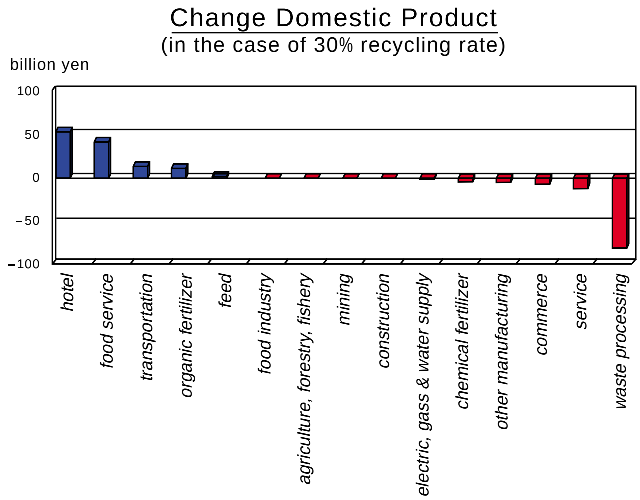
(3) The remaining problem

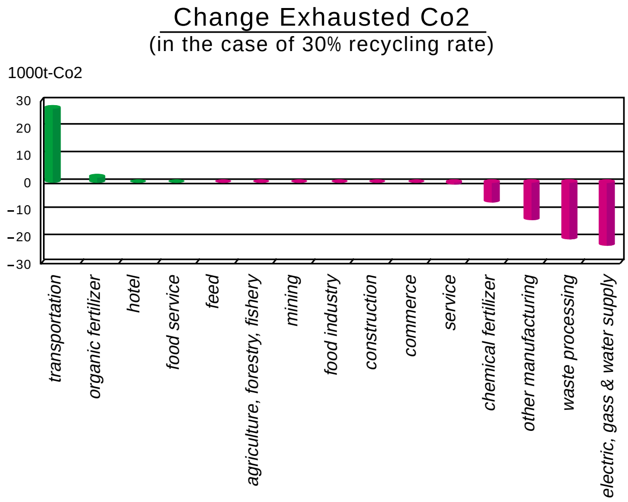
Due to insufficient data for an economic analysis, the estimation of bio-energy recycling could not be calculated.

3. Related publication

Yoshida, T. (2002.7) Estimation of economic effects of the recycling of food wastes, *PRIMAFF Review* 4.

Research members
Taiji Yoshida and Tetsuro Yakushiji





Development of a Method for Econometric Estimation of Technological Innovation in Agricultural Production

Shunji ONIKI

1. Objective

This study develops econometric models to estimate technological changes in agricultural production, and conducts empirical analysis using the models. Using aggregate data for Japanese rice production, relationships between innovation based on capital investment and innovation toward quality improvement of the products are investigated. Also, the possibility of long-run growth in agricultural production under environmental constraints is examined.

2. Method

Panel data has been compiled for the rice production, and the quality index of rice covers eight areas over the 16 year period (1984-99). Using the data, a translog cost function model including a variable of product quality is estimated. Relationships between the quality index and the total factor productivity (TFP) are also tested in regression models.

3. Outline of the results

(1) The rates of increase in the quality index and the rates of increase in yield are higher where yield per hectare in the initial period is lower, implying the quality improvement accelerates as the yield increase stagnated (Table 1). Quality improvement has significantly contributed to an increase in productivity.

(2) The panel data analysis reveals a negative relationships between the yield and the quality index (Table 2).

(3) Changes in the output levels, as well as technological changes, affect demand for the intermediate inputs, such as fertilizers and chemical, while changes in the product quality do not shift the demand significantly (Table 3). These results imply that quality-based innovation is induced as effects of innovation based on capital investment diminish. In addition, the amount of the intermediate inputs per output adjusted by the quality changes in the product does not continue to increase, due to the quality improvement. Thus, sustainable growth under environmental resource constraint is possible considering the quality-based innovation.

Table 1. Growth Accounting of the Japanese Rice Production, 1984-99

	Region**							
	I	II	III	IV	V	VI	VII	VIII
TFP annual growth rate*	1.45%	1.40%	1.34%	0.43%	1.76%	0.69%	0.99%	0.68%
Contribution of quality in TFP	42.1%	36.6%	23.4%	63.5%	11.3%	45.5%	38.1%	56.3%
Annual growth rate of yield	−1.02%	−0.97%	−0.53%	0.17%	0.27%	−0.63%	−1.02%	−0.67%
Annual growth rate of quality of rice	0.61%	0.51%	0.31%	0.27%	0.20%	0.31%	0.38%	0.38%
Annual growth rate of area	1.81%	1.42%	1.76%	1.35%	1.43%	2.03%	1.04%	2.66%
Annual growth rate of factor use	0.59%	0.14%	0.87%	1.80%	0.08%	1.31%	0.13%	1.77%
Initial value of average cost (1984)	0.93	0.95	0.94	1.09	1.23	1.19	1.12	1.00
Initial value of yield (1984)	1.09	1.01	0.96	0.91	0.95	0.96	0.97	0.96
Initial value of quality of rice	0.97	1.12	1.01	0.98	0.99	0.97	0.98	0.98

*Adjusted by the quality changes.
**I: Tohoku, II: Hokuriku, III: Kanto, IV: Tokai, V: Kinki, VI: Chugoku, VII: Shikoku, VIII: Kyushu.

Table 2. Panel Data Analysis on the Quality Index

	Model			
	Fixed Effect		Random Effect	
Constant	n/a		1.0825	(46.896)
Yield	−0.0002	(−5.664)	−0.0002	(−6.202)
Trend	0.0038	(22.003)	0.0038	(22.157)

Note: The values in the parantheses show t-statistic computed by the heteroscadestic-robust standard errors.

Table 3. Effects of Output and Technical Change Bias in Factor Demand in Japanese Rice Production

	Labor		Land		Intermediate		Capital
Output Effects	0.0276	(0.739)	0.2220	(3.327)	−0.0132	(−0.334)	−0.1029
Quality Effects	−0.3115	(−0.914)	0.0221	(0.040)	0.2008	(0.457)	0.1952
Technical Change Bias	−0.0077	(−4.661)	0.0140	(3.276)	0.0022	(1.172)	0.0007

Note: t-statistics are in parentheses.

Economic Analysis of the Vegetable Price Stabilization Program

Toshitaka KATSUKI

The vegetable price stabilization program is formulated based on the Vegetable Production and Marketing Stabilization Act. The aim is to secure consistency of production in the subsequent year. In the event of price decrease in the preceding year, this will be achieved by producers making, under certain conditions, ex-post subsidy payments.

However, there is inadequacy in researching the significance of the role of the above-mentioned program. Therefore, a method has been developed during the research to evaluate and verify the vegetable price stabilization program, focusing on individual items, by applying the means of cost-benefit analysis.

First of all, DPAs (Designated Production Areas), which are approved areas for price supplement, were compared with non-DPAs in order to find the degree of effect on the production stability in the DPAs made by the price stabilization program.

Next, in order to evaluate the vegetable production business, based on the assumption that the same measures apply to both DPAs and non-DPAs without the price stabilization program (i.e. the reduction of cropping acreage in both DPAs and non-DPAs in the following year due to the previous year's price decline), the impact on the trade value caused by shipment quantity and price fluctuation was estimated and compared with the expenditure incurred by the operation of the program.

Described below are the results, which have been reached through the evaluation, focusing particularly on cabbage, the item for which a large subsidy is granted (of high demand with extreme production fluctuation).

(1) Compared to the non-DPAs, certain measures are taken in the DPAs to sustain the consistency in the production (with minimum production fluctuation) of the following cropping season for which subsidy has already been granted (i.e. the price has fallen in the previous year). (Fig.1)