ASEC 2024 Conference
The 5th International Electronic Conference on Applied Sciences
04–06 December 2024 | Online
MDPI

# A Systematic Review of Biomass-Derived Potassium Extraction for Potassium-Ion Batteries: Techniques, Challenges, and Sustainable Energy Solutions

**Bjorn Louis Dizon, Carlou Eugico, Rugi Rubi**
**Adamson University**

## INTRODUCTION & AIM

This review will explore innovations for agricultural waste management, assessing the current development in post-harvest waste utilization. The rapidly growing demand for food stock pressures the agricultural sector to develop an able supply, needing more consideration of the hazardous implications to human health and the environment. Presently, burning crop residue is a prominent method of managing post-harvest waste. This intensified agriculture exploited the environment beyond what is sustainable, resulting in negative effects: air quality deterioration, smog, haze, heat waves, and various health issues.

In the Philippines, it is estimated that it will take 30 years for farmers to withdraw from the burning practice. This practice significantly depletes soil nutrients, leading to a surge in demand for fertilizers. Compost fertilizers value at an annual average of PHP 25 billion.

Accordingly, this review will identify the gap in agricultural biomass residue and its utilization in energy, particularly for potassium-powered batteries. Focusing on extracting invaluable elements from agricultural production byproducts, while minimizing non-reusable wastes. Integrating existing research and technologies that can harness the extracted elements beyond agricultural applications, in the energy department. The analysis aspires to pave the way for innovations that address waste and energy concerns.

## METHOD

This systematic review evaluates the current methods of extracting potassium from biomass, with a focus on its application in K-ion batteries (KIB). Following PRISMA guidelines, a systematic search was conducted across major databases using broad keywords related to biomass-derived potassium extraction and its use in energy storage. Articles were reviewed for relevance, and a subset was selected based on criteria such as extraction techniques (pyrolysis, acid leaching, and alkaline hydrolysis), biomass types, and battery applications.

## RESULTS & DISCUSSION

This literature review tackles invaluable ideas focused on biomass-derived potassium for K-ion Batteries, and the extensive energy dilemma in Philippines.

Disposal of agricultural residues poses severe challenges to the Philippines, impacting the environmental and resources sector. In order to mitigate such implications, it is imperative to enhance post harvest residue management, an innovative way of dealing with these byproducts is utilizing them in energy generation.

Studies have shown that the cellulose-rich agricultural residues like banana fibers and rice straw is fit for bioenergy production. The utilization of these materials will present renewable energy solutions, such as biofuel and biogas generation from agricultural residues. This has the potential to improve the Philippines' energy security.

Extracting valuable elements, particularly potassium, from agricultural biomass is yet to be fully explored. Few of the methods found are pyrolysis, acid leaching, and alkaline hydrolisis. Optimization to improve the efficiency and mitigate the negative impact of these processes still require thorough research.

Today, Philippines faces a surge of trouble in energy resources, mainly due to the inability to cater the demand, which calls an immediate action to navigate alternative renewable energy sources. Exploring abundant renewable resources, such as biomass, can help alleviate the country's energy crisis.

Potassium-ion batteries are entering the picture as a potential substitute for energy generation due to their capacity to exploit more copious resources. The shift will open an opportunity for fostering renewable energy remedies. This emerging technology can help alleviate detrimental effects associated with the conventional energy generation technologies while providing comparable efficiencies and applications.

However, gaps in bridging agricultural waste management, potassium extraction, and K-ion Batteries still exists. Further research is necessary to scrutinize the integration of the aforementioned disciplines.

## CONCLUSION

Capitalizing on post-harvest byproducts for sourcing potassium presents an innovative method in dealing with the energy dilemmas in the Philippines. Through enhancing various approach in potassium sourcing and nurturing KIB, energy security and environmental sustainability is attainable.

## FUTURE WORK / REFERENCES

Gomez, C. C., Demafelis, R., Magadia, B., Matanguihan, A. D., Estante, E. P. V., Nuñez, C. J. E., Sumague, J. V., Chong, K., Roeder, M., & Jamieson, C. (2024). Greenhouse Gas Mitigation Potential of the Enhanced Rice Straw Biogas System in the Philippines. IOP Conference Series: Materials Science and Engineering.

Kamal, A., Taguba, M., Marasigan, A. M. G., Samonte, R. M., Bata, A., Manhic, A. G., Alzona, A., & Santos, F. (2020). Characterization of Alkali-Treated Banana Fiber and its Effects as Web Reinforcement on the Axial Load Capacity of Concrete. Key Engineering Materials.

Balbin, A., Capilitan, J., Taboada, E., & Tabañag, I. (2023). Characteristics of Nickel Laterite Mine Waste in Caraga Region, Philippines and Its Potential Utilization. Nature Environment and Pollution Technology.

Gibe, H. P., & Cayetano, M. (2017). Spatial estimation of air PM 2.5 emissions using activity data, local emission factors and land cover derived from satellite imagery. Atmospheric Measurement Techniques.

Jr., V., Alvizo, N., Acuña, G., Lambayan, N. Jr., & Remolino, G. J. (2023). EVALUATION OF SANITARY LANDFILL IN DALAGUETE, CEBU, PHILIPPINES BASED ON NORTHERN TERRITORY ENVIRONMENTAL PROTECTION AUTHORITY. *Journal of Wastes and Biomass Management*.