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# Improving Adaptive Water and Nutrient Management in Food Value Chains for Climate Change Adaptation: A Case of Sensor Technology in Malawi

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**Abstract**

Soil water and nutrient management for climate-smart agriculture by smallholder farmers have typically been by trial and error. Studies were conducted to adapt the use of sensor farmer–friendly monitoring technology in measuring soil water and nutrients with the aim of improving the efficiency of resources in the food value chain. Simple monitoring tools (chameleon and Wetting Front Detector) which were designed to fit the mental model of African farmers and to give an output that is linked to action were deployed to farmers in nine irrigation schemes in Malawi. Chameleon illustrates information on soil moisture status by colours - blue, green and red colours representing adequate moisture, moderate and dry soil status, respectively. The use of colours and not numbers promoted inclusiveness across illiterate and all gender categories. Farmers participated in sensors' installation, soil moisture measurement, data visualization and learning platform to get insights from their participation. The chameleon was combined with an online communication and learning system to improve adaptive water management at scheme level. The results indicated that: (1) the tools gave farmers new frames of reference; (2) it improved farmers on time, labour and water-saving by reducing irrigation intervals; (3) it gave farmers new reference of experience to change their irrigation traditions; (4) it also reduced conflict for water in irrigation schemes between users apart from generally improving the efficiency of soil water and nutrient use in various value chains. Use of sensor technologies became a rigor that made scientists easily communicate science to lay farmers and initiated the movement of farmers who know how to use water in times of climate change. It can be concluded that combined use of sensors, online communication and learning system is adaptive and helps to improve climate change adaptation to water scarcity whilst improving efficiencies in food chain.

*Keywords*: Irrigation; Soil water; Nutrient; Climate change

## 1. Introduction

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