

# DESIGN OF BIOCHAR YIELD PREDICTION MODEL VIA ADAPTIVE NEURO-FUZZY INFERENCE SYSTEM FOR ECONOMICALLY VIABLE AND ENVIRONMENTALLY FRIENDLY ASSESMENT

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## ABSTRACT

Sustainable agricultural development is one of the major challenges that call for effective actions.

Agricultural residues and waste have been long used as an important bioresource for energy and material recovery. Biochar has great prospect which can improve soil properties, crop productivity and carbon sequestration in soil. Biochar is produced by pyrolysis of agricultural waste and residues. Slow pyrolysis process can obtain a relatively large proportion of biochar content.

The large amount of agriculture waste produced by agriculture and animal husbandry has prompted environmentally friendly treatment of biomass and nutrient recycling. Developing efficient and low energy consuming biomass carbon industry can be achieved by producing carbonized products for reuse in agriculture and for satisfying energy demands in agriculture production and rural area. The production and application of biochar in the rural area serve a suitable choice for pollution control and carbon abatement.

The agriculture sector has unique characteristics, it is main contributor to climate change. Meantime, it also affected by climate change. 20% to 35% of the greenhouse gases produced are related to the agricultural sector, while some are as high as 50%. Slow pyrolysis of agriculture waste produces relatively high proportion of biochar and bio oil, bio-gas. There are several factors will affect biochar yield and properties. Reaction temperature, reaction time, heating rate will

affect biochar yield, and different type of biomass, moisture content, and particle size also will affect biochar properties. Biochar at 600 °C had better physiochemical properties than biochar at 400 or 500 °C. In this work, the data collect from previous literature reviews, which the properties of feedstocks and process conditions data are collected. After built up database, adaptive neuro-fuzzy inference system (ANFIS) is used for prediction of biochar yield and properties.

The traditional prediction methods have been introduced in this paper, such as the least square-support vector machine (LS-SVM), artificial neural network (ANN) and generalised linear model. They will be compared with ANFIS model in this paper.

**Keywords:** Biochar, Agriculture development, Biochar prediction, ANFIS model.