



Harvesting Energy: The Power of Biomass Agricultural Residues in Indonesia

Digging into the background of the research of Hidayatul Fitri, PhD student at the Biogas Research Team under the guidance of Assoc. Prof. Dr. Hynek Roubík.

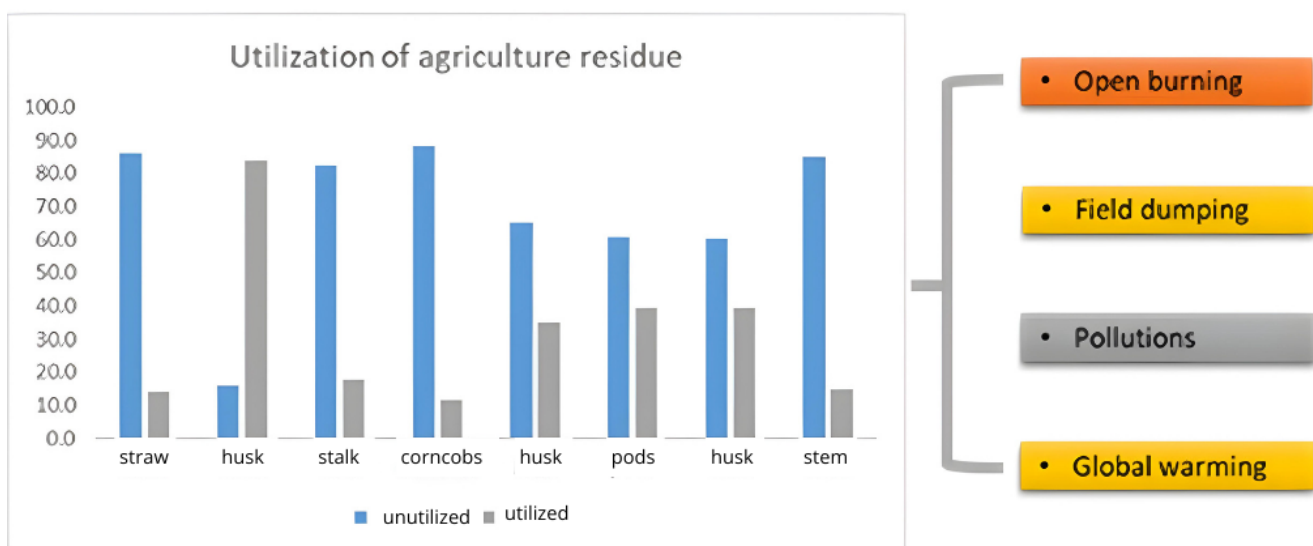
The young researchers of the Biogas Research Team (BRT) are diligently working to increase the visibility of the success and potential of bioenergy sources across the globe. From Indonesia to Vietnam to Ethiopia, their efforts to highlight the impact and importance of incorporating renewable energy technologies are creating change worldwide.

With this popularization series, we aim to showcase the impact of our research on renewable energy in strategic countries around the globe.

Agriculture in WNT

Agriculture is a critical sector that builds Indonesia's economic and food security, which is known as an agrarian country. Agriculture production in the West Nusa Tenggara province (WNT) is diverse, characterised by traditional and small-scale agriculture, and contributes a vital role to the region's economy and culture. Production depends on the arable land and the climate conditions of each part of the region. Rice, corn, cacao, and coffee are the major commodities growing in this region that contribute to the fulfilment of needs for domestic consumption and even the export market. The WNT region, with abundant agricultural residues, provides an opportunity to harness the power of biomass for clean energy generation. In this article, we explore how the agricultural residue on the WNT can power a cleaner and greener future for the region.

What is the main problem after harvesting?



Percentage of surplus residues and impacts on the environment.

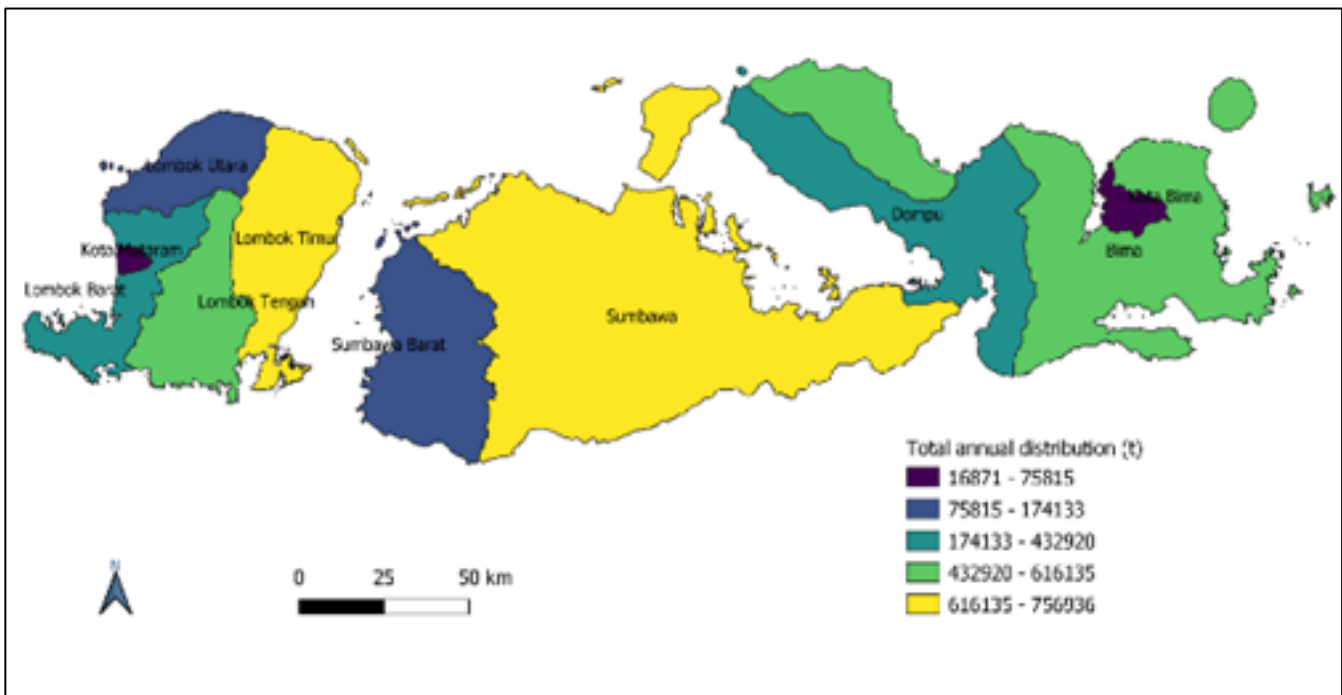
Crop residue is the material left on the land after harvest. Residues left in the field can carry pathogens or pests that can affect future crops. However, farmers, especially in developing countries, are prone to burn the residues left in order to speed up preparation for the next crop. Open burning of residues in the field is a common agricultural practice that is considered a convenient and quick way to clear the field. Burning open fire can have several negative impacts on the environment and health. Smoke pollutes the air we breathe. Ash pollutes our soil, groundwater, lakes, rivers and streams.

Unlocking the Potential

Biomass refers to the organic material used for energy production, which varies in the source such as agriculture residues, animal waste, municipal waste, and industrial waste. Agro-waste material is composed of cellulosic components, which are suitable for bioenergy generation. Unlike fossil fuels, which contribute to pollution, biomass offers a renewable and eco-friendly

source of energy. In addition, excess residues with abundant amounts can be an alternative to energy sources without any competition to food security.

The agricultural residue in WNT, a natural by-product of farming activity, includes the leftover stalk, husk, and straw. Instead of discarding the residue as waste or burning in an open area, they can be converted into valuable energy through several methods like biogas and biofuel production.



Potential biomass of agriculture residues in the WNT region by Fitri et al. (2023)

Environmental benefits

The generation of energy from agriculture residues is a sustainable and eco-friendly alternative to replace fossil fuels. The dependence on unsustainable energy, such as coal and fossil fuel, can be reduced by deploying and developing energy production from biomass use. The emission level of biomass is way smaller than fossil fuel, which helps to reduce the greenhouse effect. The use of biomass for bioenergy resources is very promising, particularly for the WNT region, with the potential for unused agricultural residues. Furthermore, it can lead to the construction of waste management and promote nutrient cycling in the agriculture field.

Way forward

By recognising the potential of agriculture residues, the WNT region can take a significant step toward a cleaner and more sustainable future. Considering the residues' specific characteristics, choosing an appropriate technology for energy transformation is essential. Also, note that crop rotation and harvest frequency are used to estimate the residues' availability for energy generation. Resource management, sustainable collection, and technology investment are crucial to gain an effective transition to a greener future.

Government and community participation should play an imperative role in maximising the potential of agriculture by-products.

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Interested in more details? Check out:

Fitri, H., Gürdil, G. A., Demirel, B., Cevher, E. Y., & Roubík, H. (2023). Biomass potential from agricultural residues for energy utilization in West Nusa Tenggara (WNT), Indonesia. *GCB Bioenergy*.

<https://onlinelibrary.wiley.com/doi/full/10.1111/gcbb.13100>