On the Change of Virtual Water in China under Regional Restructuring from 1997 to 2000

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Abstract The Chinese government started reforms and open-door policies in 1978, and the policies have continued to contribute to its economic growth. However, as a result of dynamic growth in the economy, water demand has been increasing and it also has worsened the water shortage. To achieve a sustainable economic development, economic planners must develop an understanding of the actual dynamics of water usage as it relates to the economics of interregional trade. In this study we show a structure of water demand in China by using the concept of virtual water. In particular we estimate multi-regional I-O tables in 2000, and calculate the amount of virtual water required. In addition, we analyze the transformation of virtual water by comparing the 2000 figures with those of 1997. The comparison suggests that the virtual water displacement from the southern coastal area toward other areas would have increased. In the view of Yellow River Basin, where water shortage is serious, virtual water transformed increasingly from the developed downstream. At the upstream basin, the forms of agriculture were encouraged to change and water demand to increase, too.

Key words: Comparison in time, MR IO analysis, regional development, virtual water, Yellow River basin

Introduction

China has realized a rapid economic growth due to the reform and open-door policies adopted since 1978. However, to achieve more economic development, several challenges had to be met. In the Yellow River Basin, a rapid economic growth caused serious water problems and administration of the water resource emerged...
as an important issue (Allan, 1997). In order to manage water resources in a vast basin like the Yellow River, it is important to conduct water management based on scientific principles after determining the actual conditions of water usage. On the other hand, China’s regional division of work has progressed due to the introduction of a market economy, thus this situation is enabling China to transport a product from a water-abundant region to a water-deficient one. Based on this problem consciousness, we have introduced the concept of virtual water for the analysis of water demand in China and we have sharpened our understanding of the actual condition of multi-regional transfer of virtual water with domestic multi-regional trading (Allan, 1998).

In China, however, economic growth continued rapidly in the late 1990s, and this growth resulted in modifying the domestic production system dramatically. In addition, it might be expected that this changes its trade practices due to economic growth would bring a drastic change in the virtual water transfer in China. We believe that several suggestions could be provided to consider how China’s water demand would change and how China would have to modify its water resource management by correlating the change of water demand with the economic growth. In order to provide such a suggestion, we conducted a study of the actual conditions of virtual water transfer in 2000 and an analysis of China’s multi-regional virtual water transfer in 1997. With comparison of both results, we aim to reveal how virtual water transfer among regions changed due to the economic growth in the late 1990s. This paper consists of the following chapters; explanation of relevant studies on virtual water is provided in the second section. In the fourth section we demonstrate the actual condition of virtual water transfer in the year 2000 by employing the MRIO tables for water analysis, and we describe the results of analysis on the modification from 1997 to 2000.

**Previous Relevant Study**

**Studies on Virtual Water**

In the 1990s, Allan introduced the concept of virtual water (Allan, 1997, 1998). Production of agricultural or industrial goods usually needs a water resource, indicating the simultaneous occurrence of indirect water export and import with trading of goods. Virtual water indicates the volume of water that would be required if all imported products were made in a demanding region. Studies on virtual water analysis for imported agricultural products have been conducted because agricultural production needs a large water resource. Miyake et al. (2002), for example, revealed the virtual water transfer with importing of agricultural products in Japan.