

The New U.S.-Japanese Beef Agreement: Some Implications for the U.S. Beef Industry

Hiroshi Mori, Bing-Hwan Lin, William D. Gorman

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Contents

Introduction	3
Japan's Beef Imports and Past Regulations	4
The 1988 Beef Trade Agreement	5
Import Quotas 5, LIPC's Role in Beef Trade 6, Tariff Rates 7	
Substitutability Between Domestic and Imported Beef	7
Producing Beef for Japan	8
Chilled Form vs. Frozen Form 9, Producing Longer-Fed Beef 9, Estimated Gross Receipts 10, Estimated Costs 10, Net Returns 11	
Conclusion and Future Research	11
Appendix A — Results of Correlation Analyses	12
Appendix B — Extended Feeding Program: An Expanded Literature	13
Inoue's Approach for Fed Dairy Steers 13, Mori's Approach for Fed Dairy Steers 13, A Probabilistic Approach for Wagyu Steers 14	
Literature Cited	15

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Published and distributed by the
Idaho Agricultural Experiment Station
Gary A. Lee, Director
University of Idaho College of Agriculture
Moscow, Idaho 83843

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Hiroshi Mori, Biing-Hwan Lin, William D. Gorman

Introduction

Being an island nation with limited resources for animal husbandry, Japan has traditionally relied on fish and shellfish as the major source of animal protein. Over time, the westernization of the Japanese diet, rising income and changes in relative prices between meat and fish have gradually enhanced the importance of meat consumption in Japan. During the past decade, per capita beef consumption in Japan has increased 53 percent while that of fish increased only 6 percent, pork 29 percent and chicken 51 percent.

Japanese people (population: 122 million as of Oct. 1, 1986) consumed 561 thousand metric tons (mt) of beef (primal cut weights¹), 1,296 thousand mt of pork, 1,192 thousand mt of chicken and 4,419 thousand mt of fish and shellfish in fiscal year (JFY) 1986 (ending March 31, 1987). Thus, although consumption has been increasing, beef is still a minor source of animal protein in the Japanese diet. Nevertheless, it has been widely accepted that beef is the most income elastic of all meats and is quite likely to be most price elastic as well (M. Sawada 1985; Wahl et al. 1987; Dyck 1988). Therefore, a steady increase in beef consumption is expected to accompany the rapid economic growth and continuous relaxation of the Japanese beef import regulations.

Roughly two-thirds of the beef consumed in Japan is produced domestically and the remaining one-third supplied from overseas, mainly Australia, the U.S. and New Zealand. Beef imports into Japan have been subject to government regulations by means of import quotas, import tariffs and the involvement of the Livestock Industry Promotion Corporation (LIPC) — a quasi-

government agency. One of the major responsibilities of the LIPC is to keep wholesale prices of domestically produced beef within stabilization price bands determined annually by the government to protect domestic beef producers. With an 80 percent allotment of beef import quotas, the LIPC has attempted to stabilize prices of domestic beef by adjusting its buffer stock of frozen imported beef.

Japan is the leading importer of U.S. agricultural commodities, accounting for almost 20 percent of total U.S. agricultural exports in 1987. For the same year, Japan received more than 70 percent of all U.S. beef exports, worth \$771 million.² Because Japanese domestically produced beef³ has commanded an extremely high price in Japan, the belief is widely held that U.S. beef exports to Japan can be greatly expanded when trade barriers imposed on beef are removed. Consequently, the U.S. government has persistently requested a total liberalization of the Japanese beef market in its negotiations with Japan during the past decade.

Ohga (1988), Sanderson (1987) and others have estimated that Japanese beef imports could easily increase by 4-fold or even up to 10-fold under free trade. The authors believe these estimates are far too optimistic, resulting from the assumption that imported beef and Japanese beef are perfect substitutes. Consequently, the rate of protection on Japanese beef and the demand price elasticity for imported beef may have been overestimated. This publication attempts to assess the extent of market expansion for imported beef under free trade conditions.

²Beef imports into Japan reported by the U.S. government include diaphragm, but diaphragm is separated from beef imports according to the Japanese classification. According to the Japanese government, Japan imported 54,749 million yen (\$378 million using an exchange rate of \$1 to 146 yen) of beef from the U.S. in 1987 calendar year.

³In Japan, domestically produced beef comes from two sources: (1) the traditional beef cattle sector and (2) the dairy sector. The former is based on indigenous Japanese breeds or Wagyu and the latter consists almost entirely of Holstein beef. See Longworth (1983) for more discussion on the Japanese beef supply sectors.

¹According to Longworth (1983, p. 167), "With the rapid growth in the part-cuts trade, there has been a growing need to standardize the way the carcasses are broken down and to establish acceptable grades for cut meat. The Japan Meat Grading Association, in cooperation with MAFF, established a set of transaction standards for primal cuts of beef in 1975." The Japanese standard primal cuts and the cuts commonly used in the U.S. and Australia are presented (p. 168).

Since the U.S. and Japanese governments have recently reached a new trade agreement on beef, the U.S. cattle industry needs to examine production and marketing alternatives that will allow for further expansion of beef exports to Japan under the current trade guidelines. The main purpose of this publication is to examine the feasibility of producing longer-fed beef in the U.S. for the Japanese market. The first section analyzes the extent of substitutability between Japanese domestic beef and imported beef of current product characteristics, and the second examines the benefit and cost of producing longer-fed beef.

Japan's Beef Imports and Past Regulations

Import quotas and tariffs are the main instruments for restricting beef imports into Japan. Beef imports are subject to an ad valorem tariff of 25 percent and a miscellaneous charge of approximately 10 percent. Import quotas comprise two broad categories — general quotas and special quotas. The former accounts for 90 percent of the total quotas. The special quotas include Hotel Quota, Okinawa Quota, School Lunch Quota and Cooked Beef Quota. LIPC receives 90 percent of the general quota and the remaining 10 percent is allotted to private organizations which include Zennikuren (National Organization of Meat Trade) and Japan Ham and Sausage Organizations. All beef must be imported through 39 trading companies designated by the Japanese government.

At the 1977-78 Multilateral Trade Negotiations, a new category of imported beef — high quality beef (HQB) — was created within the global quotas. HQB was defined as beef from cattle fed on high-concentrate diets for more than 100 days and not older than 24 months of age when slaughtered. Beef graded USDA Choice or above was automatically regarded as HQB. At that time, the United States and Canada were the only countries which could supply HQB. The term "HQB" was created to separate U.S. grain-fed beef from Australian grass-fed beef. According to Japanese grading stan-

dards, U.S. grain-fed beef is rated lower in quality than most Japanese beef.

Japan imported 92,550 mt of beef, primal cut basis,⁴ in 1977 (Table 1). The U.S. provided 9.3 percent of total imports, Australia 84.1 percent and New Zealand 5.0 percent. At the 1977-78 negotiations the U.S. and Japanese governments agreed that imports of HQB were to be increased to at least 30,800 mt by 1983 (ending March 31, 1984). Being an operational arm of the government, the LIPC was committed to expanding imports of HQB without regard to relative economic profitability (Mori and Gorman 1985). As a result, the U.S. share of the Japanese imported beef market increased to 27.5 percent in 1983, while the Australian share declined to 65.3 percent. This increase in the U.S. share of the imported beef market has been attributed at least partially to the creation and expansion of HQB (Anderson 1983; Mori and Gorman 1985).

During the 1983-84 negotiations, the U.S. government demanded full liberalization of beef trade, which the Japanese government found unacceptable from the standpoint of domestic politics. As a compromise, the two nations agreed that import quotas for HQB would be increased by 6,900 mt per year over a 4-year period starting in 1984, and total import quotas were to be increased by 9,000 mt annually. Considering that the U.S. was the main supplier of HQB, this agreement was a great concession to the U.S., mainly at the cost of Australia.

The 1987 import quotas were increased by 46,000 mt rather than the agreed amount of 9,000 mt from the 1986 quotas. In 1987, Japan imported 84,045 mt of beef from the U.S. (38.8%), as compared to 118,349 mt from Australia (54.7%) and 7,666 mt from New Zealand (3.5%) out of the total imports of 216,367 mt. Many researchers (Anderson 1983; Mori and Gorman 1985; Teal et al. 1987) have argued that the increase in U.S. share of the Japanese imported beef market was

⁴Throughout this report, Japanese beef imports are fresh, chilled and frozen beef and are stated in a primal cut basis unless otherwise stated.

Table 1. Japanese beef imports: JFY 1977-87.

JFY	Total imports (mt)	Imported from					
		Australia		U.S.		New Zealand	
		(mt)	(%)	(mt)	(%)	(mt)	(%)
1977	92,550	77,835	84.1	8,611	9.3	4,665	5.0
1978	100,842	75,672	75.0	16,325	16.2	17,168	7.1
1979	130,022	102,087	78.0	22,703	17.5	2,288	1.8
1980	117,718	89,076	75.7	22,312	19.0	4,554	3.9
1981	114,767	80,274	70.0	25,754	22.4	5,456	4.8
1982	133,886	93,776	70.0	34,861	26.0	4,691	3.5
1983	140,257	91,583	65.3	38,602	27.5	8,769	6.3
1984	144,842	91,503	63.2	42,059	29.0	7,267	5.0
1985	153,130	93,385	61.0	49,482	32.3	6,096	4.0
1986	183,040	108,137	59.1	63,940	34.9	6,307	3.5
1987	216,367	118,349	54.7	84,045	38.8	7,666	3.5

Note: Bone-in weights are converted to boneless (primal cuts) weights using a conversion factor of 0.7.

Source: Japan Tariff Association, Japan Exports and Imports, Commodity by Country, various issues.

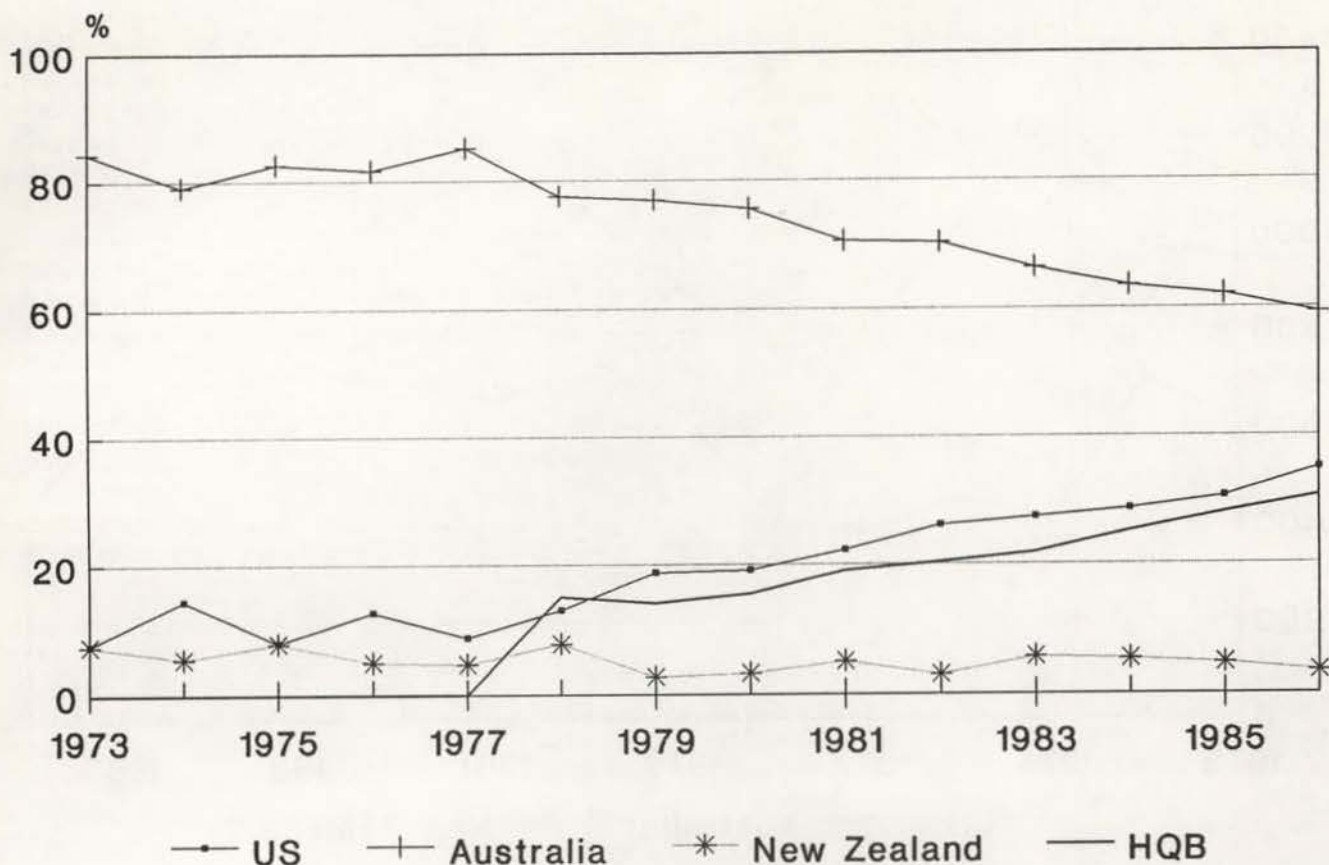


Fig. 1. Market share of Japanese imported beef: 1973-86 calendar year.

Note: HQB is the ratio of high quality beef quota to the total import quota. The 1987 figures are not included because the 1987 import quotas for high quality beef are not known. Beef offals are excluded.

Sources: Japan Tariff Association, Japan Exports and Imports, Commodity by Country, various issues.

a result of political pressure from the U.S. government. This argument can be supported by an obvious correlation between the rate of increase in HQB quota as a ratio to the total quota and the U.S. share of the Japanese market at the expense of Australia and New Zealand, as shown in Fig. 1.

Other factors also are believed to have affected the share distribution of beef imported into Japan from Australia, the U.S. and New Zealand. They are: (1) increasing price competitiveness of U.S. beef relative to Australian beef since 1978, and (2) an alleged greater preference of Japanese consumers for grain-fed beef from the U.S. over the grass-fed beef from Oceania suppliers (U.S.MEF 1987; Longworth 1983).

The increasing price competitiveness of U.S. beef relative to Australian beef since 1978 is evident in Fig. 2. This increasing price competitiveness may come from three sources: (1) demand and supply conditions of the beef market in the U.S. and its competitors; (2) variations in exchange rates between the U.S. dollar and its competitors' currencies against the Japan yen; and (3) variations in the composition of beef exports toward lower-valued cuts from the U.S. While the hypothesis of increasing preference for U.S. grain-fed beef over Oceania grass-fed beef has yet to be tested, the effects of price competition and political preference

given to U.S. beef on the share distribution of the Japanese imports were analyzed by Lin et al. (1988) using a market share econometric model.

The 1988 Beef Trade Agreement

In June 1988, the U.S. and Japan reached a new beef trade agreement which was also accepted by Oceania suppliers. The agreement made several major changes concerning the quantity of import quotas, tariff rates and the role of the LIPC in beef trading.

Import Quotas

Beef import quotas will be completely removed by the end of a 3-year phase-out period (i.e. March 31, 1991). During this phase-out period, import quotas will be increased by 60,000 mt per year, starting with 214,000 mt in 1988 and reaching 394,000 mt in 1990.

The new agreement has no preferential quota for HQB. As before, 80 percent or more of the total import quotas will be handled by the LIPC. Because the LIPC's tender for grain-fed beef is made separately from grass-fed beef, the amount of beef for which the LIPC requests U.S. packers to submit tender plus beef imported under the Hotel Quota in effect constitute the import quota for HQB.

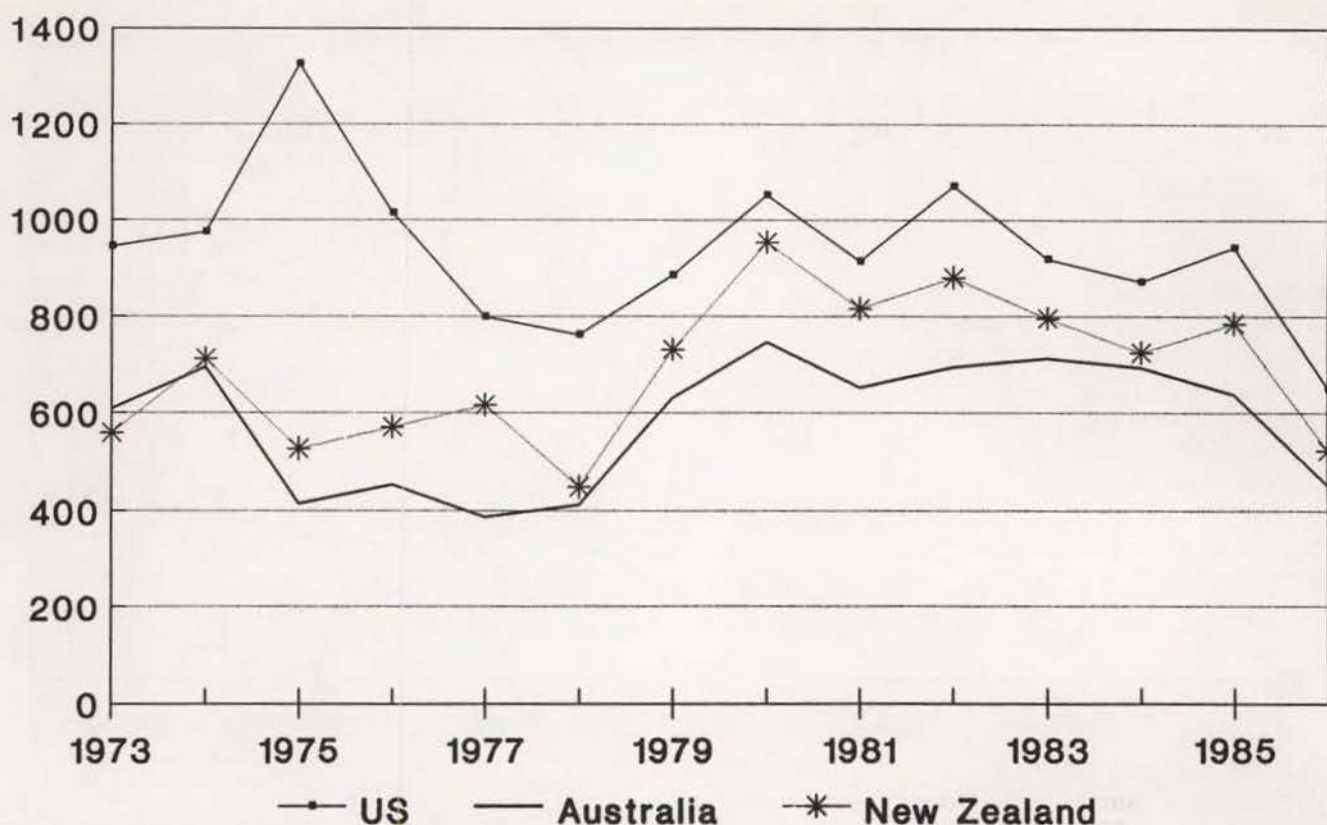


Fig. 2. Prices of imported beef: 1973-86 calendar year.

Source: Japan Tariff Association, Japan Exports and Imports, Commodity by Country, various issues.

Once the LIPC decides, for political or economic reasons, to buy certain amounts of beef by cuts, sources and product forms (grain-fed or grass-fed beef, frozen or chilled form), a tender is called from registered packers through designated trading companies for the specified beef. Because the LIPC has made politically motivated tenders, allegations have been made that grain-fed beef from the U.S. has generated smaller profit margins, at least percentage-wise, to the LIPC and its buyers than grass-fed beef (Teal et al. 1987).

Actually, the LIPC, as a government agency deprived of free merchant-like discretionary powers by bureaucratic red tape, cannot extend preferential treatment to any packer. In the case of grain-fed beef, even if a certain primal cut from a particular packer is much preferred to the same cut from other packers in the Japanese market, the packer submitting the lowest price bid will get the business as long as the beef meets the LIPC's standards. Thus packers have no incentives to improve their products with respect to quality, cutting practices or packaging beyond the LIPC's lowest standards. Consequently, low Choice beef instead of high Choice or Prime tends to be exported to Japan (Gorman and Faminow 1987; Mori and Gorman 1988). This creates a gap between the demand for and supply of good quality imported beef.

As an attempt to import beef of desired types, cuts and grades, a simultaneous buy/sell (S/B/S) system was

first introduced in the latter half of JFY 1984. This arrangement allows a greater freedom in importing the desired beef products within the limit of 10 percent of the general quota allotted to the LIPC. Under the S/B/S system, direct negotiations are permitted to take place between packers and Japanese buyers so that bids can be prepared and submitted to the LIPC.

This type of tender has taken place twice a year since its creation and has been quite popular with Japanese buyers. For the past few years, grain-fed beef has accounted for more than 80 percent of all beef purchased under S/B/S. A much greater percentage of higher-valued cuts such as loins and short-ribs has been imported under this system than under the regular LIPC buying programs (Mori and Gorman 1988).

Under the new agreement, the S/B/S system will be expanded from the current 10 percent of LIPC quota to 30 percent for JFY 1988, 45 percent for 1989 and 60 percent for 1990. So far the system has been applied to frozen beef only. It will be gradually expanded to include chilled beef.

LIPC's Role in Beef Trade

Since the S/B/S system will have an increasing share of the LIPC quota during the 3-year phase-out period, the LIPC's involvement in beef trade will be gradually reduced during the phase-out period and will be discontinued starting April 1, 1991. The LIPC has been

responsible for stabilizing prices of domestic beef within predetermined bands by adjusting its buffer stock of imported beef.⁵ Whether the LIPC will maintain its buffer stock of imported beef to carry out this mission is not clear.

Tariff Rates

The current import duty on beef is 25 percent of value (i.e. ad valorem) on a cost-insurance-freight (CIF) price basis. At the end of the 3-year phase-out period, the ad valorem tariff will be increased to 70 percent, then decline to 60 percent in the following year (JFY 1992) and settle at 50 percent thereafter. However, the tariff is subject to negotiations at the ongoing Uruguay Round of GATT. If imports exceed 120 percent of the previous year's imports, Japan may impose an additional 25 percent ad valorem tariff for the remainder of the fiscal year as a safeguard against disruptive surges in imports through 1994.

Substitutability Between Domestic and Imported Beef

Hayami (1979) and others have often stated that beef in Japan is 7 to 10 times more expensive than beef in the U.S. and Australia. Indeed, one can easily find beef priced at \$40 to \$50 per pound in ordinary supermarkets and even up to \$100 per pound in many department stores.⁶ However, this comparison unfairly ignores the quality difference between domestic and imported beef. Unfortunately, this comparison has served as the basis for estimating the rate of import expansion resulting from trade liberalization. For example, Sanderson (1987) and Ohga (1988) stated that trade liberalization would result in a 10-fold increase in Japanese beef imports even if domestic production is maintained under government subsidy programs. These estimates would have been much smaller had the quality characteristics of domestic and imported beef been correctly factored into the analyses.

Broadly speaking, Japan has at least three categories of beef: (1) Wagyu beef, (2) fed dairy beef and (3) imported beef and lower grade dairy beef. The top quality Wagyu beef is the famed Kobe or Matsusaka beef. The most expensive Kobe beef is often sold for \$80 to \$100 per pound at the retail level. Second grade dairy beef, the most popular domestic beef which may correspond to U.S. Prime or high Choice grade, is priced around \$4 per pound, carcass basis, at wholesale markets. Thinly sliced square-cut chuck from these car-

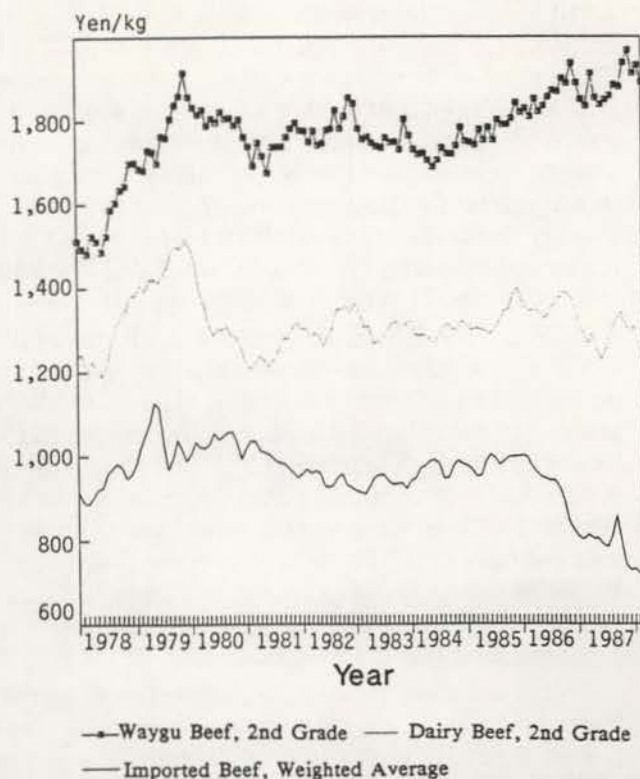


Fig. 3. Monthly average wholesale prices of domestic beef and imported beef, carcass basis, January 1978 to March 1988, Tokyo.

Source: Prices for domestic beef from MAFF, Dept. of Statistics and Information, Shokuniku Ryutsu Tokai (Meat Marketing Statistics), various issues. Prices for imported beef compiled from Chikusan Nippo (Livestock Daily), Tokyo, various issues.

casses may sell for \$10 to \$13 per pound at ordinary supermarkets, compared to \$4 to \$5 for similar cuts from frozen U.S. grain-fed beef and \$3 to \$4 for Australian grass-fed beef. Thus it is evident that beef in Japan is priced at a very wide range.

Fig. 3 illustrates the substantial price differences between Wagyu, fed dairy and imported beef. These price differentials represent the Japanese willingness to pay an incredibly high price premium for beef quality. Degree of marbling is the most important factor in the Japanese beef grading system,⁷ and higher degree of marbling can be achieved only through longer feeding periods. In general, Wagyu steers are fed high-energy diets for as long as 20 months. Dairy steers are fed for nearly 14 months. U.S. cattle are fed for only 4 to 5 months.

Fig. 3 also shows that the average wholesale price of imported beef declined 28.3 percent from an average of 1,014 yen per kg, carcass weight, in 1980-81 to 727 yen in the first quarter of 1988 as a result of increased beef imports. During the same period, wholesale prices of Wagyu steer beef, 2nd grade, have increased 7.6 percent from around 1,775 yen per kg to

⁵Before April 1, 1988, there were two price stabilization bands for Wagyu and dairy beef. Starting on April 1, 1988, there has been only one price stabilization band for beef graded B2/B3. See In Brief, April, 1988, published by Australian Meat and Livestock Corporation, for more information concerning Japanese beef grading.

⁶Department stores in Japan are usually located close to the suburban railway terminals. Most department stores carry a great variety of food items.

⁷Other quality attributes include tissue firmness, color and flavor. According to Jarratt and Longworth (1987), marbling is the most important attribute in Japanese beef grading.

1,910 yen, and those of dairy steer beef, 2nd grade, declined 1.6 percent from 1,292 yen to 1,272 yen. These price movements seem to suggest that imported beef and Wagyu beef are not substitutes, and that imported beef and dairy beef are not good substitutes. According to economic theory, substitute commodities should exhibit similar trends in their price movements. In other words, prices of substitutes are expected to be highly and positively correlated (Tomek and Robinson 1981, Chapter 7; Wahl et al. 1987, pp. 15-16).

Different correlation analyses are conducted to further study the substitutability between domestic and imported beef for selected cuts. Results of three correlation analyses of monthly wholesale prices for the period October 1981 through September 1985 are shown in Appendix A. These correlation analyses again cast serious doubts about even weak substitutability among imported beef and dairy beef.⁸ The same conclusion is also shared by H. Miyazaki (personal communication 1987) and Namiki (1988) and can be supported by observing Japanese food consumption patterns.

Beef is still a new product for most Japanese people. Younger Japanese do enjoy eating hamburger made from inexpensive grass-fed beef. In general, Japanese eat beef only occasionally and have a strong preference for highly marbled beef. Despite the fact that per capita GNP in Japan reached the level of Western industrialized countries more than 10 years ago, per capita caloric intake in Japan has consistently remained around 2,600 kilocalories per day, which is almost 30 percent below that of the U.S. and West Germany. Therefore, consumption of meats with high fat content is not a concern among Japanese people. As their income grows, Japanese tend to consume a greater variety of goods of desired quality in small amounts. Because marbling, tissue firmness and flavor are considered the main attributes of beef quality and because the Japanese diet is relatively low in calories, domestic (especially Wagyu) beef and imported beef are not likely to be substitutes.

If indeed "beef is not beef" and domestic beef and imported beef of current product characteristics are not good substitutes, previous studies may have overestimated the effects of trade liberalization on beef imports. The LIPC's surcharges, in addition to the 25 percent tariff, are reported to present an equivalent of 96 percent ad valorem tariff (Cargill 1988).⁹ If the import quota were replaced by a 25 percent ad valorem tariff

⁸All correlation analyses are designed to detect the relationship among prices and ignore the factors (i.e. quantity, prices of substitutes and consumption expenditure) affecting the prices in question. Therefore, demand analyses using econometric methods are more powerful in detecting the degree of substitutability among different types of beef.

⁹On average, the CIF price of imported beef is 500 yen/kg. The LIPC's resale price is then 1,105 yen/kg by adding the tariff and LIPC's surcharges to the CIF price. When import quota is replaced by the additional 25 percent tariff, the resale price should be 750 yen/kg or 38 percent less $[(1,105 - 750)/(1,105 + 750)/2]$.

in addition to the current 25 percent tariff, then beef imports into Japan would be taxed at 50 percent. Consequently, the LIPC's resale price would decline by approximately 38 percent.

Lin et al. (1988) estimated wholesale demand for imported beef with an own-price elasticity in the range of 1.0 to 1.5. Using this figure and the 50 percent tax, Japanese beef imports would increase from the current quota of 214,000 mt to approximately 315,000 to 381,000 mt, or by 38 to 57 percent. If Japanese beef trade were totally liberalized now, prices of imported beef would drop from 1,105 yen to 500 yen per kg, or 75.4 percent, and beef imports would increase by 75.4 to 113.1 percent. As mentioned earlier, these estimates are much smaller than those predicted by many studies.

While the lack of substitutability between domestic and imported beef of current product characteristics might dampen our expectations about the market potential for imported beef in Japan under trade liberalization, this actually represents an opportunity for the U.S. beef industry to penetrate the high-valued market niche in Japan. This opportunity may occur when import quotas are lifted in 1991. Four factors support this hypothesis:

1. Trade liberalization will have a limited effect on the price of domestic beef (especially Wagyu beef) due to lack of substitutability;
2. The demand price elasticity for Wagyu beef is believed by the authors to be quite high;
3. Japan has relied on the U.S. for feed grains. Shipping beef to Japan is much less expensive than shipping feed grains of beef equivalent weights; and
4. Japanese cattle farms are too small in size to take advantage of economies of scale.

Therefore, the U.S. cattle industry should be able to compete with the Japanese cattle industry in producing high quality beef for the Japanese market. Australia also is capable of producing high quality beef.

Producing Beef for Japan

One of the keys to successful international marketing is to produce and market types of goods compatible with foreign consumer demand. Due to the enormous domestic market, U.S. traders have tended to push into overseas markets products that are produced for domestic consumers. In the case of beef exports to Japan, many Americans have been frustrated to see that U.S. Choice and Prime beef are sold at prices below 2nd grade fed dairy beef (Table 2).

Trade barriers such as import quotas are often singled out as the main impediment to penetrating the Japanese beef market. The lack of understanding of Japanese preferences for beef, in effect, is another form of barrier in expanding U.S. beef exports to Japan.

Table 2. Wholesale carcass prices of domestically produced and imported beef, by type of animals and grade, Tokyo, 1987.

	Supreme	Superior	1st	2nd	3rd	Utility	Average
	(U.S. \$/cwt)						
Wagyu female	1,054	827	695	589	468	305	608
Wagyu steers	942	799	681	584	484	338	636
Dairy female	-	-	547	422	326	223	324
Dairy steers	-	-	510	400	358	248	379
			U.S. Prime	U.S. Choice	Australia		
Imported grain-fed beef ²			381	366	326		

¹U.S. \$1.0 = 146 yen in 1987.

²June to December.

Sources: For domestic beef, Monthly Report of Meat Marketing Statistics for January 1988, Ministry of Agriculture, Forestry and Fisheries. For imported beef, personal communications with H. Imamura of Tokyo Meat Wholesale Market Co., Ltd.

Several production and marketing alternatives do exist for expanding U.S. beef exports to Japan. The possibilities of shipping U.S. beef in chilled form rather than frozen form and of producing longer-fed beef are discussed in this section.

Chilled Form vs. Frozen Form

To enhance Japanese acceptance of imported beef, the beef should preferably be shipped and marketed in chilled/fresh form all the way to consumers. Mori and Gorman (1987) cite four reasons for Japanese preference for chilled beef over frozen beef:

1. Chilled beef ages (i.e. matures and becomes more tender) during the journey to Japanese ports;
2. Chilled beef does not incur thawing losses both in quality and weight;
3. Most Japanese end-users and consumers are more accustomed to handling chilled beef than frozen beef; and

4. Thinly sliced thawed beef does not appeal to consumers.

This preference has been recognized by most Australian packers but neglected by most U.S. packers. Consequently, more than 97 percent of U.S. beef exported to Japan was in frozen form, excluding small amounts of air-freighted chilled carcass, while approximately 42 percent of Australian beef was in chilled form in JFY 1987.

The prices of chilled and aged full-set beef from Australia are shown in Fig. 4.¹⁰ The price premium enjoyed by chilled beef over aged beef has been widened drastically since 1986 when the price of aged beef started a sharp downward trend. Therefore, exporting chilled beef rather than frozen beef appears to be a marketing alternative for the U.S. beef industry. Shipping U.S. beef in chilled form will, however, require a 60-day shelf life in Japan in addition to a 14-day sea journey.

Producing Longer-Fed Beef

Mori and Gorman (1985) examined the feasibility of feeding U.S. cattle high-concentrate diets for 260 days for the Japanese market. This longer feeding practice has been adopted by only a handful of feedlot operators who export live cattle for slaughtering in Japan. Even though it costs about \$640 per head¹¹ to ship live cattle to Japan, this is the only viable way that longer-fed cattle and beef can be imported into Japan under the current regulations. When import quota are lifted and the LIPC discontinues its function in beef trading starting JFY 1991, Japanese imports of HQB with high

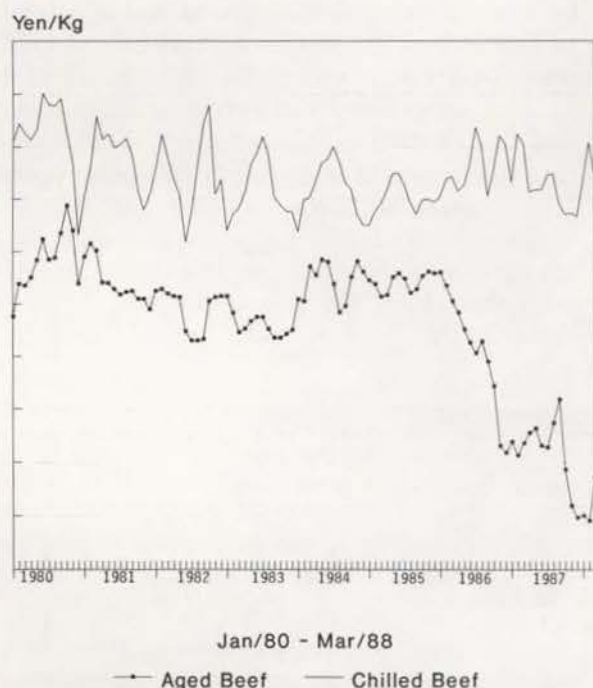


Fig. 4. Wholesale prices of Australian aged and chilled full set.

Source: Chikusan Nippo, op. cit.

¹⁰Aged beef leaves Australia in chilled form and ages (matures and becomes more tender) on the journey to Japan. Upon arrival in Japan this beef is snap frozen by a special process in certain designated freezing works (Longworth 1983, p. 176). Once beef is frozen, it can be stored and used to influence the price of domestic beef by the LIPC. Chilled and aged beef originally came from the same type of cattle — Heavy Bullock.

¹¹According to Motoyama Hiroya of the LIPC office in Denver, CO, costs are approximately 25 million yen to ship 300 head of live cattle from Chicago or San Francisco to Tokyo or Osaka on a charter plane. Using the current exchange rate of \$1 U.S. to 130 yen, the cost to ship one head of live cattle to Japan is approximately \$641. Imports of live cattle into Japan are not subject to quota constraints, but quarantine regulations and a tariff of 75,000 yen/head are restrictions.

degree of marbling and desirable quality characteristics will be facilitated. Therefore, it is timely to study alternative production and marketing strategies for exporting U.S. beef to Japan. The economics of extending feeding periods for cattle have been studied in Japan. This literature is briefly reviewed in Appendix B and expanded by including a discussion of risk involved. The profitability of feeding cattle for 260 days rather than the usual 130 days in Idaho is analyzed in the remainder of this section.

Estimated Gross Receipts

Several steps are required to calculate the gross receipts for feeding cattle high-concentrate diets for 260 days in Idaho. The first step is to estimate the carcass price in the Tokyo meat wholesale market. Next, expenses for the wholesale market commission in Japan, transportation charges between Idaho and Tokyo, tariff and miscellaneous charges levied by the Japanese government are deducted from the Tokyo wholesale price to derive an FOB carcass price in Idaho. Slaughtering and processing costs and value of by-product are then factored into the calculation to estimate the gross receipts for carcass in Idaho. Finally, the gross receipts are converted from carcass to liveweight basis.

Cattle fed high-concentrate diets for 260 days and air-freighted in chilled form are assumed to be valued at the weighted average price of 2nd and 3rd grades Wagyu and fed dairy steers. This assumption appears to be reasonable judging from the price data listed in Table 2 and personal communication with industry people. The 1987 weighted average wholesale carcass price was ¥ 647 per pound using the following quality grade and price distribution:

Grade and class	Wholesale carcass price, 1987	Percent of total animals marketed
2nd Grade Wagyu Steers	¥852/pound	20
3rd Grade Wagyu Steers	¥709/pound	40
2nd Grade Dairy Steers	¥585/pound	25
3rd Grade Dairy Steers	¥709/pound	15

The tariff rate of 70 percent and the wholesale market commission of 3.5 percent (Longworth 1983, p. 146) are used in the analysis. Edible diaphragm has been imported free of quantity restrictions and under a tar-

iff rate of 15 percent since 1985. Therefore, the ratio of wholesale price to CIF price for diaphragm could be used to estimate the same ratio for beef after 1991. The ratio for diaphragm ranges from 1.18 to 1.95 with an average of 1.40 for the period 1985-88. The ratio of wholesale to CIF price for beef after 1991 is assumed to be 190 percent using the tariff rate of 70 percent. The air freight rate for chilled carcass is reported to vary between \$0.6 to \$1.2 per pound. A rate of \$1.0 per pound is assumed for chilled carcasses shipped from Idaho to Japan. Therefore, the 1987 FOB carcass price in Idaho is estimated to be \$1.53 per pound using an exchange rate of 130 yen per dollar.

Slaughtering and processing costs and value of by-products were assumed to be \$0.09 and \$0.06 per pound carcass weight, respectively. In addition, yearling steers are assumed to reach a finish weight of 1,410 pounds and have a dressing ratio of 62.5 percent. Death loss is, on the average, 0.91 percent for the conventional feeding program and is assumed to be 1 percent for the second phase of the extended feeding program. Using these assumptions, the probable gross receipts for steers fed 260 days in Idaho are estimated to be \$1,307 per head or \$92.77 per cwt liveweight.

Estimated Costs

The yearling-to-slaughter program covered in the Idaho Livestock Enterprise Budgets involves feeding 750-pound steers to a finish weight of 1,150 pounds. During this feeding period, each animal is fed 23.87 pounds of generic finish ration per day and gains an average of 3.07 pounds per day. Therefore, the feed conversion ratio is approximately 7.75:1. According to Mori and Gorman, the feed conversion ratio increases by 3 for the second feeding period. Because the change in feed conversion ratio is not known with certainty, three feed conversion ratios (9.75:1, 10.75:1 and 11.75:1) are assumed and three cost estimates are derived in this study.

In 1987, the cost of generic finish ration was \$68.39 per ton. Since the feeding period of 260 days is exactly twice the 130-day feeding period covered in the Idaho Livestock Enterprise Budgets, fixed and variable costs other than steers and feed are assumed to be double those for the 130-day feeding period (Table 3).

Table 3. Production costs, revenues and returns for different feeding programs.

	130 days		260 days	
	7.75:1 ratio	9.75:1 ratio	10.75:1 ratio	11.75:1 ratio
Variable costs: 1987				
Steer	\$562.50	\$ 562.50	\$ 562.50	\$ 562.50
Finish ration	106.11	239.60	253.30	266.99
Others	40.20	80.40	80.40	80.40
Total	\$708.81	\$ 882.50	\$ 896.20	\$ 909.89
Fixed costs	15.69	31.38	31.38	31.38
Total costs	\$724.50	\$ 913.88	\$ 927.58	\$ 941.27
Gross receipts	\$752.11	\$1,306.70	\$1,306.70	\$1,306.70
Net returns	\$ 27.61	\$ 392.82	\$ 379.12	\$ 365.43

Net Returns

Net returns for the 130-day feeding program are \$27.61 per head, while those for the 260-day feeding program exceed \$350. Clearly, producing longer-fed beef for the Japanese market is a promising production and marketing alternative for the U.S. beef industry when the beef import quotas are lifted in 1991.¹² Clearly also, the profitability of producing longer-fed beef depends crucially on the wholesale carcass price in Japan. We assumed that cattle fed for 260 days are priced at the weighted average price of the 2nd and 3rd grades of Wagyu and dairy steers. This assumption appears to be reasonable, judging from the prices listed in Table 2, but it should be tested by additional research.

Price is determined by demand and supply conditions. Because both the U.S. and Australia have the ability to supply longer-fed beef to Japan and the Japanese beef industry is likely to be heavily subsidized by its government, monitoring the future supply of longer-fed beef in Japan is important. Equally importantly, demand analysis should be conducted to estimate the Japanese demand for beef and the degree of substitutability among beef of different quality characteristics.

Conclusion and Future Research

Beef in Japan is often said to be 7 to 10 times more expensive than beef in the U.S. and Australia, and many researchers believe that trade liberalization would result in a 10-fold increase in Japanese beef imports. Consequently, the U.S. government has persistently requested a total liberalization of the Japanese beef market in its negotiations with Japan during the past decade and has accepted high tariff rates as a replacement for import quotas after 1991.

During past negotiations between the U.S. and Japanese governments on beef trade, literature concerning the Japanese beef market has proliferated. One of

the major findings in the literature is the realization that beef in Japan is not a homogeneous product and may consist of three or more differentiated products — Wagyu, dairy and imported beef. Therefore, Dyck (1988) has recommended treating beef as a heterogeneous product in the demand analysis. When the product characteristics of different types of beef are incorporated in empirical study, results show that the demand price elasticity for imported beef and the rate of protection on beef in Japan have been overestimated. Furthermore, Lin et al. (1988) estimated that a total liberalization in the Japanese beef market would increase beef imports from 75 to 113 percent. This estimate is substantially smaller than those projected by other researchers.

While the lack of substitutability between domestic and imported beef should have dampened our expectations about the Japanese beef market potential, this important finding actually represents an opportunity for producing high quality beef in the U.S. for the Japanese market when import quotas are lifted in 1991.

Two production and marketing alternatives for producing beef in the U.S. for the Japanese beef market are discussed here. They are: (1) exporting beef in chilled form rather than frozen form, and (2) exporting highly marbled cattle and beef to Japan. The profitability of extending the feeding period from 130 days to 260 days is examined by using the 1987 Idaho Livestock Enterprise Budgets. Preliminary results suggest that extending the cattle feeding period is a promising production alternative for Idaho's feedlots. Because the preliminary results are derived from several assumptions, future research is still warranted to generate the following information:

1. The optimal combination of feed ration, breeds of cattle and duration of feeding program for producing highly marbled beef.
2. The quality and price distribution of highly marbled beef produced in the U.S.
3. Japanese demand for beef of different quality characteristics.
4. Future domestic and import supply of highly marbled beef in Japan.

¹²This production/marketing alternative can also be considered before 1991, because the S/B/S system will be expanded in volume and scope during the phase-out period. However, the LIPC's surcharges need to be net of the Idaho's FOB prices. The LIPC's surcharges during the phase-out period are not known and cannot be predicted.

Appendix A — Results of Correlation Analyses

Results of the Pearson correlation analysis are summarized in Table A.1. Because the Pearson correlation analysis is suitable only for detecting a linear relationship among prices and because it is possible that prices of different types of beef may exhibit a nonlinear relationship, prices are analyzed

using the Spearman and Kendall Tau B methods with results presented in Tables A.2 and A.3. Readers interested in the formula of these correlation methods and references should read SAS User's Guide: Basics published by SAS Institute, Inc. (1988).

Table A.1. Pearson correlation coefficients between wholesale prices of Japanese domestically produced beef and imported frozen HQB by primal cuts: October 1981 through September 1985.

		Imported frozen HQB			
		Short plate	Sirloin	Sq cut chuck	Tenderloin
Wagyu	Short plate	-0.052	0.161	0.041	-0.285**
Steer	Sirloin	-0.144	-0.778*	-0.132	-0.734*
2nd Grade	Chuck roll and tender	-0.157	-0.494*	-0.140	-0.440*
	Tenderloin	0.050	-0.644**	0.047	-0.678*
Dairy	Short plate	0.068	0.044	0.250***	-0.223
Steer	Sirloin	-0.268***	-0.352**	-0.274***	-0.501*
2nd Grade	Chuck roll and tender	-0.249***	-0.165	-0.218	-0.299**
	Tenderloin	-0.095	-0.251***	-0.082	-0.520*

Note: *is significant at 1% level, **at 5% level and ***at 10% level. Prices for imported HQB are "Nakama Sobas" (purveyor's prices). All prices are for Tokyo area.

Sources: Chikusan Nippo, op. cit. for imported beef and Japan Meat Trading Center, "Monthly Report" for domestic beef.

Table A.2. Spearman correlation coefficients between wholesale prices of Japanese domestically produced beef and imported frozen HQB by primal cuts: October 1981 through September 1985.

		Imported frozen HQB			
		Short plate	Sirloin	Sq cut chuck	Tenderloin
Wagyu	Short plate	-0.069	0.124	0.041	-0.273***
Steer	Sirloin	-0.300**	-0.748*	-0.217	-0.572*
2nd Grade	Chuck roll and tender	-0.133	-0.440*	-0.129	-0.362**
	Tenderloin	-0.035	-0.519**	0.067	-0.610*
Dairy	Short plate	0.012	0.056	0.244***	-0.196
Steer	Sirloin	-0.300**	-0.410*	-0.393*	-0.442*
2nd Grade	Chuck roll and tender	-0.157	-0.142	-0.279**	-0.275**
	Tenderloin	-0.018	-0.261***	-0.029	-0.348**

Note: *is significant at 1% level, **at 5% level and ***at 10% level. Prices for imported HQB are "Nakama Sobas" (purveyor's prices). All prices are for Tokyo area.

Sources: Chikusan Nippo (Livestock Daily), op. cit. for imported beef and Japan Meat Trading Center, "Monthly Report" for domestic beef.

Table A.3. Kendall Tau B correlation coefficients between wholesale prices of Japanese domestically produced beef and imported frozen HQB by primal cuts: October 1981 through September 1985.

		Imported frozen HQB			
		Short plate	Sirloin	Sq cut chuck	Tenderloin
Wagyu	Short plate	-0.050	0.081	0.013	-0.202**
Steer	Sirloin	-0.183***	-0.551*	-0.142	-0.411*
2nd Grade	Chuck roll and tender	-0.086	-0.292*	-0.088	-0.253**
	Tenderloin	-0.022	-0.345*	0.058	-0.440*
Dairy	Short plate	0.007	0.027	0.159	-0.126
Steer	Sirloin	-0.194**	-0.285*	-0.276*	-0.329*
2nd Grade	Chuck roll and tender	-0.094	-0.116	-0.195**	-0.203**
	Tenderloin	-0.043	-0.179***	0.011	-0.230**

Note: *is significant at 1% level, **at 5% level and ***at 10% level. Prices for imported HQB are "Nakama Sobas" (purveyor's prices). All prices are for Tokyo area.

Sources: Chikusan Nippo (Livestock Daily), op. cit. for imported beef and Japan Meat Trading Center, "Monthly Report" for domestic beef.

Appendix B — Extended Feeding Program: An Expanded Literature

Marbling is one of the most important quality attributes in Japanese beef grading. Higher degree of marbling can be achieved only through longer feeding periods. The profitability of extending feeding periods was studied by Japanese researchers for both Wagyu and dairy cattle. These studies are briefly reviewed in this Appendix. In addition, the degree of risk involved and its implications in extending the feeding period are discussed.

Inoue's Approach for Fed Dairy Steers

Inoue (1985) compared the daily revenue and cost of extending the feeding period for dairy steers. He assumed that a dairy steer each day consumes 10 kg of high concentrate feed which was priced at 60 yen/kg in 1984. Assuming that other costs amount to 306 yen per day, then the total daily cost is 906 yen per day. Daily gain is assumed to be 1.0 kg in liveweight and 0.8 kg in carcass weight. This dressing ratio of 0.80 may appear to be too high, but it is for the additional weight. Assuming that carcass price is 1,250 yen per kg, then daily revenue is 1,000 yen. Since the daily revenue is greater than the cost, extending the feeding period is recommended. For the current situation (i.e. April-June, 1988), the average price of dairy steers, carcass basis, has fallen to 1,150 yen/kg while the feed price has declined to 45 yen/kg due to an appreciation in yen against the U.S. dollar. Under these new price and cost conditions, the daily revenue is 920 yen/kg, which is still greater than the daily cost of 756 yen/kg. Thus the feeding period should be extended until the daily gain in liveweight diminishes to 0.82 kg.

While Inoue's approach follows closely the principle of marginal analysis, it ignores an important goal of Japanese cattle farmers. The goal is to extend the feeding period to obtain higher grade and the associated price premium. Therefore, Mori (1986) proposed to modify Inoue's approach by extending the feeding period on a monthly basis rather than a daily basis.

Mori's Approach for Fed Dairy Steer

The average feeding period for fed dairy steers is assumed to be 10 months. Suppose that when the feeding period is extended to 11 months, liveweight increases from 580 to 610 kg (or a daily gain of 1.0 kg), dressing ratio improves from 60.0 to 60.5 percent, and average price, carcass basis, increases from 1,210 to 1,250 yen/kg due to quality upgrade. Monthly revenue increases by 40,232 yen per head resulting from two sources: improved grade and dressing ratio.

Using the 1984 cost figures of Inoue, the monthly cost increases by 27,180 yen, which is 13,052 yen below the marginal revenue. When this monthly profit of 13,052 yen is scaled for the daily equivalent, it is still greater than the daily profit calculated for 1984 by

Inoue. Therefore, Mori concluded that the feeding period should be extended for at least 1 month. The same conclusion is reached for the 1988 price and cost figures. To examine the profitability of feeding dairy cattle beyond 11 months, the producer would need to determine the feed conversion ratio, grade improvement and dressing ratio for longer feeding periods.

Because carcass price is not guaranteed to increase from 1,210 yen/kg to 1,250 yen/kg, break-even analysis can be conducted to determine the minimum price increase needed to match increased marginal cost. For 1984 figures, as long as the carcass price for the extended feeding period is above 1,214 yen/kg, marginal revenue will be above marginal cost, so longer feeding would be warranted. Break-even analyses can also be conducted to determine the maximum feed price and other costs so that the increase in marginal revenue (i.e. 40,232 yen/head) can be matched. The break-even feed price and other costs are 103.5 and 741 yen/day, respectively.

The previous two illustrations are designed for dairy steers. If the profitability of extending the feeding period is to be examined for the U.S., Wagyu steers rather than dairy steers are more likely to be considered because selected U.S. cattle breeds may be genetically closer to Wagyu than dairy cattle. Further, employing a probabilistic approach is more realistic for addressing an associated probability distribution for upgrading carcass quality of different feeding periods.

A Probabilistic Approach For Wagyu Steers

Yokota (1985) reported results of an experiment of feeding Wagyu steers up to three different ages — 24 months or younger, 25 to 27 months and 28 months or older. Out of 140 head of Wagyu steers, 27 head were slaughtered at 24 months or younger, 14 at 25 to 27 months and the remaining 99 head at 28 months or older. The distribution of these steers in terms of grade and age is summarized in Table B.1.

In 1987, average wholesale prices of Wagyu steers at Tokyo Central Meat Wholesale Market were 2,198 and 1,884 yen/kg for the 1st and 2nd grade, respectively. When Wagyu steers are fed to the age of 24 months, their liveweight averages 570 kg/head with a dressing ratio of 62 percent. When the feeding period is extended beyond the age of 28 months with a daily consumption of 10 kg of concentrated feed, liveweight is expected to increase to 630 kg (a daily gain of 0.5 kg), dressing ratio will increase from 62.0 to 63.5 percent and death loss of 1.0 percent is also expected. Then the expected increase in revenue for a 4-month extended feeding period is 143,391 yen/head, and the expected increase in total cost is 98,720 yen/head, as shown on the next page.

The expected marginal revenue = $630 \text{ kg} \times 0.635 \times (2,198 \text{ yen/kg} \times 0.63 + 1,884 \text{ yen/kg} \times 0.37) - 570 \text{ kg} \times 0.62 \times (2,198 \text{ yen/kg} \times 0.22 + 1,884 \text{ yen/kg} \times 0.78) = 143,391 \text{ yen}$.

The expected cost = $120 \text{ days} \times 10 \text{ kg/day} \times 45 \text{ yen/kg} + 120 \text{ days} \times 306 \text{ yen/day} + 800,000 \text{ yen} \times 0.01 = 98,720 \text{ yen}$.

Since the marginal revenue of the 4-month extended feeding period is greater than the marginal cost, it is profitable to extend the feeding period for 4 additional months.

Because there is a probability distribution of grades and the associated prices, different feeding programs also produce different degrees of risk. The conclusion so far is that the feeding period should be extended when the expected marginal revenue is greater than the marginal cost. Strictly speaking, this is only valid for risk-neutral farmers. If longer feeding periods also produce larger variances in marginal revenue (marginal cost is assumed to be deterministic here), then risk-averting farmers need to weigh the increase in the expected profit with the increase in profit variability to reach a rational decision. On the other hand, if the longer feeding program reduces the variance in revenues, marginal revenue should be inflated for risk averters.

Let $P[i]$ be the probability of achieving grade i for a particular feeding practice; P_i the price of grade i ; and Q the carcass weight. Then the expected revenue (ER) and its variance (VAR) for a particular feeding practice are:

$$ER = \sum_i P[i] \times P_i \times Q$$

$$VAR = \sum_i P[i] \times (P_i \times Q - ER)^2$$

Since marginal cost P_i and Q are assumed to be fixed, the variance in profit is then a fraction of the variance in revenue. Further, the relative variability in revenue of different feeding programs can be ranked by comparing the degree of dispersion of the probability distribution shown in Table B.1. When the feeding period is extended from 24 to 28 months in age, the probability distribution between the 1st and 2nd grades becomes less dispersed according to the results shown in Table B.1. Therefore, this 4-month additional feeding period will not only increase profit but also reduce the variability in profit.

These conclusions are derived from the results shown in Table B.1. Since the experiment includes only 140 cattle and has not been repeated, the reliability of its results is not known. Therefore, these conclusions should be regarded as tentative at best.

Extending the feeding period involves other sources of risk. For example, prices of different grades are likely to exhibit different degrees of variability. This source of risk should also be considered in the analysis. For the period from January 1978 through December 1986, prices of 1st and 2nd grade Wagyu steers had a standard deviation of 86.5 and 89.0 yen/kg with a mean of 2,098 and 1,752, respectively. This difference in price variability will further enhance the benefit of extending the feeding period for risk-averting farmers.

Table B.1. Grade distribution of different feeding duration.

Grade	Age of animals when slaughtered							
	24 months <		25-27 months		28 months >		Total	
	Head	%	Head	%	Head	%	Head	%
2nd Grade or below	21	(77.8)	4	(28.6)	37	(37.4)	62	(44.3)
1st Grade or above	6	(22.2)	10	(71.4)	62	(62.6)	78	(55.7)
Total	27	(100.0)	10	(100.0)	99	(100.0)	140	(100.0)

Source: T. Yokota, Beef War, San-ichi Shobo, Tokyo, Japan.

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