

# Improving Water and Nutrient Use Efficiency for Crop Production in Dry Lands via Soil Amendments and Remote Sensing Techniques

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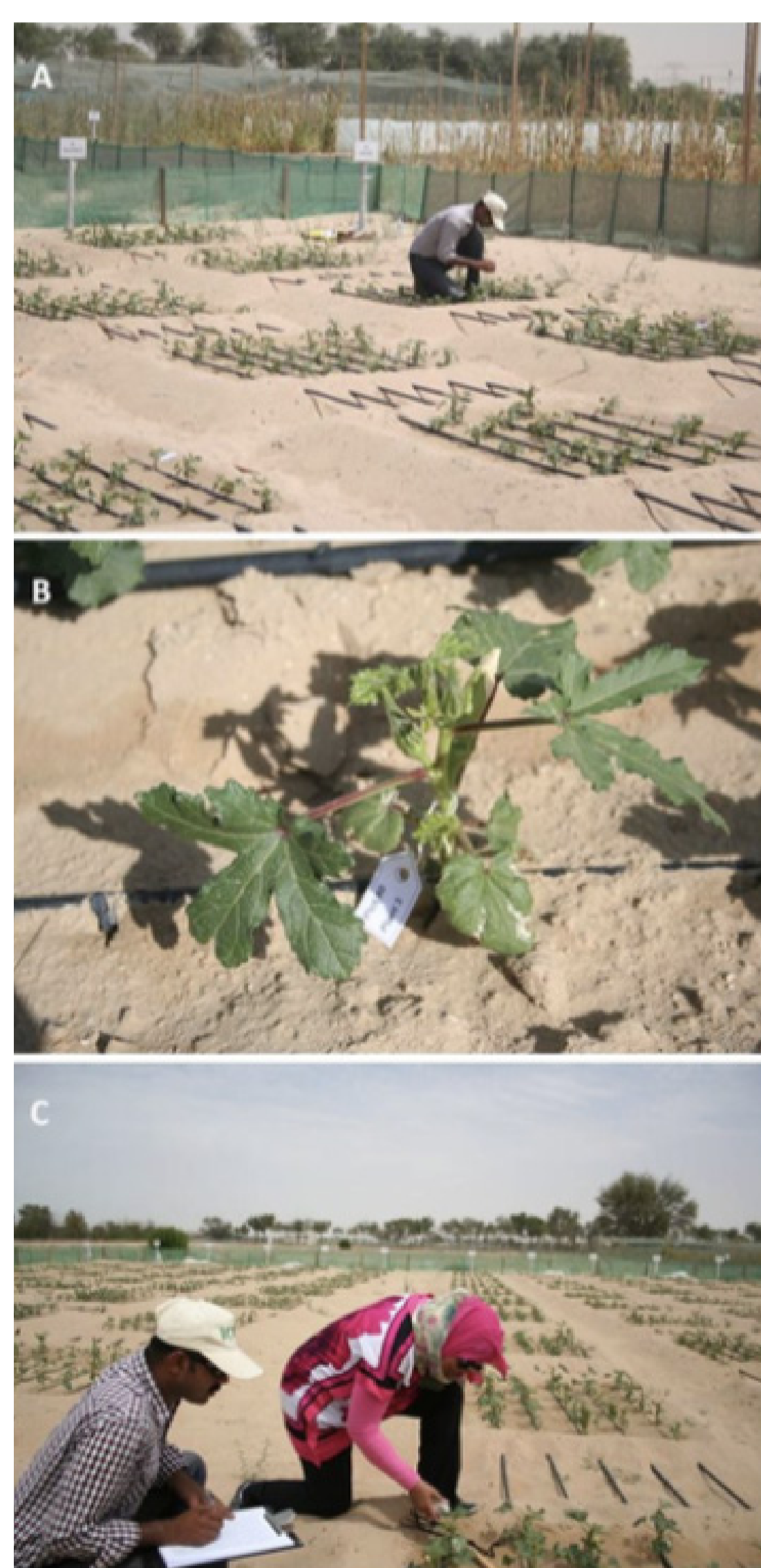
## Background

The soils of the Arabian Peninsula in general and GCC countries in specific are dominantly sandy (low nutrient and water holding capacity, high infiltration rate). These soils need high inputs for crop production. To be cost-effective in agriculture production these soils need careful consideration to enhance water and nutrient use efficiency and increase crop production. A number of organic and inorganic amendments have been used by various researchers in this regards. However, little has been done in this respect on UAE soils, and hence forms the focus of this study. The study aims to achieve this through soil improvement using soil amendments and assessing the efficiency through remote sensing techniques.

## Objectives

- Assess performance of selected amendments in improving soil properties in term of water saving
- Enhance the monitoring efficiency via remote sensing techniques .
- Transfer of the technology

## Materials and Methods



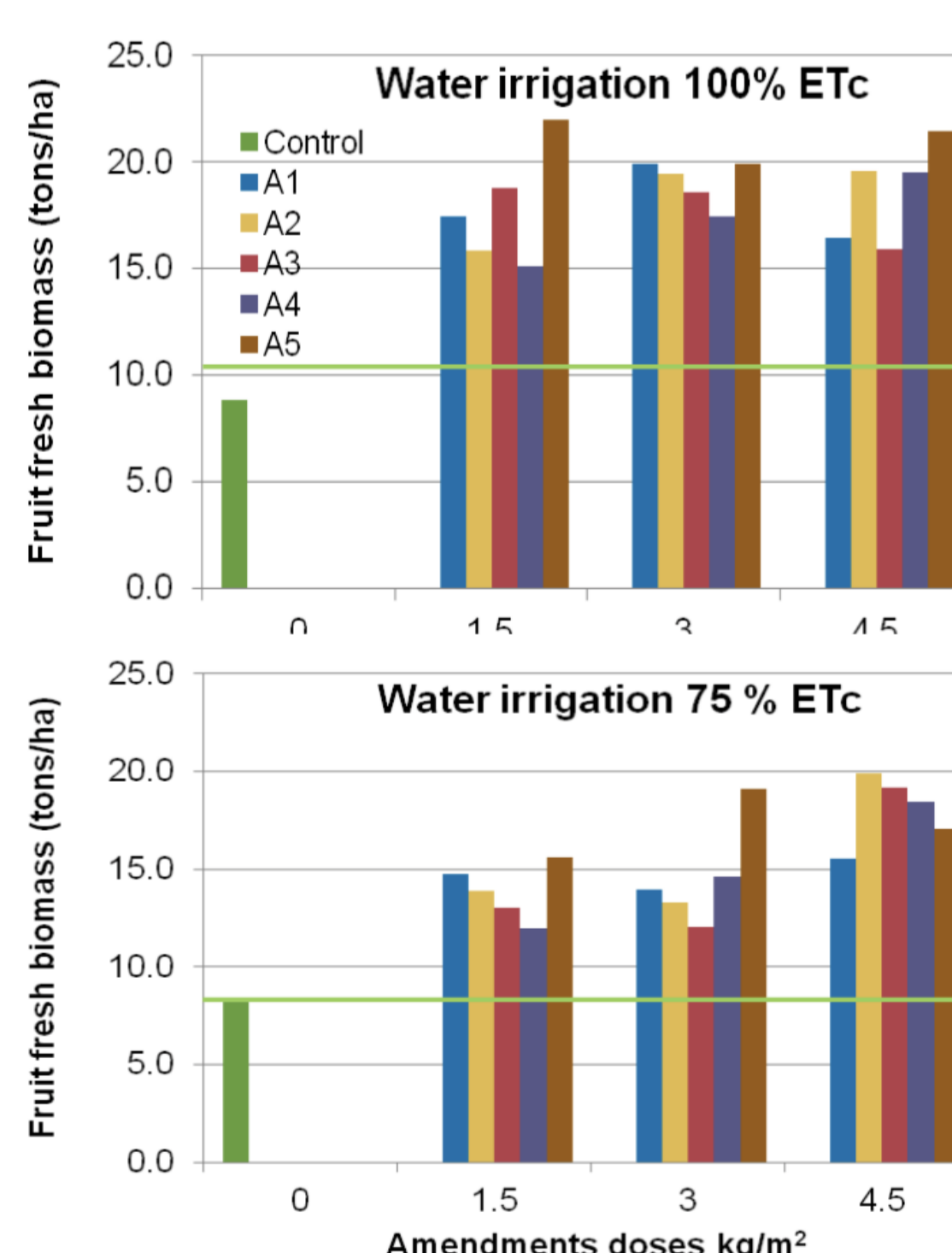
Data collection in field



A field trial was started at ICBA station on okra crop ( 28 January 2015 ) irrigating with fresh water equivalents to 75% and 100% ETc, using four inorganic amendments and the compost( organic amendment ) at the rates of 0, 1.5, 3 and 4.5 kg/m<sup>2</sup>. Treatments were triplicated in Randomized Complete Block Design ( RCBD ). The plot size is 2.25 m<sup>2</sup> ( 1.5m x 1.5m ) and the distance between plants is 25 cm between lines and 30 cm between plants.



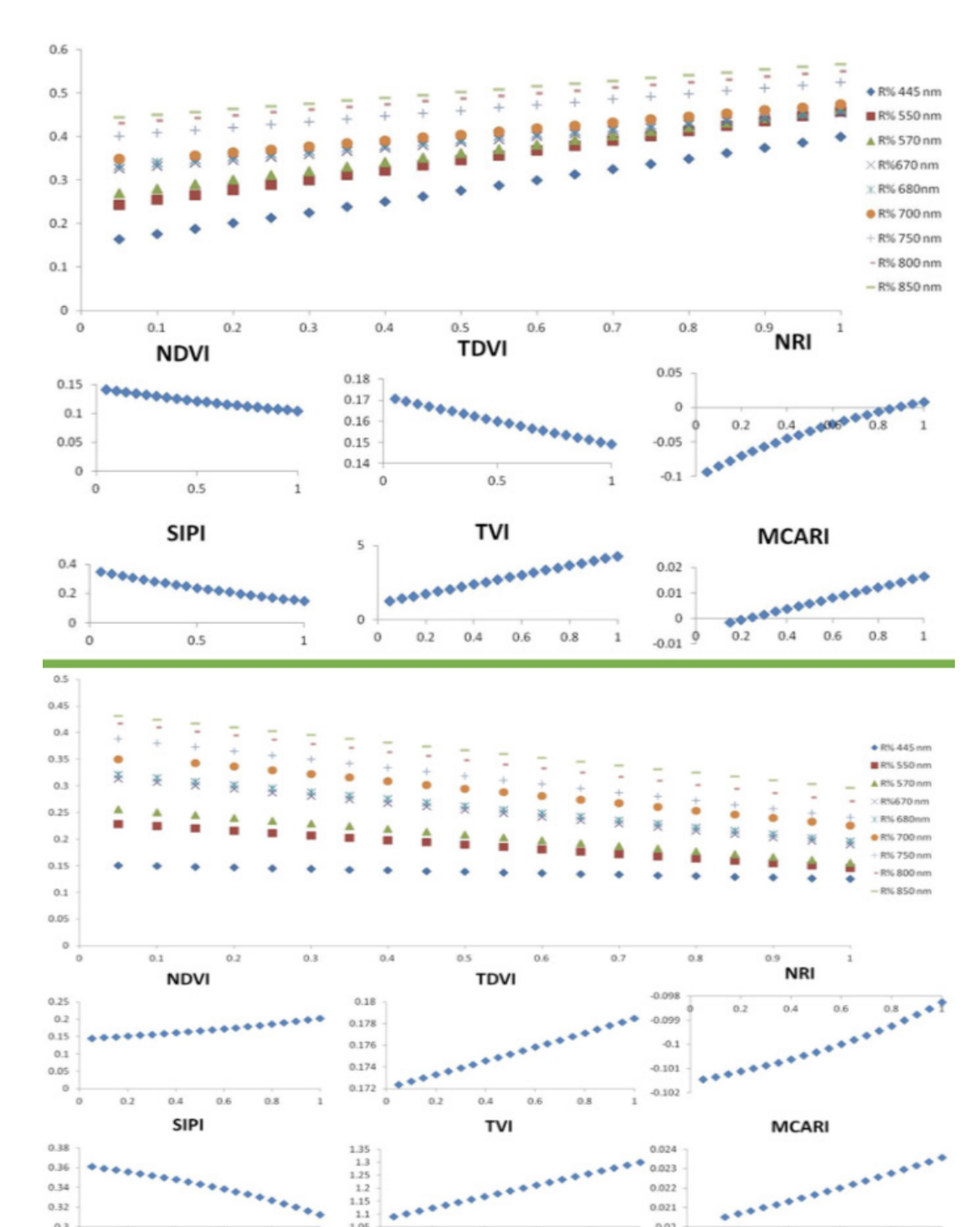
Weekly Fruit harvest



Okra fruit biomass production as result of amendments rates ( 0, 1.5, 3, 4.5kg/ m<sup>2</sup> ) and deficit irrigation ( 100% and 75%ETc )

Treatments	A		B	
	Fruit Fresh Biomass tons/ha	Percent increase over control	Fruit Fresh Biomass tons/ha	Percent increase over control
<b>75% % ETc</b>				
Control	8.2		8.9	
AustralHort (1.5 kg/m <sup>2</sup> )	14.7	79.2	17.4	79.2
Meliort (1.5 kg/m <sup>2</sup> )	13.9	69.0	13.9	69.0
Zeoplant pellet (1.5 kg/m <sup>2</sup> )	13.1	59.0	13.1	59.0
Zeoplant (1.5 kg/m <sup>2</sup> )	12.0	45.6	12.0	45.6
Compost (1.5 kg/m <sup>2</sup> )	15.6	90.2	15.6	90.2
<b>100% % ETc</b>				
Control	8.2		8.2	
AustralHort (3 kg/m <sup>2</sup> )	14.0	69.9	14.0	69.9
Meliort (3 kg/m <sup>2</sup> )	13.3	61.7	13.3	61.7
Zeoplant pellet (3 kg/m <sup>2</sup> )	12.0	46.5	12.0	46.5
Zeoplant (3 kg/m <sup>2</sup> )	14.6	78.0	14.6	78.0
Compost (3 kg/m <sup>2</sup> )	19.1	132.7	19.1	132.7
<b>75% ETc</b>				
Control	8.2		8.2	
AustralHort (4.5 kg/m <sup>2</sup> )	15.0	89.0	15.0	89.0
Meliort (4.5 kg/m <sup>2</sup> )	19.9	142.2	19.9	142.2
Zeoplant pellet (4.5 kg/m <sup>2</sup> )	19.2	133.5	19.2	133.5
Zeoplant (4.5 kg/m <sup>2</sup> )	18.5	124.9	18.5	124.9
Compost (4.5 kg/m <sup>2</sup> )	17.1	108.8	17.1	108.8
<b>100% ETc</b>				
Control	8.2		8.2	
AustralHort (4.5 kg/m <sup>2</sup> )	15.0	89.0	15.0	89.0
Meliort (4.5 kg/m <sup>2</sup> )	19.9	142.2	19.9	142.2
Zeoplant pellet (4.5 kg/m <sup>2</sup> )	19.2	133.5	19.2	133.5
Zeoplant (4.5 kg/m <sup>2</sup> )	18.5	124.9	18.5	124.9
Compost (4.5 kg/m <sup>2</sup> )	17.1	108.8	17.1	108.8

Comparative statement of fruit biomass production and percent increase over control for Okra crop in greenhouse experiment at 75% ( A ) , and 100% ETc irrigation rate ( B ).



Effect of Amendments on Vegetation Indices and their respective Reflectance values using UAE Soil (mixing rate passing from 5% to 100%).

The organic and inorganic amendments in general improved the water use efficiency as well as enhanced the biomass production to a significant extent compared to the treatment where amendments were not used. At 75% ETc the performance of amended soils was comparable to 100% ETc and fruit biomass production was similar. The use of the soil amendments can save up to 25% of the irrigation water in sandy soils.