Supporting Information

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SI Methods

Crop water use includes both rainwater (or "green water") and irrigation water (or "blue water"). Because irrigation water information was not available, the actual water use in the grabbed land can range between the green water use (i.e., rain-fed agriculture) and the sum of green and blue water calculated as the net irrigation water that should be supplied to maximize agricultural production, assuming that all of the grabbed land is irrigated ("$\mathrm{blue}_{\mathrm{max}}$" in Table 2). We also calculate a rate of blue water consumption ("$\mathrm{blue}_{\mathrm{avg}}$" in Table 2), assuming that the fraction of grabbed land that is irrigated is the same as the fraction of agricultural land that in the same country is equipped for irrigation. In both cases the blue water consumption in irrigated land is the same as the net irrigation calculated as follows: For each crop area the potential evapotranspiration and crop water requirement (millimeter·month^{-1}) were calculated with the Penman–Montieth method by using the CROPWAT 8.0 (1) model with crop parameters corresponding to irrigated conditions (2). More specifically, the evapotranspiration rate was calculated for a well-watered surface with a reference crop having 0.12-m height, albedo = 0.23, and surface resistance equal to 70 $\mathrm{s{\cdot}m^{-1}}$ (2). Accordingly, the actual crop evapotranspiration was estimated as the product of potential evapotranspiration with a crop-specific and time-varying factor (2). Values of actual crop evapotranspiration were used to calculate the net irrigation, or blue water; gross irrigation was estimated as the ratio between net irrigation and the efficiency, e_{i}, of the irrigation method, which accounts for evaporative and drainage losses. Efficiency values were assumed to be $e_{\mathrm{i}} = 0.5$, 0.7, and 0.95 for surface, sprinkler, and drip irrigation, respectively (3). The irrigation method was selected based on the dominant technique used in the region according to the AQUASTAT dataset (4). In countries encompassing a variety of agro-climatic regions, the agricultural area was subdivided into subareas and the crop type was assigned to each subarea using the AGROMAPS (5) product in FAOSTAT (6).

The amount of water that needs to be supplied by irrigation is the gross irrigation, and the fraction of irrigation water that is taken up by vegetation (or "net irrigation") is the actual blue water cost of crop production. Green water requirements were estimated as the effective precipitation if the irrigation requirement was greater than zero; otherwise, the green water requirements were calculated by CROPWAT 8.0 as the volumes of rainwater evapotranspiration. Blue water is given by the crop water use minus green water. Values of total, green, and blue water requirements were calculated by multiplying depth amounts by the grabbed area. The actual water grab is expected to be comprised between the green water and the sum of green and blue water requirements, depending on climate, soil, and water availability (i.e., on whether agriculture is irrigated or rain-fed). Grabland areas used for livestock production are assumed to be only rain-fed.

The yield gap (Table S2)—that is, the difference between potential and actual crop productivity rates—was calculated using the Food and Agriculture Organizaiton (FAO) and World Bank methodology, which is based on the global agro-ecological zoning (AEZ) models (7, 8). For each country the potential productivity rate of major crops was taken from the global Agro-Ecological Zones system dataset. The land suitable for agriculture was determined as the sum of very suitable, suitable, and moderately suitable land for agriculture under rain-fed or irrigated conditions, using AEZ (9) data. Country-specific values of total renewable freshwater resources (Tables S2 and S3) were taken from the AQUASTAT (4) database, whereas malnourishment data (Table S2) were taken from FAOSTAT (6) database.

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Other Supporting Information Files

Table S1 (DOC)
Table S2 (DOC)
Table S3 (DOC)