كلية الزراعة
قسم الهندسة الزراعية

جامعة الفيوم

البحث الثالث

مشترك - منشور بمجلة دولية ((غير مستخلص من رسالة))

عنوان البحث:

Machine learning and analytic hierarchy process integration for selecting a sustainable tractor

دمج التعلم الآلي وعملية التحليل الهرمي لإختيار جرار زراعي مستدام

Abstract:

Selecting the appropriate tractor for small-scale farms is a complex process due to the multitude of technical, environmental, and economic criteria that must be evaluated. This study addresses this challenge by integrating the Analytic Hierarchy Process (AHP) with machine learning (ML) to reduce the number of criteria and simplify the decision-making process. The research aims to determine the most relevant criteria aligned with sustainable development goals for selecting the right tractor, focusing on small farms in the Egyptian Delta. Four tractors, with horsepower ranging from 55 to 95, were evaluated based on inputs from forty-two governmental service providers in the study area. Initially, nine criteria were identified, encompassing key technical, environmental, and economic factors. These criteria were reduced to three—price, power, and maintenance costs by weights 0.142, 0.334, and 0.525, respectively—using Hierarchical Agglomerative Clustering with Euclidean distance. This reduction streamlined the selection process, making it more practical for farmers. Results show that the second tractor (T2), with a priority score of 0.326 and a normalized value of 33.4%, emerged as the optimal choice for small-scale farmers, outperforming the first tractor (T1) (28.7%) and third tractor (T3) (21%). Integrating AHP and ML simplifies tractor selection, ensuring sustainability, cost-efficiency, and operational effectiveness.

الباحثون:

Hassan A. A. Sayed[1,2], Mahmoud A. Abdelhamid[3], **Tarek Kh. Abdelkader[4,5]**, Qinghui Lai[1], Ahmed M. Mousa[2] & Mohamed Refai[6]

1 School of Energy and Environment Science, Yunnan Provincial Rural Energy Engineering Key Laboratory, Yunnan Normal University, Chenggong University Town, No. 768 Juxian Road, Kunming 650500, P.R. China.

2 Department of Agricultural Power and Machinery Engineering, Faculty of Agricultural Engineering, Al-Azhar University, Cairo 11751, Egypt.

3 Department of Agricultural Engineering, Faculty of Agriculture, Ain Shams University, Cairo 11241, Egypt.

4 Solar Energy Research Institute, Yunnan Normal University, Kunming 650500, China.

5 Department of Agricultural Engineering, Faculty of Agriculture, Fayoum University, Fayoum 63514, Egypt.

6 Department of Agricultural Engineering, Faculty of Agriculture, Cairo University, Giza 12613, Egypt.

المجلة وتاريخ النشر:

Scientific Reports (**2024**), 14(1), 26735.
https://doi.org/10.1038/s41598-024-78023-z