PROGRAMA DE PÓS-GRADUAÇÃO EM CIÊNCIAS AMBIENTAIS
PROVA DE INGLÊS - Seleção do Mestrado PPGCA – 2018

Nome (letra de FORMA): _____

INSTRUÇÕES

1. A prova de inglês é de caráter classificatório.
2. Esta prova de inglês deverá ser desenvolvida em no máximo em 2 (duas) horas;
3. A prova deverá ser respondida com caneta esferográfica preta ou azul;
4. A prova poderá ser desenvolvida com consulta a dicionário de inglês;
5. Não é permitido o empréstimo de dicionário durante e após a finalização da prova;
6. Não é permitido acrescentar folhas em branco que não tenham sido fornecidas pela Coordenação do Processo;
7. Não é permitido o diálogo com os demais candidatos no momento da realização da prova;
8. Não é permitida a utilização de equipamentos eletrônicos como Palm-tops, calculadoras ou equivalentes, incluindo aparelhos de telefonia celular, durante a realização das provas.

Texto base - Carolina Monteiro de Carvalho, Semida Silveira, Emilio Lèbre La Rovere, Allan Yu Iwama. *Deforested and degraded land available for the expansion of palm oil for biodiesel in the state of Pará in the Brazilian Amazon*. Renewable and Sustainable Energy Reviews, v. 44, 2015, p. 867-876.

Palm oil and the Brazilian biodiesel program

Palm oil trees come from the west coast of Africa, and there are two species of commercial interest: *Elaeis guineensis* and *E. oleifera*, the latter being a native of Latin America. Two types of oil can be extracted from the palm, one from the fruit and the other from the seed. Palm oil trees have a 25-year life cycle and can reach up to twenty meters in height. They are widely grown in Indonesia and Malaysia, and these countries are responsible for approximately 90% of the palm oil production worldwide.

However, the two countries have been criticized due to the high environmental impact of their palm oil expansion, including inappropriate land management and deforestation of native forest, which has led to the loss of local biodiversity and increased social pressures on the local populations. Brazil is the 10th largest producer in the world although its contribution is still very marginal.

Global palm oil production has expanded rapidly in recent years and is likely to continue growing. The environmental, economic and social impacts attached to this expansion prompted the creation of the RSPO (Roundtable on Sustainable Palm Oil), an international, multi-stakeholder organization, in 2006. The RSPO develops criteria for palm oil production that incorporate sustainability along with economic use values.

Palm was introduced in the state of Bahia in Brazil in the 16th century, and in 1947, it was introduced in the Amazon, including in the state of Pará. Palm oilseed is promising because of the potential oil yield that can be accrued per hectare, approximately 368 t of oil/km^2, which is the highest among the various oilseeds.

In contrast, soy produces only 42 t of oil/km^2. Palm oil is well adapted to the Amazon region, and it is a perennial crop that could be used to promote the social inclusion of small farmers and to help recover degraded lands. In addition, once biodiesel production is in place in the region, palm oil can also be used as a substitute in diesel generators and boats, which are widely used for local and regional transport. The state of Pará has favorable environmental conditions for palm crops, including rainfall of 2500 mm/yr, 2000 h of sunlight that are well distributed throughout the year, temperatures between 24 °C and 28 °C and humidity between 75% and 90%.

In 2004, the Brazilian government launched the National Biodiesel Program (PNPB) to increase energy security through the sustainable production of biodiesel from oilseeds. The program focused on social inclusion and regional development with an emphasis on job and income generation and the sustainable use of various oilseeds. The program also hoped to reduce GHG emissions. Financial incentives were provided to foster the production of various crops. The mixing of 2% biodiesel into the fossil diesel began in 2008, and in 2010, this amount was raised to 5%; there are plans to increase the mix to 20% in 2020. At present, the biodiesel mix is at 7.6%. In this context, palm oil is an attractive crop due to the high oil yields that can be achieved, its potential to adapt to climate change, and the opportunities it presents to promote social inclusion and sustainable development.

Another feature of the National Biodiesel Program was the creation of the Social Fuel Label, which is granted to biodiesel producers that use oilseeds produced by small farmers. When a certain amount of oilseeds originating from small-scale producers are used, the biodiesel producer is entitled to tax reductions. The minimum amount of raw material from small farmers required to obtain the tax benefits varies among the country's macro-regions: 30% in the Northeast, Southeast and South Regions and 15% in the North and Central-West Regions. In addition, the contracts made with small farmers should be intermediated by small farmer representatives, and the producer company must provide technical assistance and training to the farmers.

In the beginning of the PNPB program, soy and animal fats comprised most of the source material for biodiesel, indicating that the potential of various crops was not being fully explored despite increasing oil seed production. Brazil has a diversity of potential feedstocks, such as castor beans, palm oil, soy, Jatropha, sunflower and others as well as a significant amount of available land. To explore this diversity, a solid structure for the production of various feedstocks and the distribution of program benefits needs to

be implemented under the PNPB. The PNPB can currently be considered to be a successful program in terms of production targets as it did achieve the proposed 5% biodiesel mix, which amounts to the production of no less than 2.4 billion litres of biodiesel per year. Moreover, the production of oil seeds has increased continuously over the years. However, from the social and environmental point of view, there is still a lot to be done because the inclusion of small farmers in the program has been limited, the diversity in the sources of oilseeds has not been fully achieved, and environmental controls, especially those under the application of the Social Fuel Label, have been inadequate.

As previously mentioned, 1400 km^2 of land in Brazil are currently being cultivated, and there are plans to expand palm oil crop production to a total of 3300 km^2 in Pará by 2020. This expansion can bring economic, social and even environmental benefits to the region, however, negative impacts can be also expected, such as deforestation. Native forest is cleared to make room for crops, releasing GHG emissions and reducing biodiversity and ecosystem services in addition to affecting local communities that depend on forest resources.

Palm oil expansion should be carefully conducted. Because of that, the ZAE (Agroecological Zoning) and the Sustainable Palm Oil Program were launched to regulate this expansion. The ZAE provides the basis for pursuing social, economic and environmental sustainability in the expansion of palm oil crops and indicates what land is most suitable for growing palm by taking into account soil characteristics, topography, climate and crop-specific environmental factors. It has identified approximately 130,000 km^2 of deforested land that is potentially available for palm oil expansion in Brazil, excluding forested areas, Indian reservations and protected areas. Based on that information, it is possible to identify the areas with the highest potential for palm crops and monitor the expansion to avoid negative environmental impacts.

ZAE classifies land according to its palm oil potential: preferred (high potential), regular (medium to high potential), marginal (low potential), not suitable (no potential) and not mapped (native forest and protected areas). The ZAE was developed to account for two levels of crop management: level B is the adoption of farming practices that reflect an intermediate degree of technological inputs with modest capital investment, and level C reflects agricultural practices incorporating a high level of technology, including mechanization. The ZAE has concluded that as a perennial crop, palm oil has the potential to generate income, protect the soil against erosion and degradation, and provide a high rate of carbon sequestration.

The Sustainable Palm Oil Program was launched after the ZAE and aim to regulate the expansion of palm oil production, restrict it to degraded lands and areas that were deforested before 2008, and support the recovery of these degraded areas. The deforestation of native vegetation for the purpose of planting palm oil is strictly forbidden. Therefore, this is an opportunity to recover degraded land and related environmental and social benefits, since these directives are followed. To achieve that, a more deep analysis regarding degraded land are needed.

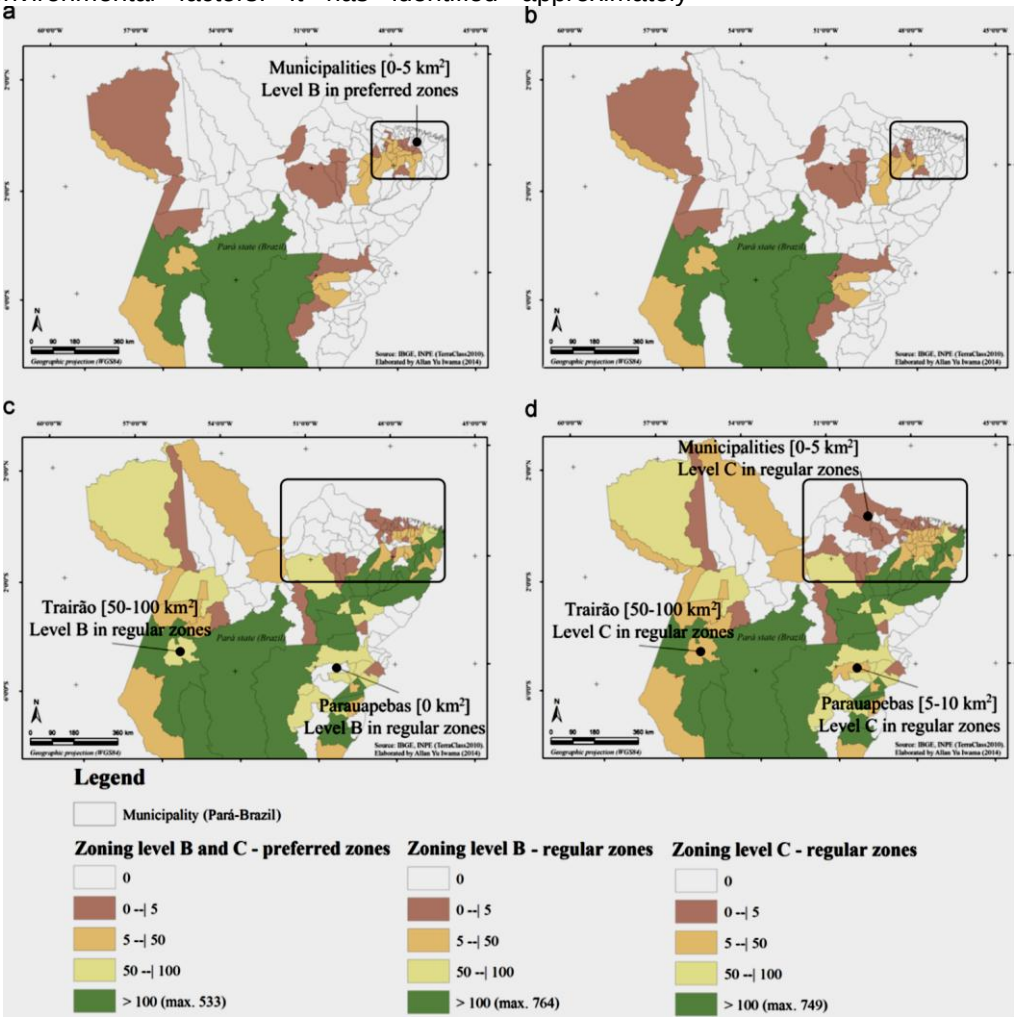

Fig. 4 The distribution of deforested and degraded land in Pará state, crosschecked with ZAE (preferred and regular zones), in ranges of extent from 0-5 km2, 5-50 km², 50-100 km² and 4100 km². (a) Land in the preferred zone of ZAE level B, (b) land in the preferred zone of ZAE level C, (c) land in the regular zone of ZAE level C and (d) land in the regular zone of ZAE level C.

Questões:

1) Elabore um Resumo contendo de 10 a 15 linhas, que contenham os principais argumentos discutidos no fragmento de texto "**Palm oil and the Brazilian biodiesel program**", de Carvalho et al (2015).

2) *Fig. 4 shows how the deforested and degraded land is distributed throughout the palm oil producing municipalities and the whole state, taking the ZAE classification into account*. **Apresente os argumentos do texto que apoiam esta afirmação.**