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QUALITY-EQUIVALENT AND COST-ADJUSTED MEASUREMENT OF INTERNATIONAL COMPETITIVENESS IN JAPANESE RICE MARKETS

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ABSTRACT

In this research, the quality of foreign japonica rices was evaluated in terms of prices relative to Japanese domestic retail prices. Then, retail prices, consumer benefit, and competitiveness among the foreign rices in the Japanese market were estimated assuming those rices were imported at prices based on their production and transportation costs. According to the results, rices produced in China are quite superior to rices grown in the United States. Further, a 700 percent of tariff, which was discussed in the GATT negotiation and assumed to be imposed on rices imported to Japan, appears to be too low for Chinese rices and too high for American rices.

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QUALITY-EQUIVALENT AND COST-ADJUSTED MEASUREMENT OF INTERNATIONAL COMPETITIVENESS IN JAPANESE RICE MARKETS[*]

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1. INTRODUCTION

Rice prices in Japan are far higher than in any other country (Wailes, et al. 1991). It is often overlooked that the type of rice Japanese consumers prefer is not necessarily the same as the rice grown in other nations. Although rices in the world are divided into three broad categories -- indica, japonica and javanica -- taste preferences of Japanese consumers are specialized even among japonica varieties. All short and medium grain rices are often thought to be japonica rice, and this has caused considerable confusion. In

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fact, many varieties of short/medium grain rices, such as those grown in the southern U.S., have characteristics that are not suitable for Japanese consumer preferences.

In the international agricultural trade literature, export and import elasticities have been widely estimated and employed for estimating trade flows (Gardiner and Dixit, 1986). Recently, more sophisticated methods have been applied for analyzing international trade for differentiated goods (Bateman, 1988; Ito et al., 1990; Cramer et al., 1993; Agcaoili-Sombilla and Rosegrant, 1994), but these analyses still characterize trade in terms of elasticities. Trade elasticities are hard to estimate for countries, such as Japan, that have not traded internationally or that have rigid protection measures for their domestic agriculture, because no reliable trade data are available.

To cope with this problem, concepts of producer and consumer surplus equivalents and nominal rates of protection have been used (Tweeten, 1992). A problem with estimation of these values is that they are calculated based on market prices at individual locations, and quality differences and consumer preferences between products are generally neglected. Difference in production costs among exporting countries are also ignored. For example, an implicit agreement within the Uruguay Round on a 700 percent tariff for Japanese rice imports was based solely on differences between California and Japanese market prices (Institute of Food Policy, Japan, 1992). However, the quality of japonica rices grown in California, China, or elsewhere is not necessarily equivalent to those grown in Japan. If different qualities of products are compared, the estimated equivalent tariff may be inappropriate.[1]

Quality issues are becoming increasingly important in world agricultural trade (Huang and Lin, 1994; Hyberg et al., 1993). In addition, production costs differ depending upon country or region, and market prices fluctuate reflecting market conditions rather than production costs. It is important, therefore, to characterize the quality and production costs of commodities and to control for these differences when estimating competitiveness between and among exporting and importing countries.

In this research, a modeling approach incorporating quality and production costs is first developed. Second, foreign-produced japonica rices are evaluated by Japanese consumers in taste tests relative to the prices of domestically produced rice in Japan. Although the quality of rice for industrial uses can vary widely, rice for home use in Japan must be of high quality. Japanese consumers will not buy low quality rice even at low prices. Accordingly, it is important to evaluate rice based on the quality of individual varieties. Third, production costs of foreign japonica rices and their transport

[1] The base for the 700% concept can be seen by comparing California rice market prices and Japanese government procurement prices for the 1988 crops in the countries. The annual average market price of California medium grain, for which Calrose rice accounts for about 80%, was $16.70 per 100 pound of milled rice during August 1988 and July 1989 (USDA, July 1994). Meanwhile, Japanese procurement price for 1988 crop was 16,743 yen per 60kg of brown rice (Wailes et al., 1991). Applying 10% loss of milling brown rice and an exchange rate of 120 yen to a U.S. dollar, the Japanese rice is calculated to be approximately 700% higher than the Calrose rice at the wholesale market.

costs are identified so that border prices for individual products can be estimated. Finally, based on the evaluated prices and production costs for foreign produced rices, simulations for Japanese imports of particular types of rice were conducted to predict what the border (CIF) price would be, how much consumer benefit would be generated, and how much tariff would need to be imposed on the imported rices in order to make prices for imported rices equivalent to the domestically produced rices in the market. Consequently, competitiveness among the foreign-produced rices in the Japanese market is evaluated.

2. MODELING APPROACH

Estimation of the nominal rate of protection is described by Tweeten (1992, pp.49-54). The nominal protection coefficient (NPC) of the i-th commodity is defined as the ratio of its domestic price P_d to its border price P_b:

$$NPC_i = P_{di} / P_{bi} \quad (1)$$

where,

NPC_i = nominal protection coefficient for the i-th commodity in a given country,
P_{di} = domestic price of the i-th commodity at the producer or wholesale level,
P_{bi} = border price of the i-th commodity at the same market location as the domestic price, with the border price being its international trade or world price times the rate of exchange.

Then, the nominal protection rate (NPR) is defined in percentage form as:

$$NPR = 100(NPC - 1) \quad (2)$$

Even though "the border price is the world price less all resource costs ..." (Tweeten, p.51), the world price still reflects the current market condition.

In the research here, the magnitude of protection is instead estimated based on quality and costs of the foreign products relative to the domestic products in the market, and the estimated magnitudes for individual foreign-produced products can be interpreted to be the level of competitiveness among the products in the market.

First, a border price is estimated based on costs of production in the foreign country and transport costs from the producing country to the i-th market:

$$PB_{ij} = PP_j + PT_{ij} \qquad (3)$$

where,
PB_{ij} = border price of the j-th product at the i-th market,
PP_j = total production costs for the j-th product,
PT_{ij} = transport costs for the j-th product from the production site to the i-th market's border.

Once the border price is defined, then the product's retail price in the i-th market can be calculated by adding import fees and marketing margins in the domestic market:

$$PA_{ij} = PB_{ij} + PE_{ij} + PM_{ij} \qquad (4)$$

where,
PA_{ij} = calculated domestic retail price for the j-th product in the i-th market,
PB_{ij} = as defined in the previous equation,
PE_{ij} = fees for customs and storage for the j-th product at the border,
PM_{ij} = a standard margin for the j-th product in the i-th market between the border and the retail shop.

Now, it is possible to calculate the consumer benefit per unit of volume by comparing between consumers' evaluated price and the calculated price:

$$PS_{ij} = PQ_{ij} - PA_{ij} \quad (5)$$

where,
PS_{ij} = consumer benefit for the j-th product in the i-th market,
PQ_{ij} = quality equivalent price evaluated by consumers in the i-th market for the j-th product,
PA_{ij} = as defined in the previous equation.

The PQ_{ij} is an evaluated price for the j-th product based on the current market price in the i-th market.

Finally, it is possible to estimate the rate of protection in the i-th market:

$$RQC_{ij} = (PS_{ij}/PB_{ij})*100 \quad (6)$$

where,
RQC_{ij} = quality-equivalent and cost-adjusted protection rate for the i-th market,
PS_{ij} = as defined previously,
PB_{ij} = as defined previously.

The RQC_{ij}, if it is imposed as a tariff, is the rate which would make the consumer benefit, PS_{ij}, zero in the i-th market. The RQC_{ij} is also interpreted as the magnitude of competitiveness for foreign products in the i-th market; the greater RQC_{ij}, the more competitive the product. If the situation below reveals,

$$RQC_{ij} > RQC_{ik} \quad (7)$$

then the j-th product is more competitive than the k-th product in the i-th market. In other words, the government would have to impose a larger tariff for the j-th product to protect the domestic market than for the k-th product.

3. EVALUATION OF TASTE FOR JAPONICA RICES PRODUCED OUTSIDE JAPAN

To evaluate tastes of Japanese varieties of rice grown outside Japan, two rice taste tests were conducted as blind tests with Japanese consumers. The first test included five Koshihikari rices from Arkansas, California, Thailand, Philippines, and Japan.[2] Before the taste test, the only two pieces of information given to the participants were the rices' places of production (but not identifying the origin of each individual rice), and the retail price of Japanese Koshihikari rice. The questionnaire at the taste test covered various questions related to the taste of and willingness-to-pay for each rice and the participants' eating habits. Consumers' evaluation were based solely on the participants' willingness-to-pay for the individual foreign produced rices compared with the Japanese-produced Koshihikari, which was sold by 10kg bag of milled rice for 6,000 yen each, or $55.65/10kg, milled.[3]

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[2] Koshihikari is the name of a japonica rice variety developed in Japan three decades ago. It is still preferred by most of the Japanese consumers.

[3] The detailed method and some results of the test are documented by Ito et al (1993).

The average of evaluated prices in Table 1 shows that participants rated California rice the highest at $44.69 per 10kg of milled rice, followed by Japan, Arkansas, Thai, and Philippine Koshihikari. At this point, it is important to be aware of the date each rice was actually milled. Once rice is milled, the taste of rice deteriorates gradually. California rice had a slight advantage over the other varieties in the test because the California rice was milled immediately before the taste test, while Japanese rice was milled one month before, and Arkansas, Thai, and Philippine rices were milled about two months before the taste test.[4] Given the different milling dates, the tastes preferences for California, Japan, and Arkansas Koshihikari can be viewed as similar, while Thai and Philippine Koshihikari are inferior to the other three. The adjusted prices in Table 1 are obtained by multiplying the averages of the evaluated prices by 1.278. This was done to calibrate the base rice, Japanese Koshihikari, to its actual retail price of $55.65 per 10kg. Some of the participants were unable to identify Japan Koshihikari in the blind test and assigned lower prices to Japanese rice than its actual retail price. To facilitate comparison with actual retail prices, the evaluated average price was therefore adjusted upward to the actual retail price.

To examine the quality of other foreign-grown japonica rices, a second taste test for California Calrose, and China's Ha-jiang19 and Sung-gang2 was conducted in the same manner. The results are reported in the bottom section of Table 1. This test indicated that northeastern China is producing high quality japonica rices. Ha-jiang19

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[4] Ideally, it would be the best to obtain unmilled brown japonica rices and bring them into Japan, then mill them at the same time just before the test. However, it is extremely difficult to obtain unmilled brown

and Sung-gang2 were evaluated at $46.84 and $49.55, respectively, while California Calrose was evaluated at $38.12 per 10kg of milled rice. Calrose from California was thus inferior to the other japonica rices tested.

4. ESTIMATING FOR PRICES FOR FOREIGN-PRODUCED JAPONICA RICES

Under the Uruguay Round agreement of the GATT (General Agreement on Tariff and Trade) negotiation, Japan partially opened her rice market as of April 1995.[5] Permitted imports will be 4 percent of total domestic consumption of about 9 million metric tons of milled rice in 1995, increasing to 8 percent by the year 2000. As shown in Table 1, there is a huge difference in retail prices between Japanese and foreign markets. To assess the competitiveness of foreign-produced rice in the Japanese market, it is important to investigate the FOB prices for these types of rice. Further, once FOB prices are estimated, it is possible to estimate the border (CIF) prices, retail prices, consumer benefit and competitiveness among the imported rices. U.S. produced japonica rices, Koshihikari from Arkansas and Calrose from California, and Chinese japonica rice, Ha-jiang 19, were examined in detail, as representative of rices from developed and developing countries.

japonica rices in foreign countries. Most of them are stored in rough rice then completely milled once they are brought to the mills under the systematic process. It is prohibited to bring rough rice into Japan.

[5] Independently of the Uruguay Round agreement, Japan imported about 2.5 million metric tons of rice during the 1993/94 marketing year under an emergency measure due to an unusual crop failure in 1993.

ARKANSAS KOSHIHIKARI

Koshihikari is a new variety in Arkansas and currently is only produced on one rice farm. Traditionally, only indica rice (long grain) has been grown in the South, so production of a Japanese-developed variety in Arkansas in 1992 was a surprise to the U.S. and the world rice industry. Because production of new varieties incurs risks, such as low yields, and requires learning different water management and fertilizer practices, it is important for a producer to obtain at least the same amount of profit from growing Koshihikari as he/she receives from growing local long grain variety rice.

Table 1--Average evaluated prices, adjusted prices, and retail prices of foreign grown Koshihikari as well as other japonica rices based on blind tests. 1/

(10 kg, milled)

Varieties	Number of Responses	Raw Average Prices	Adjusted Prices	Local Retail Prices 3/
		(Dollars)		
Japan Koshihikari	67	43.55	55.65	55.65
Arkansas Koshi.	68	40.59	51.88	15.42
California Koshi.	65	44.69	57.11	--
Thai Koshihikari	65	35.25	45.04	23.84
Philippino Koshi.	66	37.89	48.42	18.33
California Calrose 2/	88	30.92	38.12	7.71
China's Ha-chiang19 2/	87	37.99	46.84	1.72
China's Sung-gang2 2/	87	40.19	49.55	1.15

1/ Conducted at Tottori University on December 18, 1992.
2/ Conducted at Tottori University on December 17, 1993.
3/ Actual prices in individual countries during 1992 and 1993 period.

Accordingly, an FOB price for Koshihikari in Arkansas was estimated from an opportunity cost point of view, to determine the price per unit the producer would require for Koshihikari in order to receive the same profit obtained from long grain rice. To do this, 1992 production data were collected from the only farmer who produced both long grain and Koshihikari rice in Arkansas. Table 2 compares the production costs for the two types of rice. Yields were 6,800 lbs. and 4,800 lbs. per acre for the long grain and Koshihikari varieties, respectively, a 29.4 percent lower yield for Koshihikari. Milling yields were the same, but broken rice accounted for 12 percent for the long grain rice and 32 percent for Koshihikari.

Compensations for the lower crop and milling yields of Koshihikari were estimated. Assuming the target price of $10.71/cwt is paid for the long grain rice, a yield deficiency of 29.4 percent must be added to Koshihikari, namely, $3.15/cwt. The problem of excessive broken rice must also be compensated for in the case of Koshihikari, namely, $3.21/cwt. These adjustments increase the farm price of Koshihikari to $17.07/cwt, which is regarded to be equivalent to the target price of $10.71 for long grain.[6]

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[6] If deficiency payment rate of $4.21 is subtracted, farm market prices would be $6.50/cwt and $12.86/cwt for long grain and Koshihikari, respectively. However, the deficiency payment was disregarded in this research. Because deficiency payment is paid based on government yields (not actual yields), the difference between the payments on the two types of rice should be minimal.

Table 2--Estimate for cost-oriented FOB price per 10kg of Arkansas Koshihikari milled and packed relative to long grain rice production, 1992. 1/

	Long grain (a)	Koshihikari (b)	(b)/(a)
Yield, lbs./acre	6800	4800	70.6%
For 1 cwt of roughrice			
Milling yield, lbs.	72.0	72.0	100.0%
Whole kernels, lbs.	60.0	42.0	70.0%
Brokens, lbs.	12.0	30.0	
Weight of milled rice (5% brokens), lbs.	63.0	44.1	
Farm cost ($)	10.71	10.71	
Compensation for yield ($) 2/	--	3.15	
Compensation for fewer whole kernels ($) 3/	--	3.21	
Assembly cost ($) 4/	0.31	0.31	
Costs of milling and packing ($)	1.25	4.00	
Cost of milled rice ($)	12.27	21.38	
For 10kg of milled rice (5% brokens)			
Costs of product ($)	4.29	10.69	
Cost of a 10kg bag ($)	0.35	0.35	
Shipping to port and loading costs ($)	0.40	0.40	
FOB price at port ($)	5.04	11.44	

1/ Opportunity costs of Koshihikari production with respect to long grain rice production.
2/ Compensating the situation that yield of Koshihikari was 29.4% smaller than long grain; obtained by multiplying 10.71 by 0.294.
3/ Compensating 30% for fewer whole kernels of Koshihikari relative to long grain; obtained by multiplying 10.71 by 0.3.
4/ Obtained from Smith, Randall K. et al., The Market Structure of the U.S. Rice Industry, Arkansas Agricultural Experiment Station Bulletin 921, University of Arkansas, 1990.

Adding assembly and milling/packaging costs, the price of milled rice with 5 percent brokens for 63.0 lbs. of long grain and 44.1 lbs. of Koshihikari would be $12.27 and $21.38, respectively (Table 2). Milling and packaging costs of $4.00 for 100 lbs. of roughrice for Koshihikari are large relative to the cost of $1.25 for long grain rice.

Higher costs are due to the higher milling standards and different equipment required for processing Koshihikari.

Converting to metric measurements, the costs are $4.29 and $10.69 at the mill gate for 10kg of milled rice with 5 percent brokens, and FOB prices are $5.04 and $11.44 after adding costs of bag and shipping and loading costs for Arkansas long grain rice and Koshihikari, respectively.[7] If brokens and milling and packaging costs could be reduced by half as farmers and millers gain familiarity with Koshihikari, the FOB price for the Arkansas Koshihikari would be reduced from $11.44 to $6.90.

CALIFORNIA CALROSE

California Calrose is a brand name and consists mainly of the M202 variety developed in California. This variety is the most widely planted variety in California because it can be grown in a shorter growing season and has a higher yield than M401. Yields of M202 for Calrose can be as high as 10,000 lbs. per acre. In this study, the average yield of 8,200 lbs.. per acre established in California in 1993 was used to estimate its FOB price (Table 3).

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[7] Arkansas rice may be shipped to New Orleans along the Mississippi River and loaded there for exports. Shipping from Arkansas to the port and loading would cost 40 cents per 10kg of milled rice (Smith et al., 1990).

Table 3-- Estimate for cost-oriented FOB price per 10kg of California Calrose milled and packed, 1994.

Production costs per acre ($) 1/	793.82
Yield, lbs./acre 2/	8200
For 1 cwt of roughrice	
Farm costs ($)	9.68
Assembly cost ($) 3/	0.45
Costs of milling and packing ($)	1.25
Milling yield, lbs. 4/	68.0
Whole kernels, lbs.	56.0
Brokens, lbs.	12.0
Weight of milled rice (5% brokens), lbs.	58.8
Cost of milled rice ($)	11.38
For 10kg of milled rice (5% brokens)	
Costs of product ($)	4.27
Cost of a 10kg bag ($)	0.35
Shipping to port and loading costs ($)	0.20
FOB price at port ($)	4.82

1/ Salassi, Michael E., *U.S. Rice Production Practices and Costs, 1988*. USDA/ERS, Statistical Bulletin Number 837, May 1992, pp.51-55. Production costs in California were $632.46 per acre excluding government payments. This figure was added by $40.27, which is residual returns to management and risk under government subsidies. This amount of returns to producer is assumed to be appropriate in this research. The figure was further inflated by 1.18 to account for inflation between 1988 and 1993.
2/ United States Department of Agriculture, *Rice Situation and Outlook Report*, ERS, RCS-68, October 1993, p.21.
3/ Smith, Randall K. et al., *The Market Structure of the U.S. Rice Industry*, Arkansas Agricultural Experiment Station Bulletin 921, University of Arkansas, 1990.
4/ Reference same as 2/.

Salassi (1992) estimated rice production costs in California for the 1988 crop year at $632.46 per acre, disregarding government payments. Adding $40.27, which is the residual return to management and risk under government subsidies to the total costs and multiplying the total by 1.18 to adjust for inflation between 1988 and 1994, the current production costs of rice in California are estimated to be $793.82 per acre.[8] The cost of 100 lbs. of roughrice, therefore, are calculated to be $9.68.

Taking costs for assembly and milling/packaging, together with milling yield, into consideration, costs of 58.8 lbs. of milled rice with 5 percent brokens generated from 100 lbs.. of roughrice are calculated to be $11.38 for Calrose. This figure is converted to $4.27 per 10kg of milled rice with 5 percent brokens. Finally, the FOB price for Calrose would be $4.82 per 10kg after adding production costs and costs of bag, shipping to port and loading.[9]

CHINA'S HA-JIANG19

Ha-jiang19 variety rice is grown on about 200,000 ha and is the most widely planted variety in Heilongjiang Province in northeast China. Cost of production data for Ha-Jiang 19 are not available. However, the provincial government provided a support price of 38.35 yuan for 50kg of roughrice for 1993 production, a 9.6 percent increase from 1992. This is slightly higher than the national guideline of the Ministry of Agriculture for rice procurement prices, which range between 29 yuan and 36 yuan for 50kg of roughrice (Huang, 1993). An upper bound for production costs for Ha-jiang19 is therefore assumed to be equivalent to the support price.

Table 4, therefore, starts with a support price of 76.70 yuan for 100kg of roughrice, and assumes this equals the production costs. Using a Chinese standard rate of

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[8] It is assumed that a $40.27 of residual returns to management and risk would be indispensable for producers regardless of government subsidies.

[9] Rice from California may be exported from Sacramento ports. Therefore, shipping costs from mills to the ports may be cheaper than those in Arkansas.

milling/packaging costs and milling yield, 63kg of milled rice with 5 percent brokens would cost 78.70 yuan, or 12.49 yuan for 10kg. China's currency, the yuan, was devalued from 5.8 yuan per US dollar to 8.7 yuan, a 50 percent devaluation, starting in January 1, 1994 (Japan Economic Journal, 1994).[10] Therefore, an FOB price for 10kg of Ha-jiang19 is US$1.49, substantially cheaper than Japonica rice from the U.S.

5. SIMULATION OF PRICES OF FOREIGN PRODUCED JAPONICA RICE IMPORTED TO JAPAN

Table 5 shows the results of simulated retail prices of Arkansas Koshihikari, California Calrose, and China's Ha-jiang19 when exported to Japan. These are derived using the FOB prices estimated in this study and adding relevant freight and miscellaneous costs. The retail price of Arkansas Koshihikari is also given when it is assumed that brokens and milling and packaging costs are reduced by half, as might happen as U.S. producers become more familiar with the variety. In this case,

[10] China has a floating exchange rate system.

Table 4--Estimate for cost-oriented FOB price per 10kg of China's Ha-chiang 19 milled and packed, 1994. 1/

	Cost/Weight
For 100 kg of roughrice	
Government purchase price (CY)	76.70
Costs of milling and packing (CY)	2.00
Milling yield, kg	70
Whole kernels, kg	60
Brokens, kg	10
Weight of milled rice (5% brokens),	63
Cost of milled rice (CY)	78.70
For 10 kg of milled rice (5% brokens)	
Costs of product (CY)	12.49
Cost of a 10 kg bag (CY)	0.30
Shipping to port and loading costs (CY)	0.20
FOB price at port (CY)	12.99
FOB price at port in US $ 2/	1.49

1/ Based on a survey in July 1993.
2/ Exchange rate: 8.7 China's yuan (CY) equal to a US dollar.

the FOB price of Arkansas Koshihikari is $6.90 instead of $11.44 for 10kg. In another simulation, the retail price of Ha-jiang19 is calculated assuming that domestic production costs, and hence the FOB price, is doubled. International shipping costs for rice from China are assumed to be one-half of the costs from the U.S.

FOB prices vary by variety and originating country. The FOB price of Ha-jiang19 from China ($1.49) is almost one-eighth of the price of Arkansas Koshihikari ($11.44). CIF prices at Japanese ports are estimated to range from $13.09 for Arkansas Koshihikari to $2.12 for China's Ha-jiang19.

If there was no tariff, retail prices should be $20.66 for Arkansas Koshihikari (or $15.90 if brokens and milling and packaging costs were halved), $13.72 for California Calrose, and $9.69 for Ha-jiang19 (or $11.25 if production costs were doubled), as shown in row (12) in Table 5. On the other hand, evaluated prices by Japanese consumers are $51.88 for Arkansas Koshihikari, $38.12 for Calrose, and $46.84 for Ha-jiang19. The evaluated prices thus range from 2.5 times to almost five times as much as the calculated retail prices based only on actual costs of importation to Japan. Accordingly, the domestic consumer benefit is large, as indicated in row (14) of Table 5, suggesting that there would be a substantial amount of consumer surplus generated in Japan if greater imports of foreign-produced japonica rices were allowed.

The numbers in row (15) of Table 5 show the tariff (%) needed to make prices of imported rices equivalent to their consumer evaluated prices at the retail

Table 5--Simulated prices for imported Arkansas Koshihikari, California Calrose, and China's Ha-chiang 19 rices in Japan. 1/

	Ark. Koshi. (a)	Ark. Koshi. (b) 2/	California Calrose	Ha-Chiang 19 (a)	Ha-Chiang 19 (b) /3
(1) FOB price ($)	11.44	6.90	4.82	1.49	2.98
(2) Freight ($)	1.05	1.05	1.05	0.53	0.53
(3) Insurance {[(1)+(2)x 0.006} ($)	0.07	0.05	0.04	0.01	0.02
(4) Interest {[(1)+(2)+(3)]x0.012} ($)	0.15	0.10	0.07	0.02	0.04
(5) Handling {[(1)+(2)+(3)]x0.03} ($)	0.38	0.24	0.18	0.06	0.11
(6) CIF price {[(1)+(2)+(3)+(4)+(5)]} ($)	13.09	8.33	6.15	2.12	3.68
(7) Tariff, (%)	0.00	0.00	0.00	0.00	0.00
(8) Customs fee: 7,000 yen/ton ($)	0.64	0.64	0.64	0.64	0.64
(9) Cost of storage at port for 20 days: 600 yen/ton/10 days ($)	0.11	0.11	0.11	0.11	0.11
(10) Price at warehouse {[(6)+(8)+(9)]} ($)	13.84	9.08	6.90	2.87	4.43
(11) Domestic handling costs: 750 yent/10 kg ($)	6.82	6.82	6.82	6.82	6.82
(12) Retail price {[(10)+(11)]} ($)	20.66	15.90	13.72	9.69	11.25
(13) Evaluated price ($)	51.88	51.88	38.12	46.84	46.84
(14) Domestic consumer benefit {[(13)-(12)]} ($)	31.22	35.98	24.40	35.59	35.59
(15) Tariff rate to give zero consumer benefit {[(14)/(6)]} (%)	238	432	397	1,755	967

1/ Items from (2) to (5), (8), and (9) were quoted from K. Shimizu: "Estimate of price difference between imported and domestic rices," in Simulation of Impacts from Rice Liberalization, edited by S. Morishima, Fumin-Kyoukai, Tokyo, 1991, pp. 124-127. Exchange rate for items (8), (9), and (11): 110 yen/US dollar.

2/ Assuming a case for Arkansas Koshihikari that brokens are reduced half.

3/ Assuming a case that production costs (FOB price) for Ha-chiang 19 are doubled.

store as defined by RQC in equation (6). The tariff rates would need to be around 400 percent for rices from the U.S., but for those from China the tariff rates would need to be as large as 1,755 percent. Even if China's FOB price doubled, the required tariff would still need to be about 1,000 percent. This suggests that China's Ha-jiang19 is much more competitive than either rice from Arkansas or California. It is ironic that a 700 percent tariff, which was calculated based on a simple comparison of market prices at the GATT negotiations, would be too high for rices from the U.S. but too low for those from China to maintain the competitiveness of domestically produced rice.

6. CONCLUSIONS

Japan has decided to open its rice market on a limited basis beginning in 1995. By the year 2000, Japan may be importing over 700,000 metric tons of milled rice and could be one of the largest rice importers in the world. Japan's domestic production costs and consumer prices are currently extremely high relative to those in other nations. Accordingly, Japan will be an attractive market for rice exporters. However, it is important to recognize that Japanese rice consumers have a preference for high quality japonica rice.

In this research, the quality of individual japonica rices produced outside Japan was tested and evaluated in terms of prices relative to Japanese domestic rice. Also, FOB prices incorporating production costs were estimated, and finally domestic retail prices for imported rice were simulated. The results of the simulations indicated that there would be a huge amount of consumer surplus created in Japan once foreign-produced high-quality japonica rices are imported. The results also show that China's production costs are very small relative to the U.S., while the quality of China's rice is quite suitable for Japanese consumers; therefore, rice exporters such as the U.S. will face severe competition from China in the new Japanese rice market. Further, contrary to previous predictions (Institute of Food Policy, Japan, 1992), foreign-produced rices such as Chinese rices would be still imported even with tariff rates of 600 percent to 700 percent.

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