

# 高粱節水灌溉之田間試驗與效益分析

## Field Experiment and Benefit Analysis of Water-Saving Irrigation for Sorghum

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### 摘要

為應對氣候變遷對旱作農業的挑戰，本研究旨在評估並量化穿孔管灌溉技術應用於高粱（品種：臺南 8 號）栽培時，相較於傳統溝灌的節水效益與產量表現。研究於農業部農田水利署臺南大內灌溉試驗中心進行，劃分為穿孔管灌區與溝灌區進行對照實驗。

首期作結果顯示，穿孔管灌溉區的總用水量（ $33.3 \text{ m}^3/323.7 \text{ m}^2$ ）較溝灌區（ $49.4 \text{ m}^3/334.5 \text{ m}^2$ ）節省約 30%。儘管用水量顯著降低，但作物農藝性狀與產量指標並無負面影響：穿孔管灌區的平均株高（126.8 cm）與穗長（34.8 cm）均略優於溝灌區（104.3 cm；32.6 cm）。基於乾穗重推估的公頃產量，兩區表現相當（穿孔管區約 4888 kg/ha；溝灌區約 4512 kg/ha）。

初步研究證實，穿孔管灌溉是一項極具潛力的節水技術，能在不犧牲產量的前提下，顯著提升高粱栽培的水分利用效率，對發展永續旱作農業具有重要參考價值。

關鍵詞：高粱，節水灌溉，穿孔管灌溉，水分利用效率，產量

### Abstract

To address the challenges posed by climate change to dryland farming, this study focuses on water-saving irrigation strategies by evaluating and quantifying the water use efficiency and yield performance of perforated pipe irrigation for sorghum (variety: Tainan No. 8) cultivation, in comparison with traditional furrow irrigation. The research was conducted at the Danei Irrigation Experiment Center in Tainan, where a comparative experiment was established with plots for both perforated pipe and furrow irrigation systems.

Results from the first crop cycle show that the total water consumption in the perforated pipe irrigation plot ( $33.3 \text{ m}^3/323.7 \text{ m}^2$ ) was approximately 30% less than that of the furrow irrigation plot ( $49.4 \text{ m}^3/334.5 \text{ m}^2$ ), demonstrating improved water use efficiency through this

water-saving irrigation method. Despite this significant reduction in water usage, there were no adverse effects on key agronomic traits. The average plant height (126.8 cm) and panicle length (34.8 cm) in the perforated pipe plot were slightly superior to those in the furrow irrigation plot (104.3 cm and 32.6 cm, respectively). Furthermore, the estimated yields per hectare, based on dry panicle weight, were comparable between the two plots (approx. 4888 kg/ha for the perforated pipe plot vs. 4512 kg/ha for the furrow irrigation plot).

This preliminary study confirms that perforated pipe irrigation is a promising water-saving irrigation technology capable of significantly enhancing water use efficiency in sorghum cultivation without sacrificing yield. These findings provide a valuable reference for the development of sustainable dryland agriculture.

Keywords: Sorghum, Water-saving irrigation, Perforated pipe irrigation, Water use efficiency, Yield