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# Evaluating the vapour shift concept in agriculture: some aspects

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Human population growth leads to an increasing pressure on freshwater resources. By 2050 Falkenmark et al. (2004) estimate a global water deficit for crop production of 5800 km3.y-1. This has important consequences for management of fresh water resources at different scales, and new strategies at different scales are required.
One of the strategies suggested is that of managing crops in such a way that the use of rainfall and irrigation is shifted as much as possible from evaporation towards transpiration, a so-called vapour shift. The suggested savings are in the order of 330 km3.y-1, and are based on estimates of the magnitude of three processes: Reducing early season evaporation; increasing canopy cover; and increasing yield levels.
The vapour shift concept was evaluated empirically, and in a simulation study.
The empirical evaluation using results for wheat, maize, millet, cotton, and barley suggests the estimate of potential savings is 37% lower than the estimate by Falkenmark et al. (2004). The uncertainty is large and due to the limited number of experiments in which a separation of evapotranspiration in evaporation and transpiration has been made over the entire growing season. This suggests that theoretical support for the vapour shift concept should become more important.
In the simulation approach two management options, mulching and planting density, are evaluated for a site in India for an irrigated wheat crop using a simulation approach for water limited crop yield. Given the simulation model used, and the management options investigated, the assumption implicit in the vapour shift concept - decreasing evaporation with increasing yield level - does not hold in irrigated areas, or in areas in which water is the most limiting factor. This suggests that vapour shift will be largest in those areas where nutrients and pests- and diseases are still limiting or reducing crop yields, and measures are taken to reduce those limitations.