



Seasonal effect on the Western Sudan Baggara bulls fattening operations at the Animal Production Researches Centre (APRC), Sudan

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Abstract

Records of 16361 Baggara bulls purchased and fattened in 143 batches during 9 years (1992 -2000) at the Animal Production Research Centre (APRC) were used to examine the effect of year and season of purchase on the performance of fattening operations. The data were grouped into 9 groups according to year of purchase. The data were further grouped according to season of purchase into winter, dry summer and wet summer groups. Two way analysis of variance was used for statistical analysis. The number of animals/batch, purchase weight, selling weight, fattening period, daily body gain, purchase price and selling price averaged 114±61 animals, 217.0±42.04 kg, 254.0±46.09 kg, 49±27 days, 0.770±0.344 kg/day, 0.571±0.180 Dollar/kg live weight, 0.742±0.150 Dollar/kg live weight, respectively. The number of animals per batch and the purchase body weight increased with year advancement, whereas, the selling body weight, fattening period, the daily body gain, purchase and selling prices decreased with the year advancement. There was no variation imposed by season of purchase on the number of animals per batch and purchase and selling body weights. Whereas, the fattening period, daily body gain, purchase and selling prices were significantly affected by season of purchase. The study concluded that the fattening operations of Baggara bulls at APRC expanded successfully with years, and the season had important impact on the fattening operations.

Keywords: Baggara; cattle; fattening; Sudan

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Introduction

As part of the research work and to avail funding for the animal production researches, the Animal Production Researches Centre (APRC) practices fattening of Western Sudan Baggara bulls on commercial basis. This practice exemplifies the success of cattle fattening operations by utilizing cheap crop residues and agro-industrial by-products. The use of agro-industrial by-products as animal feed in Sudan was the result of intensified research activities designed to find efficient methods of recycling agricultural waste for ruminants in different production systems and production purposes (El-Hag and George, 1981, Elkhidir et al., 1989 and Aboud et al., 1999).

Mohammed et al. (2007) added that the cost of feeding is the major limitation to beef production investments in the Sudan. The main beef breed used for local consumption and export is the Western Sudan Baggara cattle (Alsiddig et al., 2010). Abdel Rahman (2007) noted that the homeland of Western Sudan Baggara cattle is the savannah belt of central Sudan between latitudes 10°-16°N, west of the Nile bank. According to the Sudanese Meteorological Department, this area is mainly a flat country of altitude range 500-570 meters above the sea level. The climatological normal ranges during dry summer, winter and wet summer are: 33.0-41.0, 28.7-37.3 and 29.0-38.0°C, respectively (maximum temperature), 16.1-26.9, 10.1-22.4 and 17.8-25.5°C, respectively (minimum temperature) and 0.0-

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123.9, 0.0-1.9 and 2.4-255.2 mm, respectively, (rainfall). It is also reported that because of the scarcity of grass and water resources during the dry season in the north, and the insect infestation during the rainy season in the south, the pattern of animal husbandry is mainly nomadic, where Baggara cattle are driven yearly more than 1000 km in round trips (north-south) movements by nomadic tribes. However, more recently there is a trend towards partial settlement and pastoralism taking place around small villages. According to Alsiddig et al. (2010), Baggara cattle are characterized by a relatively large hump and short horns. The hump is cervico-thoracic in position and had straight stature and the horns are mainly crescent in shape. They have variable coat colours, however, the basic colour is white or white with some black spots or markings, while brown or red cattle are also found. About 50% of the studied Baggara cattle had straight face profile, some individuals had convex facial profile, however, fewer concave facial profiles were also seen. Subjective evaluation of dewlap feature indicated that it was well developed in the studied population. The prepuce was either slightly developed or moderately developed.

Bulls fattened in the APRC are drawn from range pasture and are subjected to short-term closed feeding period to reach the marketing weight. The climate change is expected to have an impact on this fattening operation by reinforcing existing factors those are affecting this investment, such as the availability of animals at market, the purchasing prices, initial weight of animals and the demand for slaughtered animals. Consequently, awareness of the seasonal effect on Baggara bulls fattening operations can provide appropriate management practices which enable to cope with the problems. The objective of this study is to examine the effect of year and season of purchase on the performance of fattening operation at the Animal production Research Centre, Khartoum, Sudan.

Materials and methods

The Department of Livestock Fattening Researches of the APRC, Khartoum North fattened Baggara bulls of about 1.5 years old (Babiker et al., 2009; Suliman et al., 2009). These animals were purchased from Omdurman Central Livestock Market at El-Miwailih and were moved on hooves along 26 Km to the research station on the eastern bank of the Blue Nile. They were kept in an open sided shed roofed with bamboo and were provided with watering and feeding facilities. At arrival, bulls were kept for an adaptation period during which they were ear tagged, vaccinated against epidemic diseases and treated against internal and external parasites. They were weighed at the beginning of the adaptation period. The animals of matching body

weights were accommodated and fed together on concentrate and roughage. The concentrate was offered in one daily morning meal at the rate 2.5% of average body weight and thereafter sorghum straw was offered *ad libitum*. The concentrate was a molasses based diet of 11.09 MJ/kg DM metabolizable energy and 19.6% crude protein contents. It was formulated of 52% molasses, 39% wheat bran, 5% groundnut cake, 3% urea and 1% common salt. A weekly allowance of 2 kg/head of green alfalfa was offered to the animal as a source of carotene. All animals were regularly weighed at weekly intervals to the nearest 5 kg after overnight fasting. Finished animals were either sold alive or slaughtered.

For the purpose of this study the records of numbers of batches, number of animals purchased per batch, dates, prices and weights of purchase and selling of fattened bulls during 9 years (1999-2000) were used. During this period, 16361 Baggara bulls were purchased and fattened in 143 batches. Among these animals only 68 animals died. The data were grouped into 9 groups according to year of purchase. The data were further grouped according to season of purchase into winter group for those purchased during the months of October, November, December, January and February; dry summer group for those purchased during the months of March, April, May and June and wet summer group for those purchased during the months of July, August and September.

Statistical analysis

Using the Statistical package *STATISTICA* (StatSoft, 2011), the descriptive statistics (means, standard deviations and coefficients of variation) of the population under study were calculated. The significance of effects of year and season of purchase on the studied traits were tested by two way analysis of variance (StatSoft, 2011).

Results

Table 1 showed the descriptive statistics of the population under study. Table 2 illustrated the effect of year of purchase on the number of animals per batch, purchase and selling weights, fattening period, body weight gain and purchase and selling prices. The total number of purchased animals/year and number of batches/year were variable among years. The lowest number of animals and batches were observed in the year 1992 (381 animals in 8 batches). The year 1999 had the highest number of purchased bulls in 22 batches. The number of animals per batch increased significantly ($P < 0.05$) with years' advancement to reach 156 heads in the year 2000. No mortality was reported for the Baggara bulls fattened during the years from 1992 to 1995, however the mortality was reported to

increase with year advancement to reach the rate of 0.93% at the year 2000. The purchase body weight at the year 1992 (181.2 kg) was significantly ($P<0.05$) lower than most of those of the following years which always exceeded 200 kg. The selling body weight of bulls varied significantly ($P<0.05$) with years with no obvious trend. The lightest selling body weight was observed at the year 1992, and the heaviest one was observed at the year 1994. The fattening period ($P<0.05$), the total and daily body gains ($P<0.05$) as well as the purchase ($P<0.05$) and selling ($P<0.01$) prices varied significantly among years, however, the general trend is the decrease of the values of these traits with the years' advancement.

Table 1: Overall means, standard deviation and coefficient of variation of the examined traits

	Mean	Standard. Deviation.	Coefficient of variation
No of animals/batch	114	61	53.91
Purchase weight, kg	217.0	42.04	19.37
Selling weight, kg	254.0	46.09	18.15
Total gain, kg	36.9	25.74	69.67
Period, days	49	27	54.44
Daily gain, kg/day	0.770	0.344	44.68
Purchase price, Dollar/kg	0.571	0.180	31.57
Selling price, Dollar/kg	0.742	0.150	20.18

Table 3 showed the effect of season of bulls purchase on the fattening performance and selling of Baggara bulls. The total number of animals and number of batches during winter season were the highest whereas those during wet summer were the lowest. There was no variation imposed by season of purchase on the number of animals per batch and purchase and selling body weights. Mortality rate was significantly ($P<0.05$) variable among seasons; however it is always less than 1%. The fattening period ($P<0.05$), daily body gain ($P<0.01$), purchase ($P<0.05$) and selling ($P<0.05$) prices were significantly affected by season of purchase. The period of fattening at wet summer was

the shortest and that at winter was the longest. The daily body gain during wet summer was higher than those during winter and dry summer which were similar. The price of purchase of a kilogram of live weight was lower during dry summer than those during winter and wet summer which were similar. Whereas, the selling price during dry summer and wet summer were similar and the two were lower than that during winter.

Discussion

The coefficients of variation of number of animals/batch, total body gain, fattening period and purchase price showed high discrepancies among the studied population for these traits. The effects of year and season of purchase might be the main cause of these discrepancies. The average number of purchased animals/batch was higher than the range of 48 to 69 bulls reported for 30 batches during the years 1992–1994 by El Khidir and Ibrahim (1999). The average daily body gain was within the range (0.630 – 0.820 kg/day) reported by Suliman et al. (2009) and it was higher than 0.621 ± 0.04 kg/day reported by Mustafa (2012), but it was lower than 0.94 kg/day reported by El Khidir et al. (1995), 0.95 ± 0.014 kg/day reported by El Khidir and Ibrahim (1999) and 0.89 kg/day reported by Mohammed et al. (2007). The fattening period was lower than that reported by Mustafa (2012) for the fattening operations at APRC in the period 1996 -1999 which was 35.99 ± 0.285 days.

The increase of number of animals/batch with year advancement indicated the continuous expansion of the successful commercial fattening operations at the APRC. The yearly descending trend of the period for which animals were allowed to stay on fattening also demonstrated the increase of the interest and awareness for the APRC production of red meat because off-take of fattened bulls for selling or slaughtering is mainly controlled by consumers' demand. This reduction of

Table 2: Effect of years on Baggara bulls fattening (years 1992-2000)

Items	1992	1993	1994	1995	1996	1997	1998	1999	2000	SE	Sign.
No of batches	8	18	11	15	22	19	17	22	11		
No of animals	381	1387	1077	1623	2833	2087	2135	3122	1716		
No of animals died	0	0	0	0	9	9	17	17	16		
Mortality rate, %	0.00	0.00	0.00	0.00	0.32	0.43	0.80	0.54	0.93	$X^2=39.1$	*
No animals/batch	48 ^d	77 ^{cd}	98 ^{bc}	108 ^{bc}	129 ^{ab}	108 ^{bc}	126 ^{ab}	142 ^{ab}	156 ^a	4.7	*
Purchase weight, kg	181.2 ^b	208 ^{ab}	221.2 ^a	210 ^{ab}	225.9 ^a	214.7 ^a	223.4 ^a	224.5 ^a	221.5 ^a	3.50	*
Selling weight, kg	237.7 ^c	264.8 ^{abc}	394.9 ^a	277.4 ^{ab}	255.3 ^{bc}	234.8 ^c	248.3 ^{bc}	240.6 ^c	241.1 ^c	3.68	*
Total gain, kg	56.5 ^b	56.9 ^b	73.7 ^a	67.3 ^{ab}	29.4 ^c	20.2 ^{cd}	25 ^{cd}	16.1 ^d	19.6 ^{cd}	1.30	*
Period, days	61 ^b	62 ^b	82 ^a	80 ^a	41 ^{cd}	45 ^c	34 ^{cd}	27 ^d	35 ^{cd}	1.6	*
Daily gain, kg/day	0.925 ^a	0.953 ^a	0.892 ^a	0.832 ^{ab}	0.751 ^{abc}	0.519 ^c	1.004 ^a	0.63 ^{bc}	0.523 ^c	0.026	*
Purchase price, Dollar/kg	0.687 ^b	0.813 ^a	0.588 ^{bc}	0.523 ^{cd}	0.446 ^d	0.570 ^{bc}	0.508 ^{cd}	0.477 ^{cd}	0.614 ^{bc}	0.013	**
Selling price, Dollar/kg	0.858 ^a	0.880 ^a	0.843 ^a	0.674 ^b	0.663 ^b	0.816 ^a	0.664 ^b	0.613 ^b	0.789 ^a	0.010	**

a, b, c, d, e, f, g = means on the same row of different superscripts are significantly different; * = $P<0.05$, ** = $P<0.01$.

Table 3: Effect of season on the fattening performance of Baggara bulls

Items	Dry		Wet	SE	Sign.
	summer	Winter	summer		
No of batches	46	54	43		
No of animals	5241	6345	4775		
No of animals died	20	32	16		
Mortality rate, %	0.38	0.50	0.34	X ² =7.5	*
No animals/batch	114	118	110	5.1	NS
Purchase weight, kg	220.7	215.7	213.8	3.53	NS
Selling weight, kg	260.2	254.2	247.1	3.87	NS
Total gain, kg	39.3	38.5	33.3	2.15	NS
Period, days	50 ^{ab}	54 ^a	42 ^b	2.2	*
Daily gain, kg/day	0.727 ^b	0.681 ^b	0.933 ^a	0.028	**
Purchase price, Dollar/kg	0.515 ^b	0.601 ^a	0.606 ^a	0.015	*
Selling price, Dollar/kg	0.720 ^b	0.792 ^a	0.716 ^b	0.013	*

a, b = means on the same row of different superscripts are significantly different; * = P<0.05; ** = P<0.01

fattening period resulted in the reduction of selling weight and total body gain of bulls. Similar observations were reported by Mustafa (2012). He reported that the variation of fattening period across years probably reflects the variation on the consumers' demand for fattened animals, since animals were held for a longer period on station and are allowed to reach higher weights when consumers' demand is low. The reduction of daily body gain with year was also reported by El Khidir and Ibrahim (1999). They noted that year effect on average daily gain and FCR was mostly induced by the effect of season and initial live weight.

The highest daily body gain observed during the wet season (July – September), intermediate in dry summer (March-June) and the lowest during winter (October – February) was also reported by El Khidir and Ibrahim (1999). They attributed the high daily gain during wet summer to the phenomenon of compensatory growth. They noted that in late dry summer the meagre pasture available along the cattle routes from production areas in Western Sudan to consumption markets in central parts of the country had caused the animals to reach the fattening station in their poorest body conditions and they showed maximum compensatory growth during re-alimentation. Scarcity of range pasture during the journey of animals from the production areas to the markets was the main factor for the low purchase price of under fed animals during dry season compared to high prices for well-nourished animals during wet summer and winter. Usually during dry summer, livestock depends mainly on the expensive stored agriculture by-products and feed supplementation, so the animal owners bring some of their animals to markets to feed the rest. In the animal markets of central Sudan, the period during wet summer is usually known as the off-season since animals are kept on pasture and those reach the market will be of heavy weights and expensive. Alsiddig et al. (2010) noted that

Baggara cattle can reach large size and heavy weight that ranged between 400 and 600 kg and marketed during wet summer season as over fat stock which are locally called (Daoul). The study indicated that the fattening operations of Baggara bulls at APRC expanded successfully with years. The study also highlighted the seasonal variation of the fattening period as well as the purchase and selling prices and concluded that the season had important impact on fattening operations at APRC.

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