Geographical Study of the Spatial Patterns and Determinants of Farmland Abandonment at the Former Municipality Level in Japan

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1. Introduction
In the recent years, Japan has experienced an unprecedented increase of abandoned farmland, which not only caused serious environmental problem and rural landscape loss but also had negatively significant socio-economic consequences. However, regarding this issue, spatial patterns and determinants of farmland abandonment in Japan are still not completely clear. It is of significant meaning to have a clear and precise understanding of farmland abandonment.

2. Data and methodology
This paper analyzed the farmland abandonment condition from a national scale by utilizing the former municipalities (in Japanese: Kyuchoson) in 1950 as unit samples. The spatial patterns and characteristics of farmland abandonment in Japan are explicitly displayed(Fig 1). As for the reasons and determinants, we employed multiple linear regression model and geographically weighted regression model to investigate the determinants of farmland abandonment by dividing the determinants into geographical and socio-economic aspects with more than 10,000 municipalities’ data records, the explanation variables are selected and calculated based on empirical studies and data from the Ministry of Agriculture, Forestry and Fishery (MAFF).

3. Spatial patterns of farmland abandonment
While taking farmland abandonment rate and abandoned area as measurements, we have found that most abandoned farmland located in Kanto, Chubu, Chugoku and Shikoku regions compared to other regions with a good agriculture condition like Hokkaido, Tohoku and Kyushu regions. Moreover, farmland abandonment in Japan had displayed a positive spatial clustering with 4 types of spatial agglomerations, namely low-low, low-high, high-low and high-high.

4. Conclusion
We have found that, firstly, farmland abandonment in Japan has exhibited significant spatial characteristics. Secondly, we identified the main factors associated with farmland abandonment in Japan, results indicated that “arable land ratio of self-sufficient farm households” strongly correlated with farmland abandonment. Rather than geophysical factors, socio-economic factors are more prone to influence farmland abandonment. Thirdly, among our selected variables, the explanation ability is different from region to region. Farmland abandonment in Kanto and Chubu regions are significantly affected by geographical factors while labor conditions mainly contributed to the abandonment in Chugoku and Shikoku regions.

Fig 1. Farmland abandonment areas in Japan in 2015