Mechanisms of agricultural scale affecting greenhouse gas emissions

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Agriculture is a significant contributor to anthropogenic global warming. In recent years, agricultural greenhouse gas (GHG) emissions in China, which is the largest emitter, has been decreasing. In order to identify whether or not Chinese agricultural development has affected GHG emission, we used the logarithmic mean Divisia index (LMDI) factor decomposition model to study the effect of productivity factors on GHG emission and their characteristics in four phases of Chinese agricultural development. The results indicate that land productivity is the most significantly promotion factor which contributes 1.12 Gt CO_2e GHG emission growth. On the contrary, technological input intensity exerts an obvious mitigating effect with 1.57 Gt CO_2e GHG emission reduction. The effects of productivity factors on GHG emission differ between household-based farming systems and large-scale management systems. A more nuanced perspective on the significant role of agricultural large-scale management in GHG emission could aid climate change mitigation.

Keywords: Agricultural development phases, climate change mitigation, global warming, greenhouse gas emission, productivity factors.

and legislation thereafter. During 1999–2008, MSM was realized by means of paid farming service, and land transfer and cooperation. After 2009, the agricultural management scale was further expanded in various forms, including innovative agricultural management units (e.g. family farms, professional households, peasant cooperatives, agricultural industrialization leading enterprises, etc.) and innovative agricultural service units that provide professional and large-scale services such as replaced plough and sow, combined tillage and land trust for continuous tillage. The latest agricultural census data show that the number of large-scale agricultural operators is 3.98 million households accounting for 2% of the national agricultural operators[4].

Research showed that agricultural-scale management characterized by centralized use and effective management of land and concentrated input of production factors to land could affect GHG emissions[5,6]. The aim of the present study is to uncover the relationship between agricultural development and GHG emissions. First, we estimate agricultural GHG emissions from 1979 to 2015. Second, we divide agricultural development into four stages according to the characteristics of agricultural management. Third, using the logarithmic mean Divisia index (LMDI) f-