

## GIS modeling of the impact of drip irrigation, of water quality and of soil's available water capacity on *Zea mays* L. biomass yield and its biofuel potential

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### ABSTRACT

The scope of present work was the modelling and mapping of maize biomass yield in correlation with water quality and irrigation water management effects in an experimental field with combinational use of in situ measurements and Information and Communication Technologies (ICT) such as Geographic Information Systems (GIS), Global Positioning System (GPS), Geostatistical modeling. The investigation of drip irrigation frequency effects in yield and in the proportion of biomass in the various plant parts and in the distribution of soil moisture were studied, in an experimental parcel of three interventions (i.e. irrigation per 9, 12 and 15 days) in a four replications, randomized complete block design (RCBD) with systematic plot arrangement, in a farm located in central Greece (Larissa), at the farming period of year 2003. The cut plants fractions results for the distribution of above ground biomass (dry matter), were: 47.74% grain, 26.72% stalk, 11.43% leaf, 7.25% cob, 6.86% husk, and for the distribution of biomass in stover (dry matter) were: 49.75% stalk, 22.27% leaf, 16.22% cob and 11.76% husk. The mean biomass in stover yield was found 11,562.99 kg ha<sup>-1</sup>. It was observed that the 9 days irrigation treatment resulted in the greatest biomass in stover yield (13,198.02 kg ha<sup>-1</sup>) and the highest potential for bioethanol production (5,411.18 L ha<sup>-1</sup>), and from the statistical analysis of the plots harvested mean biomass yields, it was found that their values were significantly different at level of significance  $p < 0.05$ . ICT provided significant insight into the nature of biomass yield and the field's spatial variability as effected of the integrated irrigation water management and its biofuel potential, aiming at water savings and environmental protection.

**Keywords:** Irrigation water management; Maize biomass GIS modeling; Drip irrigation; Biomass renewable energy use for environmental protection; Biofuel production

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