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ANALYSIS

The economic cost of the use of fire in the Amazon

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Abstract

The objective of this study is to investigate the cost of the use of fire in the Amazon. Burnings are commonplace in the Amazon production process and contribute towards the region's agricultural expansion. Fire is used by farmers in the land preparation process and in clearing forest areas. It also helps combat plants that overrun pastures. However, fire also generates losses for farmers and landowners when it gets out of control. Since the use of fire from a private perspective obeys an economic rationale, the measurement of losses associated to the use of fire must consider the difference between intentional and accidental fires. This study introduces these important concepts which are fundamental to measure the cost of fire. Losses also reach social proportions. To address this issue, we estimated losses related to the release of carbon into the atmosphere, as well as losses due to respiratory ailments provoked by smoke from fires. Our study covered costs related to accidental pasture fires, fence losses, forest losses, carbon emissions, and impacts on human health. Our most conservative estimates indicate an average cost of around 0.2% of the region's GDP during the 1996–1999 period.
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1. Introduction

Fire is used by farmers in the Amazon to turn cleared forest into ash during the land preparation process. It also helps combat plants that overrun pastures. Burnings[1] are commonplace in the Amazon production process and contribute towards the region's agricultural expansion. There is an inherent rationality to the use of fire in the Amazon, which is similar to the one existing in other tropical rain forests. This rationality may be explained by the fact that producers are faced with resource restrictions such as the cost of labor, low agricultural revenue,

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[1] Forest clearing and land preparation method in which fire is used.

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the lack of economically viable alternatives, as well as bad quality of the soil, which would justify the intense use of fire in agriculture and cattle raising endeavors (Nepstad et al., 1999a,b, 2001).

However, fire also generates losses for farmers and landowners when it gets out of control. The risk of uncontrolled fires discourages landowners from investing in their properties, perpetuating the supremacy of cattle raising and slash-and-burn agriculture, in detriment to the establishment of agro-forest systems and sustainable forest management (Nepstad et al., 1999a, 2001).

Although the study of the use of fire may be extremely relevant, different than deforestation, research on the evaluation of costs related to the use of fire is not common. This is due to several factors. Fire generates a great variety of costs that not only have private effects, but also that affect society. A study of the use of fire in Indonesia (Varma, 2003; WRI, 2000) for the 1997–1998 period shows that the net loss of welfare reaches 7.6% of GDP. Some of the factors considered in this study are lumber, plantation and pasture losses, CO_2 emissions, health damage, the effects upon genetic resources, etc.

Since the use of fire obeys an economic rationale, the measurement of losses associated with the use of fire must consider the difference between intentional and accidental fire. As shall be seen later, our study introduces the important difference between intentional and accidental fire, which is fundamental to measure the cost of agricultural and forest resource losses.

In this study, we shall develop an initial rigorous estimate of the economic costs of fire in the Amazon. In rural properties, the main losses brought about by the use of fire occur when burnings get out of control and accidentally spread into pasture and forest areas. In this case, if the affected areas are pastures, then losses may be valued as the cost of leasing other pastures for a 3-month period, which is the time necessary for the grasses to recover. Furthermore, fence destruction must also be accounted for. Fences are important in the Amazon because this region is still largely unexplored, so the demarcation of land with fences almost becomes a property right. If the surrounding areas include forests, then the economic cost may be valued as burned commercial value lumber.

Losses may reach social proportions. In this case, we estimated losses related to the release of carbon into the atmosphere, which affects the economy negatively by contributing towards global warming, and affects the population due to respiratory ailments provoked by smoke from fires. The cost items that were estimated are those for which reliable data is available, and were divided into the following categories: costs for agricultural production (1996–1999); forest loss costs (1995–1998); costs associated to CO_2 emissions (1995–1998); and costs associated to human health damage (1996–1999). According to economic valuation practice, our exercise comprised two steps: the estimation of physical damage for each cost category analyzed, and the determining of the monetary value of the estimated physical damage.

This study is structured as follows. As in Sections 1 and 2 considers the cost of the use of fire associated with cattle-raising, namely pasture and fence losses due to accidental fires. This section also considers the forest damage. With regard to forest damage, the costs were valued by the loss of commercial value lumber due to accidental forest burnings. Section 3 deals with the valuation of damage caused to society by CO_2 emissions. These costs are estimated by the measurement of current emissions produced by the burning of vegetation biomass. In Section 4, the human health costs were obtained from the number of morbidity cases due to respiratory diseases provoked by smoke produced by fire. Lastly, in Section 5, the main conclusions of this study are presented.

2. The costs of fire for rural property owners

As mentioned in Section 1, from a diagnosis of Amazon fires two fundamental concepts may be derived: intentional fires and accidental fires (Alencar et al., 1997; Nepstad et al., 1999a). Accidental fires are the ones for which private rural property damages are assessed, because fire, when used intentionally, benefits the farmer by reducing production costs. Naturally, the total burned area is the sum of intentional and accidental fire areas.

2.1. Losses for agriculture and cattle-raising

Several types of damage are caused by fire in agricultural production. These range from the accidental burning of pastures and plantations, to the destroy-

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