土壤分層概念於土壤水分移動模式之應用研究

Application Study of the Concept of Soil Stratification in Soil Moisture Movement Model

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摘 要

擬定旱田灌溉計畫時，需要掌握土壤內的水收支變化，尤其在常年降雨量低的乾燥地區，對於灌溉水量的供給與拿捏非常重要，若是能精準掌握土壤水分量之變化，可以作為灌溉策略制定的依據，也可以避免灌溉過剩造成浪費。

本研究在前人所修正之旱田水筒的基礎下，將水筒模式引入土壤分層概念，在既有的修正型旱田水筒下方增加一個水筒，將總土層分為兩段進行模擬與分析，並以溪州包心白菜試驗地作為一般旱作之研究對象，新化甘藷試驗地為根莖作物之研究對象，分別建置修正型旱田水筒模式及二段式旱田水筒模式，並模擬土壤水分移動行為，最後探討不同旱田水筒模式於一般旱作與根莖作物的適用性。

一般旱作模擬結果顯示，二段式旱田水筒參數數量相較於修正型旱田水筒多了將近一倍，因此模擬效果並沒有修正型旱田水筒來得好，在參數設定上需要更加細微調整，才能使模擬結果更貼合實際的土壤水分變化，若是能夠找到更合適的參數組，或許可以提升模擬成效。根莖作物模擬結果顯示，二段式旱田水筒的評估結果優於修正型旱田水筒，因此判斷二段式水筒可應用於根莖作物的土壤水分變化模擬。

修正型旱田水筒參數數量較少，使用修正型旱田水筒就能大致模擬土壤水分的變動，但是將土層分段模擬對於各土層具有不同性質之土壤，能夠使模擬更加符合實際土壤水分變化。

關鍵詞：土壤水分、修正型旱田水筒、根莖作物

Abstract

When formulating irrigation plans for upland farming, it is crucial to understand the water balance within the soil, especially in regions with consistently low rainfall. Precise management of irrigation water supply is essential to avoid wastage due to over-

irrigation. Accurately grasping the changes in soil moisture levels can serve as the basis for formulating irrigation strategies.

This study builds upon the modified upland tank model proposed by predecessors. Introducing the concept of soil stratification into the water tank model, an additional tank is placed beneath the modified upland water tank model, dividing the total soil layer into two segments for simulation and analysis. The experimental fields of Baoxin cabbage in Xizhou are chosen as representative of general upland crops, while the sweet potato fields in Xinhua serve as the focus for root and tuber crop research. Both the modified upland water tank model and the two-stage upland water tank model were established and used to simulate soil moisture movement behavior. Finally, the applicability of different upland water tank models to both general upland crops and root and tuber crops is explored.

The simulation results for general upland crops indicate that due to the increased number of parameters in the two-stage upland water tank model compared to the modified upland water tank model, finer adjustments are required in parameter settings to better fit the actual soil moisture variations. Finding more suitable parameter sets may further enhance simulation effectiveness. The simulation results for root and tuber crops indicate that the evaluation of the two-stage upland water tank model performs better than the modified upland water tank model. Therefore, it is concluded that the two-stage upland water tank model can be used to simulate soil moisture variations for such crops.

With fewer parameters, the modified upland water tank model can roughly simulate soil moisture variations. However, segmenting the soil layers in the simulation better fits the actual soil moisture variations for soils with different properties in each layer.

Keywords:Soil Moisture, Modified Upland Tank Model, Root and Tuber Crop