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Opportunities and challenges to the sustainable development of cattle raising in Brazil, 1970–2005☆

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Abstract

The paper provides historical and analytical perspectives for the assessment of the challenges and opportunities of cattle raising activities in the transition toward a low-carbon agriculture in Brazil. It is organized as follows. The next section presents long run historical perspectives on the development of cattle raising in Brazil. The third section analyzes the patterns of growth of cattle raising in Brazil based upon municipal panel data of Agricultural Census from 1975 to 2006. The fourth section uses a framework analogous to Hayami and Ruttan (1985) to estimate growth convergence equations for major aspects of cattle raising activities, namely the stocking ratio, the specialization in cattle and farm expansion. The report concludes with a discussion of policy options for a transition toward sustainable cattle raising in Brazil.

JEL classification: Q150; Q23; C330

Keywords: Panel data; Arrellano–Bond; Agricultural economics; Land use; Cattle ranching; Deforestation

Resumo

O trabalho propõe perspectivas histórica e analítica para uma avaliação dos desafios e oportunidades da pecuária no processo de transição para uma agricultura de baixo carbono no Brasil. Após a introdução, a segunda seção apresenta perspectivas históricas sobre o desenvolvimento secular da pecuária brasileira. A terceira seção analisa os padrões de crescimento da pecuária no Brasil com base em dados municipais dos Censos Agropecuários de 1975 a 1996. A quarta seção utiliza um esquema analítico análogo ao modelo de Hayami e Ruttan (1985) para estimar equações de convegência de crescimento das principais dimensões das atividades pecuárias, quais sejam, a intensificação das pastagens, o grau de especialização na pecuária e a expansão da atividade agrícola. O trabalho conclui com uma discussão das opções políticas na transição para pecuária sustentável no Brasil.

Palavras-chave: Análise de dados de painel; Arellano–Bond; Economia agrícola; Uso da terra; Pecuária; Desflorestamento

This paper presents historical and analytical perspectives on the challenges and opportunities of cattle raising activities in the transition toward a low-carbon agriculture in Brazil. It is organized as follows. The first section poses the problem. The second presents historical perspectives on the development of cattle raising in Brazil. The third section

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uses an analytical framework analogous to Hayami and Ruttan (1985) to decompose cattle herd in three multiplicative components: the stocking ratio, the cattle specialization ratio, and the farm area. This decomposition is then used to describe the municipal patterns of growth of cattle raising activities in Brazil from 1975 to 2005. The fourth section estimates simple equations of municipal growth convergence for each of the components of the identity. Finally, to identify the main factors behind the patterns of municipal growth convergence, the fifth section specifies and estimates conditional convergence models for each of the identity components. The paper concludes with a discussion of policy options for a transition toward sustainable cattle raising in Brazil.

1. The problem

Historically, cattle raising in Brazil has been extremely land intensive when compared both to other agricultural activities and to other countries. As late as 2006 – last Agro Census available – average stocking ratio in Brazil was less than one head per hectare. Therefore, cattle ranching is, by far, the most extensive use of land in Brazilian agriculture. In 2006, it responded for 48% of the farm area in Brazil and 19% of the value of agricultural output. In that same year, agricultural crops represented 10.6% of farm area and 66% of the value of output (IBGE, 2013).

Land abundance – defined both in terms of relative factor availability and open access to land property – and high transport costs were major historical drivers of the extensive land use patterns of cattle raising. This is currently true in the Brazilian Amazon where land is still abundant and property rights remain largely undefined. As consequence, cattle raising in Brazilian Amazon became the main source of deforestation and carbon emission (Reis and Margullis, 1990; Chomitz and Thomas, 2000; Andersen et al., 2002; Chomitz and Thomas, 2003; Moreira and Reis, 2003).

According to Census figures, from 1970 to 2006, agro-pastoral uses of land in Brazilian Amazon—where it can be roughly equated to deforestation—increased 42 million ha or 8.4% of the geographic area of the region.[2] Pasture areas contributed with approximately 70% of the deforested area in the period, crop areas with 24% and fallow areas with the remaining 6%. The significance of cattle raising as a source of carbon emission can be assessed taking account that carbon per hectare in pasture areas is, approximately, 5 ton/ha compared to 150 ton/ha in pristine forest areas (Fearnside and Guimaraes, 1996; Reis, 1996; FUNCATE—Fundação de Ciência, 2010; Houghton et al., 2012).

Other environmental damages caused by cattle raising in the Brazilian Amazon include soil compacting which makes the recovery of secondary vegetation much slower in former pasture areas than in the other traditional agricultural uses of land (Uhl et al., 1988; Weinhold, 1996; Andersen et al., 2002). The consequences are increased water run off and soil degradation, reduced agricultural productivity and thus further stimulus to shifts in the agricultural frontier and to deforestation.

The arguments above clearly suggest a win-win situation where there is ample scope of increased efficiency in Brazilian cattle raising activities with substantial environmental benefits from reduced clearing of native vegetation. The policy solution is just to bring inefficient cattle raisers to the technological frontier (Schneider et al., 2000; Cohn et al., 2011; Assunção et al., 2013c; Strassbourg, s.d.; Strassbourg, s.d.).

The problem, however, is made more complex given the equity and incentive issues involved. Since primeval times, cattle raising has been one of the most traditional channels of economic and social mobility in agrarian economies. This is particular true for poor and small farmers to whom wealth or capital accumulation is practically synonym to increase in cattle herd. No wonder cattle and capital have the same semantic root (Rebello, 2004; Pacheco, 2009; Pacheco and Poccard-Chapuis, 2012).

More important, small farmers usually tend to adopt technologies of cattle raising which are land intensive and inefficient. The main reasons behind are restricted access to finance education, technology and the very high inter-temporal discount rates which are intrinsically related to poverty. From the individual perspective, extensive ranching becomes a rational choice in the attempt to maximize the mining of (unpaid) natural resources.

Furthermore, cattle is a fungible asset performing a multiplicity of valuable functions and services in the generation and storage of wealth. Chiefly among them are its self reproduction and accumulation capacity, resilience to unfavorable climate and geographic conditions, productive uses in generating physical force in agricultural, industrial and trans-

[2] Based upon Landsat images, estimates of deforestation from 1978 to 2006 are close 54 million ha. Estimates of deforestation based upon Census data differ from those based upon satellite images because the latter started only in 1978 and, by that time, they underestimated the extent of deforestation. Thus, deforestation in 1977 was, approximately, 47.5 million ha according to Census figures and 15 million ha according to Landsat.

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