氣候變遷下灌溉配水計畫可靠度分析-以金門農業灌溉區為例

Reliability analysis for the climate change agricultural irrigation water allocation planning: a case study of kinmen region agricultural irrigation area

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在氣候變遷背景下，分析灌溉配水計畫的可靠性是確保農業可持續發展的關鍵，本研究希望以現有的一套灌溉配水模式，與當地農民配合調整灌溉模式的可行性研討，並以氣候數據分析、降雨時間分布模擬及灌溉模式測試來確認模式是否能在不同情境皆能提供良好的用水調配，有效應用做為水源的民生回收水，提高整體的種植效率。

金門地區灌溉作物以小麥及高粱為主，約在每年 1-6 月種植小麥，7-12 月種植高粱，經由金門農會保價收購此兩種作物。因此，當地農民時常出現灌溉配水不均的情況，在接近水源區的灌溉方式多採漫流的方式，將灌溉水漫流至整個田區；在無水源的區域，則採用水車運水以噴灑的方式噴灌，不論是採用哪種方式灌溉皆會產生灌溉水源分配不均甚至搶水的情況發生。本研究將根據試驗田驗證結果，調整和優化灌溉配水模式，使用 Python 或 R 進行高解析度氣候數據，並利用歷史數據進行偏差校正，確保預測的準確性，最後，將數據劃分為不同時間段，計算年降雨總量和月均降雨量，並分析不同情境下的降雨變化，分析金門地區的降雨變動趨勢，將使用基於水資源評估與規劃系統(WEAP)的灌溉配水模式測試高粱及小麥輪種的模擬產量，評估在未來不同情境下的產量能否維持良好的產出。

關鍵字

中文：氣候變遷、水資源評估與規劃系統(WEAP)、灌溉作物

Abstract

In the context of climate change, evaluating the reliability of irrigation water distribution plans is crucial for achieving sustainable agricultural development. This study aims to utilize the existing irrigation distribution model in collaboration with local

farmers to assess the feasibility of adapting the current irrigation system. By incorporating climate data analysis, rainfall distribution simulation, and irrigation model testing, the study seeks to verify whether the model can deliver effective water allocation across different scenarios. A particular focus is on the potential use of recycled water as a supplementary source to enhance water availability and improve overall crop productivity.In Kinmen, the primary irrigated crops are wheat and sorghum. Wheat is cultivated from January to June, while sorghum is planted from July to December. Both crops are purchased at guaranteed prices by the Kinmen Farmers' Association, incentivizing continuous rotation but often leading to imbalanced irrigation practices. In areas near water sources, flood irrigation is commonly used, while distant areas rely on water transported by trucks for spraying. This disparity results in uneven water distribution and, at times, competition for water access.To address this, the study will refine the irrigation distribution model through experimental field validation and model optimization. High-resolution climate data will be processed using Python or R, with bias correction applied to historical datasets to enhance forecasting accuracy. The rainfall data will be analyzed by aggregating total annual rainfall and average monthly rainfall, simulating changes under various climate scenarios.The study will further investigate rainfall trends specific to Kinmen and apply the Water Evaluation and Planning (WEAP) system to simulate irrigation distribution for wheat–sorghum rotation. The simulated yields under different climate scenarios will be evaluated to determine whether stable agricultural output can be maintained, ultimately supporting sustainable farming practices and equitable water resource management in Kinmen.

英文：Climate Change, Water Evaluation And Planning System(WEAP), Irrigation Crop