CATTLE HERD DATA IN ANIMAL UNITS (AU)

Document elaborated by the Pasture Research Nucleus of the Image Processing and Geoprocessing Laboratory (Lapig) of the Federal University of Goiás (UFG), coordinated by professor Laerte Guimarães Ferreira. This and other methods relative to data production and pastures information are available in the Atlas of Pastures platform.

Goiânia, January 2022.

1. Contextualization

The livestock sector occupies 30% of arable land on the earth's surface, contributes up to 40% of the world's agricultural gross domestic product (GDP) and provides income for more than 1.3 billion people (Herrero et al., 2013). Globally, an estimated 20% of pasture areas (680 million hectares) are degraded due to inadequate pasture management and grazing above the area's carrying capacity (Postel et al., 1998). The knowledge of an area's carrying capacity, which is the animal stock density that a pasture can support without compromising its productivity or persistence, enables the identification of environmentally vulnerable areas and the discerning of underused areas that can be intensified (Ebrahimi et al., 2010).

In Brazil, livestock farming is extensive, has a low technological level and predominantly depends on pasture (Paulino et al., 2011). The intensification of livestock farming systems has been seen as a solution to reduce the competition between agricultural expansion and conservation of natural environments (Bowman et al., 2012; Strassburg et al., 2014). The intensification process, as it is related to an improvement in the quality of pastures, also contributes to the reduction in the emission of greenhouse gasses per animal unit (AU), as it shortens raising and age of slaughter of the animals. By improving pasture quality, carbon sequestration increases (0.61 Mg C ha-1 yr-1 for a well-managed pasture vs. 0.28 Mg C ha-1 yr-1 for a degraded one), as well as the transfer of water to the atmosphere (45 mm month-1 of a well-managed pasture vs. 31 mm month-1 of a degraded one) (Maia et al., 2009; Mazzetto et al., 2015; Andrade et al., 2016).

With that in mind, knowing the stocking rate is instrumental for identifying the potential for livestock systems intensification and, consequently, the potential for public policies that aim to provide loans for the restoration of pastures with low productivity and under its carrying capacity.

2. Analysis approach

2.2 Census data

The stocking rate was estimated for the entire territorial extension of Brazil, considering herd composition, accordingly to the Agricultural Censuses of 1996 and 2006 (IBGE), and the total number of cattle, from Municipalities Livestock Production data (PPM / IBGE).

In the 1996 and 2006 Agricultural Censuses, the composition of the cattle herd for facilities with over 50 heads is detailed for each animal age category: less than 1 year old (bull calf and heifer calf), from 1 to 2 years old (yearling bulls, steers and heifers) and over 2 years old (cows, sire bulls, ox - cattle for meat production and for work).

The 2013 municipal vectorial base of the Brazilian Institute of Geography and Statistics (IBGE) and the Mapping of Brazilian Pastures, elaborated by the Laboratory for Image Processing and Geoprocessing (LAPIG/UFG) were also used.

2.3 Analytical procedures

From the 1996 and 2006 Censuses, it was generated the percentage of each animal category (i.e., the number of cattle per each age category divided by the total number of cattle) multiplied by the total number of cattle in each year, from 1986 to 2020 (accordingly to the data provided by the Municipalities Livestock Production - PPM), given that for the years 1986 to 1999, data from the 1996 agricultural census were used; and for the years 2000 to 2020, data from the 2006 agricultural census were used.

For each animal category, the fraction equivalent to one AU was estimated by dividing the average weight of the category by 450 kg (1 AU). The estimate of the average weight of the category was based on the average of the initial and final weight of each category, obtained from literature data and from the commercialization of animals in 2015, considering the values for Nellore animals (85% to 90% of the Brazilian beef herd) (Mousquer et al., 2014). The stocking rate for each category of cattle was calculated by multiplying the AU equivalent value and the number of cattle in each year. Then, the total AU was divided by the pasture area of each municipality in Brazil (figure 1).

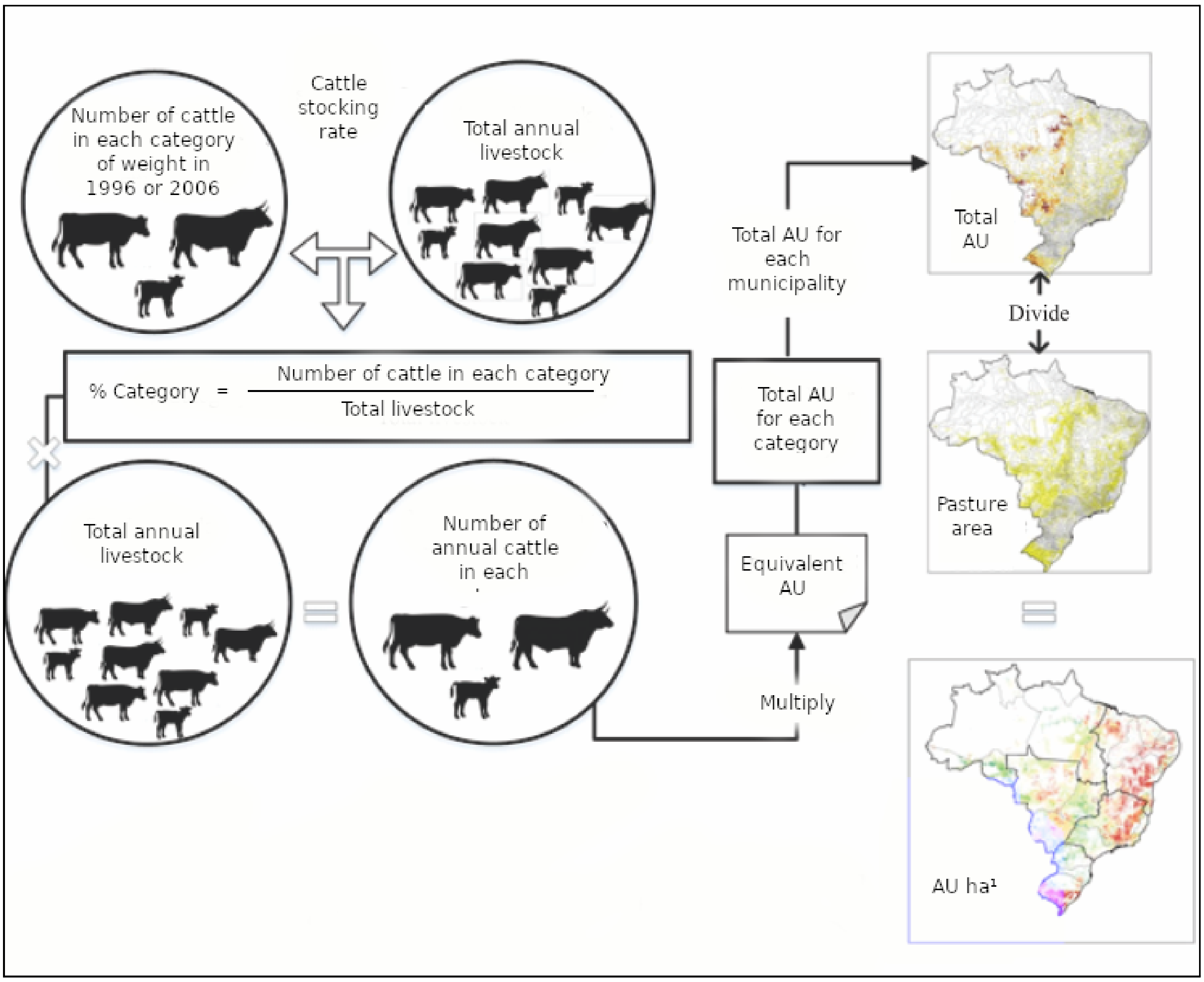

Figure 1. Fluxogram for estimates of cattle stocking rates

2.4 Data and model limitations

The limitations of the data and models used to generate the bovine stocking are related to those found in the Agricultural Census and PPM data, since the Census data may be underestimating or overestimating the number of cattle in some municipalities in Brazil, for the information collected is self-reporting. Due to the lack of data on the composition of the cattle herd in the 2017 Census, it was necessary to use the composition of the cattle herd from the 2006 Census for the years subsequent to the Census. In this case, it is assumed that there was no significant change in the composition of the herd in this period. The weight of each category was based on initial and final weight values for Nellore animals, not considering the weight of other cattle breeds.

References

ANDRADE, R.G.; TEIXEIRA, A.H. de C.; LEIVAS, J.F.; NOGUEIRA, S.F. Analysis of evapotranspiration and biomass in pastures with degradation indicatives in the Upper Tocantins River Basin, in Brazilian Savanna. Revista Ceres, v.63, n.6, p.754-769, 2016. DOI: 10.1590/s0034-737x201663060002.

BOWMAN, M.S.; SOARES-FILHO, B.S.; MERRY, F.D.; NEPSTAD, D.C.; RODRIGUES, H.; ALMEIDA, O.T. Persistence of cattle ranching in the Brazilian Amazon: A spatial analysis of the rationale for beef production. Land Use Policy, v.29, p.558-568, 2012. DOI:10.1016/j.landusepol.2011.09.009.

EBRAHIMI, A.; MILOTÍC, T.; HOFFMANN, M. A herbivore specific grazing capacity model accounting for spatio-temporal environmental variation: A tool for a more sustainable nature conservation and rangeland management. Ecological Modelling, v.221, n.6, p.900-910, 2010. DOI: 10.1016/j.ecolmodel.2009.12.009.

HERRERO, M.; HAVLÍK, P.; VALIN, H.; NOTENBAERT, A.; RUFINO, M.C.; THORNTON, P.K.; BLÜMMEL, M.; WEISS, F.; GRACE, D.; OBERSTEINER, M. Biomass use, production, feed efficiencies, and greenhouse gas emissions from global livestock systems. Proceedings of the National Academy of Sciences of the United States of America, v.110, n.52, p.20888-20893, 2013. DOI: 10.1073/pnas.1308149110.

IBGE. Produção Pecuária Municipal. Rio de Janeiro: IBGE

IBGE. Censo agropecuário 2006. Disponível em: https://www.ibge.gov.br/estatisticas/economicas/agricultura-e-pecuaria/21814-2017-censo-agropecuario.html?=&t=downloads

IBGE. Censo agropecuário 1996. Disponível em: https://www.ibge.gov.br/estatisticas/economicas/agricultura-e-pecuaria/21814-2017-censo-agropecuario.html?=&t=downloads

MAIA, S.M.F.; OGLE, S.M.; CERRI, C.E.P. Effect of grassland management on soil carbon sequestration in Rondônia and MatoGrosso states, Brazil. Geoderma, Amsterdam, v.149, n.1-2, p.84-91, 2009. DOI: 10.1016/j.geoderma.2008.11.023.

PAULINO, H.B.; de SOUZA, E.D.; CARNEIRO, M.A.C.; SMILJANIK JUNIOR, E. Production and quality of Brachiaria forage plants in southwestern Goiás state. Acta

Scientiarum Animal Sciences, v.33, n.4, p.341-346, 2011. DOI:10.4025/actascianimsci.v33i4.8960.

POSTEL, S.L. Water for food production: will there be enough in 2025? BioScience, v.48, n.8 , p.629-637, 1998.

STRASSBURG, B.N.; LATAWIEC, A.; BARIONI, L.G.; NOBRE, C.A.; da SILVA, V.P.; VALENTIM, J.F.; VIANNA, M.; ASSAD, E.D. When enough should be enough: Improving the use of current agricultural lands could meet production demands and spare natural habitats in Brazil. Global Environmental Change, v.28, p.84-97, 2014. DOI:10.1016/j.gloenvcha.2014.06.001.