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## Long-term trends in intersectoral water allocation and crop water productivity in Zhanghe and Kaifeng, China

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**Abstract** This paper examines the trends in water allocation among sectors, water use by source, cropped area, crop production and water productivity. The study was undertaken at two sites in China: the Zhanghe Irrigation District in the Yangtze River Basin approximately 200 km west of Wuhan and Kaifeng City Prefecture located just south of the Yellow River in Henan Province. In both areas, water demand for purposes other than irrigation has grown. In the Zhanghe Irrigation District this resulted in a sharp reduction of water availability for irrigation. The decline of water availability for irrigation resulted in adoption of water saving practices and policies that led to a significant gain in water productivity per unit of irrigation water. In the Kaifeng City Prefecture the increased demand from other uses was met by an increase in groundwater extraction without the dramatic cuts in supplies for agriculture as in the Zhanghe Irrigation District. Gains in water productivity were due almost exclusively to higher crop yields. There will be continu-

ing pressure to further reduce diversions to agriculture from the Zhanghe main reservoir in the Zhanghe Irrigation District and from the Yellow River in Kaifeng. Research continues on testing practices that have the potential for further increasing water productivity, some of the results of which are reported in other papers in this volume.

**Keywords** Trend analysis · Crop production · Water saving · Irrigation · Water allocation · Water productivity · Hubei · Henan

### Introduction

Major efforts have already been made to save water in irrigated rice areas and there is much to learn from previous efforts, particularly in China, where researchers and practitioners have pioneered and developed many practices for farmers to deliver less water to their fields. These methods are collectively known as water-saving irrigation (WSI) practices and many success stories are reported (Wang 1992; Mao 1993; Li and Cui 1996; Peng et al. 1997; Li et al. 1998; Wu 1998; Li 1999; Belder et al. 2004), such as alternate wet and dry irrigation (AWD), which has spread in South China (Li et al. 1999). Li et al. (2003) give an extensive overview of the developments in WSI research in China.

This paper describes the changes in water allocation, crop production, and water productivity over a period of three decades in the Zhanghe Irrigation District (ZID) in the Yangtze River Basin, Hubei Province and in Kaifeng City Prefecture, along the Yellow River in Henan Province (Fig. 1).

First the research locations are described in more detail, after which the sources of data and the rationale for dividing and averaging the data across three separate time periods are discussed. The changes over time in water allocation among alternative uses are described followed by a description of the changes in area irrigated, crop production, and crop productivity. Finally, the factors that

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