

Author:  [ADVANCED](#)Volume  Page Keyword:   

[TOP](#) > [Available Issues](#) > [Table of Contents](#) > [Abstract](#)

ONLINE ISSN : 1349-1008

PRINT ISSN : 1343-943X

**Plant Production Science**

Vol. 10 (2007) , No. 2 182-188



[\[PDF \(429K\)\]](#) [\[References\]](#)

## No-Tillage Enhanced the Dependence on Surface Irrigation Water in Wheat and Soybean

[Morio Iijima](#)<sup>1)</sup>, [Satoru Morita](#)<sup>1)</sup>, [Walter Zegada-Lizarazu](#)<sup>1)</sup> and [Yasuhiro Izumi](#)<sup>2)</sup>

1) Graduate School of Bioagricultural Sciences, Nagoya University

2) School of Environmental Science, The University of Shiga Prefecture

(Received: June 27, 2006)

**Abstract:** No-tillage often affects crop root development due to the higher mechanical impedance to root elongation, resulting in yield reduction under an unfavorable rainfall pattern, such as drought. In this study, we analyzed the changes in water source of wheat and soybean under drought stress in a continuous no-tillage field. Deuterium-labeled irrigation water was applied at different growth stages of crops to analyze their water uptake pattern. Mechanical impedance of the surface soil was 3.5 and 4.4 times higher in the no-tillage than in the conventional tillage under wet and drought conditions, respectively. Root length density and root branching index (the length of lateral roots per unit axile root length) of soybean in the surface soil layer were higher in the no-tillage field. This indicates that the increased branching by the higher mechanical impedance of undisturbed surface soil causes roots to accumulate in the surface soil layer. The deuterium concentration in the xylem sap of both crops was significantly higher in the no-tillage than in the tillage under a drought condition. This indicates that the crops in the no-tillage field depend highly on the newly supplied easily accessible water (irrigation water and/or rainfall) as compared with those in the conventional tillage field under a limited water supply. In conclusion, enhanced surface root growth in the no-tillage condition would result in higher dependence on surface supplied irrigation water than in the conventional tillage under drought.

**Keywords:** [Deep root](#), [Heavy water](#), [Soil mechanical impedance](#), [Stable isotope](#), [Sustainable agriculture](#), [Water source](#), [Water uptake](#)



[\[PDF \(429K\)\]](#) [\[References\]](#)

Download Meta of Article [\[Help\]](#)

[RIS](#)

[BibTeX](#)

To cite this article:

Morio Iijima, Satoru Morita, Walter Zegada-Lizarazu and Yasuhiro Izumi: "No-Tillage Enhanced the Dependence on Surface Irrigation Water in Wheat and Soybean". *Plant Production Science*, Vol. **10**, pp.182-188 (2007) .

---

doi:10.1626/pps.10.182

JOI JST.JSTAGE/pps/10.182

Copyright (c) 2007 by The Crop Science Society of Japan

---



---

[Japan Science and Technology Information Aggregator, Electronic](#)

