Macro-economic analysis of food distribution cost

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In Japan, the share of the distribution sector in consumers' food and beverage expenditure is growing. This study examined trends in food distribution costs by macro-economic analysis using input-output tables. To begin with, trade margin rates (proportion of value of trade margin in consumers' expenditure) of agriculture and fishery products and food industry products were measured. Next, a "margin index", newly defined as an index of value of margin per unit of quantity, was calculated using linked input-output tables 80-85-90, 85-90-95 and 90-95-2000, and factors affecting trade margin rate change were analyzed.

Fig. 1 shows induced added values by sector of food and beverage expenditure in Japan. The trade and transport sector has been clearly growing proportionally, suggesting increased food distribution costs. But it possibly went with increase in distribution service level, such as improved convenience for consumers.

Taking into account that the trade sector's product is distribution services, distribution costs should be measured by cost per unit of that service, in the same way that production costs of goods are measured by cost per unit of quantity produced. But as it is difficult to measure the quantity of produced distribution service, for the time being, there is no choice here but to consider trade margin rates.

Fig. 2 shows the trade margin rates of agricultural and fishery products and food industry products in Japan and in the U.S. calculated by using input-output tables. The agricultural and fishery products here are raw fish and shellfish, vegetables, fruit and eggs. Frozen fish and shellfish, rice, and meat are products of seafood processing, rice milling and meat processing respectively, and included among food industry products.

The trade margin rate of agricultural and fishery products in Japan is slightly higher than the U.S. That of raw fish and shellfish raises Japan's margin rate, but there is not a significant difference between the two countries for crops. For food industry products, Japan's margin rate was lower than the U.S. until about 1990. But after a sharp rise until about 1995, its level was similar to the U.S. by about 2000. In Japan, wholesale margin rates are higher and retail margin rates are lower than the U.S. The increase in the trade margin rate of food industry products in Japan until 1995 was due mostly to the rise in the wholesale margin rate.

A decomposition of Japan's increase in trade margin rate of food industry products from 1990 to 2000 into items shows that, of a rise in the trade margin rate of 6.97 percent points, 2.47 percent points are caused by rise in "other foods," 1.55 percent points by "soft drinks" and 1.31 percent points by "noodles, bread and confectionery". The rise in the trade margin rates and expenditure share of these items contributed mostly to the rise in the trade margin of food industry products. "Other foods" includes takeout dishes, packed lunches and rice balls etc. The expansion of demand for these pre-cooked and ready to eat foods which are highly convenient to consumers affected the rise in the trade margin rate of food industry products, suggesting that it went with some rise in the level of distribution services.

As the trade margin rates are the proportion of value of trade margin in the consumer's expenditure, changes are influenced by the producer or consumer price. A decrease in the producer price without changes in the trade mar-

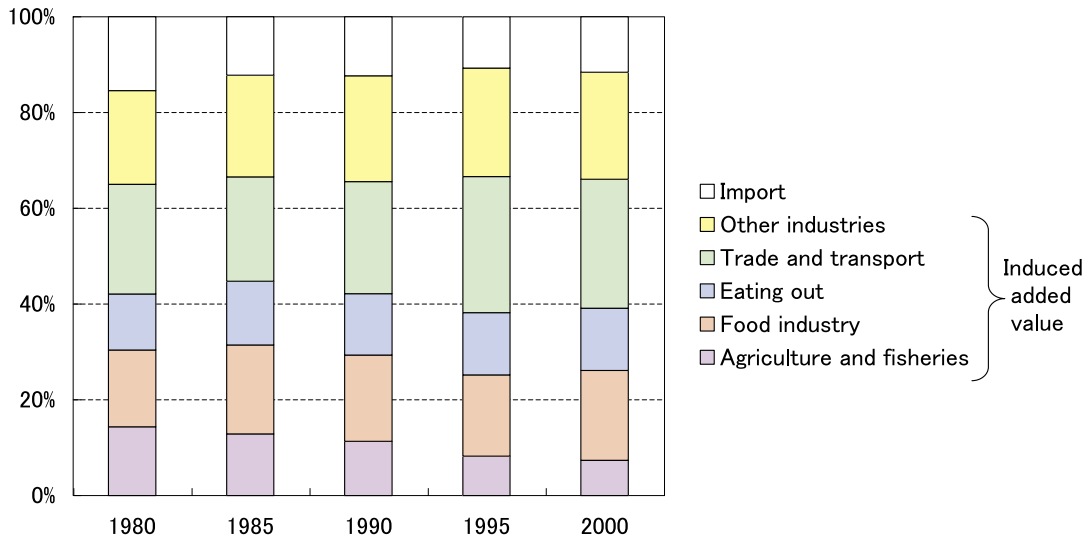

Fig.1. Induced Added Value of Food and Beverage Consumption Expenditure by Sector (Component Ratio)

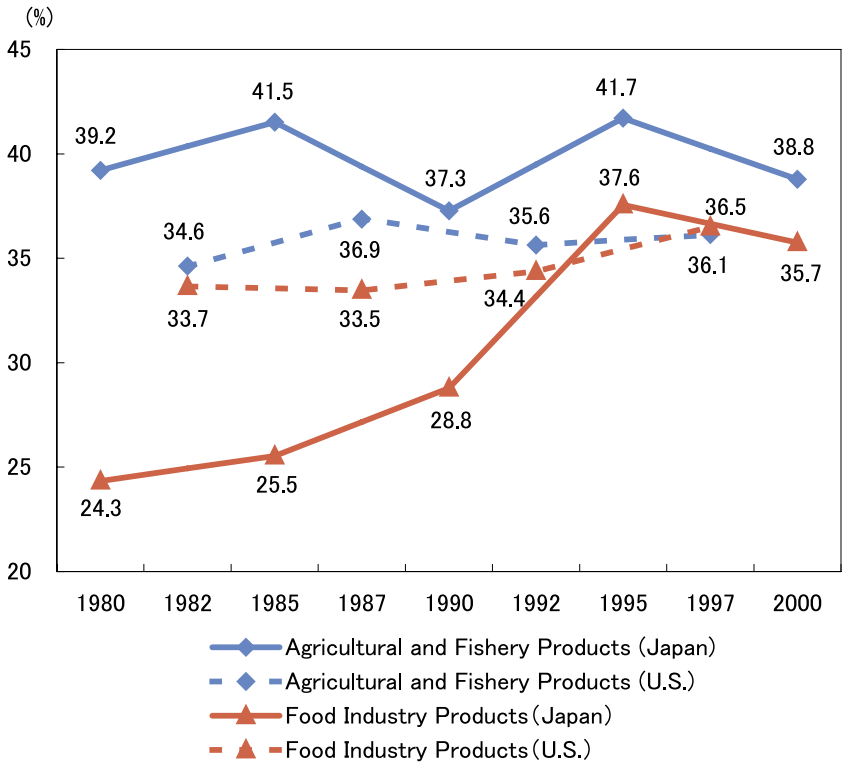

Fig.2. Trade Margin Rates in Japan and the U.S.

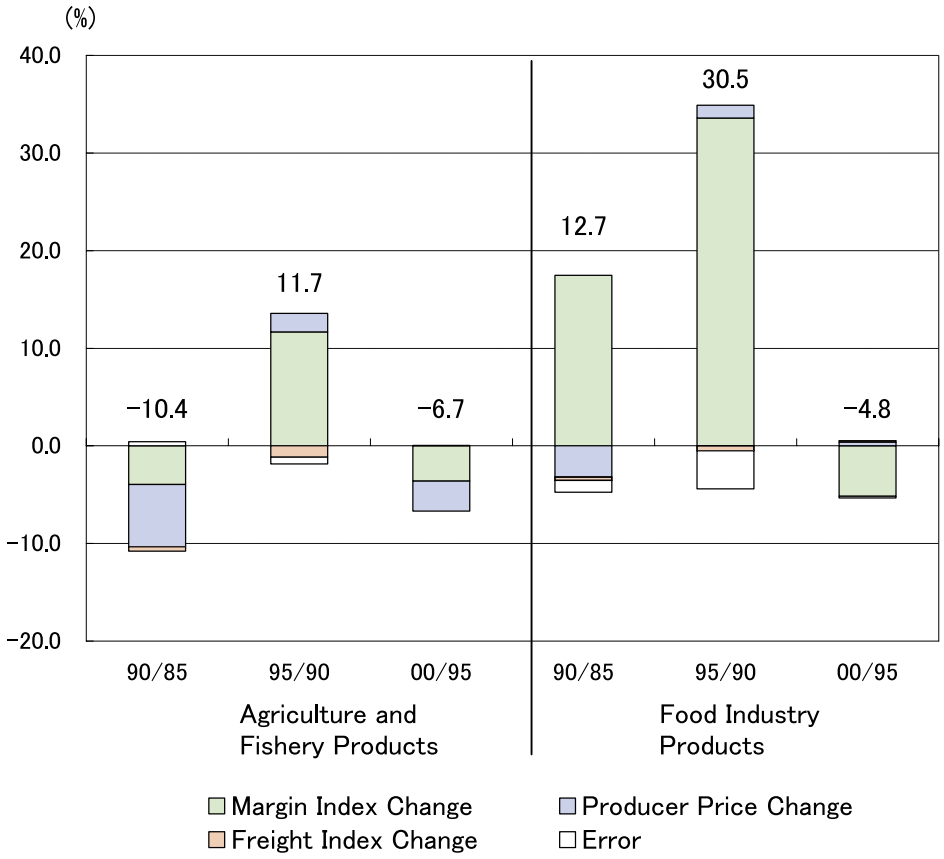

Fig.3. Factor of Trade Margin Rate Change

gin, for example, would raise the trade margin rate. We defined a new indicator "margin index" so as to analyze changes in trade margin without being influenced by the changes in producer or consumer prices. This index is an index of value of margin per unit of quantity of merchandize, obtained by dividing value index of margin by quantity index of merchandize passing through the distribution channel. Similarly freight index is calculated by dividing the value index of transport margin by the same quantity index. These indices were calculated by using linked input-output tables.

Fig. 3 shows a decomposition of changes in trade margin rate into factors affecting them by using calculated margin index. Influence of

producer price change was relatively small for both agriculture and fishery products and food industry products; margin index change mostly affected the trade margin rate change.

Examining the changes in cost structure of wholesale and retail sectors obtained by the linked input-output tables clarifies that the margin index change was affected mostly by wages and salaries for both wholesale and retail sectors.

Developing an Environmental Accounting for Agriculture

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1. Objective

This study aims to consider whether environmental accounting for the non-agricultural sector can be applied to agriculture and how it should be modified, and then to develop an environmental accounting for agriculture.

2. Procedures

First, we consider why environmental accounting for non-agricultural sectors cannot be applied to agriculture. Then, we tried to develop a new environmental accounting for agriculture which farmers can use easily.

3. Application of environmental accounting to agriculture

Although environmental accounting is widely used in large firms in the non-agricultural sector, it is hardly used at all in agriculture. This is because agriculture has followed three characteristics. First, agricultural production strongly relates to nature. Firms in the non-agricultural sector can calculate their environmental loads caused by their activities by measuring pollutants from their facilities and offices. However, as agricultural production is practiced by using natural resources such as land and soil, there is no clear border between nature and agricultural production.

Second, agriculture has multifunctionality. Agricultural production provides not only foods and materials but also positive externality such as environmental benefits and beautiful landscape. As environmental accounting can only measure negative externality, some modification should be made to measure multifunctionality.

Thirdly and finally, the agricultural sector mainly consists of small-scale family farms, especially in Japan. Most farms do not have sufficient knowledge and skills to carry out environmental accounting.

In spite of these three points, environmental accounting in agriculture has some advantages for farm management. As consumer awareness for the environment and food safety has increased rapidly and some more agri-environmental policies are to be implemented in the near future, eco-friendly farming will become an important requirement. It is important for farmers to evaluate agri-environmental activities objectively. Environmental accounting provides farmers quantitative evaluation of their agri-environmental activities.

How then should we modify environmental accounting to introduce it to agriculture? We found that it is not enough to measure only environmental factors quantitatively; we also need to evaluate qualitative factors if we are to try to evaluate a farm's agri-environmental activities. So, we developed a new tool for evaluating agri-environmental activities both quantitatively and qualitatively. We have called it "Agri-Environmental Activities Check Software: AEACS".

4. Agri-Environmental Activities Check Software (AEACS)

AEACS is a tool for evaluating farmers' agri-environmental activities both quantitatively and qualitatively. It is designed as software and incorporates Internet accessibility and radar chart graphs so that it is convenient for farmers to use. In the project, we developed AEACS for paddy rice cropping farms. This is because rice is one of the most important crops in Japan, and it is widely planted throughout the country.

AEACS consists of 5 parts, from Step 1 to 5. As shown in Fig. 1, in all parts, users can easily input their data on the screen by mouse-clicking or via the keyboard.

In the Step 1, users input 14 items of basic information, such as paddy field area, volume of fertiliser, etc.. Step 2 is based on "Code for Agricultural Practice in Harmony with the Environment", which was formulated by MAFF in 2004. Detailed activities are asked about in Step 3 and activities for multifunctionality promotion are asked about in Step4.

As shown in Fig. 2, in Step5, results of the evaluation are indicated by indexes and graphs which are made from input data in previous steps. Environmental loads from agricultural production are calculated in this part. Users