



# Incentive mechanism for promoting farmers to plant green manure in China

Fuduo Li <sup>a</sup>, Jing Ren <sup>a</sup>, Stefan Wimmer <sup>b</sup>, Changbin Yin <sup>a,c,\*</sup>, Zhongyi Li <sup>d</sup>, Changxu Xu <sup>e</sup>

<sup>a</sup> Institute of Agricultural Resources and Regional Planning, Chinese Academy of Agricultural Sciences, Beijing, 100081, China

<sup>b</sup> Agricultural Production and Resource Economics, Technical University of Munich, Freising-Weihenstephan, 85354, Germany

<sup>c</sup> Research Center for Agricultural Green Development in China, Beijing, 100081, China

<sup>d</sup> Institute of Agricultural Resources and Environment, Guangxi Academy of Agricultural Sciences, Nanning, 530007, China

<sup>e</sup> Institute of Soil&Fertilizer and Resource&Environment, Jiangxi Academy of Agricultural Sciences, Nanchang, 330200, China

## ARTICLE INFO

### Article history:

Received 8 October 2019

Received in revised form

26 March 2020

Accepted 11 May 2020

Available online 16 May 2020

Handling editor: Jun Bi

### Keywords:

Green manure program

Eco-compensation policy

Willingness to accept

Contingent valuation method

Double-hurdle model

Southern China

## ABSTRACT

The Green Manure Planting Program (GMP), which is a typical case of payment for farmland ecosystem services, has come into play on conserving paddy fields in China. This paper analyses farmers' willingness to accept (WTA) for adopting GMP by employing the contingent valuation method (CVM) and Double-hurdle (D-H) model on the basis of a sample data set containing information on 1217 farmers in five provinces in southern paddy fields region (SPF) of China. The results show that farmers' WTA for adopting GMP was 3323 CNY/ha per year, which is much higher than the current compensation standards (com-standards) in the study region. This result explains why the current policy does invalidly stimulate farmers for adopting GMP. Farmers' WTA is not only influenced by the cost-benefit effect of GMP adoption, but also impacted by their perceived environmental value in improving the quality of paddy fields as well as the demographic and socioeconomic information such as farmers' age, political identities, income and paddy field area. It is costly if the government compensates all farmers who adopt GMP, letting farmers aware of more environmental value of GMP and maximally promoting the transformation of these environmental values into economic benefits is an effective measure to encourage them to adopt GMP. The results of this study can guide policy makers in determining the budget for GMP compensation and designing systematic compensation mechanism hence improve the sustainability of paddy fields conservation.

© 2020 Elsevier Ltd. All rights reserved.

## 1. Introduction

China is the world's largest country of rice production and consumption. In 2017, 30.7 million ha of farmland was planted with rice and 145.9 million tons of rice was produced in China, occupying about 30% of total global output (National Bureau of Statistics of China, 2018). Meanwhile, 480.4 million tons of rice were globally consumed that year, and more than 30% was consumed by China (Ministry of Agriculture and Rural Affairs of the People's Republic of China, 2019). According to National Food and Strategic Reserves Administration (2018), China's annual demand for rice will

stabilize at about 140–150 million tons in the next five years. To secure rice production and supply as paddy fields shrink, the intensity of paddy fields utilization will inevitably continue to increase.

In fact, the long-term over-exploitation of paddy fields and unreasonable use of chemicals in rice production have caused serious environmental problems such as soil erosion and pollution, which worsen the basic conditions of food production. According to "Bulletin of National Farmland Quality Grade", more than 40% of paddy fields in China have been degraded to some degree in the past decade (Ministry of Agriculture and Rural Affairs of the People's Republic of China, 2014a,b). The "Bulletin of National Soil Pollution Survey" indicates approximately 37% of the paddy fields in China were contaminated by heavy metals. More than 12 million tons of rice are lost per year due to soil degradation and pollution, resulting in direct economic losses of up to 20 billion CNY. In response to the widespread degradation and pollution of paddy

\* Corresponding author. Institute of Agricultural Resources and Regional Planning, Chinese Academy of Agricultural Sciences, Beijing, 100081, China.

E-mail addresses: [lifuduo2010@163.com](mailto:lifuduo2010@163.com) (F. Li), [renjing@caas.cn](mailto:renjing@caas.cn) (J. Ren), [stefan.wimmer@tum.de](mailto:stefan.wimmer@tum.de) (S. Wimmer), [yinchangbin@caas.cn](mailto:yinchangbin@caas.cn) (C. Yin), [lizhongyi2007@163.com](mailto:lizhongyi2007@163.com) (Z. Li), [changxux@sina.com](mailto:changxux@sina.com) (C. Xu).