

旱作物採用噴灑灌溉之用水量探討-以宜蘭縣大同鄉四季平台為例

Investigation on the Water Consumption of Spray Irrigation for Dry Farming – a Case Study of Four-Season Platform of Datong Township, Yilan County

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摘 要

本研究以宜蘭縣大同鄉四季平台為研究案例，灌區內主要種植作物為甘藍，灌溉方式多為管路灌溉噴灌型式，灌溉水源主要來自鄰近野溪，由於灌溉水源受限於天然降雨條件，在旱季偶有水源不足的問題，因此精準掌握作物灌溉用水量為灌溉管理之首要工作。首先透過現地普查現有灌溉方式，當地灌溉方式在早晨以及傍晚時段分別噴灑 20 分至 30 分鐘，若有下雨或遇水情不佳時，則不進行灌溉或酌量縮短噴灑時間。以一田區約 1,565 平方公尺進行試算，現況布置噴灑灌溉行間距約為 8 公尺×8 公尺，共計有 15 顆全旋轉式噴頭，設定壓力為 1.5kg/cm^2 ；噴灑半徑 8.3m；噴灑流量為 10.5L/min。若以一天噴灑 40 分鐘計(上下午各 20 分鐘)，日用水量約 6.3m^3 ，單位面積用水量則為 $40.26\text{m}^3/\text{公頃}$ ，換算每日的灌溉用水深約 4mm。另外，以聯合國糧農組織(FAO)所發展之 CROPWAT 模式計算作物需水量，以 6 月 1 日定植，生育日數約 60 日進行計算，每日田間灌溉用水約為 2.6 至 5.0mm，大致與實際灌溉用水相符。在作物定植後，由於根系不深，田間容水量不高，採用多次少量的灌溉方式，配合氣候條件精確掌握灌溉時機，更能有效提高灌溉水資源之有效利用。

關鍵詞：管路灌溉，CROPWAT，灌溉用水量

Abstract

Four-Season Platform of Datong Township, Yilan County was chosen as a case study in this study. The main crop in the irrigation area is cabbage. The irrigation method is mostly pipeline irrigation with sprinkler. The irrigation water source mainly comes from the nearby stream. There is occasionally a shortage of water during the dry season since the irrigation water source is limited by rainfall conditions. Therefore, accurately controlling the amount of water used for crop irrigation is the primary task of irrigation management. Applying an

on-site survey of existing irrigation methods, the irrigation time is lasting for 20 to 30 minutes by sprinkler in the morning and evening respectively. If the rainfall condition is not good, irrigation will not be carried out or the spraying time will be shortened. A calculation was carried out based on a field area of 1,565 square meters. The current layout of sprinkler irrigation is about 8 meters × 8 meters. There are a total of 15 fully rotating sprinklers. The pressure is supposed to be 1.5kg/cm²; the spraying radius is 8.3m; spray flow rate is 10.5L/min. If the irrigation time for 40 minutes a day (20 minutes in the morning and 20 minutes in the afternoon), the daily water consumption is about 6.3m³, and the water consumption per unit area is 40.26m³/hectare, which means a daily irrigation water depth of 4mm. In addition, the crop water demand is calculated using the CROPWAT model developed by the Food and Agriculture Organization of the United Nations (FAO). The calculation is based on June 1st planting and approximately 60 crop growth days. The daily field irrigation water is approximately 2.6 to 5.0mm, which is roughly consistent with actual irrigation condition. After the crops are planted, the water capacity of the field is not high since the crop root is not deep. Applying multiple small-scale irrigation is recommended with considering the climatic conditions. The accurately irrigation timing can improve the effective use of irrigation water resources.

Keywords: pipeline irrigation, CROPWAT, crop water requirement