***CONSUMER RESPONSES TO FOOD PRODUCTS PRODUCED NEAR THE FUKUSHIMA NUCLEAR PLANT***

Kentaka Aruga, Ishikawa Prefectural University

Phone: +81-76-227-7410, E-mail: kentaka.aruga@gmail.com

## Overview

 On March 2011, the Fukushima Daiichi nuclear plant was hit by a tsunami and this resulted in a meltdown of three nuclear reactors. Right after this accident, the plant started to release substantial amounts of radioactive material into air, and hence, many food products have been contaminated with radioactive material. Up to the present, radioactive material has been found in various food products such as vegetable, meat, seafood and rice, and in drinking water as well. The Japanese government has soon set a severe safety standard to regulate the limits of radioactivity in food products but many consumers started to avoid purchasing food that are produced near the Fukushima nuclear plant. Because of such consumer response toward agricultural products produced near the Fukushima nuclear plant, the prices of food products produced near the plant have depreciated remarkably compared to those produced in other areas of Japan.

 The purpose of this study is to understand consumer responses for food produced near the Fukushima nuclear plant in order to debunk rumors that food products produced near the nuclear plant have the risk of radioactive contamination. To achieve this goal, the study will investigate the consumer responses for seven agricultural products (rice, beef, pork, cucumber, apple, egg, and shiitake mushroom) produced near the nuclear plant and find out what factors and attributes of consumers affect their purchasing behavior.

 There are many studies investigating how consumers respond toward food safety issue such as in genetically modified food (Costa-Font et al., 2008; McCluskey et al., 2003) or in mad cow disease (Pennings et al., 2002) but only few studies exist which cover the radiation contamination. Thus, we hope to cover this gap in this study. We also believe this study is important because understanding economic effects on agricultural products after the Fukushima nuclear incidents is a crutial issue for nuclear power plants to understand and prepare for such underlying risk.

## Methods

 We set the $WTA\_{i}$ as the individual’s willing to accept (WTA) compensation for agricultural products produced near the Fukushima nuclear plant relative to agricultural products produced further away from the nuclear plant. In this study we let the $WTA\_{i}$ as the indicator variable for the individual’s latent WTA value for various agricultural products. We assumed that the respondent’s true WTA lies within the interval defined by the lower and upper thresholds of the payment card. By using this variable we build the following model,

$WTA\_{i}=x\_{i}^{'}β+ε\_{i}$ (1)

where $x\_{i}^{'}$ is the vector of explanatory variables that have potential effects on the willingness to accept for different agricultural products, and $ε\_{i}$ is the normally distributed error term.

 To evaluate this model, we designed a consumer survey to find out at which discount rate people are willing to accept to buy agricultural products produced near the Fukushima nuclear plant compared to agricultural products that are produced further away from the nuclear plant. The questionnaire for the parment card to configure consumer’s WTA toward food products produced near the nuclear plant was as follows: *Imagine a case where agricultural product that are produced 100km apart from the nuclear plant and the same product produced 300km apart from the nuclear plant are sold next to each other in a grocery store. Are you willing to buy the food produced 100km apart from the nuclear plant if the discount rate was \_\_% for this product compared with the one produced 300km apart from the nuclear plant?* The product name was randomly set to either rice, beef, pork, cucumber, apple, egg, and shiitake mushroom. The discount rate is initially asked at a zero discount rate but is increased by 10% up to 60% if the consumer answers “no” to the question. Thus the question is asked seven times until the discount rate reaches 60%. We assume the consumer is not willing to buy the food produced 100km apart from the nuclear plant if the consumer answers “no” even at the 60% discount rate.

Besides the questions to reveal consumers’ WTA toward food products produced near the nuclear plant, we also asked questions about their demographic attributes of the consumers, income, education level, ditstances of their dwellings from the nuclear plant, environmental consciousness, importance of food safety issue, trust toward the food safety standard, risk conscious toward food products after the nuclear incident, and knowledge toward radiation and radioactive materials.

The survey data was gathered through online survey which was conducted during the Jan. 30, 2014 – Feb. 4, 2014 period. In total, 8732 consumers from all parts of Japan were surveyed.

For the econometric analysis to identify the consumer response toward agricultural products produced near the nuclear plant using equation (1), we used the ordered probit model.

## Results

 For most of the seven agricultural products investigated in the study, the results of the ordered probit model suggested that consumers that put high priority on food safety issue, live distanced from the nuclear plant, live with many children under age of 15, and think the risk of radiation contamination is higher after the nuclear incident have a higher WTA toward agricultural products produced near the Fukushima nuclear plant. Thus this results implied that such consumers are less likely to buy agricultural products produced from areas near the nuclear plant.

On the other hand, consumers that have high environmental consciousness, high knowledge toward radiation and radioactive materials, and high trust in food safety standard tend to have a lower WTA toward food products produced near the nuclear plant. These consumers were even willing to buy food products produced near the nuclear plant at the same price as the ones produced further away from the nuclear plant.

## Conclusions

 Comparing the results of factors that affected the WTA toward agricultural products produced near the Fukushima nuclear plant, it seemed that consumers that are knowledge about radiation and radioactive materials and can grasp the risk of radiation contamination as tangible risk are more likely to accept to buy food produced near the nuclear plant. On other hand, the results of our study seemed to imply that consumers who perceive such risk as intangible tend to have high WTA toward agricultural products produced near the nuclear plant. Hence, it is important for the Japanese government to construct food safety standard in a way that the consumers can see the actual risk of the radiation contamination and to educate and train consumers so that they will become more knowledgeable about radiation and radioactive materials.

## References

Consta-Font, M., J. M. Gil, and W. B. Traill. 2008. Consumer acceptance, valuation of and attitudes towards genetically modified food: Review and implications for food policy. *Food Policy* 33: 99-111.

McCluskey, J., K. M. Grimsrud, H. Ouchi, and T. I. Wahl. 2003. Consumer response to genetically modified food products in Japan. *Agricultural and Resource Economics Review* 32: 221-231.

Pennings, J., B. Wansink, and M. Meulenberg. 2002. A note on modeling consumer reactions to a crisis: The case of the mad cow disease. *International Journal of Research in Marketing* 19: 91-100.