BeefTrader (part III): meat industry opportunity to improve its profitability reducing greenhouse gases emission and pollutants based on optimal economical endpoint identification

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Introduction

Feedlots rented or belonging to meat packers are increasing in Brazil and about half million cattle was produced on such feedlots in 2014. On the other side, the meat packers buy a significant quantity of cattle (~ 5 millions animals/year) from other feedlots. Independent if animals have being finished in livestock producers or meat packers feedlot, the individual monitoring based on the optimal economical endpoint (OEE) should improve the profitability decreasing greenhouse gases emission (GEE) and others pollutants for both sides of this market chain. However, the maximization of profitability is central for OEE, and the challenge is to solve it for meat packer, as the marginal value is calculated from carcass and non-carcass tissues deposition

over time. Additionally, the marginal cost need to consider operational costs from industry, logistics (from farm-industry-final customer) and maintenance stocks (in or out of industry boundaries). The aim of this study was evaluate the economic and environmental benefits to meat packers based on OEE individual identification. The hypothesis of this study was: traditional slaughter endpoint (TSE) vs. OEE have differences for marginal profit, GHG emission and manure production by kg of meat produced in the meat industry boundary. The current study is the third from three sequential abstracts based on BeefTrader DSS to maximize profitability of farmers and the meat industry.

Material and Methods

In the BeefTrader (part I) abstract two datasets (DS) were created. The DS1 was formed by experimental feedlot variables (diet chemical composition, intake, daily weight gain and body chemical composition). The Davis Growth Model (DGM; Oltjen et al. 1986, 2000) reparametrized by Biase (2016) was used to predict the animal growth and body chemical composition. Variables from DGM, exogenous information to predict OEE, GHG, water intake and manure production performed the DS2. The DS2 was used to simulate the carcass and non- carcass growing during the feedlot than DS3 was created. Main Brazilian meat cuts according MAPA (1988) and non-carcass commercial tissues (skin, liver, heart, kidney, rumen-reticulum, tong and internal fat) were modeled. The meat cuts:carcass and non-carcass:empty body weight ratios simulated in DGM were used to model these tissues deposition over time. The relative cuts and tissues weights were multiplied by prices performed by industry to predict the marginal value daily. Nonparametric bootstrap (NB) resampling was used to create a synthetic population DS4 from DS1, DS2 and DS3. The NB performed 100,000 resampling nonparametric for each experimental unit and the confidence of biased corrected percentile bootstrap was determined using the R software (Development Core Team, version 3.1.0, 2014). The mean, median, lower and upper limit were calculated from NB. Biased corrected percentile booststrap interval (95% confidence level) was used to

compare the methods from DS3 according its symmetric and asymmetric distributions probabilities (Efron, 1981).

Results and Conclusions

The OEE economic and environmental benefits for producers can also be observed for meat packers the same way as observed in the situations portrayed in the previous studies (BeefTrader part I and II). However, the simulation of this study shows that the impact on retail prices paid by the meat and internal tissues had a great influence on profitability. Logistics and stocks, national and international customers tendencies, business rules understanding (among farmer-industry--customer) are essential to be implemented in a more realistic model to maximize the profitability.

References

BIASE, A.G. Parameterization of Ordinary Differential Equations Systems in the growth of beef cattle and production of gases. Piracicaba, 2015. 146p. **Thesis** (Phd em Science) – "Luiz de Queiroz College of Agriculture", University of São Paulo.

EFRON, B. 1981. Nonparametric standard errors and confidence intervals. **Canadian Journal of Statistics.** 9: 139-172.

MAPA. Ministério da Agricultura, Pecuária e Abastecimento. Beef cattle cuts standardization. Portaria nº 5, nomember,8th 1988. Available in: <http://extranet.agricultura.gov.br/sislegis- consulta> Accessed: april 29, 2016.

OLTJEN, J.W.; BYWATER, A.C.; BALDWIN R.L.; GARRETT W.N. 1986. Development of a dynamic model of beef cattle growth and composition. **Journal of Animal Science** 62: 86-97.

OLTJEN, J.W.; PLEASANTS, A.B; SOBOLEVA, T.K. ODDY, V.H. Second-generation dynamic cattle growth and composition models. p. 197-209, 2000 In: Mcnamara, J.P.; France, J.; Beever, D.E. Modelling Nutrient Utilization in Farm Animals. CAB International, London, LDN, United Kingdom.

R Core Team (2014). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL http://www.R-project.org/

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