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Effect of weather patterns on preweaning growth of beef calves in the Northern Great Plains

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ABSTRACT

Records from a 76-year investigation into effects of line breeding and selection of Hereford cattle, and concurrent weather records, were used to assess effects of weather patterns on growth of suckling calves. Calf growth data were adjusted for trends arising from selection and inbreeding, and for effects of age of dam and sex of calf to produce clean estimates of year effects. Daily maximum and minimum temperatures were summarized to identify first and last days of a 1500 growing degree growing season. Precipitation was accumulated from: 1) end of the growing season the previous year through 31 December; 2) 1 January through the beginning of the current year growing season; and 3) during the current growing season. Principal components were used to characterize years. Pre-weaning growth of the calves in sets of eight extreme years identified by each of the principal component was contrasted. Irrespective of precipitation pattern before the growing season and with near or above average precipitation during the growing season, calves reared in years characterized by longer, cooler growing seasons grew faster from birth to weaning than in opposing years. This retrospective analysis indicates a general increase in temperature could decrease growth of suckling calves on the Northern Great Plains of North America.

KEYWORDS

Beef Calves; Climate Change; Growth; Precipitation; Temperature

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References

- [1] Subak, S. (1999) Global environmental costs of beef production. *Ecological Economics*, 30, 79-91. doi:10.1016/S0921-8009(98)00100-1
- [2] Beauchemin, K.A., Janzen, H.H., Little, S.M., McAllister, T.A. and McGinn, S.M. (2010) Life cycle assessment of greenhouse gas emissions from beef production in western Canada: A case study. *Agricultural Systems*, 103, 371-379. doi:10.1016/j.agsy.2010.03.008
- [3] Crosson, P., Shalloo, L., O' Brien, D., Lanigan, G.J., Foley, P.A., Boland, T.M. and Kenny, D.A. (2011) A review of whole farm systems models of greenhouse gas emissions from beef and dairy cattle production systems. *Animal Feed Science Technology*, 166, 29-45. doi:10.1016/j.anifeedsci.2011.04.001
- [4] Harle, K.J., Howden, S.M., Hunt, L.P. and Dunlop, M. (2007) The potential impact of climate change on the Australian wool industry by 2030. *Agricultural Systems*, 93, 61-89. doi:10.1016/j.agsy.2006.04.003
- [5] Weltzin, J.F. and McPherson, G.R. (2003) *Changing Precipitation Regimes and Terrestrial Ecosystems: A North American Perspective*. University of Arizona Press, Tucson.
- [6] Heitschmidt, R.K. and Vermeire, L.T. (2006) Can abundant summer precipitation counter losses in herbage production caused by spring drought? *Rangeland Ecology and Management*, 59, 392-399. doi:10.2111/05-164R2.1

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- [7] Milchunas, D.G., Mosier, A.R., Morgan, J.A., LeCain, D.R., King, J.Y. and Nelson, J.A. (2005) Agriculture, Ecosystems and Environment, 111, 166-184. doi:10.1016/j.agee.2005.06.014
- [8] Craine, J.M., Elmore, A.J., Olson and K.C., Tolleson D. (2010) Climate change and cattle nutritional stress. *Global Change Biology*, 16, 2901-2911. doi:10.1111/j.1365-2486.2009.02060.x
- [9] Wan, S., Hui, D., Wallace, L. and Luo, Y. (2005) Direct and indirect effects of experimental warming on ecosystem carbon processes in a tallgrass prairie. *Global Biogeochemistry Cycles*, 19, GB2014,
- [10] Baker, B.B., Hanson, J.D., Bourdon, R.M. and Eckert, J.B. (1993) The potential effects of climate change on ecosystem process and cattle production on US rangelands. *Climate Change*, 25, 97-117. doi:10.1007/BF01661200
- [11] Bolorsetseg, B. and Tuvaavsuren, G. (1996) The potential impacts of climate change on pasture and cattle production in Mongolia. *Water, Air, and Soil Pollution*, 92, 95-105.
- [12] Hanson, J.D., Baker, B.B. and Bourdon, R.M. (1993) Comparison of the effects of different climate change scenarios on rangeland livestock production. *Agricultural Systems*, 41, 487-502. doi:10.1016/0308-521X(93)90047-6
- [13] MacNeil, M.D. (2009) Invited review: Research contributions from seventy-five years of breeding Line 1 Hereford cattle at Miles City, Montana. *Journal of Animal Science*, 87, 2489-2501. doi:10.2527/jas.2009-1909
- [14] MacNeil, M.D., Urick, J.J., Newman, S. and Knapp, B.W. (1992) Selection for postweaning growth in inbred Hereford cattle: The Fort Keogh, Montana Line 1 example. *Journal of Animal Science*, 70, 723-733.
- [15] Kuchler, A. (1964) Potential natural vegetation of the coterminous United States. Special Publ. 36, American Geographic Society, New York.
- [16] Boldman, K.G., Kriese, L.A., Van Vleck, L.D., Van Tassell, C.P. and Kachman, S.D. (1995) A manual for use of MTDFREML. A set of programs to obtain estimates of variance and covariances [Draft]. US-DA-ARS, Clay Center.
- [17] Miller, P., Lanier, W. and Brandt, S. (2001) Using growing degree days to predict plant stages. Montguide MT200103 AG 7/2001. Cooperative Extension Service, Montana State University, Bozeman.
- [18] Frank, A.B. and Hofmann, L. (1989) Relationship among grazing management, growing degree days, and morphological development for native grasses on the Northern Great Plains. *Journal of Range Management*, 42, 199-202. doi:10.2307/3899472
- [19] Haferkamp, M.R., MacNeil, M.D. and Grings, E.E. (2005) Nitrogen content in the northern mixed-grass prairie. *Rangeland Ecology and Management*, 58, 155-160. doi:10.2111/04-01.1
- [20] Craine, J.M., Towne, E.G., Joern, A. and Hamilton, R.G. (2009) Consequences of climate variability for the performance of bison in tallgrass prairie. *Global Change Biology*, 15, 772-779. doi:10.1111/j.1365-2486.2008.01769.x
- [21] Kaiser, H.F. (1960) The application of electronic computers to factor analysis. *Educational and Psychological Measurement*, 20, 141-151. doi:10.1177/001316446002000116
- [22] Schwartz, M.D., Ahas, R. and Aasa, A. (2006) Onset of spring starting earlier across the Northern Hemisphere. *Global Change Biology*, 12, 343-351. doi:10.1111/j.1365-2486.2005.01097.x
- [23] Langvatn, R., Albon, S.D., Burkey, T. and Clutton-Brock, T.H. (1996) Climate, plant phenology and variation in age of first reproduction in a temperate herbivore. *Journal of Animal Ecology*, 65, 653-670. doi:10.2307/5744
- [24] Currie, P.O., Volesky, J.D., Adams, D.C. and Knapp, B.W. (1989) Growth patterns of yearling steers determined from daily live weights. *Journal of Range Management*, 42, 393-396. doi:10.2307/3899546
- [25] Bauman, D.E. and Currie, W.B. (1980) Partitioning of nutrients during pregnancy and lactation: A review of mechanisms involving homeostasis and homeorhesis. *Journal of Dairy Science*, 63, 1514-1529. doi:10.3168/jds.S0022-0302(80)83111-0
- [26] Freetly, H.C., Nienaber, J.A. and Brown-Brandl, T. (2006) Partitioning of energy during lactation of

primiparous beef cows. *Journal of Animal Science*, 84, 2157-2162. doi:10.2527/jas.2005-534

- [27] Tarr, B. (2007) Cold stress in cows. Factsheet #420/51, Ontario Ministry Agriculture, Food and Rural Affairs. <http://www.omafra.gov.on.ca/english/livestock/beef/facts/07-001.htm>
- [28] Wiltbank, J.N., Bowden, D.W., Ingalls, J.E., Gregory, K.E. and Koch, R.M. (1962) Effect of energy level on reproductive phenomena of mature Hereford cows. *Journal of Animal Science*, 21, 219-225.
- [29] Franko, K.L., Forhead, A.J. and Fowden, A.L. (2010) Differential effects of prenatal stress on glucocorticoid administration on postnatal growth and glucose metabolism in rats. *Journal of Endocrinology*, 204, 319-329. doi:10.1677/JOE-09-0390
- [30] Fowden, A.L., Forhead, A.J., Coan, P.M. and Burton, G.J. (2008) The placenta and intrauterine programming. *Journal of Neuroendocrinology*, 20, 439-450. doi:10.1111/j.1365-2826.2008.01663.x
- [31] Vermeire, L.T., Heitschmidt, R.K. and Rinella, M.J. (2009) Primary productivity and precipitation-use efficiency in mixed-grass prairie: A comparison of northern and southern US sites. *Rangeland Ecology*