

Biomass Symposium

The State of Biomass Research and Development in Angola

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Learning objectives/outcomes

1. Explain the basic aspects of the forest biomass in Angola

2. Describe vegetation index, land use and land change and land cover map of Angola

By the end of this presentation you should be able to:

4. Know some research done by *FCA/UJES* about Angolan biomass

3. Analyse the accessible of energy forest and the tree cover gain in Angola.

Presentation overview

1. Introduction.
2. Biomass in Angola.
3. Vegetation index, land use and land change in Angola.
4. Land cover map of Angola – esa 2016.
5. Accessible and energy forest energy annual increase > 50 mw.
6. Comparison of tree cover gain in Angola and other countries.
7. Angola's forest biomass research.
8. Some results of this research.
9. Opportunities and challenges.

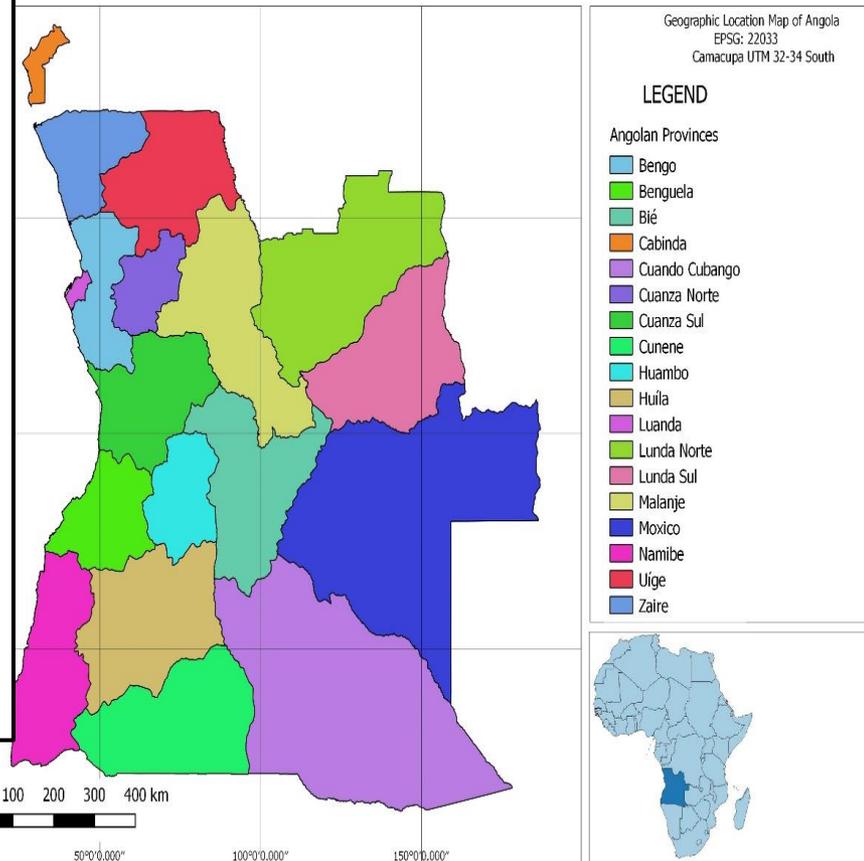
INTRODUCTION

Angola is located on the west coast of Africa below the equator and east of the Greenwich meridian, has 18 provinces.

Six terrestrial biomes can be identified in Angola:

1. *The Guinea-Congolese forest.*
2. *The Savannah Congolese Mosaic.*
3. *The Afro-montana forest.*
4. *The Karoo-Namibe biome.*
5. *The Kalahari-Plateau biome.*
6. *The Zambezian biome.*

Angola's forest biomass potential

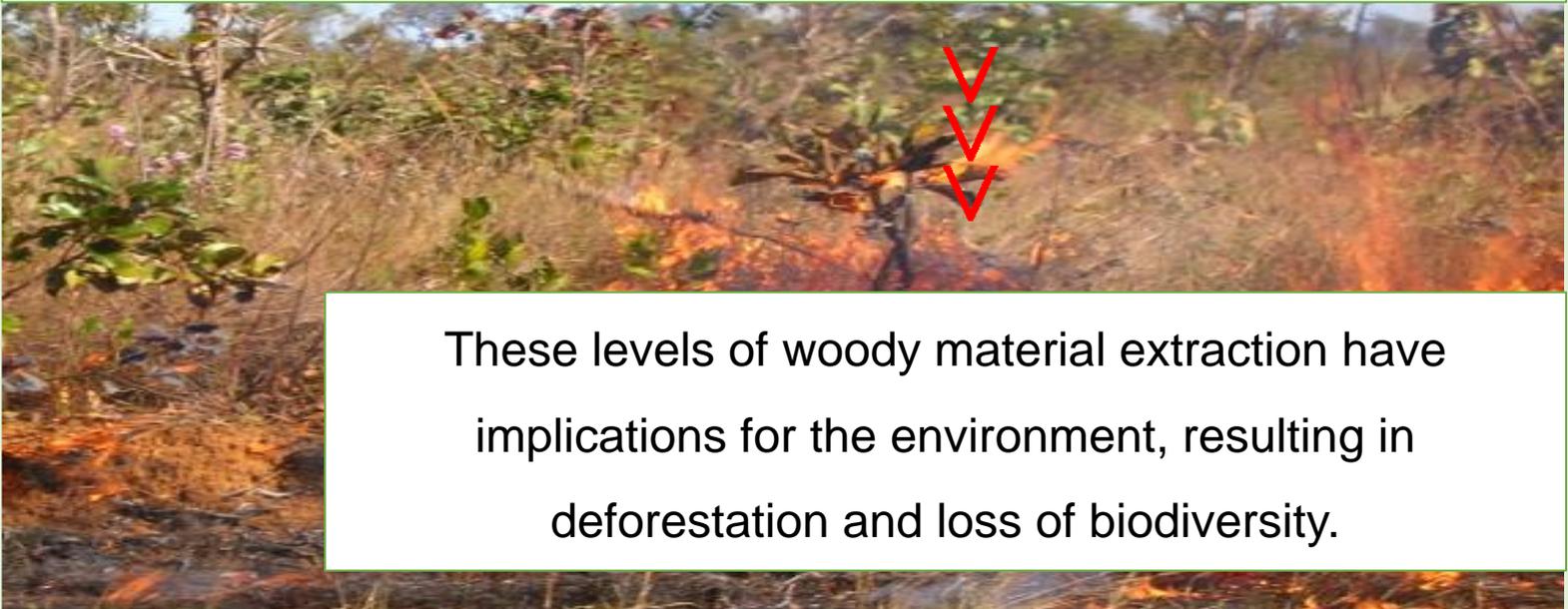


BIOMASS IN ANGOLA

- The use of biomass for power generation accounts for about **57% of the energy consumed in the country**. For this reason, wood and charcoal represent the first source of energy for domestic purposes.
- This consumption occurs mainly in the vicinity of **large urban centers**, resulting in rapidly expanding deforestation belts, especially **as rural populations migrate** to major urban centers in recent years.
- The arid and semi-arid areas of the coast and south of the country, although not very **representative from the point of view of forest cover**, are important centers of **production and consumption of firewood and charcoal**, which contributes to the destruction of **fragile ecosystems existing forests**, thus accelerating the process of **desertification** in these areas.

Cont...(Biomass in Angola)

The techniques for converting firewood to charcoal are very rudimentary and low yield, which causes a poor use of woody material and an increase in the final cost of the product. This leads to pressure on forest resources on a small number of apparently higher calorific species whose end product is more widely accepted on the market.



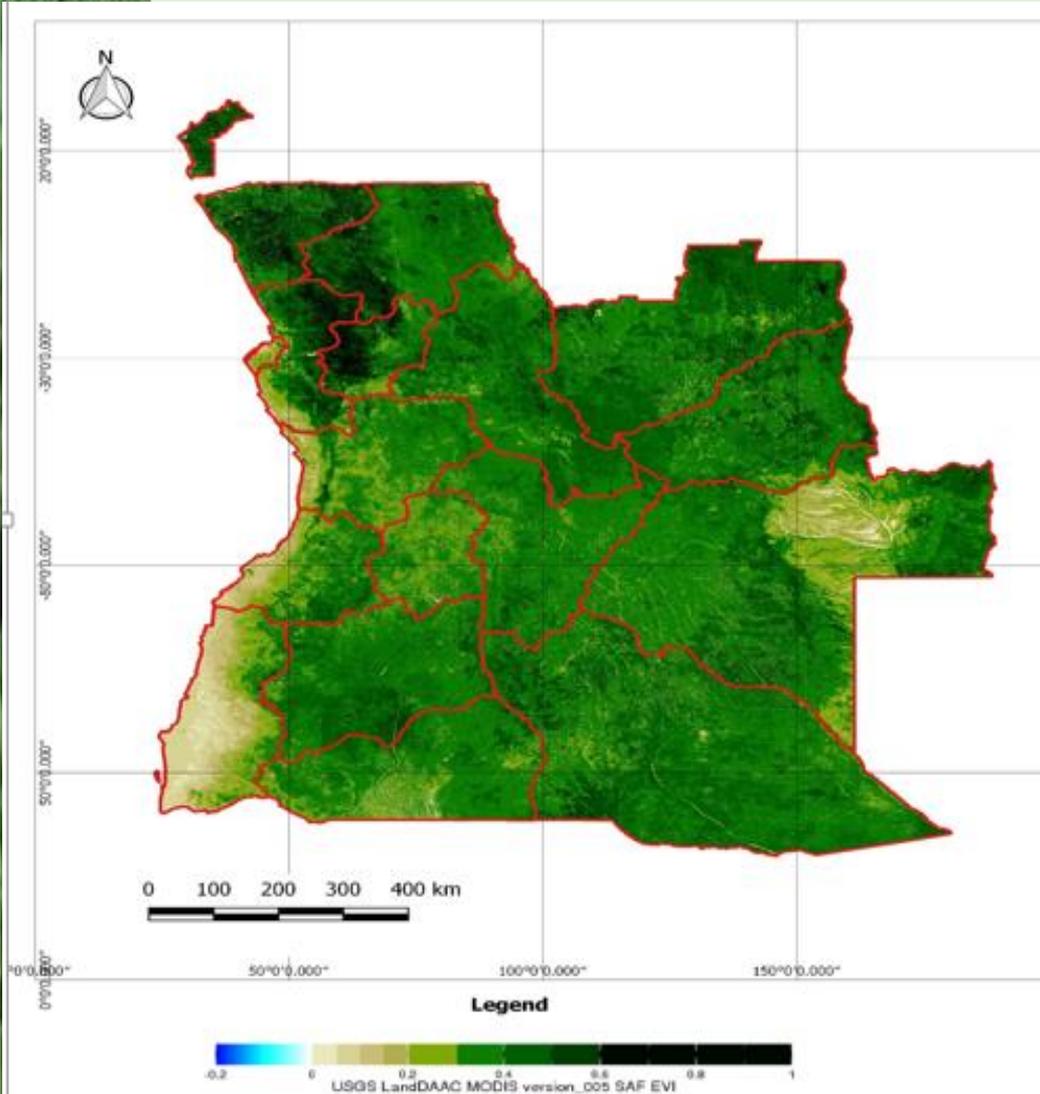
These levels of woody material extraction have implications for the environment, resulting in deforestation and loss of biodiversity.

Cont...(Biomass in Angola)

IT IS IMPORTANT TO EMPHASIZE: The assessment of Angola's biomass energy resource generally involves:

1. **Forest residues and energy crops (Six biomes);**
2. Residues from the agri-food industries (especially sugar cane);
3. Agricultural and livestock waste;
4. Urban solid waste.

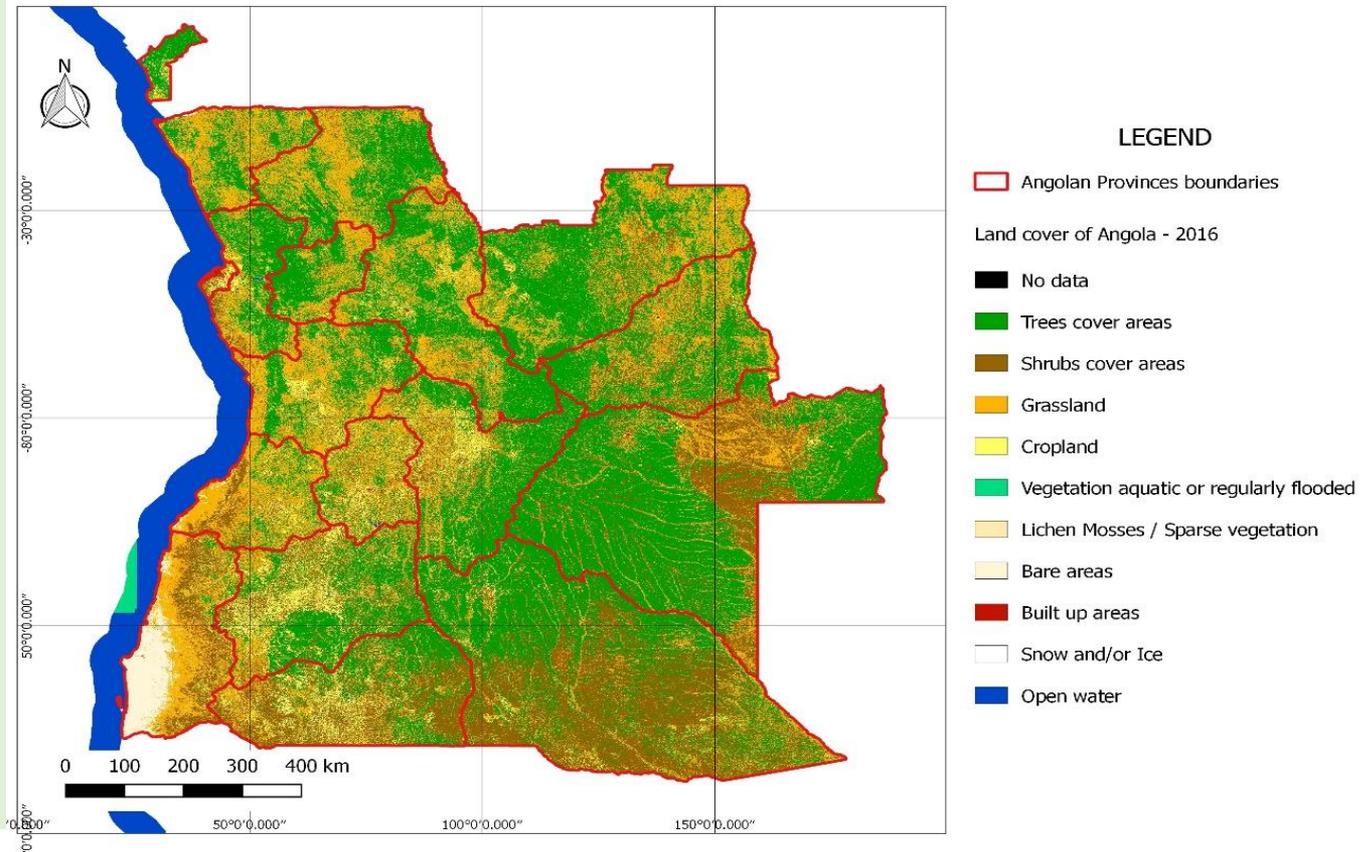
Vegetation index, land use and land change in Angola



The highest biomass concentration in Angola is located in the north and east of the country, which is related to the presence in these areas of the tropical rainforests of Mayombe (to the north) and the Congo Basin (to the east).

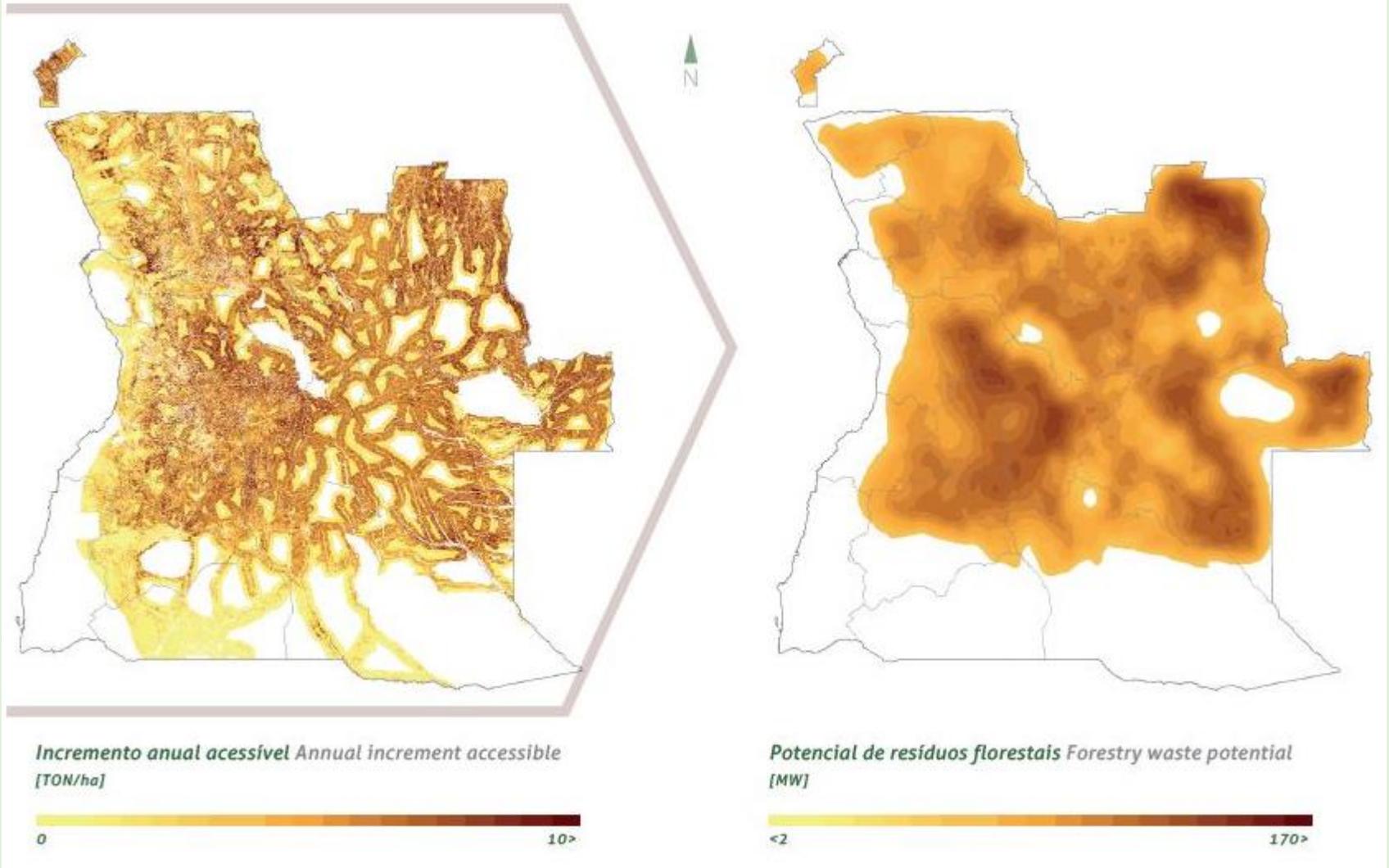
The central and southern zone of the country has low EVI values due to the occurrence in these areas of the important Miombo forest, which occupies an area in Angola of 45%, although.

Land cover map of Angola – ESA 2016



It is estimated that forests (**natural and planted**) in Angola occupy an area of 69 382 687 ha, representing 55.6% of the total area of the country. The remaining area is occupied by crops, shrubs cover areas and herbaceous vegetation, as well as bare soil and built up areas.

Accessible and energy forest energy annual increase > 50 mw



Comparison of tree cover gain in Angola and other countries

Table 1. Tree cover gain (>50% canopy) in Angola compared to other areas

| Country | Tree cover gain (kha) |
|-----------|-----------------------|
| Angola | 63.8 |
| Austria | 65.8 |
| Cameroon | 65.1 |
| Ethiopia | 62.5 |
| Swaziland | 61.0 |

ANGOLA'S FOREST BIOMASS RESEARCH

The biomass studies in Angola (FCA/UJES*) are framed in the following items:

- Wood Chemistry and Technology,
- Agro-Hissing-Pastoral,
- Forestry and Forest Resource Management.

ANGOLA'S FOREST BIOMASS RESEARCH

EFFICIENCY OF THE STOVES EMPLOYED IN CURRENT LIFE AND THE IMPROVED FIRE PROTOTYPE



ANGOLA'S FOREST BIOMASS RESEARCH

SUMMARY TABLE OF STATISTICAL ANALYSIS

| Measures | Three stones cooker | Traditional stove | Improved cooker | Minimal Significant Difference |
|--|---------------------|-------------------|--------------------|--------------------------------|
| Thermal Efficiency Power (%) | 15,13a | 20,40a | 19,23a | 9,46 |
| Specific Power of Fuel Consumed (MJ / min · L) | 0,07a | 0,129a | 0,137a | 0,10 |
| High Power CO (g / MJ) | 168,20a | 325,9a | 392,9a | 350,03 |
| Low Power CO (g / min · L) | 2,794a | 7,872a | 10,471a | 10,70 |
| High Power PM (mg / MJ) | 436a | 1.718a | 4.480 ^a | 598,73 |
| Low Power PM (mg / min · L) | 0a | 0,2a | 0a | 0,30 |
| Interior CO Emissions (g / min) | 7,476a | 21,58a | 17,269a | 22,92 |
| Interior PM Emissions (mg / min) | 11,8a | 91,2a | 162,9a | 217,7 |

*****Values with distinct letters on the same line indicate significant differences with $\alpha < 0.05$ (Tukey test) and below are the respective significant minima.

ANGOLA'S FOREST BIOMASS RESEARCH

Environmental education



Some results of this research

1. An exploratory evaluation of the pulpability of *Brachystegia spiciformis* and *Pericopsis angolensis* from the angolan *Miombo* woodlands.
2. Basic density and anatomical wood characteristics of 9 (nine) species of the Maiombe forest, province of Cabinda, Angola.
3. Deforestation rates assessment in Buco Zau municipality (Cabinda) between 2000-2017 using landsat sensor data
4. Environmental awareness of the Cachindongo and Bonga communities, Huambo province.
5. Evaluation of tree vegetation in the main streets of the city of Huambo-Angola.
6. Promotion of sustainable charcoal in Angola through a value chain approach.
7. Structure and dynamics of the regeneration of a Miombo population in the town of Chianga, Huambo province, Angola.

OPPORTUNITIES AND CHALLENGES

- Angola has enormous potential to gradually promote the replacement of forest biomass consumption by butane gas and other energy sources, thereby providing the sustainability of forest ecosystems.
- There is the possibility of introducing and using sources and technologies alternative to forest biomass, adapted to the traditions and cultures of the population, as well as the use of improved stoves that, in addition to reducing and improving the consumption of woody material for energy generation, would bring benefits. the health of the population, as such stoves reduce the emission of toxic gases inhaled by users.

Opportunities and Challenges (Cont.)

- The existence of a department for the management and transformation of forest products from the Faculty of Agricultural Sciences of José Eduardo dos Santos University, which has contributed greatly to the Education, Training and Research of biomass aspects through national and international partnerships.



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Thanks for listening!

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