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Global Food Production - Share from Sustainable and Unsustainable Groundwater Use

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Groundwater is crucial for global food security. At the same time, its contribution to global food production is largely unknown. Even more critical is the fact that groundwater depletion is occurring at an alarming and ever-increasing rate – mainly due to irrigated agriculture, progressively threatening global food security. Here we present for the first time estimates of the global food production derived from groundwater and in particular depleting groundwater.

Based on an integrated GIS analysis combining global distributed datasets on groundwater depletion, irrigated areas, and food production for the year 2005, we show that 44% of global irrigated food production is derived from groundwater. Furthermore, depleting aquifers account for between 14 and 17 percent of global groundwater-irrigated food production, between 6.0 and 7.0 percent of global irrigated food production, and between 1.8 and 2.2 percent of total food production (including rainfed). In total, between 124 and 150 mill. tonnes per year are produced unsustainably. This production occurs primarily in arid and semi-arid areas with good sub-surface water storages, with the South Asia, East Asia, Near East/North Africa and OECD regions as dominating. Crop-wise, we found that while cereals and sugar crops exhaust most groundwater, crop groups like roots and tubers, non-food crops (mostly cotton), leguminous crops, and vegetables and fruits are disproportionately and preferentially grown by depleting groundwater due to their higher value linked to the reliable irrigation source provided by groundwater.

The findings imply the critical importance of analysing and developing congruent policies at multiple levels that account for the nexus between groundwater, groundwater depletion, and global food security.

Keywords: groundwater, global crop production, unsustainable groundwater use, food security

