 |
| **D** | **Types of injury** | | | | | |
| | Cuts/laceration | 60 | 66.66 | 30 | 34.89 | 66.59 |
| | Piercing wounds | 12 | 13.33 | 16 | 18.61 | 15.91 |
| | Sprains and strains | 6 | 6.66 | 20 | 23.25 | 30.23 |
| | Mixed injuries | 14 | 15.55 | 20 | 23.25 | 19.32 |
| **E** | **Causes of injury** | | | | | |
| | Blows from whip & goring | 13 | 14.44 | 20 | 23.26 | 18.75 |
| | Crushing by implement | 20 | 22.22 | 14 | 16.28 | 19.32 |
| | Piercing wounds from environmental agents | 16 | 17.78 | 18 | 20.93 | 19.32 |
| | Pressure from harness | 34 | 37.78 | 20 | 23.26 | 30.68 |
| | 0thers | 7 | 7.78 | 14 | 16.28 | 11.94 |
| **F** | **Health seeking pattern** | | | | | |
| | Traditional (Herbs) medicine | 36 | 40.00 | 23 | 26.74 | |
| | Direct drug purchase | 20 | 22.22 | 35 | 40.69 | 31.25 |
| | Visit to quacks | 22 | 24.44 | 18 | 20.93 | 22.72 |
| | Visit to veterinary clinic | 2 | 2.22 | 4 | 4.65 | 3.41 |

| | | | | | |
|---|---|---|---|---|---|
| No treatment given. | 10 | 11.11 | 6 | 6.97 | 9.09 |

The health seeking pattern shows that 90.91% of animals injured were treated by owners either by the use of herbs (34.09%), direct purchase of drugs (31.25%), or visit to quacks (22.72%). Only 3.41% visited any veterinary clinic and 9.09% did not receive any treatment. Higher number of owners sought for treatment for injured animals during the dry season than during the working period. Indeed the habit of direct purchase of drugs was common during the resting period, while the use of herbs was common during the wet season (Table 4:13)

**4:7:0 INJURIES ON HANDLERS:**

A total of 367 handlers were interviewed a total of 213 work related traumatic injury cases were diagnosed. Most (93.89%) of the injured persons were males (plate 5), and the remaining 6.11% were females. The age distribution shows that 71.83% of children between ages 10-15yrs suffered from most of the injuries (Plate 6). More than half of the injuries were incurred on the farm during ploughing (52.58%), and 46.95% was in the home or residential areas during harnessing or on passer bys or during the feeding of these animals. The injuries were caused by kicks (45.53%); trampling on implement (31.92%) and horn gore (12.21%).

The medical seeking pattern revealed that majority of injured persons 59.15% (126/213) consulted some form of health care / medical centers, whilst of the remaining 40.84%(87/213) that did not receive any treatment, either had no knowledge of any health care facility or considered their injury trivial and requiring not so serious attention. Of the 59.15% that received

any form of treatment 14.56% consulted at least two types of treatment facility, while 16.91% visited drug stores and paramedics (fig.4:2).

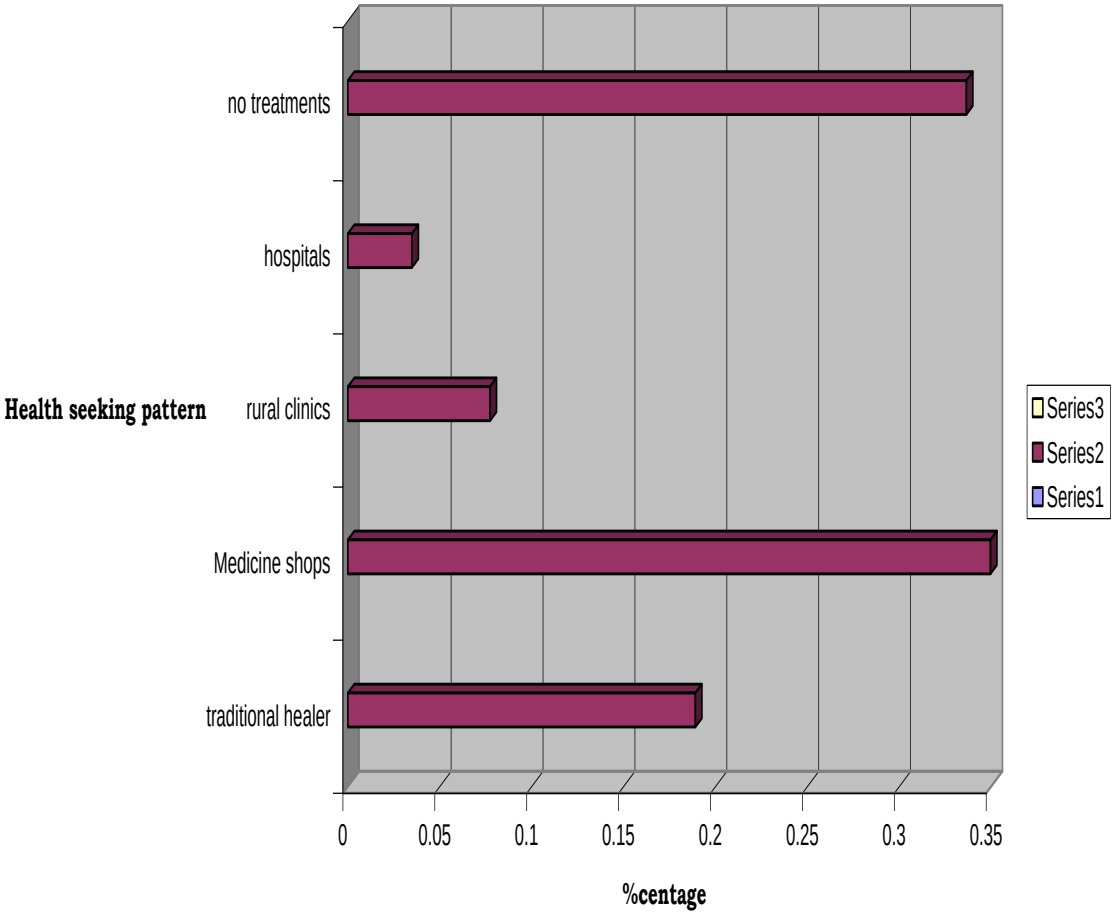
**TABLE 4:14**

**SOCIO-DEMOGRAPHIC AND WORK-RELATED INJURY CHARACTERISTICS: CAUSES AND SEVERITY IN DRAUGHT CATTLE HANDLERS.**

| S/NO. | CHARACTERISTICS | NUMBER INJURED | PERCENTAGE |
|---|---|---|---|
| **A.** | **Sex** | | |
| | Males | 200 | 93.85 |
| | Females | 13 | 6.10 |
| **B** | **Age of handlers** | | |
| | < 10yrs | 45 | 21.13 |
| | 10-15yrs | 107 | 50.23 |
| | 16-20yrs | 38 | 17.84 |
| | >20yrs | 25 | 11.73 |
| **C** | **Types of injuries** | | |
| | cuts/lacerations | 87 | 40.85 |
| | Fractures/contusions | 36 | 16.90 |
| | Sprains and strains | 59 | 27.69 |
| | Multiple injuries | 31 | 14.55 |
| **D** | **Causes of injuries** | | |
| | Kicks | 97 | 45.54 |
| | Trampling | 30 | 14.08 |
| | Farm implement | 48 | 22.54 |
| | Horn gore/Bites | 26 | 12.21 |
| **E** | **Activity of handler** | | |
| | Harnessing | 52 | 24.88 |

| | | |
|---|---|---|
| Ploughing | 113 | 53.05 |
| Feeding | 23 | 10.79 |
| Passer by | 25 | 11.74 |

**FIGURE 4:2 MEDICAL HEALTH SEEKING PATTERN OF INJURED HANDLERS OF DRAUGHT CATTLE**



# CHAPTER FIVE

## 5.0 DISCUSSIONS

There was increased numbered draught cattle surveyed during the wet season, with concurrent increase in the number of farmers willing to participate in the research. The increases could have been probably due to more farmers having better awareness of the potential benefit of the research to the health of their animals. These bulls were not castrated since most farmers claimed that castration makes the animal lazy and also reduces the market value if and when the farmers needed to sell the animals.

The ratio of draught animals per farmer during both seasons is an indication that most farmers had at least one or more than a pair of draught animal. The farmers having more than a pair were observed to hire or share with those that have less or non at all. This supports the observation by Gefu, (1987) that having more animals is a reflection of the economic and hence the social standing of the farmer in the community. The sharing or hiring of these animals may be a way for most farmers to cope with the prevailing economic state of unequal distribution of wealth within the community, therefore farmers of less economic state are saved the expenditure of keeping draught animals but can hire. Singh and Partarp (2003) observed that these processes of hiring also create opportunity for employment for ploughmen in the community.

Few female animals were seen to be used for ploughing and this is understandable since the use of bulls for farming is the norm in these areas. The use of female animals for ploughing seems to be very unpopular, but the higher numbers of female animals seen during the working period, may be suggest that farmers may use cows out of desperation when there is higher labour demand. This was also observed by Chimonyo, (1998) and Chimonyo

*et al.,* (1999). The use of cows in farming by farmers seems logical and economical considering the multi-potential of cows in providing draught power, calf and milk for the farmers.

In this study it was observed that more clinically sick animals were significantly ($P<0.05$) young animals with a mean age of 3years. These also affected the working hours per day and consequently the work output of the sick animals significantly ($P<0.05$). The significantly ($P<0.05$) higher mean work season in the apparently healthy animals is an indication that these animals are seasoned workers owned by farmers who could afford to keep them all through the year and hire them for work during the rains.

The mean weight for the clinically sick animals was significantly ($P<0.05$) less than those with apparently good health. These suggest a strong relationship between the age, the weight of the animal, the working hours spend on farm and work output of draught cattle. Since for most animals, working hours are dependent on age, the younger animals (less than 2yrs) spending less time than the older animals of 3years and above and the time is further shortened if and when the animals are sick. Most animals less than 3 years are learners on the job while the older ones are seasoned workers and so are able to spend more time working than those less than 3 years of age.

The draught animal management practice in the study area was found to be the same for all the villages involved. Most farmers were observed to have stored up crop residues under shades, in rooms or within the compound as feed supplements, while during the wet season the animals were allowed to graze in between working hours and were stall-fed with some concentrates or salt licks as the case may be. The need to feed concentrates is recognized by farmers, but most farmers give concentrates only on working days and even that is very much dependent on its availability, which also depends on the

farmers' economic standing. The similar management practices and hence the lack of variation observed in this study probably stems from the apparent lack of difference in the cultural and farming practices of the natives of this study area, a location within the same geographical zone.

Survey of the housing facility for work bulls revealed that most farmers did not have special housing facilities for their animals. The animals were either housed in a yard inside the compound as part of the household to prevent theft and fight or tittered at a nearby big tree, which provides shade for the animals. These arrangements are seen mainly with farmers with larger number of work animals and it is very much dependent on the security situation. Housing is very important for draught animals, since their ability to tolerate heat varies (Pearson and Vall, 1998) and exposure to cool dry weather exposes them to diseases (Djang-Fordjour *et al.,* 2003). In this study however most farmers were seen working these animals in the early hours of the day and the cooler hours of the evenings while resting them under available tree shades.

It was observed that most owners had knowledge of some health care for the common health problems observed, and thus indicating that most owners of draught animals recognized certain diseases in their animals and the owners either engaged the services of unqualified personnel (quacks), or used herbs or personally purchased drugs in the markets and administer themselves to their animals. The effects of such practices are that animals are either administered mainly expired drugs or low doses of drugs, propagating probable drug resistance amongst these animals. An example of the adverse effects of these unorthodox health practices is the large number of work animals having heavy helminthes load despite the administered anti-helminthtics therapy at the onset of the rains by most farmers. More farmers were seen to practice health care during the dry season than during the wet season, due to the fact that the farmers having less workload had more time

to visit markets and search for drug sellers. Likewise the higher number of attention from quacks at this time could be due to easy access to the villages when the rains have stopped. Similarly the less attention for the health practices on their animals during the wet period is explainable, farmers having busy working schedules and roads not so good. These findings agree with the report by BVA Trust Project, (1982) that most farmers are aware of the consequences of clinical disease. Hence the attempt to prevent and control acute diseases by self-medication is understandable. However this health practices for draught animals are just not adequate for their maximum performance.

Clinically more animals were seen with skin lesions likely to be dermatophilosis during the wet season than the dry season; but the disease is said to more prevalent during the wet season (Blood *et al.,* 1985), and few animals were diagnosed as having respiratory conditions similar to CBBP. The low prevalence of infectious diseases encountered during this study should not be considered as insignificant and of little economic importance to draught animals in this study area, but studies should be done more extensive to confirm the magnitude of these conditions. Also there is need for extreme caution when bringing in new draught animals from the cattle market into these areas due to the infectious nature and presence of these diseases and the prevalence of vector in the tropics (Jawara, 1990). Large number of draught animals was notice to harbor ticks and mites; though the infestation was not severe. Most Farmers were in the habit of manually removing the ticks on these animals. It is noteworthy that these parasite as vector of some infectious diseases (Fabiyi, 1984) could poise a serious problem by transmitting and spreading of these diseases such as Babesiosis and Anaplasmosis to these animals

During this study only trypanosomosis was diagnosed in the laboratory analyses of the blood samples collected, and the animals with

trypanosomosis were occasionally used for transportation and active work during the dry season and wet season respectively, but were passed as not doing well by the farmers. These affected animals had concurrent helminth infection and showed evidence of anemia with very low mean PCV, Hb and RBC values. The low mean PCV value in the cases with trypanosomes agrees with Pearson and Vall (1998) that draught animals challenged with trypanosomes result in decrease PCV and the case also agrees with McLennan, (1970) that the stress of work, poor nutrient and the presence of other concurrent diseases increases work animal susceptibility to trypanomosis.

The low incidence of trypanosomosis observed during this study may have been due to the absence of the vector or cattle route in this study area suggesting that the animals might have been purchased with the infection and this calls for caution when farmers go to purchase work bulls. Hypoproteinemia observed in these animals due to trypanosomes infection is expected, since plasma volume changes in trypanosomosis are reported to cause decrease in blood protein levels (Clarkson *et al.,* 1975; Anosa and Isoun, 1976). This is due to the physiological event evoked by the host's need to maintain a constant blood volume in the face of anemia, consequently resulting to plasma content dilutions including that of proteins.

Helminths Infestation was mainly due to strongyles in both seasons; the higher number in wet season is supported by reports of Kudi, (1998) Istifanus *et al.,* (1990) and Fabiyi (1984) of outbreaks of helminthosis occurring generally during rainy season. The dry season infection in cattle around the northern region therefore suggestive of a carry over of the wet season infection, in addition to the observed poor health management practices such as possible under dosing with anti-helminthtics by owners or quacks, and the nutritional stress of the dry season.

The observed distribution of helminths at wet and dry season is necessary and useful in devising of a control measure for these animals. However, the farmers were very much aware of effect of helminths on their animals and they applied medications either by traditional drugs or orthodox drugs purchased from the market directly to their animals at the onset of rain. Those who sought for any form of advice got such from quacks, who either gave under dosed or expired drugs. This explains the high level of helminthes even in animals the farmers claimed to have been dewormed. Most of these animals would not show clinical helminthosis, but presented sub-clinical infection, which was responsible for the decrease in the productivity of herds as observed by (Blood and Radostits, 1985).

In relation to the working seasons, working days per week, it was observed that most of the draught animals infected with helminths were not seasoned workers and though they spend significantly ($P<0.05$) more work days per week to work, the output is significantly ($P<0.05$) less than for the non infected animals. It has been observed that infection is related to the number of working hours (Mattioli *et al*, 1994), since work or hard labor is one of the stress factors of draught animals that depresses the immune responses of these animals causing an increasing susceptibility to many diseases (Campbell and Hogan, 1985; Macfarlane and Bunn, 1988), thus an observed high helminth infestation in relation to hours of work is explainable due to the stress of work and also levels of exposure to parasites during the working periods. The hematological parameters of helminths-infected draught cattle revealed significant ($P<0.05$) increases in eosinophils count and this increases have long been associated with helminthes infestation (Ogunsusi, 1975; Soulsby, 1980; Poitou *et al.,* 1993; Wameru *et al.,* 1999). Eosinophils are said to participate chiefly in detoxification of defensive process especially as a protection against the adverse effects of some of the chemicals mediators of inflammatory hypersensitivity reactions and tissue injuries (Limman, 1966), therefore the eosinophilia observed in parasitism could be

as a result of local destruction of cell by burrowing larvae causing injury and inflammation of the mucosa, thus basophils and mast cells possibly releasing eosinophil chemo-tactic factors that attract eosinophils to site of inflammation.

The serum biochemical changes showed the mean total proteins observed in these animals to be within the normal range seen in Zebu cattle around the area of study (Kadima, 1998; Oyedipe *et al.*, 1984) and the mean albumin levels was within the levels observed by Oduye and Fasanmi, (1971); Ross, (1960) and Oyedipe *et al.,* (1984), and though serum protein changes could be used as indicators of nutritional status of cattle (Payne and Payne, 1987), the individual animal variation (Pearson and Archibald, 1989) and sensitivity to stress (Payne and Payne, 1987) and presence of infectious diseases is also known to affect the protein levels cattle. The apparently higher total protein concentrations in animals during the dry season than those during wet season, although within the normal range observed in zebu cattle in these areas, may have been due to the expected dehydration associated with dry season causing heamo-concentration and the higher number of draught animals being supplemented during this season, could partly cause the increase the plasma proteins. While the moderately lower value observed during the wet season, a period of intensive work for these animals could be as a result the high parasitic infestation during this period, since it is known that loss of proteins as well as mal-absorptions occurs during inflammations or ulceration of intestinal mucosa (Schalms *et al.,* 1975) and the migration of parasite larvae into the gastric glands in the intestine causing physical injuries to the mucosa and resulting in the loss of proteins and albumins reported in helminthes infestation(Holmes and Maclean, 1971; Dargie, 1975; Yakoob *et al.*,1983).

The significant ($P<0.05$) low values of serum urea nitrogen (BUN) for dry season group was within the range seen in low dietary protein diet Zebu

cattle (Oyedipe *et al.,* 1984) and that reported by Kadima, (1998) in Zebu cattle, these values were probably due to physiological changes associated with the nutritional status of the animals during the dry season, where farmers were observed to feed more salt licks and concentrate feed to their animals claiming to aid digestion of dry feed. During the working period the BUN values were significantly ($P<0.05$) lower than that during the dry season, but were similar to the average observed by Ndlovu *et al.*, (1996). The low level observed during the working period therefore could be due to the fact that fewer farmers fed salt licks or concentrate diet in sufficient quantities to these animals and possible over rehydration of the animals associated with wet season for the working animals. The significant ($P<0.05$) increases in serum bilirubin in helminth-infected work bulls, suggest that the stress of work associated with sub-clinical infections, may have caused the elevated bilirubin levels, elevated bilirubin values has been associated with chronic infections by(Fiennes, 1954). Similarly the mean serum aspartate amino transferase (AST) was significantly($P<0.05$) lower for the infected wet season animals than those of the infected dry season, indicating possible higher tissue damage working bulls but with normal liver function.

The Serum Glucose concentration was within the values observed by Coles, (1986) for the resting group suggesting normal glucose metabolism in these animals. However the significantly($P<0.05$) lower values of glucose for the helminth-infected wet season animals, followed by decrease of $Na^+$ may be due to the relation ship between the two in the $Na^+$-glucose symport transport (Bamazan *et at.,*1996). Thus the decrease in $Na^+$ may have reduced the tissue ability to utilize glucose, hence the high levels seen in serum. The observed mean serum electrolyte values falls within the range observed by (Akerejola *et al.*, (1980); Oduye and Fasanmi, (1971); Coles, (1986), and Kadima, (1998) in Zebu cattle, and by Esievo and Moore, (1990) in high producing Hostein/Friesian dairy cattle. However significant ($P<0.05$)

increases in Na+ and $HCO_{3-}$ values of helminth infected working group is better explained using the anion gap principle. It is known that $Na^+$ is mainly extra cellular, and is actively transported, while $Cl^-$ is excreted and distributed passively according to the active transport of $Na^+$ (Coles, 1986), so also is $Cl^-$ relationship with $K^+$, hence the reciprocity in values of these electrolytes between breeds.

The anion gap principle defined as the difference between commonly measured cations (Na+, K+) and anions (Cl-, $HCO_{3-}$) was used to evaluate the acid-base status of helminth-infected work bulls. The anion gap for the helminth-infected was 18-20mmol/l suggesting a possible metabolic alkalosis. Decreased anion gap has been associated with metabolic alkalosis due to decrease in cation values (Maxwell and Kleeman, 1980). Metabolic alkalosis has been associated with tissue damage in trypanosomosis (Murray *et al.*, 1974; Ogunsami et al., 1992), this may also be happening in this case where the migratory helminth larvae might have caused sufficient tissue damage in the infected bulls, resulting in decrease Na+ K+ ATPase activity and influx of Ca+ into tissues. Also the significant ($P<0.05$) decreases in the PCV values of the helminth-infected bulls can cause reduce oxygen carrying capacity of red blood cells to tissues, leading to hypoxia and enhanced glycolysis and the liberation of lactic acids (Fieldsman and Rosenberg., 1981). This then places limits on the kidneys to regenerate the acid-base balance in these infected animals

The physical examination of draught cattle was the most useful to observed the types of lesions caused by trauma (injuries) and the contributory factors to work-related accidents, since no available veterinary records in relation to work bulls' health in the area of study. The behavior of draught cattle influenced by many factors including environment, hard work, fatigue, and bad weather, were seen as contributory factors to type and severity of injuries observed. The age group most injured was ages 2-4 years and the

injury type most common was a pressure wound on the neck region. This group were the first timers in ploughing; the animals were either reacting to the weight of the plough, or the pressure of work; the neck injuries in the seasoned work bulls were seen mainly at dry season amongst the animals that were used for Fadama farming. Other injuries like cut due the implements or sharp objects on the farm were as a result of poor farm clearing and also due to poor harnessing, the back wound were due to whipping and lashing of this animals, thus agreeing with Ramaswamy, (1998); Hovel, (1998) that injuries on draught animals are due to brutality and excessive straining of this animals.

The contributory factors to injuries such as “unsuitable method of work” and “harness design deficiency” without a technical investigator added little to our understanding of the mechanism behind the accidental injuries caused by these agents. However it was observed that the chance of incurring injuries by these agents was related to the age of draught cattle and the time spend on the task. Therefore the reductions of time spend on task especially for beginners and the use of mature cattle could greatly reduce the risk of injuries in these animals.

During the survey of accidental injuries on handlers ,the victims own description of the events and circumstances of which any injury occurred was considered of fundamental importance. The frame work of reference for injury analysis and injury prevention (Laflame 1998) was use to analyze the sequence of events and the contributory factors to work-related injuries on handlers of draught cattle. The chances of sustaining accidental injuries exist in environments in which people live and work. Injuries from draught animals have been associated with their large size and superior strength. These injuries on handlers were due to direct trauma from kicking, biting, crushing on foot, horn gore and implement cuts. Kick wounds on handlers were the most common injuries observed in this study, probably due to the

fact that harnessing allows control of the head region, but the exposure of the hind region making room for kicking. The injuries on the handlers were mostly at the knee area causing swellings and few cases of knee dislocation and bruises. The cuts on the legs were due to the sizes of the animal, poor harnessing implements and poor land clearing. The other injuries were as a result of horn gore largely on passers by when the animals are at rest. These injuries were largely left to heal without any medications applied, while the severe cases were either treated with local herbs or direct purchase of medication from drug stores, but whenever complications develop then local clinics were visited and sometimes severe case were referred to teaching hospitals. These explain the few cases reported in the hospitals around (Ameh, 2000; Kadima 2001).

In this study it was observed that the age groups of the handlers most injured were between ages less than10-15years. This group fell into the largest age groups handling these animals for the ploughing, feeding, and watering. That this group suffered severe injuries, could be attributable to the size, strength of these animals as compared to the age and ability of these handlers. Also it could be due to the exaggerated size difference between animals and the handlers or the use of handling techniques to which the animals were not accustomed to. Most handler of draught cattle were observed not using any safety equipments or garments at work and most injuries occurred at work and at home during harnessing to go to work. Also most handlers were under aged with formal training on how to work with these animals. This suggest that several injuries could have been avoided if personal safety equipment are use, proper housing of work bulls and the use of older men trained for the handling of these animals for ploughing. The frame analysis was concern with problem of injury risk at work-on farm and the daily activities around draught cattle. Thereby presenting the community, the environment and the handlers as interactive components where each has the potential to contribute to an injury. Using

the frame suggest that draught cattle handlers, may be due to their socio-economic needs within their community and their age, suffer one or several disadvantages such as less opportunity for safety, less opportunity for avoiding risk and also less opportunity to health care services. This may suggest that the relative distribution of income in the society in addition to the absolute standard of living by the farming community could be one of the determining factors of work related injuries.

This study had shown draught animal power is a very important source of help to the rural population of developing countries, but also are a source of potential danger to handlers especially the children that are left in charge of these animals within the communities in terms injuries from accidents and also possible transmission of zoonotic diseases to these handlers. Also there are hazards associated with handling these animals, the problems of injuries amongst draught cattle handlers exist, and should not be viewed as an unfortunate or unavoidable occurrence. Accidents amongst handlers should not be justified and ignored, but identified to be able to reduce the risk of accidental injuries, by assessing the effects of any accident on human and animal productivity and compiling of reliable statistic and producing practicable preventive or control measures. There is also the need for safety consciousness which was lacking and the protection of the most vulnerable section of the society particularly the socially and economically disadvantaged including women and children. Thereby fulfilling the security needs for this group and thus reduce child labor in such communities.

# CHAPTER SIX

## CONCLUSION AND RECOMENDATION

This survey has shown that most farmers had and used their own draught animals for transportation to near by markets, for ploughing and hauling of farm produce to the house and the clinically diagnosed conditions seen had significant impact on the physical data of draught cattle and consequently the work and work output. Survey also showed that farmers often gave medications to their animals and these could be attributed to the lack of veterinary care extended to these communities, and the farmers' inability to afford these services hence the visits of quacks is most welcomed by them, only very few farmers resorted to veterinary attention when the cases were considered very severe by the farmer or quacks

The high prevalence of helminths infestation during the wet season as well during the dry season observed in this study shows the importance of control measure at both seasons as a key to improving draught animal health, however the control of helminthes in developing countries has always been protective, where regular use of anti-helminthtics is practiced, and this usually is useful against serious infection and mortality, but it does not

afford protection from possible infection between treatments. Since most farmers graze these animals together during the dry season, it would be useful to deworm animals from each village at the same time, thereby reducing the intestinal worm burden and pasture contamination, once the practical and financial limitations of the farmer is overcome.

The low prevalence of Trypanosomes does not mean that infectious condition can not serve as economic constraints to draught power in the study area. The low prevalence observed could have been due to the inadequate diagnostic procedures. The infectious nature of these diseases and the presence of their vectors in the study area make it necessary to control these diseases. By taking great caution when purchasing draught cattle from any cattle market, as the purchase of infected animals into an area could be catastrophic.

The control measure for animals in the study area should be community based, because attending to individual farmers only if and when they have problems may not grapple with the health problems of these community. Since from this survey most farmers were seen to graze these animals together during the dry season, it would be useful to deworm animals from each village at the same time, thereby reducing the intestinal worm burden and pasture contamination, once the practical and financial limitations of the farmer is overcome. Also planned vaccination of these animals against infectious conditions will be more economical if done to per community than for individual farmer. There is also the need to educate the draught animal owner on the effect sub-clinical diseases on productivity and the role of health management programme necessary for effective production, also veterinarians should join draught animal researchers, and help make detailed recommendations on the disease control and production programme necessary to maximize productivity of draught animals.

Accidental injuries for draught animals and their handlers were observed in this study as a factor of the environment, age of handler and the size of the animals. Educating handlers and owners of these animals could control the risk for these accidental injuries and the use of young children under the age of 15yrs should be discouraged and older handlers should be trained as ploughmen.

This study observed that the major problems of work bulls are helminthosis and traumatic injuries as a result of the activity these animals are engaged in and the prevalence of helminths in the environments. It is recommended that for control helminthosis in draught animals to be effective, veterinarians should be involved research and extension work involving small scale livestock farmers such as draught cattle owners. Feed supplementation had significant impact on the helminth egg out put and the clinical pathological parameters, suggesting that to control helminthosis, a combination of regular deworming programme and good nutrition will greatly reduced the effect of helminth burden in draught cattle. The animals should be dewormed every 6wks during the wet season and 12wks during the dry season, since strongyles and faciola were the major helminths.

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