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Diversifying Campos dos Goytacazes' Economy through Sugar Cane Biorefineries and Eco-Industrial Parks

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INTRODUCTION

More than 80% of petroleum federal government uptake allocated to Brazilian cities is destined to Campos dos Goytacazes – a city at north of Rio de Janeiro state. This amount is responsible for at least 60% of the its annual receipt.

At the same time, the region is well known for its historic vocation for sugar cane production. However, because of petroleum industry development and the decadence of sugar cane activity in Rio de Janeiro state, its participation on Campos' GDP has already shrank 40% since 2001[1].

Some of the problems raised by this situation are:

- Lack of long term economic sustainability because of the exploration of a finite resource;
- Low level of economic diversity – which makes the city vulnerable to any disturbance in O&G market;
- Degradation of an historically sound economic sector – which is a significant loss for the whole city.

OBJECTIVES

This study performs an analysis of current status of Campos' sugar cane sector and aims to: (1) Evaluate the potential for producing bio Platform Molecules (bPM – building block chemicals with potential use in the production of numerous value-added chemicals) from the processing of sugar cane mills' bagasse surplus; and (2) Propose a new industrial arrangement for the city's sugarcane sector based on eco-industrial parks anchored on sugarcane biorefineries.

CAMPOS' SUGAR CANE SECTOR

Campos is still the city with the second largest area for sugarcane growth in Brazil. However, it has been steadly decreasing since the 1990s and its productivity is almost 40%[2] smaller than Brazilian average (Figure 1). Also, the number of sugar cane mills dropped from 15 units in the 70s to around 4 nowadays.

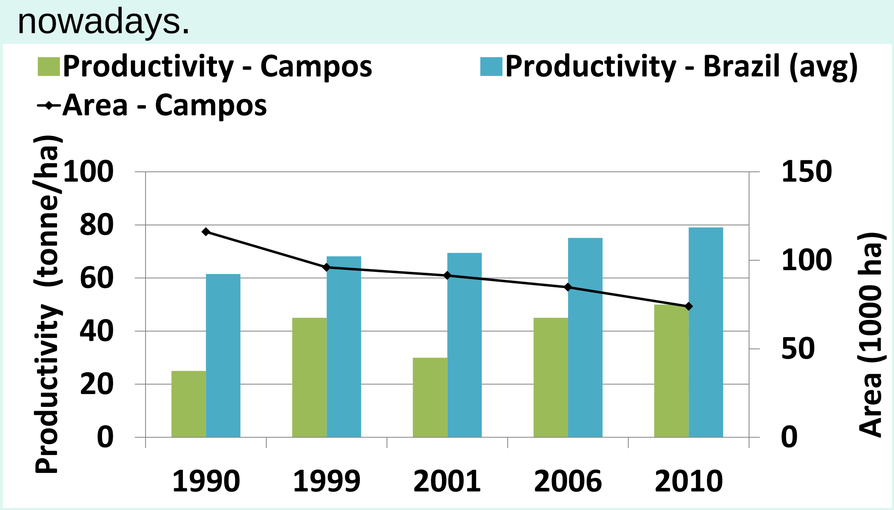

Figure 1. Area and productivity of Campos' sugar cane crops and Brazilian average productivity from 1990 to 2010. Line: Area dedicated to sugarcane plantation. Columns: Productivity of sugarcane crops.[2]

RESULTS

The biorefinery concept used in this study consists of a unit that processes: sucrose for conventional sugar and ethanol production; and bagasse for electricity generation and valuable bPM production. Table 1 shows the estimated potential yield and associate revenues of these chemicals for a typical mill.

Table 1. Estimated productivity, yield and revenues from chemicals produced in a typical [c] sugar mill

bPM from bagasse	Productivity (kg/t)	Yield (t/yr)	Gross Revenue (billion US$/yr)	Potential Buyers
Succinic Acid	1.7	3759.6	10.53	Chemical sector
Glutamic Acid	1.8	3939.8	2.44	Food sector
Levulinic Acid	5.2	11228.5	56.14	Pharmaceutical sector

[c] A typical sugar mill is characterized by sugar cane processing at 500 tonnes/hr rate and a bagass surplus of 22,8 kg/tonnes of cane[3].

The transformation industry sector of Rio de Janeiro's North region is mainly located at Campos – which holds around 70% of the companies. Facilities from food, chemicals and pharmaceutical segments comprehends 18%, 2% and 0.7% of the firms respectively[4].

CONCLUSION

Campos is facing a fragile situation because of its high liability on O&G industry. Hence, its historic vocation for sugar cane production, together with the biorefinery concept and the eco-industrial parks approach, may consist on a promising alternative toward a sustainable economic – and also social and environmental – perspective.

The next stages of the research are the identification of the location factors and definition of the industries which will compose the eco-industrial park.

REFERENCES

[1] Governo do Estado do Rio de Janeiro, Fundação CEPERJ. **Produto Interno Bruto dos Municípios 1999 – 2009**. Rio de Janeiro, December 2009.

[2] IBGE. **SIDRA-Sistema IBGE de Recuperação Automática**. Available at: http://www.sidra.ibge.gov.br/bda/default.asp. Accessed in May 15th 2012.

[3] DEDINI. **Cogeração - Uma Nova Fonte de Renda para Usinas de Açúcar e Etanol**. Simpósio Internacional e Mostra de Tecnologia da Agroindústria Sucroalcooleira. Piracicaba-SP: Dedini Indústrias de Base. 2008.

[4] FIRJAN. **Cadastro Industrial do Estado do Rio de Janeiro 2011/2012**. FIRJAN. Rio de Janeiro. 2011

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