

## Extended Abstract

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<b>Paper/Poster Title</b>	<b>Weather Shocks on Farmers' Adaptation Behaviors: Exploring Asymmetric Impacts and Experience Moderation</b>
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Abstract prepared for presentation at the 98th Annual Conference of The Agricultural Economics Society will be held at The University of Edinburgh, UK, 18th - 20th March 2024.

<b>Abstract</b>	<i>200 words max</i>
<p>Farmer is the profession closest to the natural environment and is often at the forefront of the fight against climate change, and the changes compared to historical conditions could be seen as a kind of shock to farmer's life. In this research, we examine the effect of weather shocks on three adaptive decisions by farmers, labour allocation, protective facilities, and conservation agriculture practice. Spatial seemingly unrelated regressions method is used to deal with the problem of spatial autocorrelation and correlated disturbances between equations. Using census data of vegetable farm households and historical weather data in Taiwan, our findings indicate that the effects of positive and negative shocks are inconsistent. Rainy shocks increase the ratio of households engaged in non-agricultural work and the adoption rate of organic practices, while drier shocks do not. The ratio of greenhouse increases with higher temperatures. We also observe that experience moderates the effects resulting from rainfall shocks. Furthermore, among specific groups of farm households, we found that elderly farm households show stronger effects on the non-farming ratio compared to others, whereas the behaviors of mini farm households are less likely to be affected by weather shocks.</p>	
<b>Keywords</b>	Weather shock, farmer's behavior, spatial dependence
<b>JEL Code</b>	Sustainable Development Q01; Micro Analysis of Farm Firms, Farm Households, and Farm Input Markets Q12; Valuation of Environmental Effects Q51 see: <a href="http://www.aeaweb.org/jel/guide/jel.php?class=Q">www.aeaweb.org/jel/guide/jel.php?class=Q</a> )
<b>Introduction</b>	<i>100 – 250 words</i>
<p>Numerous studies have reported the effect of climate change in human being's economic activities no matter in developed countries or developing countries. Agriculture had been taken as the sector closest to the natural environment and often at the forefront of the fight against climate change. To cope with the damage caused by climate change, farmers will have some corresponding adaptation strategies. As vegetables are extremely important crops in terms of nutritional balance, we focus on how the weather shocks affect adaptive behaviors of vegetable farm households in Taiwan in this research, using census data which contain more than eighty thousand vegetable farm households. Contributions of this study are threefold. First, this study looks at more nuanced effects by considering shocks as the changes compare to</p>	

historical condition in Chuang (2019). And further extend to both rainfall and temperature shocks instead of only focusing on the weather shocks of flood or drought in previous literatures. Another contribution of this research is to investigate whether effects of shocks are consistent in positive and negative shocks, with consideration of spatial dependence that often appears in cross-section data. Furthermore, we examine for whether there are differences in the impacts of weather shocks among elderly, mini, and core farm households (which is the majority of productivity in the country). The ability to carry out these adaptive behaviors may make a difference in their impacts.

**Methodology**

*100 – 250 words*

This research focuses on three kinds of adaptive behavior by farm households. We consider the effects of socio-economic characteristics of operators, the condition of household members, and weather factors on vegetable farm households. When using cross-section data, estimation under the assumption of spatial independence may lead to incorrect conclusions regarding spatial spill-over effects or spatial heterogeneity. Additionally, when estimating the three equations simultaneously, the same independent variables (e.g., socio-economic characteristics) and disturbances are likely correlated since they originate from the same households. By combining climate data and agricultural census data at the township level, this research examines the existence of spatial lag and error dependence, and applies the spatial seemingly unrelated regressions method. In this model, the study also examines whether the relationship between behaviors and shocks changes depending on past weather experiences through interaction terms, as well as the inconsistent impact of positive and negative shocks.

**Results**

*100 – 250 words*

This research examines for the effects of weather shocks while considering inconsistent effects, the experience of weather conditions by spatial seemingly unrelated regressions method. Our findings reveal that the impacts of positive and negative weather shocks are not consistent. Rainy shocks increase the ratio of households engaged in non-agricultural work and the adoption rate of organic practices, whereas drier shocks do not have the same effect. Additionally, higher temperature leads to an increase in greenhouse ratios. Moreover, we observed that variations in past weather conditions moderate the effects of rainfall shocks. Furthermore, among specific groups of farm households, core farm households, which constitute the primary productivity in the country, exhibit all three behaviors affected by weather shocks. Conversely, mini farm households are less likely to be affected by weather shocks. Notably, we also found that elderly farm households show stronger positive effects on the non-farming ratio compared to other groups.



<b>Discussion and Conclusion</b>	<b>100 – 250 words</b>
<p>This research mainly provides the empirical evidence for the effect of weather shocks no matter for rainfall or temperature. Results show the vegetable farm households in Taiwan tend to be affected by positive shocks, especially in rainfall. This might indicate that farm households are more risk-preventive in response to positive shocks. And the negative shock of rainfall can be compensated by proper infrastructure like irrigation facilities. The effect of weather shocks also varies between behaviors, such as the labour allocation and conservational farming practice are affected by rainy shocks while the ratio of greenhouse increases with hotter weather. The finding of the moderation of weather experience suggests that prior experience reduces their sensitivity the shocks. From subgroup analyses, it's noteworthy that elderly farm households tend to allocate their family labour to non-agricultural sectors when facing shocks. This consequence might indicate lower motivation for subsequent agricultural operations among this demographic. Additionally, mini farm households may exhibit lower responsiveness to climate shocks due to implementation costs or limited capabilities. With the full consideration of inconsistent effect, weather experience, spatial dependence, and correlation between equations, this study can provide a more comprehensive view on how weather shocks affect farm households' behaviors.</p>	