Growth Characteristics of Sahiwal x Zebu F1 Crossbred Cattle in Uganda

Article *in* International Journal of Livestock Research · January 2018

DOI: 10.5455/ijlr.20180226064352

7 authors, including:

Brian Martin Babigumira

8 PUBLICATIONS **49** CITATIONS

SEE PROFILE

Henry Aaron Mulindwa

National Agricultural Research Organization

31 PUBLICATIONS **381** CITATIONS

SEE PROFILE

James Oluka

National Agricultural Research Organization

6 PUBLICATIONS **82** CITATIONS

SEE PROFILE

Donald Rugira Kugonza

Makerere University

120 PUBLICATIONS **1,249** CITATIONS

SEE PROFILE

Original Research

Growth Characteristics of Sahiwal x Zebu F1 Crossbred Cattle in Uganda

Brian Martin Babigumira, Robinah Gertrude Nabukalu, Joseph Kibuye Masaba, George William Egadu, Henry Mulindwa, James Oluka and Donald Rugira Kugonza[1*]

National Livestock Resources Research Institute, National Agricultural Research Organisation, P. O. Box 96, Tororo, UGANDA

[1]College of Agricultural and Environmental Sciences, Makerere University, Kampala, P. O. Box 7062, UGANDA

***Corresponding author:** donkugonza@gmail.com

Rec. Date:	Feb 26, 2018 06:43
Accept Date:	May 06, 2018 13:41
DOI	10.5455/ijlr.20180226064352

Abstract

This study assessed the growth of Sahiwal x Zebu crossbreds under low input production conditions in Uganda. Primary data consisted monthly live body weights of 64 Sahiwal first filial generation (F1) crossbred calves born between 2013 and 2015. The herd was on pasture; water provided ad lib and routine control of ticks and worms done. The minimum, average and maximum birth weights for the herd were 15.0, 23.2±7.0 and 40.0 kg with a 13% heterotic effect. Birth weight was significantly (P<0.05) affected by year of birth. Birth weight averages for male and female calves were 24.0±7.4 and 22.6±7.1Kg. Average 300-day live body weights for the herd, male and female calves were 85.6, 84.8 and 86.3 kg. Birth weight significantly (P<0.001) affected average daily gains (AGDs) of the herd. Positive average daily gain significantly (P<0.05) peaked between 90 to 150 days-of-age. The study recommended targeted supplementary feeding from 90 days-of-age.

Key words: Average Daily Gain (ADG), Sahiwal, Weight for age, Uganda, Zebu

How to cite: Babigumira, B., Nabukalu, R., Masaba, J., Egadu, G., Mulindwa, H., Oluka, J., & Kugonza, D. (2018). Growth Characteristics of Sahiwal x Zebu F1 Crossbred Cattle in Uganda. International Journal of Livestock Research, 8(6), 1. doi: 10.5455/ijlr.20180226064352

Introduction

Uganda's livestock sub-sector contributes 4% to the agricultural gross domestic product (GDP) estimated as 23% of the national GDP. Cattle are a major livestock species contributing 70% to the sector GDP annually as beef (170,000 metric tons), milk (1.6 billion liters), traction and hides (DDA 2010; MAAIF 2010; UBOS 2015). The cattle population is estimated at 11.4 million (UBOS 2015). Over 1.6 million households derive food and nutrition and economic benefits from cattle (MAAIF 2010; UBOS 2015). However, the livestock subsector continues to grapple with low productivity for economically important

traits such as milk (442 Kg/cow/year) and beef (150Kg carcass weight) (Behnke and Nakirya 2012). Genetic makeup (genotype) and environment influence the measurable characteristics (phenotype) of a trait. Genetic makeup can be changed to the desired direction through selection in a breeding program. Management determines how much an animal will express its full genetic potential. Improved housing, nutrition and biosecurity quickly translate into increased unit output (Williams and Bunge 1952). The cattle genetic resources in Uganda are represented by indigenous (93.3%), exotic pure-and crossbred (5.67%) cattle (UBOS 2015). Indigenous cattle are represented by dual purpose breeds namely, Ankole Longhorn (27.7%), and Shorthorn Small East African Zebu plus others (69.5%) (Behnke and Nakirya 2012). The S.E.A Zebu is kept mainly for milk, draught power, income, manure and meat (Behnke and Nakirya, 2012; Rege 2001). However, the Zebu has birth weights and pre-weaning ADGs as low as 18 kg and 225gd^{-1} (Mulindwa *et al*., 2012). Genetic improvement of indigenous cattle has relied majorly on Artificial Insemination-based crossbreeding using exotic superior sires (Kaaya *et al*. 2005; Mugisha *et al*. 2014). Sahiwal calves may have an average birth weight of 23 kg and 90-day weight of 55 kg (Muhuyi *et al*. 1999; Rege *et al*., 1992). The average daily gain (AGD) for the Sahiwal is estimated at 300gd^{-1} (Mwandotto *et al*., 1988) or higher (Bhatti *et al*., 2012). The study characterized the growth of first filial (F1) Sahiwal x Zebu crossbred cattle for weight-or-age and average daily gain (ADG).

Materials and Methods

A herd of 64 Sahiwal × Zebu F1 crosses born in 2013 (n = 6), 2014 (n = 41) and 2015 (n = 17) were recruited in an on-station growth performance study at the National Livestock Resources Research Institute (NaLIRRI) from birth to 300 days-of-age. The calves were weaned between five to six months of age. Data collected included: calf ID, dam ID, birth date, sex, birth type, birth weight recorded within 24 hours of birth. Subsequent live weight measurements were taken monthly using a calibrated weighing scale. The calves were raised on pasture and water was provided *ad libitum*; routine control of ticks and worms was done. The calves were confined to a night paddock and let to graze during the day. Parental breed data (birth and weaning weights; and ADGs) was obtained from literature. Data was prepared in MS Excel (Microsoft, 2010) and analysis was done in the statistical software R (Team, 2015). Average daily gain (ADG) was calculated as the difference of the F1 average weight-for-age (Kg) weight from the average F1 birth weight (Kg) divided by the age (number of days from birth). Average heterosis for birth weight was computed as the difference of the parental breeds' averages from the average F1 phenotype divided by the average of the parental breeds.

Results and Discussion

DOI 10.5455/ijlr.20180226064352

Weight for Age

The minimum, average and maximum birth weights for calf crop were 15.0, 23.2±7.0 and 40.0 Kg with 13% heterotic effect. Birth weight averages for male and female calves were 24.0±7.4 and 22.6±7.1 Kg (Fig. 1). Male calves weighed 1.4 kg heavier than the females. The year of birth affected birth weight significantly (P<0.05). The 300-days live body weight average of 90 Kg fell (-20 Kg) below the 110 Kg reported by Mwandotto *et al*. (1988) and Bhatti *et al*. (2012) and was attributed to negative ADG during the first 60 days of life.

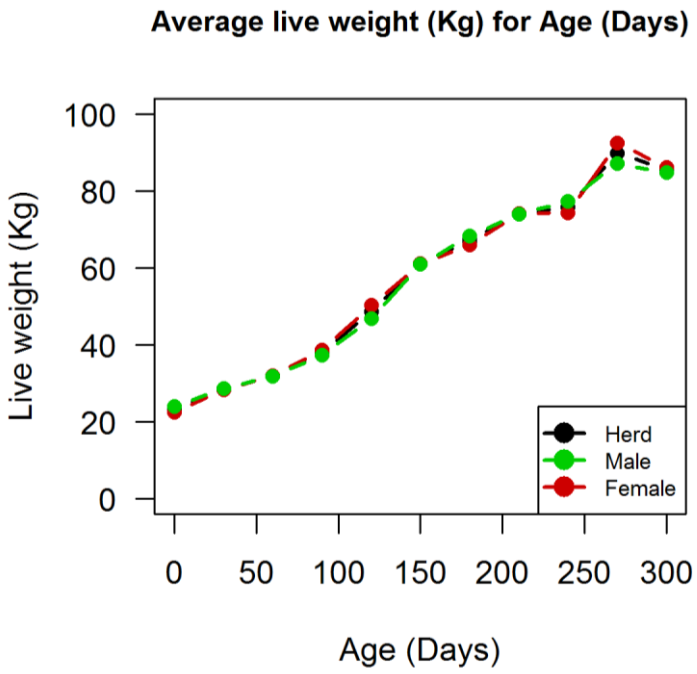

Fig. 1:PLEASE PROVIDE LEGEND

Average Daily Gain (ADG)

ADG was significantly (P<0.05) affected by birth weight. Negative ADG was observed between days 30 and 60 (Fig. 2). The negative ADG between the 30 and 60 days' period implied a mismatch between daily dam milk yield and calf nutrient requirement. The steep positive ADG observed from day 90 to 150 could indicate supplementation of dam's milk with pasture. Rapid development of the rumen occurs from birth to 3 months. The 30-days ADGs between days 90 and 150 were 354.5 and 413.5 gd^{-1}. This was followed by a negative 30-day ADG that was attributed to the weaning effect and adjustment to total dependency on pasture (Fig. 2). The adjustment period lasted about 90 days before the ADG peaked again within 30 days. The subsequent undulation in ADG could indicate pasture availability (quantity and quality).

DOI 10.5455/ijlr.20180226064352

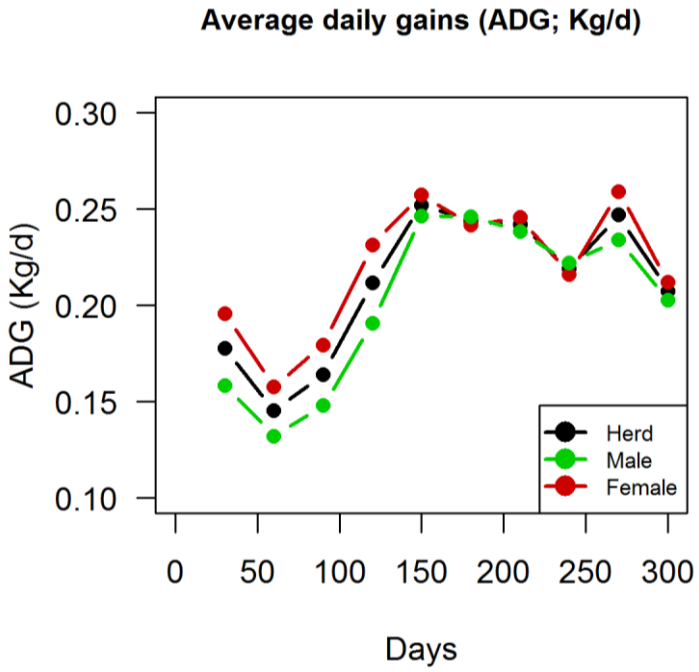

Fig. 2: PLEASE PROVIDE LEGEND

Birth weight significantly (P<0.01) affected average daily gains. Despite the apparent difference in ADGs for males and females (Fig.2). The negative ADG between the 30 and 60 days' period could be due to the inability of daily milk yield of the dams (~1.5kg) to meet daily nutritional requirements of the calf as suggested by Bhatti *et al.* (2012). The negative ADGs also explain the slowed overall growth up to day 60. Other studies have indicated a steeper growth curve for the same period e.g. Mwandotto *et al.* (1988) and Bhatti *et al.* (2012) have reported up to 50Kg live weight by day 56. Clearly, these F1s weighed almost -20Kg lighter than the 50Kg reported by those two authors. The steep positive ADG between days 90 and 150 could indicate the effect of ruminal development and thus better ability to assimilate pasture and supplement maternal milk. A closer examination of the 30 day gains in the 90 to150 days' period reveals ADGs of 354.5 and 413.5gd^{-1} from 90 to120 and 120 to 150 days followed by a negative 30-day ADG. The negative ADG starting at 150 days of age could be the weaning effect and adjustment to total dependency on pasture. This adjustment period lasted about 90 days before the herd ADG peaked again (259gd^{-1}) within 30 days. This ADG peak at 9 months agrees well with Mulindwa *et al.* (2012). However, the 9-months live weight average of 90Kg falls (-20 Kg) below the 110 Kg reported by Mwandotto *et al.* (1988) and Bhatti *et al*. (2012) and reflect the effect of negative ADG during the first 60 days of life. The subsequent undulation in ADG could indicate availability (quantity and quality) of pasture. The 90 to 150 days period represents an opportune time for targeted supplementary feeding to improve daily weight

DOI 10.5455/ijlr.20180226064352

gains in Sahiwal x Zebu F1 crosses. The 270 days' ADG presents opportunities for improvement and further supports the contribution of improved calf management to the expression of full genetic potential for growth.

Conclusion

The Sahiwal-Zebu crosses showed promising growth results underscored by a 13% heterotic effect and high ADG. This study further indicated sex as an insignificant effect ($P<0.05$) on the growth characteristics (weight-for-age and average daily gain (ADG) of this Sahiwal x Zebu herd. The 30-day ADGs between days 90 and 150 ranged between 300 and 400 gd^{-1}. Therefore, targeted feeding instituted from day 90 would achieve higher subsequent daily weight gains and improve the live body weight at nine months-of-age (weaning). Increased access to milk (e.g. fostering, bucket feeding or milk replacers) could improve daily weight gains and weight-for-age during the first 3 months and later in life.

Acknowledgments

The Director of Research, National Livestock Resources Research Institute (NaLIRRI) and the Leader and staff of the Livestock Breeding Program, NaLIRRI, National Agricultural Research Organisation Secretariat (NAROSEC), and the Government of Uganda (GoU) are gratefully acknowledged.

Statement of Animal Rights

The animals handling met the international standards of animal welfare and non-invasive methods used for data collection.

Conflict of Interest

None

References

1. Behnke, R. and Nakirya, M. (2012). The contribution of livestock to the Ugandan economy. IGAD LPI Working Paper 02-12. Addis Ababa, Ethiopia: IGAD Livestock Policy Initiative.
2. Bhatti, S.A., Ali, A., Nawaz, H., McGill, D., Sarwar, M., Afzal, M., Khan, M.S., Ehsanullah, A.M.A., Bush, R., Wynn, P.C. and Warriach, H.M. (2012). Effect of pre-weaning feeding regimens on post-weaning growth performance of Sahiwal calves. *Animal*, 6, 1231-1236. DOI: 10.1017/S1751731112000250.
3. DDA (Dairy Development Authority) (2010). Annual Report 2009/2010. Diary Development Authority, Kampala, Uganda.
4. Kaaya, H., Bashaasha, B. and Mutetikka, D. (2005). Determinants of utilisation of artificial insemination (AI) services among Ugandan dairy farmers. In: African Crop Science Conference Proceedings, 2(3), 561-567.
5. MAAIF (Ministry of Agriculture, Animal Industry and Fisheries) (2010). Agricultural Sector Development Strategy and Investment Plan (DSPIP), 2010/11-2014/15. Ministry of Agriculture, Animal Industry and Fisheries, Entebbe, Uganda.

DOI 10.5455/ijlr.20180226064352

6. Microsoft (2010). Microsoft Office Professional Plus 2010. Microsoft Excel, SP2 MSO (14.0.7173.5000) edn. Microsoft Corporation, Redmond, Washington
7. Mugisha, A., Kayiizi, V., Owiny, D., Mburu, J. (2014). Breeding services and the factors influencing their use on smallholder dairy farms in central Uganda. *Veterinary Medicine International*, Volume 2014, Article ID 169380, 6 pp. http://dx.doi.org/10.1155/2014/ 169380.
8. Muhuyi, W., Lokwaleput, I. and Sinkeet, S.O. (1999). Conservation and utilisation of the Sahiwal cattle in Kenya. *Animal Genetic Resources Information*, 26, 35-44.
9. Mulindwa, H., Kifaro, G. and Ssewannyana, E. (2012). Comparative pre-weaning growth of Zebu cattle and their crosses with Sahiwal and Boran. *Uganda Journal of Agricultural Sciences*, 13, 35-44.
10. Mwandotto, B.A.J., Carles, A.B. and Cartwright, T.C. (1988). Weaning and 18-month weights of Boran, East African Shorthorn Zebu and Sahiwal breeds or crosses in Kenya. *Tropical Agriculture*, 65(3), 257-264.
11. Rege, J.E.O., Kahi, A., Okomo-Adhiambo, M., Mwacharo, J. and Hanotte, O. (2001). Zebu cattle of Kenya: Uses, performance, farmer preferences, measures of genetic diversity and options for improved use. Nairobi, Kenya: ILRI.
12. Rege, J., Lomole, M. and Wakhungu, J. (1992). An evaluation of a long term breeding programme in a closed Sahiwal herd in Kenya. *Journal of Animal Breeding and Genetics*, 109, 364-373.
13. Team, R.C. (2015). R: A language and environment for statistical computing, 3.3.1 edn. R Foundation for Statistical Computing, Vienna, Austria
14. UBOS (Uganda Bureau of Statistics) (2015). Statistical Abstract. Uganda Bureau of Statistics, Kampala, Uganda.
15. Williams, E. and Bunge, V. (1952). Development of the Zebu herd of Bukedi cattle at Serere. *Uganda Empire Journal of Experimental Agriculture*, 20, 142-160.

DOI 10.5455/ijlr.20180226064352