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ONLINE ISSN : 1349-1008

PRINT ISSN : 1343-943X

## Plant Production Science

Vol. 12 (2009) , No. 4 503-513

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### Effects of Soil Type, Vertical Root Distribution and Precipitation on Grain Yield of Winter Wheat

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(Received: April 3, 2008)

**Abstract:** In Abashiri in eastern Hokkaido, Japan, grain yields of winter wheat (*Triticum aestivum* L. cv. Hokushin) in the western area, with umbric andosol or dystric cambisol soil types, are lower and unstable compared to those in the eastern area, with mostly haplic andosol soil type. The aim of this study was to evaluate yield differences between the eastern and western areas. The vertical root distribution of wheat plants was examined over two seasons in farmers' fields in both areas by a wall profile method. Plants grown in the western area had shallower root systems than those grown in the eastern area. Poor soil porosity and high soil penetration resistance suppressed the vertical distribution of root systems in umbric andosol and dystric cambisol. Grain yields were not always correlated with the amount and distribution of the root system. Grain yield in the 2004/2005 season was not correlated with root depth index, whereas it was positively correlated in the 2005/2006 season. During the period from heading to maturity (mid June to late July) over the two seasons, grain yield was associated with precipitation more than with temperature and total solar radiation. In the 2005/2006 season, during the late growing stage of wheat, precipitation was extremely low and soils were very dry. The difference in grain yield between the eastern and western areas was significant and negatively related to precipitation during the period from heading to maturity. Significant correlations of yield with sunshine duration and solar radiation from the heading stage to maturity were observed only on haplic andosol. The results suggest that the major factor controlling yearly changes in the difference

in grain yield of winter wheat between the eastern and western areas is the difference in photosynthetic ability, which is based on rooting depth and water supply in response to solar radiation during the late growing stage.

**Keywords:** [Grain yield](#), [Precipitation](#), [Root system](#), [Soil type](#), [Solar radiation](#), [Sunshine duration](#), [Temperature](#), [Winter wheat](#)

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To cite this article:

Hirotake Itoh, Shigeki Hayashi, Takashi Nakajima, Tomohito Hayashi, Hozumi Yoshida, Koou Yamazaki and Teruyuki Komatsu: "Effects of Soil Type, Vertical Root Distribution and Precipitation on Grain Yield of Winter Wheat". *Plant Production Science*, Vol. **12**, pp.503-513 (2009) .

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doi:10.1626/pps.12.503

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