Herd Structure, Offtake and Mortality of Cattle in a Crop-livestock Farming System of Wedza Communal Area, Zimbabwe

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Abstract

Three hundred and forty-two head of cattle were monitored for a period of two years in Chigodora and Goneso Wards of Wedza communal area. Data on the herd structure, entries and/or exits as well as the reasons for the entry and/or exit were recorded using a structured questionnaire that was administered once per month to each of the participating households. Data on the farm gate prices of animals that were sold or purchased were also collected. On average, each of the participating households kept a herd of eight cattle (range: 1-20). The average herd composition was: 28% breeding females, 14% rearing females, 11% rearing males, 25% adult castrated males, 18% calves and 4% breeding males. A mortality rate of 11% was recorded for the suckling stock, while the rearing and mature stock had an average mortality rate of 3%. Forty-two percent of the cattle died due to unknown causes. Infectious diseases contributed 17% of the deaths, accidents 17% diarrhoea 10% starvation 10% and predators 4%. Offtake was lowest for female animals at 6% and was highest for the adult castrated males at 16%. Sixty-three percent of the males and 55% of the females that left the herd as offtake were sold. Slaughters were restricted to funerals/religious occasions and constituted 40%, while slaughter of diseased/injured animals (33%) and for household consumption and or receiving a guest (27%). Calving occurred throughout the year with an annual calving rate of 36%.

Key words: Cattle, crop-livestock, productivity, production, smallholder system

Introduction

Cattle play an important role in the livelihood of people living in crop-livestock farming systems in Zimbabwe. The ownership of draft animals (mainly cattle) as well as a plough has been found to play an important role towards improving crop production in communal areas (FSRU, 1985; Shumba, 1985; GFA, 1987; Chikura, 1992). This is because these farmers are able to plant and weed their crops timously, and, thus, realise high crop yields. In addition, cattle owners have been shown to have relatively larger arable land holdings than non cattle owners and have access to manure and, therefore, attain higher crop yields (Shumba, 1985, Chimonyo *et al.* 1999).

Although cattle play an important role in the livelihood of people in smallholder crop-livestock production systems, they are usually kept with minimal use of household resources of cash and labour. Even proceeds from the sale of cattle are used for either purchase of crop inputs or other household needs such as paying school fees. (Chikura, 1999). This paper summarises the results from a study to

determine the productivity of cattle in smallholder crop-livestock production system which was conducted in Wedza communal area over a period of two years.

Materials and Methods

Study site and farmer selection

The study was conducted in Wedza District in Mashonaland East Province of Zimbabwe. The district lies between $31^{0}00\ ^{1}E$ longitude and $32^{0}\ 00^{1}E$ and $18^{0}30^{1}S\ 19^{0}15^{1}S$. Agricultural production in Wedza comprises a mixture of crop and livestock production under smallholder management. Livestock species found in the area are cattle, goats, poultry, sheep, pigs and donkeys. The main crops grown are maize, groundnuts, cotton, sunflower and sorghum. Within the district, two study sites were selected: (i) Chigodora Ward in Natural Region IIb, with an average annual rainfall above 750 mm, (ii) Goneso Ward in Natural Region III, with an average rainfall between 600 mm and 700 mm per year (Vincent and Thomas, 1960; Anderson et al.,1993).

Data collection

Data were collected from a two year monitoring study that was conducted from December 1995 to November 1997. Prior to monitoring, farmers were issued with notebooks and trained to record all the events that occurred in their cattle herds. This information was then verified monthly. Data that were collected included herd structure, birth, sales, purchases, overall mortality and mortality within 24 hours of birth. Information on farm gate prices of animals that were sold or purchased, animals received as gifts, animals that were stolen/lost and husbandry practices was also collected.

Data analyses

All data were stored in data sets created with the Panacea software package (Pan Livestock Services Ltd, 1992). Preliminary data analysis showed that there were no significant differences ($P > 0.05$) between the two wards. As a result, ward effect was ignored in the analysis. The results presented in this study were generated from 31 herds with a total population of approximately 342 cattle. The animals were divided into six categories as shown in Table 1.

Productive parameter estimates were calculated as daily incidence rates using Panacea, (1992). These were multiplied by 365 to convert them into annual incidence rates. The incidence rates were obtained by dividing the number of events such as deaths or sales that occurred during the period of observation by the number of animal-days (Rothman and Greenland, 1998).

The number of animal-days were the sum of the number of days that each animal in the observed population was present during the period of observation. Incidence rates are used when the population being studied is dynamic (with additions and/or subtractions). They are used to describe the average

rate at which the event of interest occurs per unit of animal time at risk and have no interpretation at the individual level (Martin *et al*., 1987). Incidence rates can take hypothetical values from zero to infinity because they are based on an arbitrary selection of time. However, incidence rates can be converted to proportions (risk rates), which are direct estimates of the probability of an animal experiencing the event of interest during a period. The formula to convert incidence rates to risk rates is described by Martin *et al* (1987) as;

Risk rate = $1 - e^{-k\,t}$ ---------- (1)

where *e* is the base of natural logarithm, k is the incidence rate and t is the time period of interest.

The confidence limits (CL) for the risk rates were calculated as follows;

CL risk rate = ln incidence rate $\pm$ SE incidence rate ---------- (2)

where SE incidence rate = $(1/a)^{1/2}$ where a is the observed number of events.

The parturition rate was calculated using the following formula:

Percent parturition rate = (No. of parturitions/No. of animal days)*365*100% ---- (3)

It should be noted that first parturitions were counted in the numerator, but immature females were not included in the denominator, that is, rearing females contributed to breeding female days at the time of first parturition.

Results

Herd composition

The herd composition is as shown in Table 1. On average, each of the participating household kept a herd of eight cattle with a median of seven cattle and a range of 1-20 cattle. Fifty-two percent (52%) of the herds had a range of 1-6 cattle per herd, 29% of the herds had 7-12 cattle per herd, while 19% of the herds had more than 12 cattle per herd.

Cattle mortality

The causes of deaths are shown in Table 2. A mortality rate of 11% with confidence limits of 7% and 18% was recorded for the suckling stock, while the rearing and mature stock had a mortality rate of 3% with confidence limits of 2% and 5%. Forty-eight percent of the cattle that died were consumed, while 44% were buried and 8% were burnt.

Cattle offtake

Offtake was lowest for female animals (6%) as shown in Table 3. Sixty-three percent of the males and 55% of the females that left the herd as offtake were sold. The rest of the males were slaughtered, while 30% of the females were slaughtered and the rest were used as gifts. Males constituted 57% of the offtake.

Seventy-one percent of the cattle sales were conducted locally between farmers in the same community, 25% were sold to local butchery owners and 4% were sold to middle men. Seventy-five percent of the cattle sales were conducted at the seller's homestead and the rest at the sale pens. Thirty-two percent of the proceeds from cattle sales were used to buy farm implements/crop inputs, 7% for paying school fees, 9% for paying lobola and 32% for other household uses such as buying food and clothes.

The selling prices of cattle were US$161.50 for a breeding male, US$121.13 for an adult castrated male, US$107.67 for a breeding female and rearing female and US$67.29 for rearing males. Cattle slaughters were restricted to funeral and/or religious occasions (41% of the slaughters), diseased and/or injured animals (33% of the slaughters) and either for household consumption or when receiving a guest (26% of the slaughters).

Cattle reproductive parameters

The annual calving percentage was 36%. This gives a calving interval of about three years. Calving occurred throughout the year (Figure 1). Fifty percent of the animals that gave birth for the first time were 3-4 years old and the rest were older than four years.

Discussion

The high proportion of adult castrated males (24%) within the population is within the range of those reported in Mangwende Communal Area, where a similar farming system is found (FSRU, 1985). The high proportion of adult castrated males (oxen) in the population is a reflection of their importance as a source of draft power. According to the FSRU (1985), oxen contribute up to 76% of the draft requirements for the farmers in Mangwende Communal Area.

Farmers use oxen primarily for land preparation. This operation normally takes three months (October-December). However, farmers still have to maintain the oxen and follower herd throughout the year. With proper feed management, cows can be used for draft purposes instead of oxen without adversely affecting productivity (Zerbini, *et al*. 1992; Chimonyo *et al* 2000). Culling some the oxen could go a long way in alleviating the grazing pressure in communal areas.

Breeding males (bulls) constituted 4% of the cattle population that was monitored. Although this proportion of bulls is within the recommended levels for commercial beef production (Cattle Producers' Association, 1998), the number of bulls may be insufficient under the communal area production system. This is because individual communal area farmers keep small herds and, therefore, most of the herds do not have a bull of their own.

Nevertheless, cows from herds without a bull have access to bulls from other herds in the communal grazing areas. The main problem is that such cows may not get a bull at the correct time hence some ovulations may be lost. Such a scenario could partly explain the low calving rate of 36% that was found in this study.

The results also show that the offtake from the cattle herds was low. This is in agreement with the results of Scoones (1990), that showed that cattle in communal areas are usually retained for their input into crop production as draft power and manure rather than their terminal benefit of cash and meat. Slaughters were, therefore, restricted to situations where an animal was either about to die or at funerals and other social gatherings.

Cattle sales were also restricted to those occasions when there was a pressing need for cash to either pay for school fees or purchasing farm implements. Otherwise, most of the cattle that were sold were those that were close to the end of their productive life. Thus, most of the cattle that were sold were very old castrated males which could no longer be used for draft or unproductive cows.

Calving occurred mainly during the rainy season. This means that the cattle would have been bred towards the end of the rainy season, in March/April. During this period, animals will be in good condition due to the availability of good grazing . However, the results did not show clear trends, possibly because of the short monitoring period that was used.

Conclusions

Cattle are closely linked with crop production in smallholder crop-livestock farming systems so they are rarely disposed of. Slaughtering of cattle was only done as a last resort to either salvage meat from an already dying animal or when farmers were under pressure such as at funerals and social gatherings. Cattle were sold to meet critical family needs such as school fees or when disposing of old and unproductive animals. Offtake from the communal herd could be significantly improved if farmers were encouraged to use cows rather than oxen for draft purposes. For this to succeed, there is a need to incorporate forage production into the farming systems so as to supplement the working cows.

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Table 1. Categories and number of cattle monitored during the period December 1995 and November 1997 in Wedza Communal Area

Animal category	Number	Description
Calves	60	Female and male animals up to one years of age
Rearing females	49	Weaned female animals that had not given birth
Rearing males	38	Weaned male animals up to four years of age
Breeding females	97	Females that had given birth at least once
Breeding males	14	Intact male animals above the age of rearing
Adult castrated males	84	Mature males that had been castrated
Total	**342**	

Table 2. The average herd composition of 31 cattle herds monitored in Wedza for the duration December 1995 to November 1997

Category of stock	Percent in the herd
Calves	17.5
Rearing females	14.3
Rearing males	11.1
Breeding females	28.4
Breeding males	4.1
Adult castrated males	24.6

Table 3. The causes of death in 31 cattle herds monitored in Wedza for the duration December 1995 to November 1997

Cause of death	Percent of the cattle that died
Unknown disease	41.4
Infectious disease	17.2
Accidents	17.1
Diarrhoea	10.3
Starvation	10.3
Predators	3.6

Table 4. The offtake rate (%) of cattle in 31 cattle herds that were monitored in Wedza for the duration December 1995 to November 1997

Class of stock	Offtake	Lower Confidence limit	Upper confidence limit
Females	6	4	8
Intact males	8	4	12
Castrates	10	7	13

Figure 1. Percentage of cows calving per month in 31 cattle herds monitored in Wedza for the period December, 1995 to November, 1997