ALFALFA PRODUCTS: CONDITIONS OF COMPETITION BETWEEN THE U.S. AND CANADIAN INDUSTRIES

Report on Investigation No. 332–310
Under Section 332(g) of the
Tariff Act of 1930 as amended

USITC PUBLICATION 2472
DECEMBER 1991

United States International Trade Commission
Washington, DC 20436

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PREFACE

On April 23, 1991, at the request of the U.S. Trade Representative, and in accordance with section 332(g) of the Tariff Act of 1930 (19 U.S.C. 1332(g)), the U.S. International Trade Commission instituted investigation No. 332-310, Alfalfa Products: Conditions of Competition Between the U.S. and Canadian Industries, for the purpose of providing the following information:

1. A description of the U.S. and Canadian dehydrated and sun-cured alfalfa products industries, including patterns of production, processing, and consumption since 1981;

2. A description of the current conditions of trade in dehydrated and sun-cured alfalfa products between the United States, Canada, and the rest of the world, especially the Pacific Rim countries, and any recent changes in such conditions, including information on prices, exchange rates, transportation costs, and marketing practices (to the extent such practices have measurable effects);

3. A description of the purpose, nature, and use of Federal, State, or Provincial Government (either U.S. or Canadian) programs and policies to assist alfalfa products, producers, and processors. Examples of such programs include programs that reduce fixed costs, programs that enhance revenues, and transportation assistance programs. When examining Canadian programs and policies, special attention should be given to:

   (a) Programs affecting transportation costs, including the Western Grain Transportation Act;

   (b) Government-funded assistance for conversion of processing facilities, including the Western Economic Diversification Act;

   (c) Tax rebates available to Canadian exporters of alfalfa products;

   (d) Government-subsidized loans to Canadian alfalfa growers, processors, or exporters; and

   (e) Other production, processing, transportation, and export assistance offered by Canada's national or Provincial Governments.

   (4) An analysis of the competitive factors in the U.S. and Canadian industries, including a comparison by market regions wherever obtainable, of prices and production costs.

The USTR's request, reproduced in appendix A, asked that the Commission provide a final report of the results of its investigation not later than December 31, 1991.

Notice of the investigation was posted at the Office of the Secretary, U.S. International Trade Commission, Washington, DC, and published in the Federal Register of May 1, 1991 (91 F.R. 20021).

There was no public hearing on the investigation, although the Commission invited interested persons to submit written statements concerning the investigation.

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EXECUTIVE SUMMARY

In 1990, the United States exported over 700,000 million metric tons of alfalfa products to markets in Pacific Rim countries, while Canada exported over 500,000 metric tons (table A). Alfalfa products, which include baled hay, alfalfa cubes, and alfalfa pellets and are used for animal feed, constituted only a portion of U.S. agricultural exports. However, the expanding markets in the Pacific Rim have provided significant trade opportunities for firms in the Western United States and Canada. The combined value of U.S. and Canadian exports exceeded $250 million in 1990.

The principal results of this investigation regarding the competitive factors in the U.S. and Canadian alfalfa products industries, particularly the way in which these factors affect competition in overseas markets, are as follows:

- *The U.S. and Canadian processed alfalfa products industries rely extensively on export markets in Japan.*

About 95 percent of the U.S. output of alfalfa cubes and virtually all of the U.S. output of compressed bales are exported. The Canadian industry is also highly export-oriented. In 1990, Canada exported about 83 percent of its production of alfalfa pellets and cubes. Alfalfa pellets produced in the United States are an exception, with just 2 percent of U.S. output exported.

Table A
Profile of U.S. and Canadian alfalfa products industries

	1986	1987	1988	1989	1990
United States					
Harvested acreage in alfalfa (1,000 acres)	26,911	25,435	26,750	25,944	25,401
Production:					
Hay (1,000 metric tons)	83,340	76,409	62,873	70,190	75,801
Pellets (1,000 metric tons)[1]	747	681	526	512	496
Cubes (1,000 metric tons)	530	520	555	525	588
Double-compressed bales (1,000 metric tons)	76	106	180	173	205
Exports:					
Pellets (1,000 metric tons)	138	40	2	13	11
Cubes (1,000 metric tons)	530	520	555	525	560
Double-compressed bales (1,000 metric tons)	76	106	180	173	202
Canada					
Harvested acreage in alfalfa[2] (1,000 acres)	13,435	14,217	14,673	14,637	14,767
Production[3]:					
Dehydrated pellets (1,000 metric tons)	292	346	316	347	333
Sun-cured pellets (1,000 metric tons)	55	52	119	100	124
Cubes (1,000 metric tons)	106	121	169	238	169
Double-compressed bales (1,000 metric tons)	([4])	([4])	([4])	([4])	10
Exports:					
Pellets (1,000 metric tons)	323	312	377	430	392
Cubes (1,000 metric tons)	40	45	105	155	153
Double-compressed bales (1,000 metric tons)	([4])	([4])	([4])	([4])	10

[1] Crop year.
[2] Includes all hay; 50 percent is estimated to be alfalfa according to Agriculture Canada.
[3] Crop year. Ratios of exports to production in 1990 shown for Canada elsewhere in this report are calculated from adjusted production numbers.
[4] Included with cubes. Baled alfalfa believed to be negligible.

Sources: U.S. Department of Commerce, U.S. Department of Agriculture, Alberta Agriculture, Japan Tariff Association, and USITC staff estimates.

Japan is the major market for U.S. and Canadian alfalfa product exports. The United States is the leading supplier of alfalfa cubes and double-compressed bales to Japan, while Canada is the main source for alfalfa pellets. In 1990, Japan imported 298,000 metric tons of alfalfa pellets, nearly all from Canada; 713,000 metric tons of alfalfa cubes, more than three-fourths from the United States; and 202,000 metric tons of baled alfalfa hay, nearly all from the United States.

Canadian exports of alfalfa pellets almost tripled in quantity between 1981 and 1990, while U.S. exports of pellets declined to negligible levels by 1990. U.S. exports of alfalfa cubes, however, more than doubled during the period. Canadian exports of alfalfa cubes also grew rapidly, but they are only about one-fourth the volume of U.S. exports of cubes. U.S. exports of alfalfa hay in double-compressed bales increased rapidly between 1985 and 1990, while Canadian exports of baled hay are reportedly negligible.

- *Competitiveness is assessed in this report by examining market shares in Japan, the most significant export market for U.S. and Canadian alfalfa products. By this measure, the U.S. industry has become less competitive during the 1981-90 period. An economic model suggests that Canadian rail transportation benefits account for part of this loss in competitiveness.*

The U.S. share of the Japanese market for all alfalfa products combined decreased from about 70 percent in 1981 to about 62 percent in 1990, while the Canadian share increased from about 23 percent in 1981 to about 37 percent in 1990. The situation varied by individual product types. The United States lost nearly all of its Japanese market for alfalfa pellets to Canada between 1981 and 1990. Canada now holds 99 percent of the Japanese pellet market. Although U.S. market share in cubes fell from 95 percent in 1981 to 78 percent in 1990, the United States maintained the dominant share of the Japanese market for cubes and baled hay.

An economic model was constructed to assess the effects of the Canadian Western Grain Transportation Act (WGTA) on trade and production in alfalfa products. Under the WGTA, Canadian shippers receive reduced rail transportation rates. Results from the model suggest that the shares of the Japanese market held by the respective industries would be different if the WGTA were removed. Without the WGTA, U.S. market share in pellets is estimated to be 17 percent, rather than the current level of less than 1 percent. For cubes, U.S. market share is estimated to be 85 percent, rather than 82 percent, according to results of the model.

- *Export prices of U.S. alfalfa products were consistently higher than prices for Canadian exports of similar product types.*

U.S. export prices were consistently higher than Canadian prices, according to data from questionnaires submitted by U.S. and Canadian firms. Official Japanese import data also indicate that U.S. alfalfa products are higher valued than Canadian products in the Japanese market.

Transportation costs, which affect values at the point of export and the Japanese entry port, account for part of the difference in U.S. and Canadian export prices. The prices of alfalfa products are very sensitive to transportation costs. The price differential between locations therefore represents, in a sense, the cost of transporting the commodity. Quality may account for part of the price difference as well, particularly for alfalfa cubes.

- *Transportation costs account for up to 35 percent of the value of alfalfa products landed in Japan, depending on modes of shipment used. The Canadian industry has an advantage over the U.S. industry in total transportation costs, resulting from lower cost rail freight for inland transportation and use of bulk shipping for ocean freight.*

Inland transportation costs for alfalfa pellets and cubes are lower in Canada than in the United States because of reduced rail transportation rates provided under the WGTA. The WGTA benefit amounts to $19.41 (U.S.) per metric ton of alfalfa product shipped. Virtually all of the Canadian export shipments are shipped to export ports by rail; most of the U.S. shipments are by truck. The costs for shipping by truck in the United States are about 4 cents per ton-mile, which is about the same as the rail rate in Canada without the WGTA benefit.

Canadian shippers of alfalfa products utilize bulk shipping methods more often than U.S. shippers, which reduces the ocean freight component of transportation costs. Virtually all Canadian export shipments of alfalfa pellets and about one-half to two-thirds of Canadian shipments of alfalfa cubes are shipped in bulk, while nearly all of the U.S. exports are shipped in containers. About 56 percent of the total transportation cost advantage for Canada is a result of using bulk ocean freight.

- *While the Japanese market for alfalfa products grew during the 1980s, prices of substitute products and currency exchange rates may have affected total consumption.*

The total Japanese market for imported alfalfa products more than doubled between 1981 and 1990. The largest increase was for imported alfalfa cubes. Increases in the price paid in Japan for alfalfa products compared with other feeds may have dampened consumption of alfalfa. The price paid in Japan for baled alfalfa hay rose faster than the prices for other types of imported hay and forages. Other feed ingredients may have supplanted some consumption of alfalfa pellets based on price competition. Alfalfa pellet prices in Japan have been increasing in recent years, while the prices of these substitutes have been stable.

The market for alfalfa exported from the United States and Canada has been affected by currency exchange rates. The strong yen during the mid-1980s reduced the prices paid by Japanese farmers for imported feeds. During 1986-90, the U.S. dollar depreciated with respect to the Canadian dollar by 20.9 percent in nominal terms and 12.7 percent in real terms. The changes in the exchange rates indicate that U.S. alfalfa exporters gained a competitive edge against Canadian alfalfa suppliers in Asian markets during 1986-90.

- *Total processed alfalfa production increased in both the United States and Canada during 1981-90, although the trends in production of individual product types varied between the two industries. The dehydrated alfalfa products industries in the United States and Canada in particular have shown opposite trends, with the U.S. industry contracting while the Canadian industry grew.*

U.S. production of alfalfa pellets declined by more than 50 percent during the 1980s, from 1.1 million metric tons in crop year 1981/82 to 512,000 metric tons in 1988/89 (the latest year available). The decline in U.S. production occurred mainly in dehydrated alfalfa pellets, while shipments for sun-cured alfalfa products increased. Canadian production of alfalfa pellets increased by about 73 percent, from 264,000 metric tons in crop year 1981/82 to 457,000 metric tons in 1990/91. About two-thirds of Canadian pellet production was dehydrated in these years.

Alfalfa cubes and double-compressed bales are produced primarily for export in both the United States and Canada. The growing export market in Japan has driven production increases in these products in both countries. U.S. production of cubes increased from approximately 220,000 metric tons in 1981 to approximately 588,000 metric tons in 1990. Canadian production of cubes increased from 43,000 metric tons in 1981/82 to 169,000 metric tons in 1990/91. U.S. production of double-compressed alfalfa increased from roughly 22,000 metric tons in 1981 to more than 200,000 metric tons in 1990. Canadian production of double-compressed bales is believed to be 10,000 metric tons or less.

- *Total production costs for processed alfalfa products were higher in the United States than in Canada in 1986 through 1988, but in 1989 and 1990, costs to Canadian producers exceeded those for U.S. producers. The financial experience of U.S. and Canadian processors varied.*

According to information supplied by questionnaires, the cost of alfalfa hay accounted for over one-half of total costs of processing in the United States. Raw materials costs were around 40 percent of total costs for Canadian producers. Energy costs to Canadian producers are high because the Canadian industry uses energy-intensive dehydration, while a greater share of U.S. industry produces sun-cured products. When the costs of energy to U.S. dehydrators alone are examined, average energy costs are close to those reported by Canadian firms.

The profit and loss experience of the U.S. alfalfa products industry showed mixed results for the sample period 1986-90. Those producing dehydrated pellets reported positive net income in each year, while those producing double-compressed bales reported net losses in 1987, 1989, and 1990. Producers of sun-cured pellets reported net losses from 1986 through 1988 and then positive net income in both 1989 and 1990. Producers of sun-cured cubes reported losses in 1986 and then positive net income the remainder of the period. The Canadian alfalfa processing industry reported positive net income during the sample period 1986-90.

- *The only U.S. or Canadian Government programs that directly affect processed alfalfa product exports or production are the Canadian Western Grain Transportation Act and Western Economic Diversification Act and U.S. research and export promotion programs.*

Since 1984, the Canadian Government has furnished benefits for rail shipments of alfalfa pellets and cubes shipped westbound for export under the WGTA. Expenditures attributable to alfalfa products under the WGTA totaled $10.2 million (U.S.) during fiscal 1990/91. These funds reduce the shippers' share of inland transportation costs from about 4 cents (U.S.) per ton-mile to 1.1 cents per ton-mile, amounting to a reduction of $19.41 per metric ton of product exported.

In 1987, the Canadian Government established a fund under the Western Economic Diversification Act to promote economic development in Western Canada. The Alberta Processing and Marketing Agreement (APMA), at the Provincial level, has similar objectives to Western Diversification. Total Western Diversification and APMA funds committed to 17 projects involving alfalfa processing was Can$1,981,000, or 13 percent of the total cost of the projects.

The United States provides a small amount of funding for research on alfalfa product production and for promotion of exports of processed alfalfa. Irrigation water supplied by Federal and State water projects in the United States benefits alfalfa growers and thus has an indirect effect on the processing industry. The net effect of the water subsidy on production and exports of processed alfalfa is not known; however, U.S. processors probably pay lower prices for raw materials as a result of irrigation programs.

Chapter 1
Introduction

Purpose of Study

The major objectives of this investigation are (1) to provide an analysis of the competitive factors in the U.S. and Canadian alfalfa products industries, especially the way in which those factors affect competition in overseas markets, and (2) to outline the policies and practices of the Federal, State, and Provincial Governments that affect the respective industries. The investigation was instituted on April 23, 1991, following receipt of a request on March 27, 1991, from the United States Trade Representative.[1]

Overview

Alfalfa (*Medicago sativa*), a medium-lived perennial legume, is one of the most nutritious and versatile livestock feeds in the world; it is capable of being used by nearly all classes of animals. Alfalfa is highly digestible, provides an abundance of high-quality protein, and contains vitamins (particularly vitamin A) and calcium.

Alfalfa is grown throughout the United States and Canada and is used extensively in domestic markets as forage[2] for livestock. Alfalfa is the leading hay crop produced in the United States and Canada and the volume of production at the farm level has been relatively constant over the last decade. In 1990, combined U.S. and Canadian production was about 92.4 million metric tons,[3] of which the United States produced 82.0 percent (75.8 million metric tons) and Canada 18.0 percent (16.6 million metric tons). Alfalfa is grown in all 50 U.S. States and in all 11 Canadian Provinces. Nearly 480,000 farms[4] in the United States harvested alfalfa on about 25 million acres in 1990. In Canada, data show approximately 7.4 million acres of alfalfa were harvested in 1990. While precise figures are not available, industry sources estimate the annual farm value of alfalfa production at $5.9 billion in the United States and $510 million in Canada.

Industries and Products

Within this study, the alfalfa products industries in the United States and Canada encompass those firms that utilize the alfalfa produced by the farmers in both countries to manufacture pellets, cubes, and double-compressed bales that are sold in domestic and foreign markets.[5] Regardless of geographic location, the various processes used to manufacture these products are much the same. Figure 1-1 illustrates the flow of alfalfa from the field through the various production processes and then to either on-site use or off-premise sales.

Regardless of the form of the final product, alfalfa must be dried to prevent spoilage and to facilitate storage and handling. The first distinction in the production process, and in the products themselves, is the method of drying the alfalfa—dehydration or sun-curing. Dehydrated alfalfa is used in the manufacture of pellets and cubes, while sun-cured alfalfa is used to make pellets, cubes, and double-compressed bales. These products comprise the subject of this study, and a brief discussion of the manufacturing processes and uses is necessary to provide some understanding of the factors affecting the competitiveness of the U.S. and Canadian industries.

Alfalfa Pellets

Alfalfa to be dehydrated is cut at an early stage of maturity (usually not in excess of 10-percent bloom). At this stage, the protein content and digestible fiber content are high. The alfalfa is partly dried in the field to 60- to 70-percent moisture, chopped, and rapidly dried to 7- to 10-percent moisture in gas-fired driers at 110-120 degrees Celsius. This process preserves the protein (by having less leaf loss than in field drying) and beta carotene (which deteriorates on exposure to sunlight) and results in the product having a high proportion of by-pass protein.[6] The dried alfalfa is ground into a meal and formed into 1/4-inch or 3/8-inch diameter pellets. An antioxidant is usually added during the pelleting process to help preserve the beta carotene and other vitamins during storage. For some users, alfalfa pellets are reground into meal. Unless otherwise specified, use of the term "alfalfa pellets" implies inclusion of alfalfa meal.

Sun-cured alfalfa pellets are made by similar methods, except the raw material is alfalfa hay that is dried in the field to 12- to 20-percent moisture. The hay used is often slightly more mature than that used for dehydrated pellets, resulting in a slightly lower protein content and lower carotene content. Antioxidants generally are not used in sun-cured alfalfa pellets.

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[1] The request from the United States Trade Representative and USITC notice of institution of investigation are reproduced in app. A.

[2] Forage is defined as "edible parts of plants, other than separated grain, that can provide feed for grazing animals, or that can be harvested for feeding." *Terminology for Grazing Lands and Grazing Animals*, Forage and Grazing Terminology Committee, Virginia Polytechnic Institute and State University, 1991, p. 1.

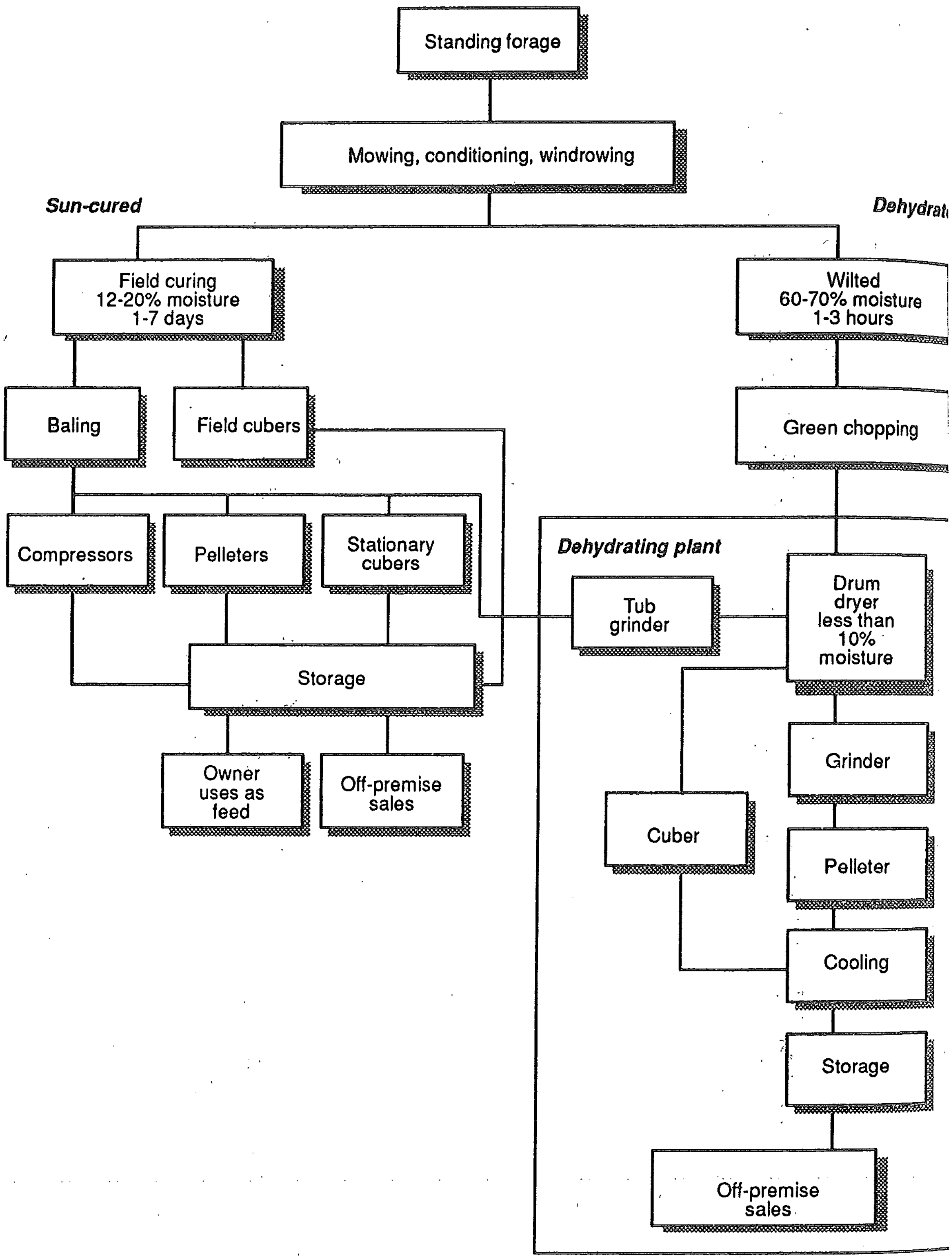
[3] Production data for the United States are from U.S. Department of Agriculture; data for Canada are USITC staff estimates.

[4] Number of farms is from 1987 Census of Agriculture.

[5] Other alfalfa products are also produced in both the United States and Canada (e.g., chopped, bagged, dehydrated hay and pellets and cubes made from hay and grains and/or oilseed meals). Output of these products, however, is so minor that they are not further considered in this report.

[6] Beta carotene is a compound that is a precursor to vitamin A. By-pass protein is that protein that is not broken down (degraded) in the rumen; i.e., it bypasses the rumen.

Figure 1-1
Movement of alfalfa from hay to processed products



Source: USITC staff.

Dehydrated and sun-cured alfalfa pellets are used for feeding to cattle, sheep, or horses, or by feed manufacturers (compounders) for inclusion in compound feeds. For use in compound feeds, the pellets are typically reground into a meal and mixed with other ingredients. The resulting compound feed is sometimes repelleted for ease in handling. Alfalfa pellets and meal are used in compound feeds for cattle, sheep, hogs, poultry, rabbits, and pets.

Dehydrated alfalfa pellets are generally sold with a guaranteed minimum protein content (usually 17 percent) and minimum vitamin A content (usually 125,000 IUPP, International Units per Pound). Sun-cured alfalfa pellets typically contain 15-percent protein and are generally not marketed with a guaranteed minimum vitamin A content. Pellets can be handled with typical bulk grain-handling equipment (e.g., augers), and are usually sold in bulk, with small amounts sold in bagged form.

Alfalfa Cubes

In the United States, alfalfa cubes are generally processed from sun-cured hay, while in Canada they are often made from a mixture of sun-cured hay and dehydrated hay. In the United States, alfalfa cubes are made either in the field using a portable cuber or after the hay is baled and hauled to a stationary cuber. In Canada, all the hay used to make cubes (including the sun-cured hay that has been baled) is run through a drier drum at the plant and then put through a stationary cuber. Binders (e.g., bentonite) sometimes are used in both the United States and Canada to help hold the plant fibers together in the cubes.

Alfalfa cubes measure about 1-1/2 x 1-1/2 x 2 or 3 inches. Alfalfa cubes are principally used to feed cattle; some are also used to feed horses, goats, and camels. Alfalfa cubes are usually sold based on a minimum protein content (typically 15 percent), a maximum fiber content (typically 28 percent), and a maximum moisture content (usually 12 percent). They tend to break apart on mechanized handling, and as such are most often shipped in containers rather than in bulk.

A minicube, measuring about 7/8 x 7/8 x 2-3 inches, is also produced in Canada. Minicubes are made on a pelleting machine from coarsely chopped sun-cured hay or mixed sun-cured hay and dehydrated hay. Minicubes can be handled using mechanized equipment (but with some breakage) and are often shipped in bulk.

Double-Compressed Bales

Double-compressed bales are standard single compressed bales (generally measuring about 14 x 18 x 36 inches) that are compressed under hydraulic pressure to about half their size (14 x 18 x 18 inches). The typical bale weighs from 80-120 pounds. Baled hay is used to feed dairy cattle, beef cattle, and horses. Double-compressed bales are produced to reduce shipping costs to foreign markets; in containers, shipping costs are based on volume not weight. Double-compressed bales are not consumed domestically in either the United States or in Canada.

Production and Trade

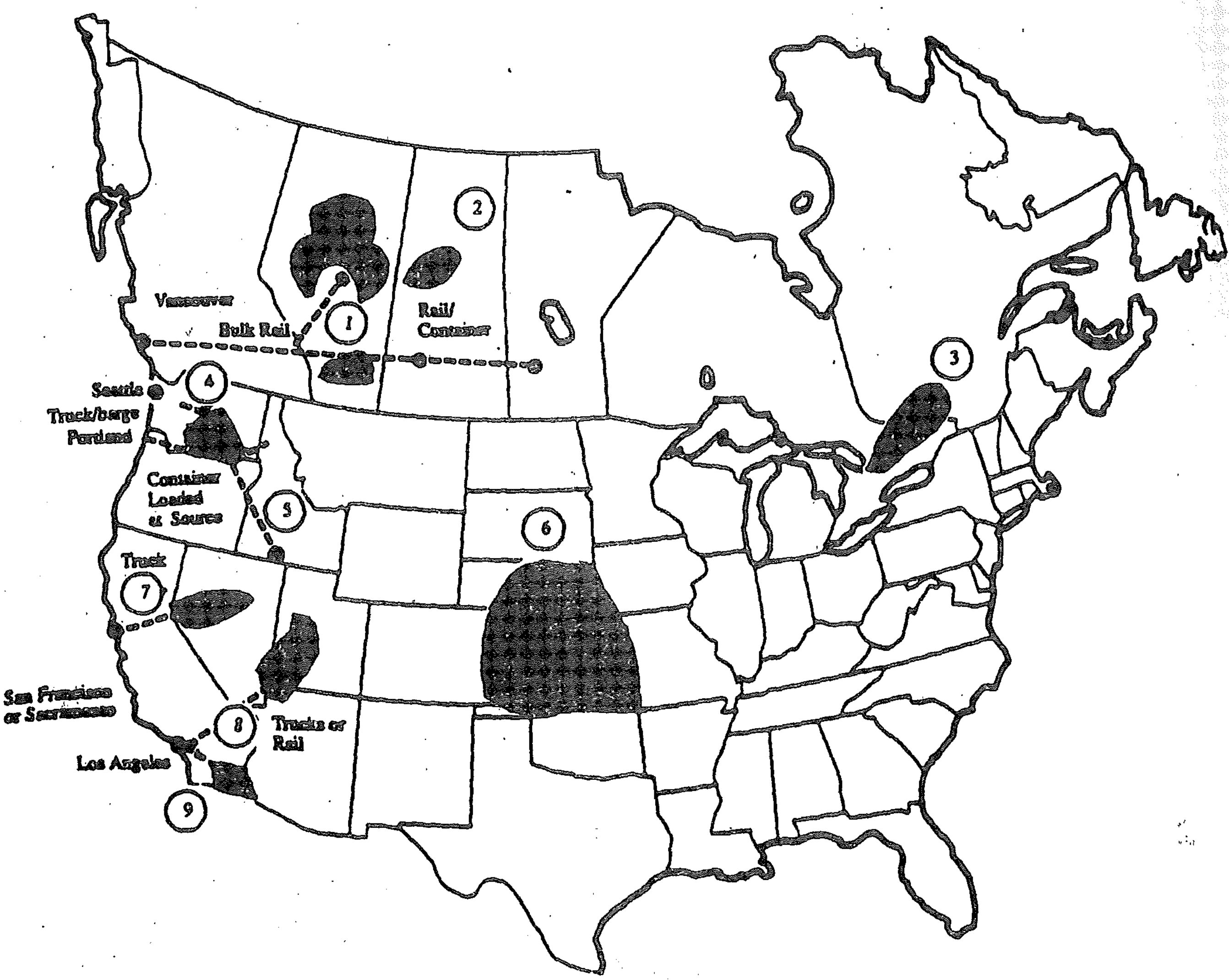
Although alfalfa is grown throughout the United States and Canada, manufacture of the alfalfa products of primary concern in this investigation is concentrated in a few areas (figure 1-2). In the United States, pellets are produced primarily in the Midwest for the domestic market, while cubes and double-compressed bales are produced closer to the west coast ports. In Canada, pellets are produced for the domestic market in Ontario and Quebec; and pellets, cubes, and double-compressed bales are produced in Alberta and Saskatchewan for export.

Figure 1-3 compares U.S. and Canadian production by product type (adjusted to a calendar-year basis). In 1990, the United States produced roughly 1.3 million metric tons of pellets, cubes, and double-compressed bales, utilizing less than 2 percent of estimated farm-level output of alfalfa. Canada's total production of 665,000 metric tons accounted for about 4 percent of its estimated farm output of alfalfa. Pellets are the leading product in both countries, followed by cubes, and then double-compressed bales although the relative percentages vary considerably.

Figure 1-4 presents the share of each product in U.S. and Canadian exports. The quantities and percentages for Canadian exports of the three products shown in figure 1-4 correspond closely to those shown in figure 1-3 for production. As shown on these figures, nearly all the Canadian production is exported. Canada's aggregate exports of 555,000 metric tons in 1990 accounted for approximately 83 percent of that year's production. Exports from the United States of 773,000 metric tons of these products accounted for about 60 percent of its 1990 production. However, the composition of U.S. exports differs considerably from production. Whereas pellet production accounted for about 39 percent of U.S. production of alfalfa products, pellets make up less than 2 percent of exports. U.S. exports are predominately cubes and double-compressed bales.

Figure 1-5 illustrates the export orientation of the alfalfa products industries. With the exception of the segment that produces pellets in the United States, the alfalfa products industries of both Canada and the United States are totally focused on foreign markets. To further illustrate the direct competition between the two industries, figure 1-6 shows the major export markets for both industries. The United States sent 98 percent of its 1990 exports to Japan, 0.1 percent to South Korea, and just under 2 percent to Taiwan. The same three markets took the bulk of Canada's 1990 exports as well, with 81 percent going to Japan, 8 percent to South Korea, and 5 percent to Taiwan.

Figure 1-2
Alfalfa product trade: Major production areas and transportation methods for alfalfa product exports

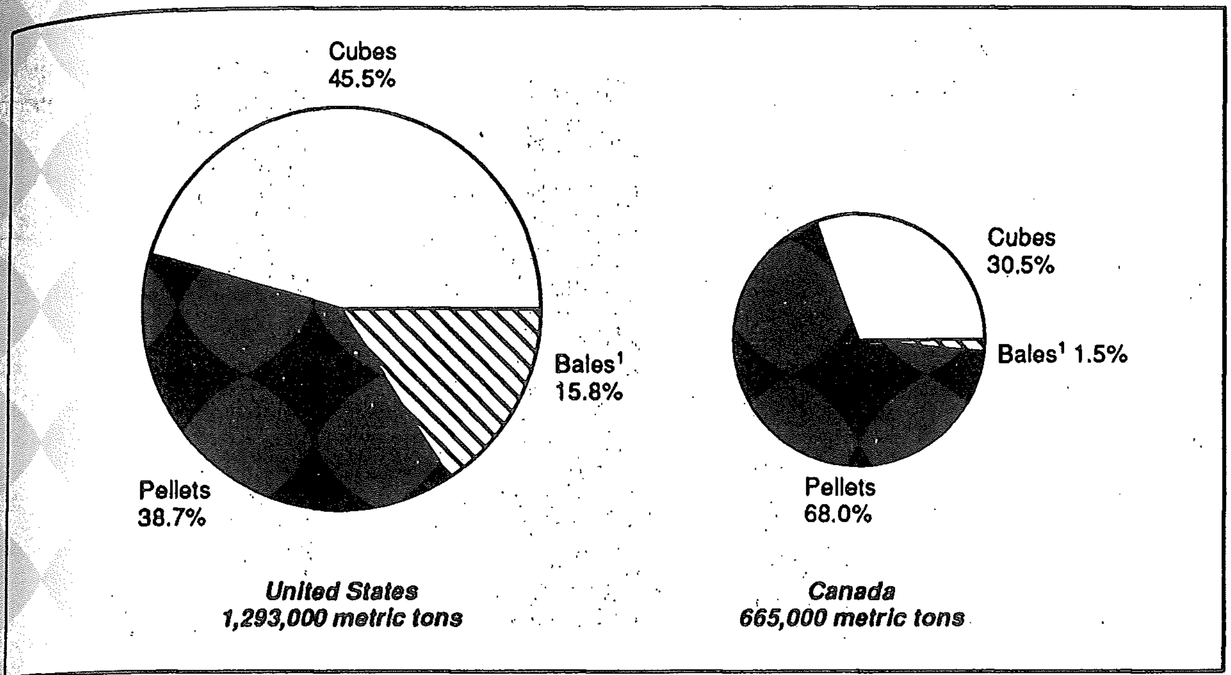


Legend

Route:
1 - Alberta
2 - Saskatchewan
3 - Quebec/Ontario
4 - Columbia Basin
5 - Idaho
6 - Midwest (mainly domestic sales)
7 - Inter-Mountain
8 - Southern Utah
9 - Imperial Valley

Source: Harvest Foods, Ltd.

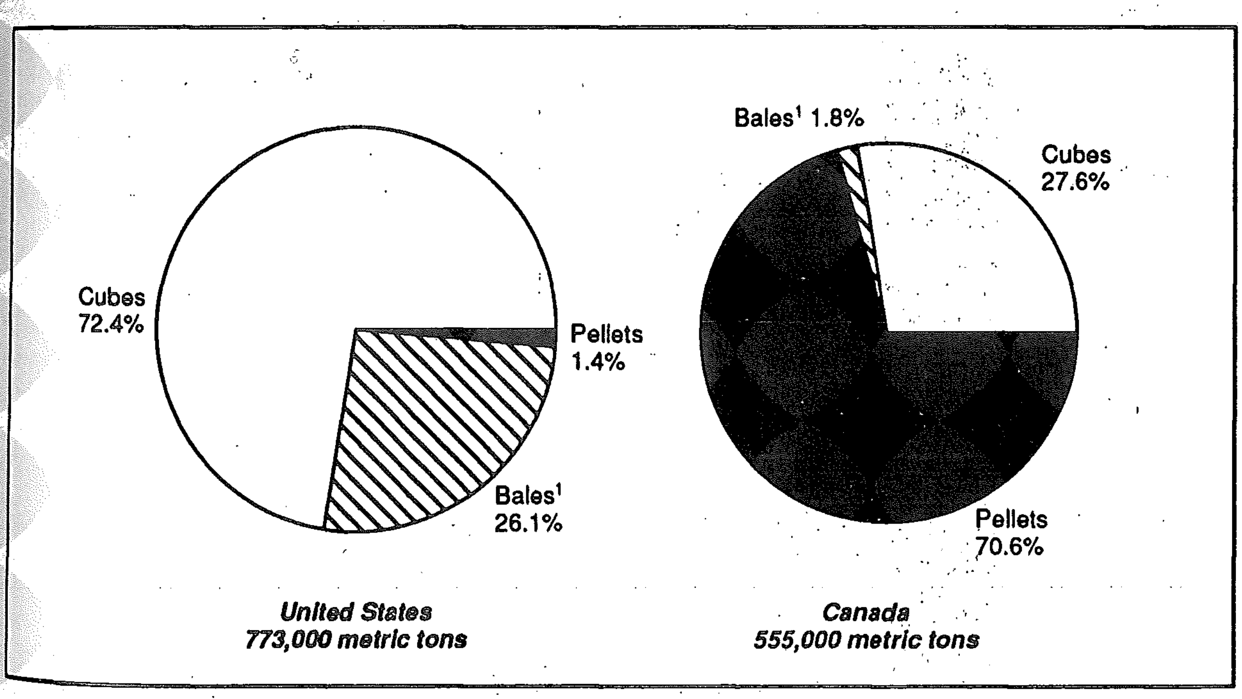
Figure 1-3
Alfalfa products: U.S. and Canadian production, by product types, 1990



[1] Includes double-compressed bales only.

Source: USITC staff estimates, based on data from the U.S. Department of Commerce, U.S. Department of Agriculture, and Alberta Agriculture.

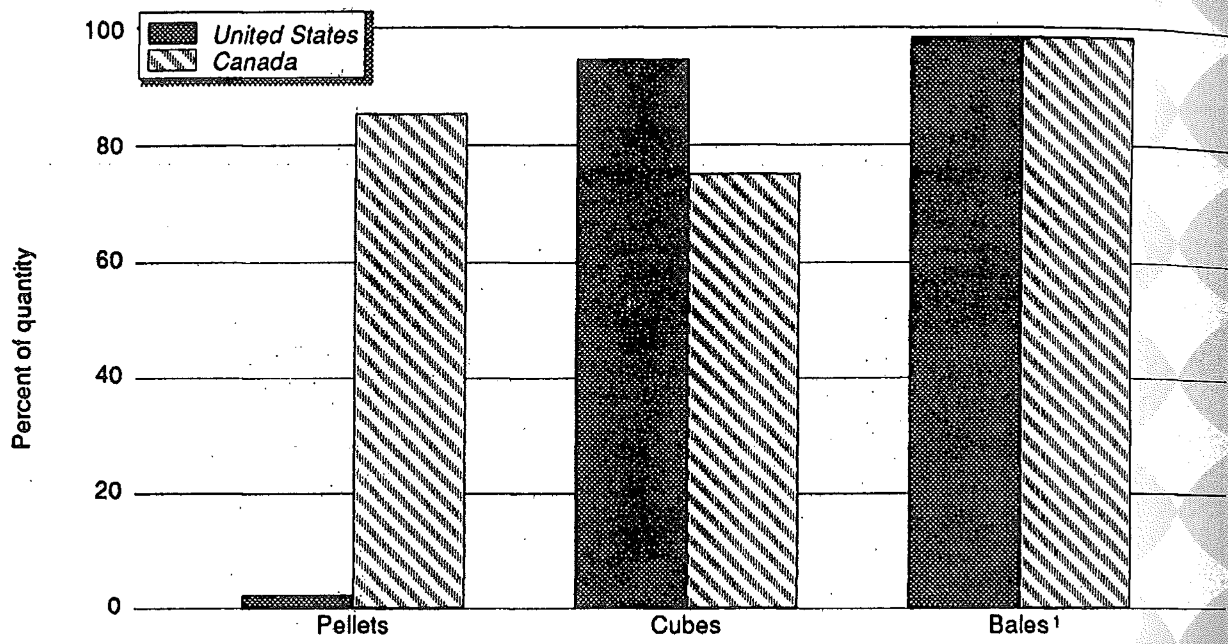
Figure 1-4
Alfalfa products: U.S. and Canadian exports, by product types, 1990



[1] Includes double-compressed bales only.

Source: U.S. and Canadian official statistics and USITC estimates.

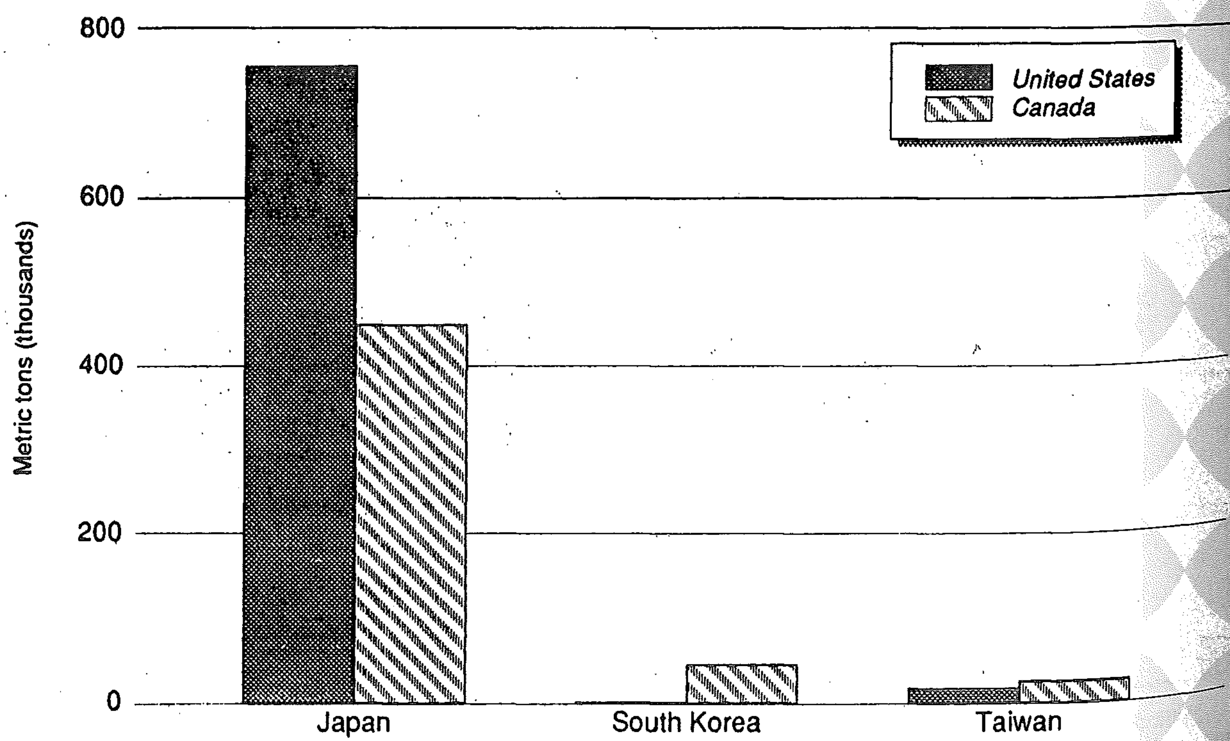
Figure 1-5
Alfalfa products: U.S. and Canadian exports as a share of production, by product types, 1990



[1] Includes double-compressed bales only.

Source: Compiled from official import statistics and USITC staff estimates.

Figure 1-6
Alfalfa products: Major export markets for U.S. and Canadian industries, 1990



Source: Compiled from official import statistics and USITC staff estimates.

Since the major markets for both the U.S. and Canadian alfalfa products industries are in the Pacific Rim, this analysis concentrates on the exports of alfalfa pellets, cubes, and double-compressed bales to Japan, Taiwan, and Korea. Given that the overwhelming majority of these exports go to Japan and that the two industries have competed head-to-head in that market for more than a decade, this report focuses primarily on the Japanese market for these products.

The Concept of Competitiveness

The first step in assessing an industry's competitiveness vis-a-vis its international rivals is to define competitiveness and how it is to be measured. Competitiveness in this study is measured in terms of U.S. and Canadian share of the Japanese market for alfalfa products. Specifically, market share is defined as the quantity imported by Japan from the United States or Canada, divided by total Japanese imports of a given alfalfa product. Japanese production of these alfalfa products is negligible.

Changes in the shares held by the U.S. and Canadian industries in overseas markets indicate whether the respective industry has been able to maintain market acceptance of its products. Market share is a more appropriate measure than total sales value (or volume) when one is interested in comparing the performance of one nation's industry with that of another. Factors that influence these measures of competitiveness are both internal and external to the industry. Internal factors include changing production or marketing costs (e.g., costs of raw material, labor, energy, water for irrigation, promotion, and transportation), management, and product quality. External factors include technological developments, interest rates, exchange rates, and government involvement (e.g., regulation, financial support, and trade barriers).

Study Time Frame and Data Sources

In most instances, the period covered throughout this study is 1981-90, especially with regard to trade data. For other data, the most recent figures available are presented. Throughout this report, monetary values are generally expressed in only one currency (U.S., Canadian, or Japanese) in the text; that is, equivalent U.S. values are not included when foreign values are expressed, and vice versa. However, where appropriate, values are shown in both currencies.

The investigation consisted of a combined analysis of information obtained from questionnaires submitted by firms in the U.S. industry and similar primary data submitted by firms in the Canadian industry, from published sources, and from staff interviews with industry representatives, government officials, and academic researchers, both in the United States and Canada. To the extent that some areas of interest have been the subject of previous government or academic studies, this report integrates them into the present investigation to minimize duplication of effort.

Organization of This Report

Chapters 2 and 3 provide a detailed description of the U.S. and Canadian alfalfa products industries and markets, respectively. The two chapters have a parallel structure: each describes in turn the country's industry (including its production and distribution), cost of production and prices, the country's market and exports, and finally government programs that affect the industry.

Chapter 4 provides a description of the major foreign markets served by the U.S. and Canadian industries. Both industries export primarily to the Pacific Rim countries of Japan, South Korea, and Taiwan. These markets are the primary areas of competition between the U.S. and Canadian industries.

Chapter 5 examines transportation as both a factor of competition and an area of contention between the U.S. and Canadian industries with respect to overseas markets. It covers the Canadian Western Grain Transportation Act (WGTA) in connection with U.S. rights under the U.S.-Canada FTA (Free Trade Agreement) and the General Agreement on Tariffs and Trade (GATT). It also looks at the modes and costs of transportation in both countries and the benefits provided by the WGTA. Finally, it analyzes the effect of the WGTA by estimating the effects on the U.S. industry, the Canadian industry, and the Japanese market of the removal of the WGTA benefits for the shipment of alfalfa products to port for export.

Chapter 6 reviews the competitive conditions facing the U.S. and Canadian industries focusing on the market share measure of competitiveness. It also examines the major factors affecting prices, such as production costs and transportation costs.

Chapter 2
U.S. Industry and Market

U.S. Industry

Alfalfa hay is grown throughout the United States as part of the rotation with other crops and for use in on-farm feeding by livestock and dairy producers. Extensive production of alfalfa for export is concentrated in the Western States, mainly California, Washington, Oregon, and Utah. The Midwestern States produce a significant amount of alfalfa for processing, but few of their products are exported.

At the farm level, the production of alfalfa hay in the United States has been stable over the past 10 years. Over 75 million metric tons of alfalfa hay were produced in the United States in 1990. The estimated farm value of production of alfalfa hay in 1990 was approximately $5.9 billion.[1] The U.S. processing industry, however, has contracted in output of dehydrated alfalfa products while expanding production of sun-cured products, particularly alfalfa cubes and baled hay for export.

Costs of production for all alfalfa products have increased, according to questionnaire responses, with the higher costs of raw materials driving the total costs of production upward. Aggregate operating income of the U.S. industry fluctuated according to year and product during the period examined. Producers of all products except dehydrated pellets experienced aggregate operating losses at some point during 1986-90. However, in 1990, only double-compressed bale producers reported an aggregate operating loss.

Domestic prices for alfalfa products generally increased during 1987-89, and began to decrease in 1990. Export prices for the different products varied.

The domestic market for alfalfa products is believed to have declined during the 1980s. Around 1 million tons of sun-cured alfalfa pellets and three-fourths of 1 million tons of dehydrated alfalfa pellets were used in 1984 in preparation of compound feed, prepared mixes of ingredients that are either commercially made or mixed on the farm. An estimated 48 million feed unit tons of alfalfa hay are used each year as forages, mainly in the form of baled hay.[2]

The U.S. export market for alfalfa products has shown uneven growth throughout the 1980s. The data suggest that U.S. exports, like domestic production, shifted from dehydrated products to sun-cured cubes and baled hay during the 1980s. The total volume of U.S. exports of alfalfa products grew by about 200 percent between 1981 and 1990.

U.S. Government programs affect alfalfa products mainly indirectly, as farm price and income support programs do not cover alfalfa. However, a small amount of government funds has been allocated to research on alfalfa and market development in Pacific Rim countries. In addition, irrigation water is supplied by Federal agencies to agricultural producers, including alfalfa growers, particularly in the West.

[1] Estimated by USITC staff.

[2] Feed unit tons are measures of nutritional content and are not directly comparable with volumetric tons shown elsewhere in this report.

Number and Location of Producers

The U.S. alfalfa products industry covered in this investigation comprises establishments that manufacture alfalfa pellets, meal, or cubes, and establishments that produce double-compressed bales of alfalfa hay. According to estimates by the staff of the U.S. International Trade Commission, there are approximately 100 firms in the industry, mainly in the Western States and the Midwest. Most of these firms are small and they process alfalfa during a short season, although many ship stored products year-round.

The *Census of Manufactures* reports that in 1987 there were 29 companies in the dehydrated alfalfa products industry, 40 percent fewer than in 1982. Companies classified as manufacturers of sun-cured and cubed alfalfa products increased from 17 in 1982 to 19 in 1987.[3] It is believed that these data do not include companies involved in production of double-compressed bales of hay, which are estimated to number about 50.

According to industry responses to USITC questionnaires, which likely cover only a sample of all U.S. producers, in 1990 firms produced alfalfa products as follows:

- 21 firms produced dehydrated alfalfa pellets;
- 12 firms produced sun-cured alfalfa pellets;
- 12 firms produced sun-cured alfalfa cubes;
- 14 firms produced double-compressed bales; and
- 6 firms produced other alfalfa products.

The numbers shown above include some double-counting, since several firms produced both dehydrated and sun-cured pellets.

Trends in Production

Farm-level production of alfalfa hay ranged between 63 million and 83 million metric tons per year during the past 10 years. Alfalfa acreage harvested has been stable, both nationwide and among the leading producing States (table 2-1). Yields have fluctuated somewhat from year to year, causing an irregular

[3] Census data are for producers of sun-cured and cubed alfalfa products together. Therefore separate data on producers and production of sun-cured alfalfa pellets and sun-cured alfalfa cubes are not available. It is believed that there are only one or two U.S. producers of dehydrated alfalfa cubes.

Table 2-1
Alfalfa hay: Acreage harvested, yield, and production, by major producing States, 1981-90

Location and year	Harvested area	Yield	Production
	1,000 acres	*Metric tons per acre*	*1,000 metric tons*
United States:			
1981	26,243	2.89	75,929
1982	26,188	3.07	80,183
1983	25,729	2.90	74,622
1984	26,818	3.05	81,779
1985	25,647	3.01	77,222
1986	26,911	3.09	83,340
1987	25,435	3.00	76,409
1988	26,750	2.35	62,873
1989	25,944	2.70	70,190
1990	25,401	2.98	75,801
California:			
1981	1,050	5.72	6,001
1982	960	6.08	5,835
1983	960	5.75	5,516
1984	1,020	5.90	6,015
1985	1,030	5.90	6,074
1986	1,080	5.99	6,467
1987	1,080	6.08	6,565
1988	1,100	5.99	6,587
1989	1,020	6.08	6,200
1990	1,060	5.99	6,347
Nebraska:			
1981	1,650	3.10	5,115
1982	1,600	3.40	5,440
1983	1,550	3.30	5,115
1984	1,600	3.30	5,280
1985	1,400	3.40	4,760
1986	1,350	3.45	4,658
1987	1,300	3.55	4,615
1988	1,350	3.00	4,050
1989	1,300	3.00	3,900
1990	1,450	3.30	4,785
Kansas:			
1981	1,000	3.60	3,600
1982	1,000	3.65	3,650
1983	930	3.00	2,790
1984	960	3.40	3,264
1985	950	3.90	3,705
1986	900	3.90	3,510
1987	850	3.80	3,230
1988	750	3.30	2,475
1989	850	3.60	3,060
1990	800	3.80	3,040
Idaho:			
1981	1,100	3.27	3,593
1982	1,020	3.36	3,424
1983	1,030	3.54	3,644
1984	1,050	3.40	3,573
1985	1,020	3.18	3,239
1986	1,100	3.45	3,792
1987	1,020	3.54	3,609
1988	920	3.45	3,172
1989	930	3.63	3,375
1990	960	3.54	3,397

Table continued on next page.

Table 2-1—Continued
Alfalfa hay: Acreage harvested, yield, and production, by major producing States, 1981-90

Location and year	Harvested area	Yield	Production
	1,000 acres	Metric tons per acre	1,000 metric tons
Washington State:			
1981	490	3.36	1,645
1982	460	3.63	1,669
1983	440	3.63	1,597
1984	475	3.90	1,853
1985	450	3.54	1,592
1986	470	3.81	1,791
1987	460	3.90	1,794
1988	490	3.81	1,867
1989	480	3.90	1,872
1990	470	4.35	2,047
Oregon:			
1981	425	3.72	1,581
1982	420	3.81	1,600
1983	440	3.81	1,677
1984	445	3.72	1,656
1985	450	3.67	1,654
1986	460	3.81	1,753
1987	400	3.81	1,524
1988	385	3.72	1,432
1989	400	3.90	1,560
1990	420	3.90	1,638
Utah:			
1981	(1)	(1)	(1)
1982	470	3.63	1,706
1983	455	3.54	1,610
1984	470	3.63	1,706
1985	460	3.54	1,628
1986	470	3.54	1,663
1987	485	3.72	1,804
1988	490	3.54	1,734
1989	470	3.36	1,578
1990	485	3.45	1,672

[1] Not available.

Source: U.S. Department of Agriculture, National Agricultural Statistics Service; Utah Department of Agriculture.

pattern of production although the widespread use of irrigation in the major producing States reduces the variation in yield for those areas compared with the national average.

The production of alfalfa pellets declined by more than 50 percent during the 1980s, as shown in the following tabulation (in 1,000 metric tons):[4]

Year	Production
1981/82	1,068.4
1982/83	1,055.5
1983/84	1,071.7
1984/85	755.4
1985/86	747.0
1986/87	680.9
1987/88	526.1
1988/89	512.3

Note.—Oct. 1-Sept. 30 crop year.

The decline in production occurred mainly in dehydrated alfalfa pellets. According to the 1987 *Census of Manufactures*, production of dehydrated alfalfa products contracted by 40 percent between 1982 and 1987. In 1982, production of dehydrated alfalfa products was valued at $58.6 million; by 1987, the value of shipments had declined to $35.2 million. The value of shipments for the sun-cured and cubed alfalfa products sector increased during the same period, from $13.8 million to $47.9 million (much of the increase is believed to be cubes for export).

The decline in production of dehydrated products between 1982 and 1987 resulted mainly from variability of energy costs. Further information on energy costs is provided below. The increasing production of sun-cured and cubed products probably is a response to a shift in consumption to relatively lower cost sun-cured pellets as costs of dehydration increased and to growing export sales of alfalfa cubes (see ch. 4).

[4] USDA, Grain and Feed Market News.

Published data are not available on production trends for alfalfa cubes and double-compressed alfalfa hay bales, although questionnaire responses decribed below provide an indication of trends. It is believed that nearly all of the production of these products is exported. Based on the trade statistics and industry sources, production of cubes and double-compressed bales of alfalfa hay is believed to have increased between 1981 and 1990 in response to growing export markets.

Responses to USITC questionnaires indicate production trends similar to those decribed above, with the addition of double-compressed bales produced for export. The total tonnage of alfalfa products produced increased approximately 60 percent between 1981 and 1990 according to questionnaires returned by alfalfa-producing companies.[5] The responding firms accounted for 880,773 metric tons of production in 1990, which represents an estimated 68 percent of total U.S. production of pellets, cubes, and double-compressed bales.

The questionnaires indicated that the largest percentage increase in production was in double-compressed bales. In 1981, companies responding indicated no production of double-compressed bales. Between 1985 and 1990, production of double-compressed bales increased dramatically, from 164 metric tons to 165,521 metric tons.

Significant increases also occurred in other sun-cured products, which rose 331 percent over the period 1981-90. Sun-cured cubes in particular showed a large increase in production, from 22,525 metric tons in 1981 to 260,893 metric tons in 1990. Sun-cured pellets more than doubled in production, from 72,207 metric tons in 1981 to 147,209 metric tons in 1990.

Although total alfalfa products production increased between 1981 and 1990, the questionnaires indicated a decrease in production of dehydrated pellets during this period. Dehydrated pellets production declined 43 percent, as production decreased from 397,524 metric tons in 1981 to 227,828 metric tons in 1990. While, as stated, sun-cured pellet production increased, the increase was not enough to compensate for the decrease in dehydrated pellet production.

Regional Production Trends

In California, over 1 million acres of alfalfa hay were harvested in 1990. While this acreage constituted only 4 percent of the alfalfa harvested area in the country, high yields in California enabled the State to produce 8 percent of total U.S. production of alfalfa.

Alfalfa pellet production in California declined significantly between 1981 and 1990. The California pelleting industry was highly export-oriented earlier in the 1980's. Sun-cured alfalfa pellet production far outstripped California production of dehydrated alfalfa pellets in the early 1980s, but production of sun-cured products then declined rapidly. Production of dehydrated alfalfa pellets in California also declined during the 1980s, but not as rapidly as sun-cured. The average annual rate of change in dehydrated alfalfa pellet production in California, at -12 percent, parallels the national trend shown by *Census of Manufactures* data. In recent years, alfalfa pellet production in California has been about evenly divided between sun-cured and dehydrated, as shown in the following tabulation (in thousand metric tons):[6]

Year	*Sun-cured*	*Dehydrated*
1981	89.9	22.7
1982	77.1	17.0
1983	71.9	15.0
1984	56.4	13.9
1985	15.7	10.4
1986	12.6	7.5
1987	3.1	8.2
1988	6.0	8.7
1989	8.9	10.9
1990	9.5	7.1

In the Pacific Northwest region, which includes Washington State, Oregon, and Idaho, 1.8 million acres of alfalfa hay were harvested in 1990. Most of these acres are irrigated. This acreage accounts for approximately 7 percent of the total U.S. acreage in alfalfa. However, with about 17[7] establishments producing alfalfa products, primarily for export, the region accounts for a large share of the export-oriented industry segment.

Between 450,000 and 500,000 acres are planted to alfalfa in Utah annually, almost all of which is irrigated. The typical cropping pattern in Utah is to plant alfalfa in rotation with corn or barley. Alfalfa generally produces three cuttings per year in Utah, ranging to as high as five cuttings in some areas. Most of the alfalfa hay grown in Utah that leaves the State is shipped to the California dairy market, mainly in 1-ton bales or as hay cubes. A significant amount of hay cubes produced by field cubers in Utah is also exported through the port of Long Beach, CA.

Most of the alfalfa-pelleting plants operating in the United States are in the Midwest States.[8] Kansas and Nebraska are the leading locations of farm-level production of alfalfa hay in the Midwest. Nebraska produces between 4 million and 5 million metric tons of alfalfa hay annually. Production in Kansas is typically 3 million metric tons per year. Between 1981 and 1990, total alfalfa hay production in these two States declined by 10 percent. Alfalfa harvested in the Midwest is used as raw material for the manufacture of pellets or cubes, is consumed by local farms or

[5] See app. B for information on number of questionnaires issued and response rates. Tables on production reported for 1981-90 are presented in app. C.

[6] Federal-State Market News Service, *Alfalfa Hay: California Market Summary*.

[7] Estimated by USITC staff.

[8] Based on responses to USITC questionnaires, about 29 pelleting plants are operating in the Midwest (12 producing dehydrated pellets, 8 producing sun-cured pellets, and 9 producing both dehydrated and sun-cured).

feedlots, or is trucked to markets in Florida. Very little of Midwest alfalfa production is exported.

Costs of Production

Information derived from industry responses to USITC questionnaires indicates that costs of production of alfalfa products increased by 28 percent between 1986-90 for U.S. processors of alfalfa pellets and cubes, but varied irregularly for producers of double-compressed bales. Raw material (alfalfa hay) costs increased at the fastest pace, growing by 59 percent over the 5-year period for U.S. producers of pellets and cubes.

Cost information was supplied to the Commission by individual type of alfalfa product, as requested in the questionnaires. But as a result of the difficulty of making allocations by individual product, the number of respondents in each category was low. Some of the results may not represent the industry at the level of the individual product. Therefore, cost of goods sold for U.S. processors of pellets, cubes, and other alfalfa products is presented in the aggregate rather than for individual product. Information on U.S. firms producing double-compressed bales is supplied separately, because the production process is sufficiently different from the pelleting and cubing process that the costs are not comparable.

Twenty-one firms provided data on the cost of goods sold for their dehydrated and sun-cured alfalfa products operations (table 2-2). Weighted-average total costs of goods sold of dehydrated and sun-cured alfalfa products per metric ton increased each year from $85.63 in 1986 to $109.62 in 1990, or by 28 percent. The four major components—raw materials, direct labor, energy costs, and other factory costs—accounted for an average of 83 percent of total cost of goods sold during the reporting periods. From 1986 to 1990, on a per metric ton basis, raw materials costs rose irregularly by 59 percent from $40.86 to

Table 2-2
Cost-of-goods-sold experience of U.S. producers on their operations producing dehydrated and sun-cured alfalfa pellets, meal, and cubes, fiscal years 1986-90

Item	*1986*	*1987*	*1988*	*1989*	*1990*
	Quantity (metric tons)				
Total net sales	315,451	338,532	354,909	372,638	408,760
	Value (per metric ton)				
Raw materials/purchases	$40.86	$42.56	$56.53	$67.08	$64.87
Direct labor	9.95	10.16	10.58	10.14	10.57
Energy costs	8.90	8.61	7.63	7.04	7.71
Repair and maintenance	7.42	7.77	7.90	7.18	7.75
Depreciation and amortization	6.39	5.54	5.87	5.60	4.37
Storage costs	0.71	0.77	0.66	0.67	0.39
Transportation-out costs for domestic sales	2.87	1.82	1.89	2.62	3.15
Transportation-out costs for export sales	0.18	0.90	0.27	0.13	0.01
Other factory costs	8.34	8.03	8.87	8.76	10.81
Total	85.63	86.16	100.21	109.21	109.62
	Share of total cost of goods sold (percent)				
Raw materials/purchases	47.7	49.4	56.4	61.4	59.2
Direct labor	11.6	11.8	10.6	9.3	9.6
Energy costs	10.4	10.0	7.6	6.4	7.0
Repair and maintenance	8.7	9.0	7.9	6.6	7.1
Depreciation and amortization	7.5	6.4	5.9	5.1	4.0
Storage costs	0.8	0.9	0.7	0.6	0.4
Transportation-out costs for domestic sales	3.4	2.1	1.9	2.4	2.9
Transportation-out costs for export sales	0.2	1.0	0.3	0.1	(1)
Other factory costs	9.7	9.3	8.9	8.0	9.9
Total	100.0	100.0	100.0	100.0	100.0

1 Positive figure, but less than significant digits displayed.

Note.—Because of rounding, figures may not add to the totals shown. Calculated from data of firms providing both cost-of-goods-sold breakout and sales quantity and therefore may not match data presented elsewhere.

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

$64.87, direct labor increased irregularly by 6 percent from $9.95 to $10.57, other factory costs rose by 30 percent from $8.34 to $10.81 and energy costs declined by 13 percent from $8.90 to $7.71.

Four firms, accounting for about 67 percent of U.S. shipments of double-compressed bales in 1990, supplied cost of goods sold data on their double-compressed bales operations (table 2-3). Weighted-average total costs of goods sold of double-compressed bales per metric ton increased by 4 percent from $134.55 in 1987 to $140.01 in 1988 and then declined by 27 percent to $102.65 in 1989 and rose by 28 percent to $131.39 in 1990. The raw materials costs and transportation-out costs for export sales accounted for the majority of the total cost of goods sold during the reporting periods.

Energy Costs

Energy is a key element in the production of dehydrated alfalfa products. Natural gas was the major source of energy supplies used by dehydrators that operated in California during the early 1980s and is also the typical energy source used by dehydrators in the Midwestern States. Some U.S. dehydrators that were major exporters in the early 1980s used fuel oil rather than natural gas, however.

Following sharp price increases between 1981 and 1983, the average price of natural gas sold to industrial consumers declined during 1983-87, then moved upward in 1988-90 (fig. 2-1). Natural gas prices in California were consistently higher than in other alfalfa-processing States during the 1980s. In California, natural gas prices dropped from a peak level of $5.49 per thousand cubic feet in 1983 to $3.48 in 1987, followed by increases in 1988-89. However, in 1990 the price fell to $4.09. Similarly, in Kansas and Nebraska prices declined during 1985-87, to $3.07 and $2.77, respectively, but increased during 1989-90, to $3.14 and $3.40. In California and Kansas, the average price of natural gas in 1990 was more than 20 percent below the peak price of 1983-84.[9]

[9] U.S. Energy Information Administration, *Natural Gas Annual*, 1988 and *Natural Gas Monthly*, 1991.

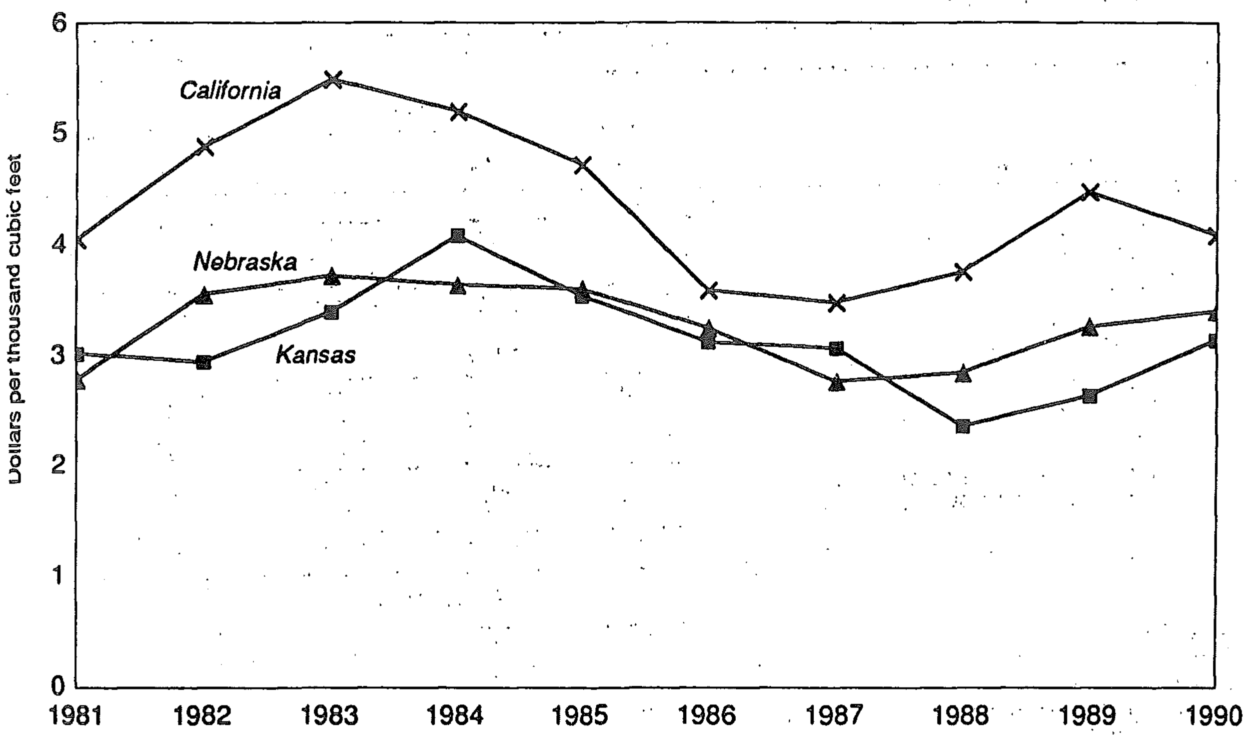
Table 2-3
Cost-of-goods-sold experience of U.S. producers on their operations producing double-compressed bales, fiscal years 1986-90

Item	*1986*	*1987*	*1988*	*1989*	*1990*
		Quantity (metric tons)			
Total net sales	-	3,612	149,379	271,644	135,036
		Value (per metric ton)			
Raw materials/purchases	-	$93.85	$102.22	$84.70	$97.71
Direct labor	-	6.64	7.26	3.71	6.62
Energy costs	-	1.11	0.27	0.28	0.50
Repair and maintenance	-	2.49	0.33	0.28	0.85
Depreciation and amortization	-	6.09	0.56	0.46	1.17
Storage costs	-	0.00	0.67	0.28	0.37
Transportation-out costs for domestic sales	-	8.58	0.42	0.28	0.66
Transportation-out costs for export sales	-	12.46	25.29	10.87	19.62
Other factory costs	-	3.32	2.98	1.78	3.87
Total	-	134.55	140.01	102.65	131.39
		Share of total cost of goods sold (percent)			
Raw materials/purchases	-	69.8	73.0	82.5	74.4
Direct labor	-	4.9	5.2	3.6	5.0
Energy costs	-	0.8	0.2	0.3	0.4
Repair and maintenance	-	1.9	0.2	0.3	0.6
Depreciation and amortization	-	4.5	0.4	0.5	0.9
Storage costs	-	0.0	0.5	0.3	0.3
Transportation-out costs for domestic sales	-	6.4	0.3	0.3	0.5
Transportation-out costs for export sales	-	9.3	18.1	10.6	14.9
Other factory costs	-	2.5	2.1	1.7	2.9
Total	-	100.0	100.0	100.0	100.0

Note.—Because of rounding, figures may not add to the totals shown. Calculated from data of firms providing both cost-of-goods-sold break out and sales quantity and therefore may not match data presented elsewhere.

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

ꟳigure 2-1
ɟatural gas: Average price to industrial consumers, California, Kansas, and Nebraska, 1981-90



ource: U.S. Energy Information Administration, *Natural Gas Monthly* and *Natural Gas Annual.*

As shown in the previous section, energy costs as ported by the U.S. alfalfa processing industry have ɔt been increasing. Questionnaire responses indicate at U.S. producers of dehydrated and sun-cured pellets ɪd cubes experienced declining energy costs between ɔ86 and 1990. Energy expenses decreased by 13.4 ɛrcent in 1990 compared with 1986 levels reported by ese firms. Lower natural gas rates to all industrial ɛers explain part of the decline. There has also been a ɪift from production of dehydrated products, which e energy-intensive, to sun-cured products, which quire less energy. Trade sources have stated that uch of the shift away from dehydration took place ɪrlier in the 1980s. The data from questionnaires esented above show the costs for dehydrators ɪmbined with producers of cubes and sun-cured ɪllets, which require less energy to produce than hydrated products.

ɪnancial Experience of U.S. Industry

ehydrated Pellets and Meal

Sixteen firms, accounting for about 85 percent of S. shipments of dehydrated pellets and meal in 1990, ɔvided income-and-loss data on their dehydrated llets and meal operations. Aggregate domestic net les of dehydrated pellets of these reporting firms rose 32 percent from [**] million in 1986 to [**] million in 1989 and then dropped by 3 percent to [**] million in 1990 (table 2-4). Export net sales fell by 90 percent from [**] million in 1986 to only [**] in 1987 and then to [**] in 1988 and 1989, before rising to [**] in 1990.

Aggregate operating income declined from $744,000, or 2.6 percent of sales in 1986, to $517,000, or 1.9 percent of net sales in 1987. Such income rose to $2.0 million, or 6.8 percent of net sales, in 1988, peaked at $3.1 million, or 9.2 percent of net sales, in 1989, and then dropped again to $1.6 million, or 4.7 percent of net sales, in 1990. Net income before income taxes and cash flow followed a similar trend as operating income.

Sun-Cured Pellets and Meal

Eight firms, accounting for an estimated 32 percent of U.S. shipments of sun-cured pellets and meal in 1990, supplied income-and-loss data on their sun-cured pellets and meal operations. The number of reporting firms varied, as certain companies produced sun-cured pellets in only a few years. Domestic net sales of sun-cured pellets declined by 12 percent from [**] million in 1986 to [**] million in 1987, but sales then rose by 17 percent in 1988, by 56 percent in 1989, and by 2 percent to [**] million in 1990 (table 2-5). Export sales of sun-cured pellets and meal increased from [**] in 1986 to [**] million in 1987, and then fell steeply for the remainder of the reporting period.

Table 2-4
Income-and-loss experience of U.S. producers on their operations producing dehydrated pellets and meal, fiscal years 1986-90[1]

Item	1986	1987	1988	1989	1990
	Value (1,000 dollars)				
Net sales:					
Domestic trade sales	**	**	**	**	**
Export trade sales	**	**	**	**	**
Total	28,565	27,415	29,756	34,213	33,707
Cost of goods sold	26,282	25,209	25,717	29,086	30,228
Gross profit	2,283	2,206	4,039	5,127	3,479
Selling, general, and administrative expenses	1,539	1,689	2,025	1,991	1,897
Operating income	744	517	2,014	3,136	1,582
Interest expense	1,020	699	635	648	848
Other income, net	1,446	1,227	1,343	658	622
Net income before income taxes	1,170	1,045	2,722	3,146	1,356
Depreciation and amortization	551	460	501	547	562
Cash flow[2]	1,721	1,505	3,223	3,693	1,918
	Ratio to total net sales (percent)				
Cost of goods sold	92.0	92.0	86.4	85.0	89.7
Gross profit	8.0	8.0	13.6	15.0	10.3
Selling, general, and administrative expenses	5.4	6.2	6.8	5.8	5.6
Operating income	2.6	1.9	6.8	9.2	4.7
Net income before income taxes	4.1	3.8	9.1	9.2	4.0
	Number of firms reporting				
Operating losses	2	3	2	2	6
Net losses	6	4	4	5	6
Data	15	15	15	16	16

[1] Fiscal year of one firm each ended Jan. 31, June 30, Sept. 30, and Oct. 31. Fiscal year of two firms ended Mar. 31, six firms ended April 30, and four firms ended Dec. 31.
[2] Cash flow is defined as net income or loss plus depreciation and amortization.

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

U.S. firms reported aggregate operating loss margins on sun-cured pellets ranging from 4.4 percent of total net sales in 1986 to 6.5 percent in 1988 and a high of 9.0 percent in 1987. However, by 1989 these responding firms earned an operating income of $989,000, or 8.1 percent of total sales. Such income rose to $1.6 million, or 12.6 percent of total net sales in 1990. Net income before income taxes generally followed a similar trend as operating income.

Sun-Cured Cubes

Seven firms, accounting for an estimated 41 percent of U.S. shipments of sun-cured cubes in 1990, or about 30 percent of total exports, provided income-and-loss data on their sun-cured cubes operations. Aggregate domestic net sales of sun-cured cubes accounted for less than 5 percent of total net sales in each year surveyed (table 2-6). Aggregate export net sales of sun-cured cubes nearly doubled from [**] million in 1986 to [**] million in 1989; however, such sales declined by about 7 percent to [**] million in 1990 from 1989.

The responding firms reported an aggregate operating loss of $212,000, or 1.2 percent of net sales, in 1986. After that, they reported aggregate operating income of $1.4 million, or 5.1 percent of total net sales, in 1987, $2.3 million, or 6.6 percent of net sales, in 1988, $1.9 million, or 5.3 percent of net sales, in 1989 and $1.2 million, or 3.5 percent of net sales, in 1990. Net income before income taxes followed a similar trend as operating income.

Double-Compressed Bales

Six firms, accounting for about 70 percent of U.S. exports of double-compressed bales in 1990, supplied income-and-loss data on their double-compressed bale operations. Two firms started their operations on double-compressed bales in 1987, with two firms entering this industry in 1988 and one in 1989.

Table 2-5
Income-and-loss experience of U.S. producers on their operations producing sun-cured pellets and meal, fiscal years 1986-90[1]

Item	1986	1987	1988	1989	1990
	Value (1,000 dollars)				
Net sales:					
Domestic trade sales	[**	**	**	**	**
Export trade sales	**	**	**	**	**]
Total	8,261	8,765	8,087	12,233	12,518
Cost of goods sold	8,314	9,173	8,322	10,888	10,548
Gross profit or (loss)	(53)	(408)	(235)	1,345	1,970
Selling, general, and administrative expenses	308	384	290	356	395
Operating income or (loss)	(361)	(792)	(525)	989	1,575
Startup or shutdown expense	0	0	0	[**]	[**]
Interest expense	[**]	[**]	[**]	[**]	[**]
Other income, net	[**]	[**]	[**]	[**]	[**]
Net income or (loss) before income taxes	(819)	(1,314)	(522)	1,218	1,445
Depreciation and amortization	[**	**	**	**]	419
Cash flow[2]	[**	(**)	**	**]	1,864
	Ratio to total net sales (percent)				
Cost of goods sold	100.6	104.7	102.9	89.0	84.3
Gross profit or (loss)	(0.6)	(4.7)	(2.9)	11.0	15.7
Selling, general, and administrative expenses	3.7	4.4	3.6	2.9	3.2
Operating income or (loss)	(4.4)	(9.0)	(6.5)	8.1	12.6
Net income or (loss) before income taxes	(9.9)	(15.0)	(6.5)	10.0	11.5
	Number of firms reporting				
Operating losses	3	2	3	1	4
Net losses	5	2	3	3	4
Data	7	6	8	7	7

[1] Fiscal year of one firm each ended May 31, August 31, and Oct. 31. Fiscal year of three firms ended April 30, and two firms ended Dec. 31.
[2] Cash flow is defined as net income or loss plus depreciation and amortization.
Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

The two new firms reported export net sales of double-compressed bales of [**] million and domestic net sales of only [**] in 1987 (table 2-7). Export net sales declined in spite of a new firm's entrance in 1989, from [**] million in 1988 to [**] million in 1990.

The two reporting firms sustained an aggregate operating loss of [**] or [**] percent of total net sales, in 1987. Aggregate operating income declined from $431,000 in 1988 to $220,000, or 0.7 percent of total net sales, in 1989 and then were reduced to losses of $35,000, or 0.2 percent of total net sales, in 1990. Net income or loss before income taxes followed generally a similar trend as operating income or loss,

Investment in Productive Facilities

The value of property, plant, and equipment and the return on book value of fixed assets are presented in table 2-8. During the reporting periods, the operating and net returns on the book value of fixed assets followed generally the same trend as did the ratio of operating and net income to net sales for all types of alfalfa products discussed above except double-compressed bales.

Capital Expenditures

The capital expenditures incurred by the reporting firms, by products, are shown in table 2-9. Total capital expenditures for all dehydrated products increased from $764,000 in 1986 to $2.7 million in 1987 and $3.5 million in 1989 before declining to $1.6 million in 1988. Such expenditures were $2.5 million in 1990. Total capital expenditures for all sun-cured products decreased from $2.6 million in 1986 to $967,000 in 1987, $2.5 million in 1988, $1.1 million in 1989, and $920,000 in 1990, For double-compressed bales, total capital expenditures jumped from [**] in 1987 to [**] in 1988. Such expenditures were $530,000 in 1989 and $414,000 in 1990.

Research and development expenses of the reporting firms were negligible.

Table 2-6
Income-and-loss experience of U.S. producers on their operations producing sun-cured cubes, fiscal years 1986-90[1]

Item	*1986*	*1987*	*1988*	*1989*	*1990*
	Value (1,000 dollars)				
Net sales:					
Domestic trade sales	[**	**	**	**	**]
Export trade sales	**	**	**	**	**]
Total	18,284	27,253	35,479	36,445	35,073
Cost of goods sold	16,305	23,392	30,977	31,963	30,981
Gross profit	1,979	3,861	4,502	4,482	4,092
Selling, general, and administrative expenses	2,191	2,471	2,173	2,550	2,875
Operating income or (loss)	(212)	1,390	2,329	1,932	1,217
Startup or shutdown expense	0	0	0	78	0
Interest expense	[**]	[**]	[**]	249	[**]
Other income, net	[**]	[**]	[**]	521	[**]
Net income or (loss) before income taxes	(255)	1,327	2,320	2,126	1,785
Depreciation and amortization	369	337	453	571	719
Cash flow[2]	114	1,664	2,773	2,697	2,504
	Ratio to total net sales (percent)				
Cost of goods sold	89.2	85.8	87.3	87.7	88.3
Gross profit	10.8	14.2	12.7	12.3	11.7
Selling, general, and administrative expenses	12.0	9.1	6.1	7.0	8.2
Operating income or (loss)	(1.2)	5.1	6.6	5.3	3.5
Net income or (loss) before income taxes	(1.4)	4.9	6.5	5.8	5.1
	Number of firms reporting				
Operating losses	2	2	2	3	3
Net losses	3	2	2	3	2
Data	6	6	7	7	6

[1] Fiscal year of one firm each ended Mar. 31, and May 31. Fiscal year of two firms ended April 30, and three firms ended Dec. 31.
[2] Cash flow is defined as net income or loss plus depreciation and amortization.
Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

Table 2-7
Income-and-loss experience of U.S. producers on their operations producing double-compressed bales, fiscal years 1986-90[1]

Item	1986	1987	1988	1989	1990
	Value (1,000 dollars)				
Net sales:					
Domestic trade sales	0	[**]	[**]	[**]	[**]
Export trade sales	0	[**]	[**]	**	**]
Total	0	[**]	23,100	29,575	19,020
Cost of goods sold	0	[**]	22,146	28,749	18,629
Gross profit	0	[**]	954	826	391
Selling, general, and administrative expenses	0	[**]	523	606	426
Operating income or (loss)	0	[(**)]	431	220	(35)
Startup or shutdown expense	0	[**]	[**]	0	0
Interest expense	0	[**]	[**]	[**]	[**]
Other income or (expense), net	0	[**]	[(**)]	[(**)]	[(**)]
Net income or (loss) before income taxes	0	[(**)]	150	(53)	(351)
Depreciation and amortization	0	[**]	[**]	126	158
Cash flow[2]	0	[(*)]	[**]	73	(193)
	Ratio to total net sales (percent)				
Cost of goods sold	-	[**]	95.9	97.2	97.9
Gross profit or (loss)	-	[**]	4.1	2.8	2.1
Selling, general, and administrative expenses	-	[**]	2.3	2.0	2.2
Operating income or (loss)	-	[(**)]	1.9	0.7	(0.2)
Net income or (loss) before income taxes	-	[(**)]	0.6	(0.2)	(1.8)
	Number of firms reporting				
Operating losses	0	[**]	1	1	3
Net losses	0	[**]	1	3	4
Data	0	2	5	6	6

[1] Fiscal year of one firm each ended Mar. 31, May 31, Aug. 31, and Sept. 30. Fiscal year of two firms ended Dec. 31.

[2] Cash flow is defined as net income or loss plus depreciation and amortization.

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

Table 2-8
Value of assets and return on fixed assets of U.S. producers of alfalfa products, by products, fiscal years 1986-90

Item	*1986*	*1987*	*1988*	*1989*	*1990*
	Value (1,000 dollars)				
Dehydrated pellets and meal:					
Fixed assets:					
Original cost	25,270	25,814	26,147	26,658	28,013
Book value	9,251	9,568	9,251	10,032	10,839
Sun-cured pellets and meal:					
Fixed assets:					
Original cost	7,046	7,427	8,143	7,697	7,672
Book value	3,375	2,727	2,584	1,465	1,469
Sun-cured cubes:					
Fixed assets:					
Original cost	3,494	4,020	5,687	6,877	8,075
Book value	2,144	2,159	3,464	3,957	4,691
Double-compressed bales:					
Fixed assets:					
Original cost	0	[**]	[**]	1,553	1,517
Book value	0	[**]	[**]	1,311	1,160
	Return on book value of fixed assets (percent)[1]				
Dehydrated pellets and meal:					
Operating return[2]	7.7	(1.0)	18.4	26.6	11.0
Net return[3]	15.7	6.3	27.6	29.0	11.8
Sun-cured pellets and meal:					
Operating return[2]	(10.3)	(29.8)	(25.4)	68.9	106.1
Net return[3]	(23.2)	(48.4)	(24.4)	88.7	100.8
Sun-cured cubes:					
Operating return[2]	(12.9)	58.9	62.4	45.3	23.3
Net return[3]	(14.8)	56.1	62.3	50.2	35.8
Double-compressed bales:					
Operating return[2]	-	[**]	[**]	12.9	(2.4)
Net return[3]	-	[**]	[(**)]	(4.3)	(28.3)

[1] Computed using data from only those firms supplying both asset and income-and-loss information, and as such, may not be derivable from data presented.
[2] Defined as operating income or loss divided by asset value.
[3] Defined as net income or loss divided by asset value.

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

Table 2-9
Capital expenditures by U.S. producers of alfalfa products, by products, fiscal years 1986-90
(In thousands of dollars)

Item	*1986*	*1987*	*1988*	*1989*	*1990*
All dehydrated products:					
Land and land improvements	[**]	[**]	[**]	12	[**]
Building and leasehold improvements	[**]	[**]	[**]	360	[**]
Machinery, equipment, and fixtures	[**]	[**]	[**]	3,109	2,015
Total	764	2,666	1,575	3,481	2,503
All sun-cured products:					
Land and land improvements	0	0	0	[**]	[**]
Building and leasehold improvements	739	[**]	[**]	[**]	[**]
Machinery, equipment, and fixtures	1,820	[**]	[**]	1,062	767
Total	2,559	967	2,454	1,066	920
Double-compressed bales:					
Land and land improvements	0	0	0	[**]	[**]
Building and leasehold improvements	0	0	[**]	[83]	0
Machinery, equipment, and fixtures	0	[**]	[**]	443	[**]
Total	0	[**]	[**]	530	414

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

U.S. Prices

The price of alfalfa hay is a main determinant of e prices of all processed alfalfa products, because a rge portion of production costs is raw material (hay) ɪst. Hay prices typically are highest in the Western nited States.[10] The following section presents ıblished data on alfalfa product prices in selected arkets and summarizes industry-supplied data on ɪmestic and export sales prices as reported in ɪestionnaires. Further analysis of the price trends as ey relate to competitiveness is provided in chapter 6.

egional Price Trends of Dehydrated lfalfa Meal

To evaluate the price trends of alfalfa and to ɪmpare the prices in the different regions of the nited States, average wholesale market prices of ɪhydrated alfalfa meal (17 percent protein) in Kansas ity, MO; Portland OR; and Los Angeles, CA; corded by the U.S. Department of Agriculture are ɪed. The three selected cities are in or near the major oducing areas noted on figure 1-2. The price for falfa meal is considered a good proxy for the price of ɪhydrated pellets. Meal is formed from reground ɪllets, but in spite of the additional grinding process, ost producers charge the same price for dehydrated falfa pellets and dehydrated alfalfa meal.

[10] USDA, National Agricultural Statistics Service, *ınual Price Summary*, June 1991, p. A-24.

The quarterly average wholesale price of dehydrated alfalfa meal in Kansas City experienced an upward trend during 1986-89 and started to decline in 1990. The quarterly prices for Portland and Los Angeles generally followed similar trends (fig. 2-2). Prices reported in Kansas City were always lower than those in Portland and Los Angeles.

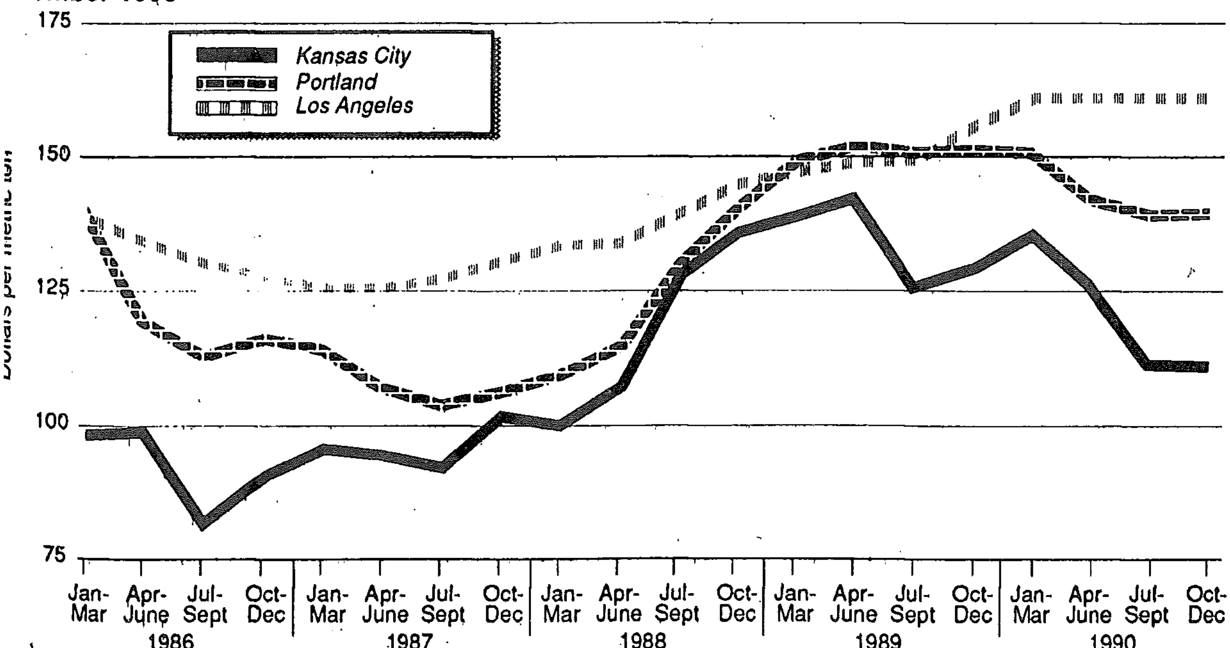
The changes in the price indicated that no regular seasonal fluctuations existed in the market, even though the prices in the third quarters were lowest in 3 out of the 5 sample years. Durability and adequate storage facilities contributed to suppressing seasonal changes in alfalfa meal prices.

U.S. Domestic and Export Prices from Questionnaires

Using industry responses to USITC questionnaires, the average quarterly prices of various alfalfa products for domestic sales and exports were calculated for the 5-year sample period, 1986-90. All selling prices are weighted-average f.o.b. plant or port prices, unless otherwise specified.[11] These are average prices

[11] Free on board (f.o.b). Most processors and exporters quoted their prices on an f.o.b. basis. A few processors and exporters quoted their price on both f.o.b. and delivered bases. Unless otherwise specified, only f.o.b. prices are used for calculating average domestic prices presented here. For exported products, however, many producers reported prices on a delivered basis, or used both delivered and f.o.b. quotations. The export data are reported on delivered, f.o.b. container yard, and combined bases for comparison below.

Igure 2-2
lfalfa: Average wholesale prices of dehydrated alfalfa meal, by selected markets, January 1986-ecember 1990[1]



[1] For 17 percent protein content.
ource: The U.S. Department of Agriculture.

charged in many different transactions and do not include all the charges required to bring the alfalfa products to the purchasers' locations. Although such nationwide data have limitations when considering particular market areas, they are useful for comparing overall trends in domestic processors' and exporters' prices and comparing price differences in the various alfalfa products.

Prices of Dehydrated Alfalfa Pellets and Meal

The average quarterly price of dehydrated alfalfa pellets and meal for domestic sales fluctuated moderately over the 5-year period (fig. 2-3). On the average, the price increased in 1987 through 1989, and then declined in 1990. The price varied within a range of about $62 per metric ton.

The average quarterly prices of U.S. exports of dehydrated alfalfa pellets and meal to Japan are shown in figure 2-4. The basis for this price is f.o.b. west coast port. The price varied within a wide range.

Among the reasons for the variability of the export price for dehydrated pellets include: there were few transactions reported for export of this product, contract specifications or quality may have been different than the usual standards, or some of the products may have been bagged for a particular specialty market such as pet foods.

Prices of Sun-Cured Alfalfa Pellets and Meal

Domestic prices of sun-cured pellets and meal generally increased during 1986-89 from $72 per metric ton to the high of $112 per metric ton in 1988, declining in 1990 to $93-$95 (fig. 2-3).

Very few exports to Japan of sun-cured pellets were reported, none after the first quarter of 1988. Export prices ranged between $130 per metric ton in mid-1986 to a low of $70 in the last quarter of 1987 (fig. 2-4).

Prices of Sun-Cured Alfalfa Cubes

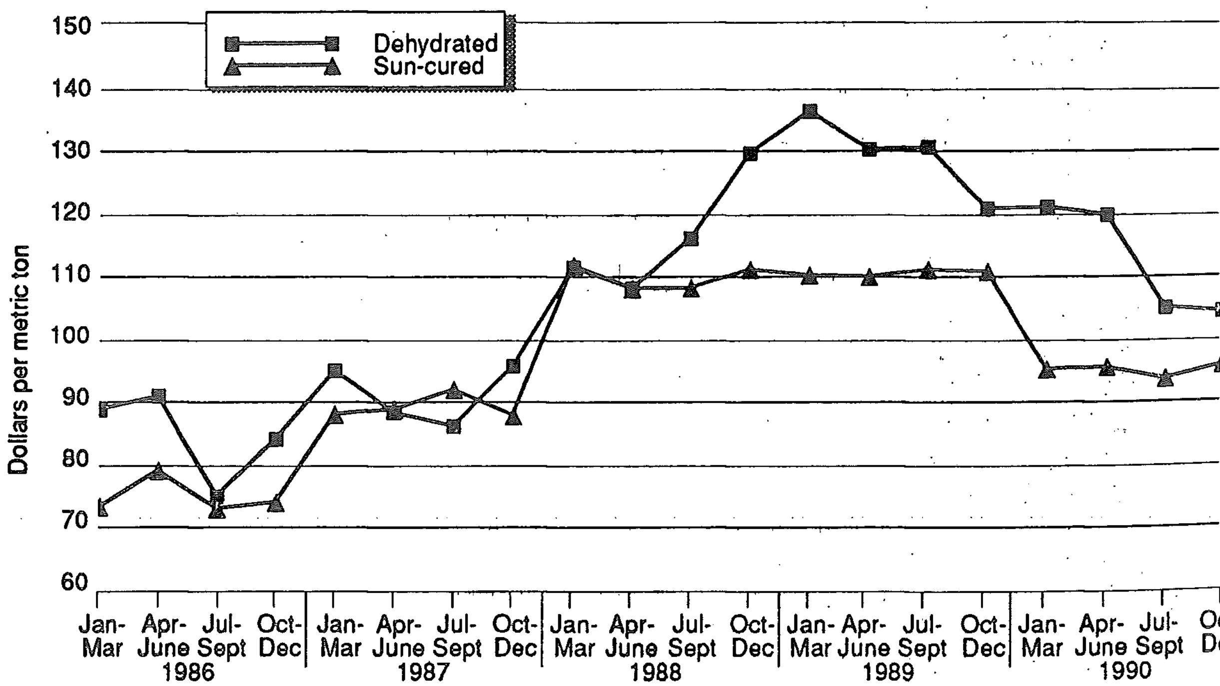
Domestic and export prices of alfalfa cubes follow similar trends, because the domestic sales reported were usually to an agent or broker and were destined for export. Some domestic sales were of off-grade product that could not be exported. Export sales prices trended upward during 1986-90. Prices are shown in figure 2-5 for delivered (c.&f. Japan), f.o.b. container yard, and for producers who quoted both delivered and f.o.b.

U.S. Export Prices of Double-Compressed Bales to Japan

Domestic sales of double-compressed alfalfa hay were limited, and usually were destined to Hawaii, Alaska, or Puerto Rico.[12] Such domestic sales were

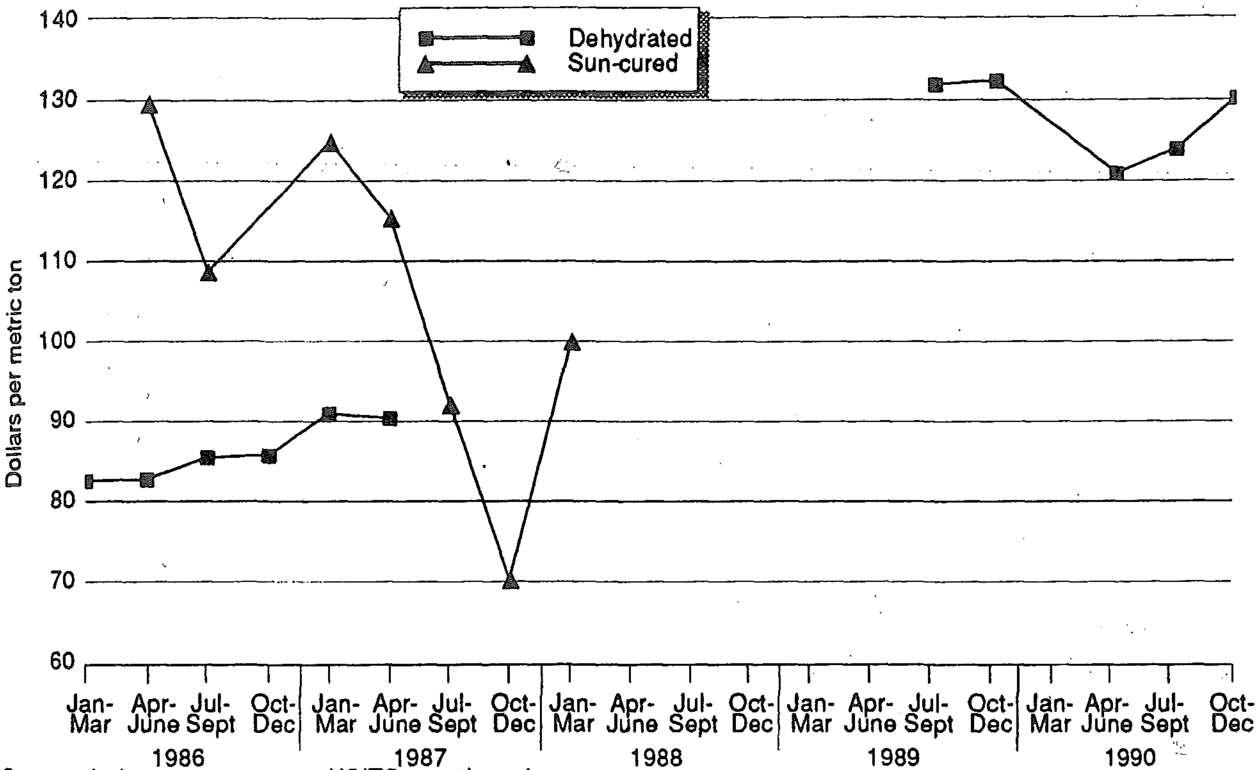
[12] One firm reported its domestic sales of double-compressed bales in the continental United States. The prices of the baled hay were extremely low because the quality of the hay could not meet the standard required for export.

Figure 2-3
Alfalfa pellets: Average U.S. domestic price of dehydrated and sun-cured, January 1986-December 1990



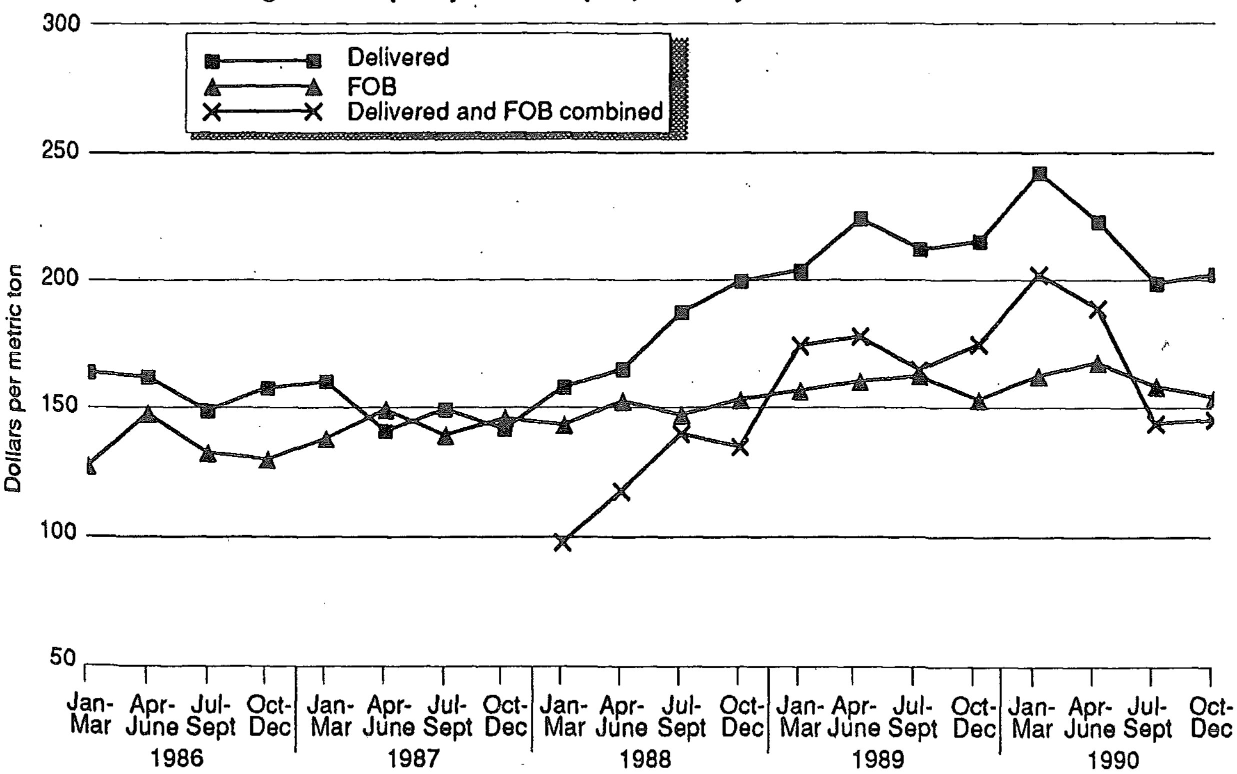
Source: Industry responses to USITC questionnaires.

Figure 2-4
Alfalfa pellets: Average U.S. export price to Japan, January 1986-December 1990



Source: Industry responses to USITC questionnaires.

Figure 2-5
Alfalfa cubes: Average U.S. export price to Japan, January 1986-December 1990



Source: Industry responses to USITC questionnaires.

mostly reported on a delivered basis, which sometimes was higher than the delivered price destined to Japan because of higher freight costs. In general, the price of compressed alfalfa hay exported to Japan has been stable according to questionnaire respondents. Prices are shown in figure 2-6 for delivered (c.&f. Japan), f.o.b. container yard, and for combined delivered and f.o.b.

The changes in the domestic prices of the three different types of alfalfa products (sun-cured cubes and sun-cured and dehydrated pellets and meal) followed a similar pattern, i.e., increasing during 1987-89, and decreasing in 1990. The quarterly price of sun-cured cubes was always higher than that of sun-cured pellets over the entire sample period. The price of cubes was also higher than that of dehydrated pellets during the first half of the period. However, in the second half of the period, the price of the dehydrated pellets was higher than the price of sun-cured cubes except in the fourth quarter of 1989, and the third and fourth quarters of 1990.

U.S. Market

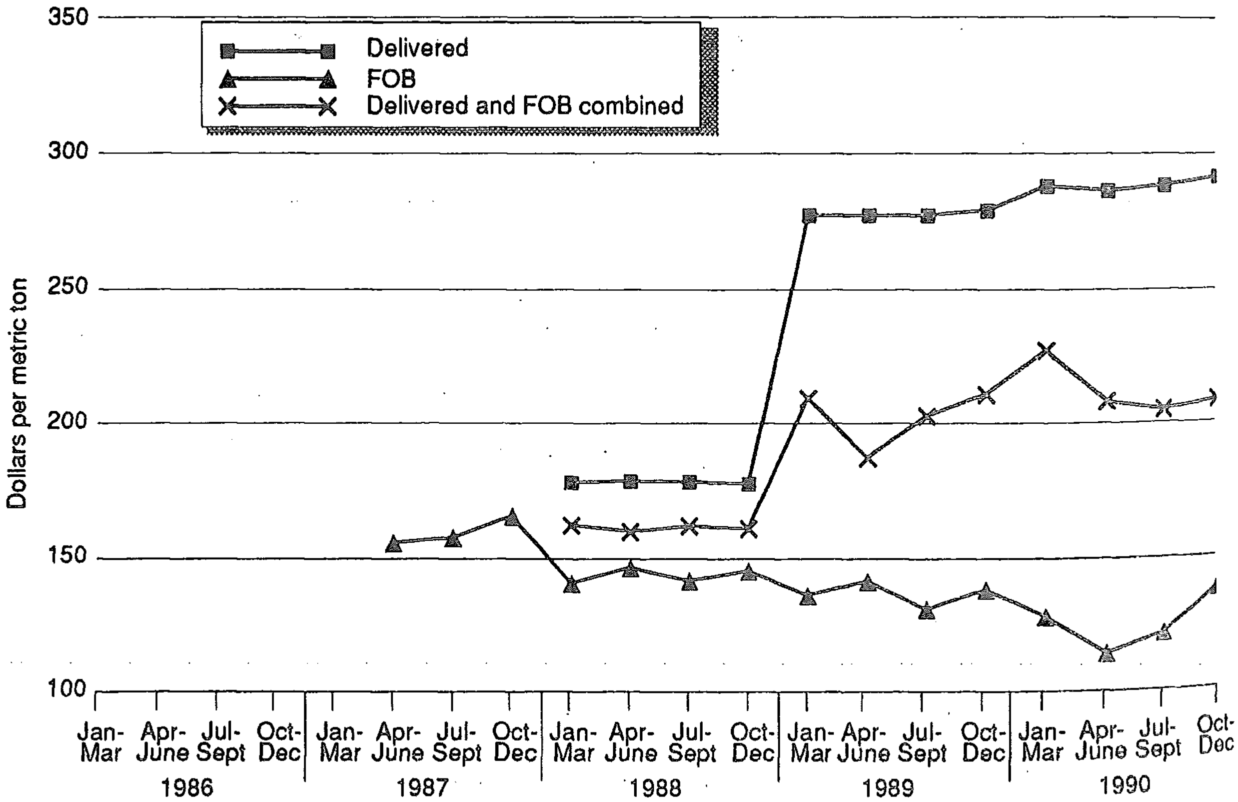
The consumption of alfalfa products, like the consumption of other animal feeds, depends largely on the number of animals being fed, the nutritional needs of livestock and poultry, and economic developments in the animal production sectors.[13] Feed production has been influenced by changes in the structure of the livestock production industry, improvements in efficiency of animal production per unit of feed, changes in consumer preferences for meat and livestock products, and developments affecting production of crops used as inputs for feed, including government programs to support crop prices and control production.

During the 1980s, total feed consumption by livestock and poultry in the United States declined slightly (table 2-10). This trend is consistent with the reduction in inventories of ruminant livestock that occurred during the period (table 2-11). The data suggest that feed concentrates, or compound feeds, have become a larger share of the feed ration, while the share of feed comprised by hay, roughage, and pasture has diminished.

In the United States, the livestock sector has become more dependent on commercially purchased feeds. Operations of 100,000 birds per farm, beef cattle feedlots of 4,000 head, and dairy herds of up to

[13] William Lin, George Allen, and Mark Ash, "Livestock Feeds," in *Seven Farm Input Industries*, USDA, ERS, AER-635, Sept. 1990, pp. 66-78.

Figure 2-6
Alfalfa hay: Average U.S. export price to Japan of double-compressed bales, January 1986-December 1990



Source: Industry responses to USITC questionnaires.

Table 2-10
Feed consumed by livestock and poultry, 1980 and 1987[1]

Feed material	Feed consumption 1980	1987
	Million feed unit tons[2]	
Concentrates:		
Corn	116	137
Other feed grains	25	35
Byproduct feeds	52	56
Total concentrates	193	228
Hay, roughage, and pasture:		
All hay	73	82
Other harvested roughages	29	18
Pasture	232	183
Total hay, roughage, and pasture	334	283
Total all feed	527	511

[1] Excludes Alaska and Hawaii.
[2] Measured in feed units per feeding year. A feed unit ton is the nutrient content of a feed product relative to a ton of corn containing 13.5 percent of moisture.

Source: William Lin, "Livestock Feeds."

Table 2-11
Livestock numbers,[1] by types, 1981-90

(1,000 head/number)

Year	Dairy cows	Beef cattle[2]	Swine	Poultry
1981	10,849	103,502	64,462	4,242,126
1982	10,986	104,458	58,698	4,228,470
1983	11,047	103,954	54,534	4,573,206
1984	11,059	102,301	56,694	4,714,708
1985	10,777	98,805	54,073	4,891,157
1986	11,116	94,262	52,314	5,118,895
1987	10,466	91,652	51,001	5,486,598
1988	10,311	89,311	54,384	5,672,713
1989	10,212	87,853	55,469	6,019,564
1990	10,153	88,009	53,821	6,382,200

[1] Inventories as of January 1 for cattle and swine; poultry data are broiler and turkey slaughter and layers on farms.
[2] All cattle except dairy cows.

Note.—Data are not available to indicate what percentage of feed rations constitutes alfalfa products for these animal types.

Source: USDA.

2,000 head have become common. Compound feeds used by these large farms are either purchased as prepared mixes or are purchased as separate ingredients and mixed on the farm. Some of these prepared feedstuffs contain a small proportion of processed alfalfa. In 1984, 760,811 metric tons of dehydrated alfalfa pellets or meal and 998,696 metric tons of sun-cured alfalfa pellets or meal were used as feed ingredients in primary manufacturing.[14] Alfalfa pellets destined for commercial farm use are consumed primarily in poultry rations, with smaller amounts consumed in swine rations. The remaining domestic market for alfalfa pellets is mainly for direct feeding to horses or rabbits, or as an ingredient in manufactured pet foods.

Forages purchased from off the farm, such as alfalfa hay bales and alfalfa cubes, are used by beef cow-calf operations, beef feedlots, dairy farms, and horse farms. Consumption of hay in the United States totaled 82 million feed unit tons in 1987.[15] Roughly

[14] Mark Ash, William Lin, and Mae Dean Johnson, *The U.S. Feed Manufacturing Industry*, 1984, USDA, ERS, S.B. No. 768, Dec. 1988, p. 125.

[15] William Lin, "Livestock Feeds," p. 67.

48 million feed unit tons of alfalfa hay are consumed domestically each year.[16]

Data are not available on U.S. consumption of all the alfalfa products covered in this investigation. However, based on available information and discussions with industry sources, it is believed that the domestic market for processed alfalfa products, particularly alfalfa pellets, contracted during the 1980s, although consumption of regular baled hay in the domestic market increased. U.S. Department of Agriculture statistics on consumption (disappearance) of alfalfa pellets and alfalfa hay are shown in the following tabulation (in thousand metric tons):[17]

Year	Alfalfa pellets	Alfalfa hay
1981	898.9	78,950
1982	887.2	78,340
1983	897.9	79,860
1984	808.0	76,310
1985	776.5	80,500
1986	588.9	78,270
1987	553.6	81,180
1988	365.1	70,360
1989	(1)	65,710
1990	(1)	75,080

[1] Not available.

U.S. Imports of Alfalfa Products

U.S. imports of alfalfa pellets (HTS subheadings 1214.10.00.20, 1214.10.00.40, and 1214.10.00.60) have a general rate of duty of 3 percent, and a column 2 rate of duty of 20 percent. Under the U.S.-Canada Free Trade Agreement, the Caribbean Basin Economic Recovery Act, and the U.S.-Israel Free Trade Area, imports of pellets are duty free. Alfalfa hay, classified under Harmonized Tariff Schedule (HTS) subheading 1214.90.00.20, is duty free under the general rate of duty.

U.S. imports of alfalfa products during 1989 and 1990 were small ($10.2 million in 1989 and $5.9 million in 1990) and were supplied mainly by Canada (tables 2-12, 2-13, 2-14, 2-15). Prior to 1989, alfalfa products were not classified separately in the import records, so data on imports during earlier years are not available. Nearly all of the imports were baled hay.

U.S. Exports of Alfalfa Products

Japan was by far the leading destination for U.S. exports of alfalfa products. Because of known classification problems with U.S. export records for the subject products, analysis of trends in trade and market shares is based on Japanese import data (see ch. 4). U.S. export data are shown below to illustrate the relatively small size of the markets in the rest of the world when compared with Japan. The data in tables 2-16, 2-17, and 2-18 show U.S. exports of alfalfa meal and pellets, alfalfa hay cubes, and hay and straw. Although the product description in the Tariff Schedules of the United States (TSUS) Schedule B specified dehydrated alfalfa products (subheading 184.80.15), it is believed that a large percentage of U.S. exports of alfalfa pellets between 1981 and 1988 were produced using a sun-curing process, but were classified under this item. Because official statistics on exports of hay do not show a separate breakout for alfalfa, a table of estimated data is shown.

Prior to 1989, separate data on exports of sun-cured and dehydrated alfalfa products were not available. U.S. export records on alfalfa products changed with the introduction of the HTS in 1989. Since 1989, data are available separately for exports of dehydrated and sun-cured alfalfa pellets and meal. U.S. exports of dehydrated alfalfa pellets were 7,511 metric tons in 1989 and 9,191 metric tons in 1990, and

[16] Estimated by USITC staff. Feed unit tons are not comparable with standard volumetric tons.

[17] Data on pellets are Oct.-Sept. crop years, from Grain and Feed Market News. Data on hay are calendar years and are estimates of alfalfa share of all hay by Western Livestock Marketing Information Project and USITC staff. Disappearance is calculated by adjusting production for changes in stocks and foreign trade. Some of the decline in disappearance for alfalfa pellets can be accounted for by reduced export sales. Some of the tonnage included as disappearance of hay is used for production of pellets, cubes, and double-compressed bales for export.

Table 2-12
Alfalfa meal and pellets, sun-cured: U.S. imports for consumption, 1989-90

Source	1989	1990
	Quantity (Metric tons)	
Canada	52	51
Total	52	51
	Customs value (1,000 dollars)	
Canada	6	5
Total	6	5
	Unit value (Per metric ton)	
Canada	$112	$93
Average	112	93

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 2-13
Alfalfa meal and pellets, not elsewhere specified: U.S. imports for consumption, 1989-90

Source	1989	1990
	Quantity (Metric tons)	
Canada	4,547	2,102
Mexico	0	1,292
Israel	0	1
All other	1	0
Total	4,548	3,395
	Customs value (1,000 dollars)	
Canada	547	261
Mexico	0	100
Israel	0	1
All other	2	0
Total	549	362
	Unit value (Per metric ton)	
Canada	$120	$124
Mexico	([1])	78
Israel	([1])	1,400
All other	2,420	([1])
Average	121	107

[1] Not applicable.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 2-14
Hay, whether or not in the form of pellets: U.S. imports for consumption, 1989-90

Source	1989	1990
	Quantity (Metric tons)	
Canada	93,344	49,640
All other	182	0
Total	93,526	49,640
	Customs value (1,000 dollars)	
Canada	9,596	5,156
All other	29	0
Total	9,625	5,156
	Unit value (Per metric ton)	
Canada	$103	$104
All other	158	([1])
Average	103	104

[1] Not applicable.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 2-15
Alfalfa hay pellets (cubes) used in animal feed: U.S. imports for consumption, 1989-90

Source	*1989*	*1990*
	Quantity (Metric tons)	
Canada	0	4,731
Total	0	4,731
	Customs value (1,000 dollars)	
Canada	0	364
Total	0	364
	Unit value (Per metric ton)	
Canada	(1)	$77
Average	(1)	77

[1] Not applicable.

Source: Compiled from official statistics of the U.S. Department of Commerce.

exports of sun-cured alfalfa pellets in 1989 and 1990 were 5,967 metric tons and 1,759 metric tons, respectively. Exports of dehydrated and sun-cured alfalfa pellets were primarily to Japan.

The importance of Japan as a destination for U.S. exports of alfalfa products increased dramatically over the past decade. Japan's purchases of U.S. alfalfa pellets varied during the 1980s from a low of 1 percent of all U.S. exports in 1985 to a high of 82 percent in 1989 and 1990. Japan also increased its share of U.S. exports of alfalfa cubes, from 80 percent in 1981 to 96 percent in 1990. There was also a significant increase in Japan's share of U.S. exports of alfalfa hay, from an estimated low of 23 percent in 1982 to a high of 98 percent in 1989, and ending with 95 percent of the exports in 1990.

Among the west coast customs districts, San Francisco was, by far, the leading port-of-exit of alfalfa meal and pellets in 1990, accounting for 76 percent of total U.S. exports, and 87 percent of U.S. exports to Japan. Seattle handled 10 percent of U.S. exports of pellets and meal, and Los Angeles was responsible for 7 percent.

The leading ports-of-exit of alfalfa cubes to Japan were Seattle (37 percent), Los Angeles (26 percent), San Francisco (25 percent), and Portland (12 percent). Seattle accounted for 37 percent of total U.S. exports of alfalfa cubes and was followed by Los Angeles and San Francisco (25 percent), and Portland (12 percent).

Los Angeles was the leading port-of-exit of hay to both the world and Japan, accounting for 45 percent and 46 percent, respectively, in 1990. Seattle was the second-leading port-of-exit, accounting for 34 percent of total U.S. exports and 34 percent of U.S. exports to Japan. Portland handled 11 percent of total U.S. exports and the same percentage of exports to Japan, while San Francisco accounted for 9 percent of total U.S. exports and the same percentage of exports to Japan.

Marketing Practices

The channels of distribution for alfalfa pellets differ from those typically used for alfalfa cubes and compressed hay, mainly because pellets are produced essentially for domestic consumption while cubes and compressed bales are usually destined for export.

The U.S. alfalfa pellet industry serves primarily domestic markets, shipping products in bulk lots to feed mills or large livestock operations. Most of the large firms are located in the Midwestern States, close to raw material supplies and to the large feed mills. The sun-cured and dehydrated pellets are marketed based on protein content, generally guaranteed to be at least 17 percent for dehydrated and 15 percent for sun-cured. Some sales are for alfalfa meal rather than pellets; meal is produced by regrinding the pellets. Many sales take place directly from the processing firm to the end user without involving additional firms in the packaging or distribution. Others are through a broker or dealer who takes title to the product. There are some sales of alfalfa pellets in small lots, generally to such operations as horse stables. These are usually bagged, often into 50-pound sizes, and sold through retail channels.

U.S. producers of alfalfa cubes and double-compressed bales are typically export-oriented firms in the Western States.[18] The largest firms are brokers that purchase hay from farms in a fairly widespread region, compress the hay or cube it at their plant, then load it into containers for export. Some other U.S. producers own or rent land and grow the alfalfa hay in addition to processing and preparing it for export. Foreign purchasers often make contacts directly with U.S. producers.

[18] A few firms produce cubes for local markets, mainly for horses, although data are not available on the quantity of such sales. Typically, cubes sold in the domestic market are sold to brokers for export or are products not of suitable quality for the export market.

Table 2-16
Alfalfa pellets: U.S. exports of domestic merchandise, by principal markets, 1981-90

Market	*1981*	*1982*	*1983*	*1984*	*1985*	*1986*	*1987*	*1988*	*1989*	*1990*
					Quantity (Metric tons)					
Japan	2,062	21,395	23,445	2,957	66	7,038	2,930	918	11,018	8,956
Taiwan	0	0	490	2,932	0	417	1,240	757	112	719
Mexico	5,841	885	38	132	96	178	83	180	1,070	650
Canada	2,632	885	1,403	69	70	119	315	175	62	0
All other	39,323	110,877	33,336	3,007	12,078	130,693	35,879	143	1,216	625
Total	49,857	134,042	58,712	9,097	12,310	138,445	40,447	2,173	13,478	10,950
					Value (1,000 dollars)					
Japan	236	1,955	3,348	503	11	879	363	42	883	1,158
Taiwan	0	0	23	450	0	27	78	59	5	99
Mexico	573	117	2	14	7	10	7	16	97	39
Canada	338	176	131	3	3	10	15	9	3	0
All other	5,616	15,216	4,536	423	1,421	13,792	3,752	17	456	110
Total	6,763	17,464	8,040	1,393	1,442	14,718	4,215	143	1,444	1,405
					Unit value (Per metric ton)					
Japan	$114	$91	$143	$170	$166	$125	$124	$46	$80	$129
Taiwan	([1])	([1])	47	153	([1])	65	63	78	45	138
Mexico	98	132	52	106	73	56	85	89	91	60
Canada	128	199	93	44	43	84	48	51	48	([1])
All other	143	137	136	141	118	106	105	119	375	176
Average	136	130	137	153	117	106	104	66	107	128

[1] Not applicable.

Source: Compiled from official statistics of the U.S. Department of Commerce. Schedule B number 184.8015 for 1981-88; HS 1214.10.00.20 and 1214.10.00.40 for 1989-90.

Table 2-17
Alfalfa cubes: U.S. exports of domestic merchandise, by principal markets, 1981-90

Market	*1981*	*1982*	*1983*	*1984*	*1985*	*1986*	*1987*	*1988*	*1989*	*1990*
					Quantity (Metric tons)					
Japan	233,336	268,004	346,731	359,622	400,435	542,447	510,016	632,363	493,984	505,281
Taiwan	0	1,086	2,064	1,027	1,414	4,893	7,196	12,694	11,233	6,972
Canada	47,647	49,186	38,427	33,507	34,754	32,530	13,555	5,010	3,764	8,081
Mexico	8,122	190	142	738	1,258	403	153	4,253	10,855	1,478
South Korea	200	0	254	115	0	0	5,479	1,088	5,406	3,152
All other	3,461	1,723	4,078	2,433	1,318	11,982	260	17,195	248	2,108
Total	292,766	320,188	391,696	397,442	439,180	592,255	536,660	672,604	525,490	527,072
					Value (1,000 dollars)					
Japan	29,968	35,826	50,024	51,361	56,801	77,533	67,611	89,930	73,887	81,608
Taiwan	0	161	307	121	225	750	757	2,050	1,812	1,094
Canada	7,358	7,744	5,858	4,926	5,138	3,413	1,625	730	580	858
Mexico	1,016	29	26	70	185	73	25	705	1,173	270
South Korea	22	0	42	19	0	0	545	157	598	533
All other	641	364	720	601	264	1,400	61	2,755	45	421
Total	39,005	44,124	56,997	57,098	62,613	83,169	70,624	96,327	78,094	84,784
					Unit value (Per metric ton)					
Japan	$128	$134	$144	$143	$142	$143	$133	$142	$150	$162
Taiwan	([1])	148	149	118	159	153	105	161	161	157
Canada	154	157	152	147	148	105	120	146	154	106
Mexico	125	153	183	95	147	181	163	166	108	183
South Korea	110	([1])	165	165	([1])	([1])	99	144	110	169
All other	185	211	177	247	200	117	234	160	185	200
Average	133	138	145	144	143	140	132	143	149	161

[1] Not applicable.

Source: Compiled from official statistics of the U.S. Department of Commerce. Schedule B number 184.8005 for 1981-88; HS 1214.10.00.60 and 2308.90.60.40 for 1989-90.

Table 2-18
***Alfalfa hay:* U.S. exports of domestic merchandise, by principal markets, 1981-90**

Market	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
	Quantity (Metric tons)									
Japan	14,522	10,813	14,374	18,821	31,820	68,099	66,415	149,029	154,498	166,148
Mexico	9,973	4,483	162	4,969	4,018	1,701	1,639	9,849	199	963
Canada	26,729	28,755	19,967	12,866	16,824	22,860	6,931	3,068	391	2,051
Taiwan	21	29	45	22	53	181	929	1,487	1,298	3,120
United Arab Emirates	0	0	0	203	0	82	273	384	397	58
Hong Kong	608	311	600	470	319	204	114	359	433	1,576
All other	1,872	1,784	2,107	745	511	378	229	393	726	682
Total	53,726	46,175	37,256	38,096	53,544	93,504	76,530	164,569	157,942	174,596
	Value (1,000 dollars)									
Japan	2,072	1,731	2,272	2,904	4,655	10,134	10,649	20,316	20,321	20,115
Mexico	934	405	16	540	484	159	142	888	23	112
Canada	2,699	2,853	1,938	1,235	1,519	1,973	586	303	42	216
Taiwan	5	5	9	2	6	51	93	191	172	543
United Arab Emirates	0	0	0	20	0	23	27	41	48	14
Hong Kong	126	74	123	76	37	21	11	35	58	178
All other	293	291	323	128	78	58	40	62	111	98
Total	6,126	5,358	4,680	4,904	6,778	12,417	11,547	21,834	20,773	21,275
	Unit value (per metric ton)									
Japan	143	160	158	154	146	149	160	136	132	121
Mexico	94	90	99	109	120	93	86	90	116	116
Canada	101	99	97	96	90	86	85	99	107	105
Taiwan	216	155	187	92	105	279	100	128	132	174
United Arab Emirates	(1)	(1)	(1)	96	(1)	276	99	107	120	233
Hong Kong	206	238	205	162	116	101	92	96	133	113
All other	156	163	153	171	153	154	175	156	152	144
Average	114	116	126	129	127	133	151	133	132	122

[1] Not applicable.

Source: USITC staff estimates.

Government Programs

U.S.-produced alfalfa is specifically targeted by two types of U.S. Government programs: research programs focusing on alfalfa and the Targeted Export Assistance program. Both of these programs are relatively small. Alfalfa is affected indirectly by other Government programs concerning income support, conservation, and irrigation.

Programs Directly Affecting Alfalfa

Research and Development

Alfalfa research receives aid from Federal, State, public, and private organizations. Data on research expenditures for alfalfa are collected by the Cooperative State Research Service (CSRS) and the Agricultural Research Service (ARS) of the U.S. Department of Agriculture (USDA) as well as the Current Research Information System (CRIS). According to these sources, the amount of public research expenditures for alfalfa increased steadily from $15.6 million in 1986 to $19.9 million in 1989.

Alfalfa research focuses on the development of new methods of growing, drying, and marketing alfalfa. One current area of research and development is solar drying, which could compete with dehydrating methods using natural gas. Additional research and development expenditures relate to more general areas of benefit to alfalfa, such as soil science, genetics, pest management, and farm equipment.

Export Promotion Programs

Through the USDA's Targeted Export Assistance/Market Promotion Program,[19] funds are provided to industry groups for foreign market development activities. Market development activities include education about U.S. products, demonstrations, and information on obtaining the product. The cooperating industry group for the alfalfa export program is the National Hay Association (NHA). The NHA has targeted South Korea, Japan, and Taiwan. Government funds and NHA contributions for market development, 1984-90, are shown in the tabulation at the bottom of the page (in dollars):[20]

[19] The Targeted Export Assistance program was renamed Market Promotion Program in 1990.
[20] NHA records.

In recent years, as the tabulation shows, the NHA has been devoting larger amounts of money to the development of the Korean market. This concentration on the Korean market followed the January 1990 liberalization of imports of alfalfa hay products by the Korean Government. The funds channeled by the NHA have been used for such educational purposes as a feed trial to demonstrate the importance of high-quality roughage such as alfalfa.

Other Federal Programs

There are no other known Federal programs that directly target processed alfalfa. Programs such as the price-support programs for dairy products and for competing crops such as wheat, feed grains, and oilseeds all influence production of alfalfa at the farm level. Alfalfa can also be grown on land under the acreage reduction program and the conservation reserve program (both programs to take land out of production), although such production cannot be harvested or grazed except during authorized periods of disaster. However, inasmuch as these programs do not directly impact the production of processed alfalfa products, these programs are not examined in further detail in this report.

Federal water projects, State water projects, and quasi-governmental bodies all provide irrigation services that have benefitted alfalfa production at the farm level, particularly in the Western States. Irrigation water available to alfalfa growers in Western States accounts for the high yields and relatively consistent quality of the sun-cured alfalfa products that originate in those States. Substantial Federal assistance has been involved in the development of the Federal Water Projects; State projects and quasi-governmental bodies also provide irrigation services. Although data are not available to indicate the overall effect of government irrigation programs on the alfalfa products industry, they is believed to have benefited processors indirectly by increasing supplies of raw materials.

It is difficult to place a monetary value on Federal and State water programs in alfalfa-growing areas. Some of the costs are capitalized into higher land values and so are paid in rents rather than in water rates. Also, establishing a basis for the market value of water is not easy. One must decide to use as a basis the residential rates in nearby areas, the value of the next highest use in that region, or yet another base.

	1984	*1985*	*1986*	*1987*	*1988*	*1989*	*1990*
Government funds:							
Japan	10,761	6,907	23,708	18,936	27,938	4,243	8,280
Korea	5,601	11,262	2,298	42,873	6,291	69,900	67,991
Taiwan	0	0	0	12,425	6,291	13,510	0
NHA contributions:							
Japan	29,920	14,480	57,883	40,524	57,011	4,243	47,774
Korea	5,628	22,736	4,810	75,497	9,312	226,343	199,655
Taiwan	0	0	0	34,052	9,312	38,383	0

Differentiation must also be made between what is infrastructure per se and what is a project of direct benefit to the farmer.

The majority of the authority for allocation and administration of freshwater resources stems from the individual States. In most States, an agency or "water court" administers the use of surface and ground-water. Generally, the Federal Government accedes to State law through the application for water rights associated with reclamation programs. Additionally, the Western States each provide for quasi-public agencies that act as wholesale or retail suppliers of water to farms. These quasi-public organizations have the power to tax both rural and urban property owners and, in some cases, they hold the power to issue tax-exempt bonds. More than one-half of the irrigation water delivered by water organizations is provided by the quasi-public organizations.[21] The amount of this water devoted to alfalfa is not known.

Federal development of irrigation works began with the Reclamation Act of 1902 (32 Stat. 388; 43 U.S.C. 391). The Reclamation Act and subsequent amendments were part of a Federal Government effort to promote settlement of the West through irrigated agriculture. The Bureau of Reclamation (the Bureau), which evolved from this first Reclamation Act, administers the reclamation programs, a task which involves completing projects still under construction, maintenance, and collecting revenue from water-supply contracts. The Bureau states that "all reclamation project costs for the purpose of irrigation, power, and municipal and industrial water supply should be repaid in full" (U.S. Department of the Interior, Bureau of Reclamation, 1972, p. ix). As of September 30, 1989, Federal investment in completed Reclamation project facilities totaled $9.7 billion, divided as follows: $1.9 billion in specific irrigation facilities, $1.8 billion in electric power facilities, $0.5 billion in municipal and industrial facilities, and $5.5 billion in multipurpose and other facilities.[22]

Irrigation and the projects that make it possible receive assistance from reduced and interest-free repayment for the projects and the basing of repayment on "ability to pay."[23] The Reclamation Act of 1902 did not specify that interest was to be charged along with the cost of the construction of the projects. The Reclamation Project Act of 1939 (53 Stat. 1187; 43 U.S. C. 485), while specific in the sections dealing with interest payment for municipal water and power, also did not deal with recovery of interest on irrigation. Interest-free repayment periods have been granted by additional reclamation legislation throughout the years.[24]

The Reclamation Act of 1939 also stated that irrigation costs beyond the irrigators' ability to pay may be shifted to other project beneficiaries such as hydroelectric power users. The Bureau of Reclamation estimates the amount an irrigator is able to pay based on developed farm budgets typical of the area. Ability to pay is determined through a percentage of net income, and water rates for a district are set accordingly.[25]

Approximately 1 million acres of irrigated land in California receive water at no cost from Federal and State projects as the result of riparian rights.[26] Riparian rights grant free water to those farms that were taking water from the source of the projects prior to construction. The amount of alfalfa grown on lands having riparian rights is not known.

Water rates vary widely among project districts and within districts. For example, in the Mid-Pacific District of the Central Valley Project, rates vary from free to riparian rights holders to approximately $90 per acre-foot for some areas which require pumping.[27] One reason for assessing different water rates is the Reclamation Reform Act of 1982, which requires charging "full cost"—to be assessed on a district by district basis—on excess acreage above a set 960-acre limitation.

In 1989, alfalfa was grown on a total of 1.7 million irrigated acres in Federal projects which represented 17 percent of total harvested acreage in alfalfa nationwide.[28] Of particular importance to alfalfa growers are the Columbia River Project, the Central Valley Project, and the Colorado River Project (table 2-19). The acreage irrigated under these projects accounts for about one-fourth of the alfalfa harvested in Washington State, California, and Utah.

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[21] *National Water Summary 1987-Hydrologic Events and Water Supply and Use*, U.S. Geological Survey, Water Supply Paper 2350, p. 99.

[22] *1989 Summary Statistics: Water, Land, and Related Data*, U.S. Department of the Interior, Bureau of Reclamation, p. 1.

[23] Richard Wahl, *Markets for Federal Water: Subsidies, Property Rights, and the Bureau of Reclamation*, Resources for the Future, 1989, p. 27.

[24] Reclamation Extension Act of 1914 (38 Stat.686), Omnibus Adjustment Act of 1926 (44 Stat. 636), and Reclamation Project Act of 1939 (53 Stat. 1187; 43 U.S.C. 485).

[25] Wahl, p. 39.

[26] USITC staff conversation with Mr. Jeff McCracken, Bureau of Reclamation, Mid-Pacific Regional Office, Aug. 19, 1991.

[27] Ibid.

[28] *1989 Summary Statistics: Water, Land, and Related Data*, p. 46.

Table 2-19
Alfalfa: Irrigated acres under Federal projects, reclamation reform contract rate, basis, actual/full cost, and crop value by regions and projects

Region and project	States affected	Type of service[1]	Acreage	Cost ranges for— Full	Contract rate	Crop value
				Per acre		$1,000
Pacific Northwest Region:						
Baker Valley	OR	S	5,095	$20.95	$1.19	$2,213
Bitter Root	MT	F	5,007	1.97	1.10	1,878
Boise	ID, OR	F, S	63,446	0-14.63	0-[2]8.73	25,603
Columbia Basin	WA	F	128,825	60.95	2.63-187.30	76,665
Crescent Lake Dam	OR	F	5,098	1.58	79	2,804
Crooked River	OR	F, S	4,111	1.41-26.39	.53-2.33	3,001
Deschutes	OR	F, S	16,984	11.76	2.62	6,795
Little Wood River	ID	S	3,045	5.10	2.04	799
Minidoka-Palisades	ID, WY	F, S, T	197,970	1.51	[2].19	67,133
Owyhee	ID, OR	F, S	18,108	.07-8.92	.05-.49	8,413
Umatilla	OR	F, S	6,285	1.60-3.37	0-.29	3,143
Vale	OR	F	8,591	8.40	60	3,650
Yakima	WA	F, S	35,275	38.33	4.54	20,244
Mid-Pacific Region:						
Central Valley	CA	F, S, T	170,862	0-320.43	0-21.98	132,862
Humboldt	NV	S	19,600	0.00	0.00	7,938
Klamath	CA, OR	F	33,595	0.00	0.00	15,864
Newlands	NV	F	35,000	0.00	0.00	17,451
Solano	CA	S	6,660	16.52	2.65	4,359
Lower Colorado Region:						
Boulder Canyon All-American Canal, Imperial Division	CA	F	166,732	0-11.72	0-5.97	141,722

See footnotes at end of table.

Table 2-19—Continued

Alfalfa: Irrigated acres under Federal projects, reclamation reform contract rate, basis, actual/full cost, and crop value by regions and projects

Region and project	States affected	Type of service[1]	Acreage	Cost ranges for— Full	Contract rate	Crop value
				Per acre	Per acre	$1,000
Upper Colorado Region:						
Carlsbad	NM	F	13,997	$0	$0	$7,698
Central Utah-Bonneville Unit	UT	F, S	7,806	306.38	4.18	2,810
Central Utah-Jenson Unit	UT	S	2,544	205.00	1.01	916
Central Utah-Vernal Unit	UT	S	7,801	51.00	2.35	1,716
Collbran	CO	S	3,030	21.46	.96	818
Dolores	CO	F, S	13,943	0.00	1.96	4,179
Emery	UT	S	7,768	54.08	6.39	2,318
Florida	CO	S	3,607	38.55	1.85	1,120
Ft. Sumner	NM	F	2,641	20.45	4.98	687
Middle Rio Grande	NM	F	31,526	21.05	4.17	20,831
Ogden River	UT	S	6,245	71.25	1.77	1,641
Paonia	CO	S	3,360	6.23	2.23	833
Provo River	CO	S	12,098	6.26	3.37	4,597
Silt	CO	S	3,042	73.62	2.72	1,037
Tucumcari	NM	F	5,053	10.56	1.42	1,728
Uncompahgre	CO	F	14,363	3.40	.44	6,336
Weber Basin	UT	S	7,398	80.64	1.09	2,124

[1] S = Supplemental service, F = full service; T = temporary.

[2] The basis for this rate is acre-foot. All other contract rates are calculated on a repayment basis.

Chapter 3
Canadian Industry and Market

Canadian Industry

Alfalfa is grown throughout Canada, but the major producing Provinces are Alberta, Saskatchewan, and Ontario. Most of the production is harvested in the form of sun-cured bales (mostly the 800-lb.-1,500 lb. round bales). Most of the baled hay is consumed by livestock on the farm on which it is produced; it typically is not sold commercially. Alfalfa is a significant crop, particularly in the prairie Provinces. It has been estimated that the forage industry in Alberta alone is worth Can$600 million annually at the farm level.[1]

The processed alfalfa products that are the subjects of this study are produced principally in Alberta and Saskatchewan, where they are produced almost entirely for export to the Pacific Rim. The small production of processed alfalfa products in other Provinces (mainly in Ontario) is principally for domestic consumption.

Costs of production for Canadian alfalfa products increased between 1986-90. Raw materials and repair and maintenance increased steadily, but direct labor and energy costs varied during the period examined. Canadian firms providing information for this study showed overall positive financial returns. Operating incomes increased between 1987 and 1988, but dropped between 1988 and 1990.

Prices of Canadian alfalfa products exported increased greatly between 1986 and 1990, with the largest increase in the price of alfalfa cubes. Data are not available on domestic price trends for Canadian alfalfa products.

The Canadian domestic market for alfalfa products appears to have remained stable or declined slightly during the 1980s. The value of domestic consumption of alfalfa products peaked in 1984/85, but then declined.

During the 1980s, Canada exported approximately 80 percent of its alfalfa products production. Between 1981 and 1990, Canadian exports of alfalfa pellets and meal increased threefold in quantity, and exports of hay and cubes increased twofold. The majority of Canadian alfalfa product exports are to Japan.

One Federal Canadian program, Western Diversification, directly targets alfalfa. A fund under this program supports the development of new products and technology for alfalfa processing in Western Canada. Another program with similar objectives, the Alberta Processing and Marketing Agreement, is run by the Alberta Government with Federal matching funds.

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[1] Submission of the Canadian Dehydrators Association, Aug. 6, 1991, p. 10.

Number and Location of Producers

Processed alfalfa producers are located in four distinct geographic regions in Canada:[2]

(1) Eastern producers—in Southeastern Ontario and Southern Quebec;

(2) Northern growing area in Saskatchewan;

(3) Northern growing area in Alberta, stretching south to Edmonton; and

(4) Southern Alberta.

The Eastern producers (two plants in Quebec and eight plants in Ontario), are small, each producing between 2,000-4,000 metric tons of dehydrated pellets annually, almost all for local consumption. These firms accounted for about 10 percent of total Canadian production of alfalfa pellets and cubes in 1988.[3]

The northern growing area in Saskatchewan began growing alfalfa for the production of alfalfa seed. Alfalfa in this region generally is not irrigated, but is produced on dryland farms. Competing crops for land use include wheat (hard spring), barley, oats, rye, canary seed, canola, flax, peas, and lentils. The first Canadian dehydration plants producing for export were in this region. Pellets are the primary product. Plants in the region produce an average of 15,000 metric tons to 20,000 metric tons annually, with capacity ranging up to 40,000 metric tons annually. Plants in the area are situated close enough together so that the area in which an individual plant contracts for alfalfa acreage overlaps with that of other facilities, thus creating competition for alfalfa acreage.[4]

The northern growing area of Alberta (extending south to Edmonton) is the largest and most diversified area, with the greatest number of the largest production facilities. Pellets (dehydrated and sun-cured) are the principal products; cubes also are produced in this area in significant volume. This is a dryland farming area with a typical farm being 1,000 acres or more. A wide variety of crops is grown, including alfalfa, small grains (barley, rye, and oats), canola, and field peas.

The southern growing area in Alberta (between Lethbridge and Medicine Hat) is generally irrigated. Other crops produced in this region include sugar beets, wheat, barley, and a wide range of vegetables. The three producers located in this area produce dehydrated and sun-cured alfalfa cubes and have a combined production capacity of 110,000 metric tons per year.

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[2] USITC staff discussion with Bryan Davidson, Executive Director, Canadian Dehydrators Association, May 3, 1991.

[3] Industry, Science, and Technology Canada, *Processed Forage Industry Profile*, 1988.

[4] ITC staff conversation with Martin Chabot, President, Parkland Alfalfa Products Ltd., Zenon Park, Saskatchewan, June 18, 1991.

The compressed hay industry in Canada is small. In Alberta, there are only four small plants producing about 10,000 metric tons of compressed product annually.[5]

The alfalfa-processing industry in Canada expanded during the early 1980's; as shown in table 3-1, the number of firms in the processed forage industry in Canada increased from 25 in 1982/83 to 35 in 1986/87.[6] Since 1988, there reportedly has been one new alfalfa-processing facility constructed in Canada; that facility, in Ontario, reportedly produces dehydrated alfalfa pellets for domestic consumption.[7]

Trends in Production

Canadian production of alfalfa hay is not separately reported; total acreage of all hay harvested increased from 12.6 million acres to 14.8 million acres during 1981-90 (table 3-2). It is believed that approximately 50 percent of total Canadian hay production is alfalfa.[8] Production of all hay (at the farm level) increased irregularly during the same period from 25.0 million metric tons to 33.1 million metric tons. Alberta accounted for 29 percent of total Canadian hay production in 1990; Ontario, for 22 percent; Quebec, for 21 percent; Saskatchewan, for 8 percent; and British Columbia, for 7 percent.

Average yield per acre of hay in Canada averaged about 2 metric tons per acre during 1981-90. During 1990, yields were highest in Ontario (2.92 metric tons per acre) and Quebec (2.86 metric tons per acre) and lowest in Saskatchewan (1.30 metric tons per acre) and Alberta (2.05 metric tons per acre).

Approximately 70-80 percent of Canada's production of processed alfalfa is in the form of pellets. Canadian production of alfalfa pellets increased by 73 percent during the 1980s, from 264,000 metric tons in 1981/82 to 457,000 metric tons in 1990/91 (fig. 3-1, table 3-3). Most of the Canadian pellets produced are dehydrated, although the share of dehydrated output has declined from 83 percent in 1981 to 73 percent in 1990, according to estimates by Alberta Agriculture. Alfalfa cube production tripled in volume during the period, rising from 43,000 metric tons to 169,000 metric tons. Canada also produces about 9,000 metric tons of dehydrated, chopped alfalfa hay per year and about 16,000 metric tons of compressed baled hay.[9]

In response to a request from the USITC, the Canadian Dehydrators Association issued a questionnaire to its members. Nine Canadian alfalfa processors and one Canadian marketing company submitted data similar in part to the questionnaire responses received from U.S. firms. The Canadian firms responding account for about 54 percent of total Canadian production of alfalfa pellets and 68 percent of total Canadian production of alfalfa cubes. An even larger share of Canadian exports is accounted for by these respondents. The firms account for about 74 percent of the quantity of alfalfa pellets exported and about 71 percent of the quantity of cubes exported. The information on costs of production, industry financial condition, and export prices shown below is based largely on these questionnaires.

Shipments of dehydrated alfalfa pellets reported in questionnaires increased 25 percent in quantity between 1986 and 1990, led by a rapid increase in exports. Shipments of sun-cured alfalfa pellets reported by the Canadian firms were small compared with those of dehydrated pellets, but sun-cured pellet shipments rose faster than those of dehydrated during 1986-90. Shipments of alfalfa cubes reported by Canadian firms increased irregularly during 1986-90 at an overall rate of 7 percent. Export sales of cubes increased by 54 percent while domestic sales dropped sharply.

[5] Submission of the Canadian Dehydrators Association, Aug. 6, 1991, p. 13.

[6] Industry, Science, and Technology Canada, *Processed Forage*, 1988.

[7] Submission of the Canadian Dehydrators Association, Aug. 6, 1991, p. 14.

[8] Based on information from the Canadian Census of Agriculture.

[9] Doug Maley, "Western Diversification Policies and Activities in the Dehydration Industry," presentation to 1989 Canadian Dehydration Conference, Nov. 20-22, 1989, p. 62. It is believed that most of the baled hay is timothy, not alfalfa.

Table 3-1
Canadian processed alfalfa industry, crop years 1982/83 to 1986/87

Item	*1982/83*	*1983/84*	*1984/85*	*1985/86*	*1986/87*
Establishments	25	29	35	35	35
Employment	575	655	725	725	725
Volume of pellets (1,000 metric tons)	242	335	381	325	347
Volume of cubes (1,000 metric tons)	47	57	65	85	106
Total shipments (million, U.S.)	$37.0	$52.3	$51.4	$42.4	$48.1
Canadian market (million, U.S.)	$7.3	$9.7	$14.7	$8.1	$7.2
Exports as percent of shipments	80.3	81.4	71.5	81.0	85.1

Source: Industry, Science and Technology Canada, Processed Forage, *Industry Profile*, 1988.

Table 3-2
Hay:[1] Canadian acreage harvested, yield, and production, by major producing Provinces, 1981-90

Location and year	*Harvested area*	*Yield*	*Production*
	1,000 acres	*Metric tons per acre*	*1,000 metric tons*
Canada:			
1981	12,624	1.98	24,990
1982	12,623	1.93	24,355
1983	12,899	1.92	24,724
1984	13,135	1.93	25,362
1985	13,182	1.78	23,429
1986	13,435	2.25	30,201
1987	14,217	2.17	30,844
1988	14,673	1.98	29,025
1989	14,637	2.11	30,840
1990	14,767	2.24	33,118
Alberta:			
1981	3,500	1.74	6,078
1982	3,500	1.58	5,534
1983	3,700	1.77	6,532
1984	3,900	1.63	6,350
1985	3,900	1.19	4,627
1986	3,950	2.00	7,893
1987	4,350	1.88	8,165
1988	4,650	1.95	9,072
1989	4,600	1.93	8,891
1990	4,650	2.05	9,526
Saskatchewan:			
1981	1,700	1.12	1,905
1982	1,750	1.56	2,722
1983	1,750	1.50	2,631
1984	1,800	1.16	2,087
1985	1,800	1.21	2,177
1986	1,860	1.51	2,812
1987	2,000	1.18	2,359
1988	2,050	.84	1,724
1989	2,050	1.19	2,449
1990	2,100	1.30	2,722
Ontario:			
1981	2,600	2.71	7,044
1982	2,540	2.73	6,926
1983	2,550	2.61	6,662
1984	2,520	2.77	6,973
1985	2,500	2.76	6,895
1986	2,500	3.05	7,624
1987	2,550	3.02	7,711
1988	2,560	2.59	6,623
1989	2,570	2.86	7,348
1990	2,550	2.92	7,439
Quebec:			
1981	2,386	2.07	4,935
1982	2,390	1.80	4,300
1983	2,395	1.64	3,920
1984	2,400	2.15	5,160
1985	2,400	2.15	5,160
1986	2,409	2.53	6,096
1987	2,436	2.67	6,505
1988	2,436	2.53	6,160
1989	2,449	2.54	6,232
1990	2,449	2.86	7,004

See footnote at end of table.

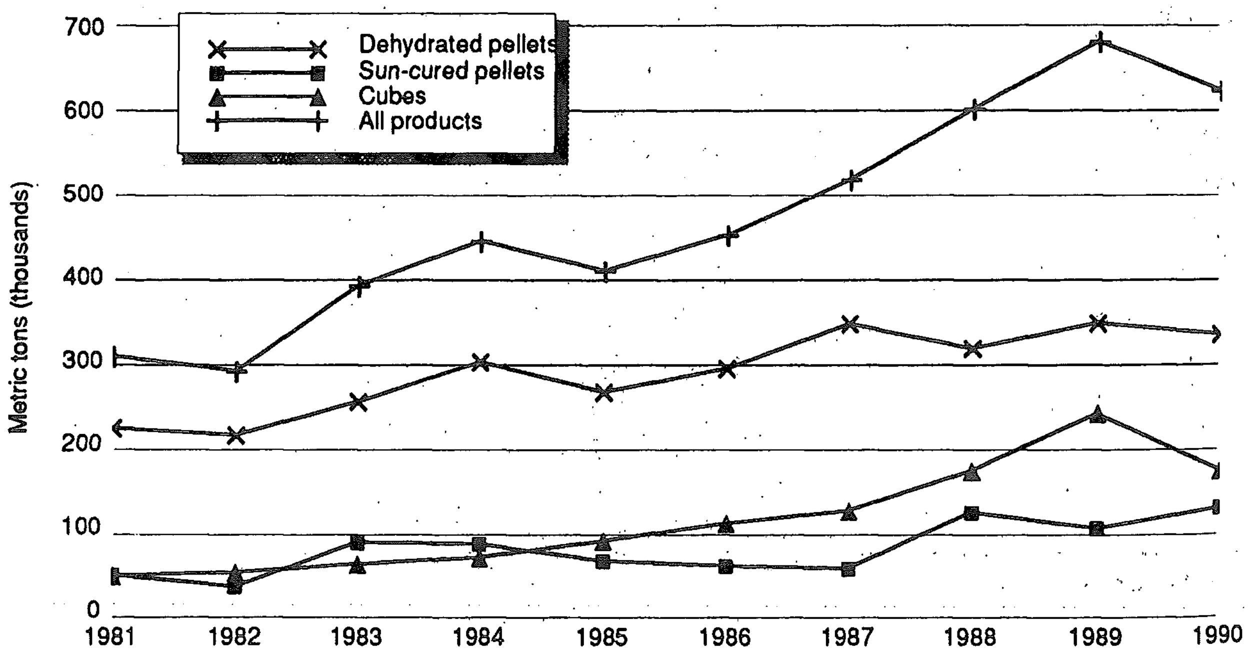
Table 3-2—Continued
Hay:[1] Canadian acreage harvested, yield, and production, by major producing Provinces, 1981-90

Location and year	*Harvested area*	*Yield*	*Production*
	1,000 acres	*Metric tons per acre*	*1,000 metric tons*
British Columbia:			
1981	717	2.53	1,814
1982	720	2.27	1,633
1983	725	2.45	1,778
1984	740	2.33	1,724
1985	760	1.85	1,406
1986	790	2.18	1,724
1987	840	2.38	1,996
1988	880	2.89	2,540
1989	870	2.40	2,087
1990	870	2.50	2,177

[1] Believed to include alfalfa and clover. An estimated 50 percent is alfalfa.

Source: Statistics Canada, Field Crop Reporting Series 22-002.

Figure 3-1
Alfalfa pellets and cubes: Canadian production, by product types, crop years 1981/82 to 1990/91



Note.—June 1-May 31 crop year.
Source: Alberta Agriculture.

Table 3-3
Canadian alfalfa pellet and cube production, by major Provinces and product types, crop years 1981/82 to 1990/91
(In thousand metric tons)

Product	1981/82	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91
Pellets	264	242	335	381	325	347	398	435	447	457
Of which produced in—										
Alberta	86	85	144	166	88	161	184	274	237	207
Saskatchewan	120	103	137	160	193	139	162	117	164	194
Manitoba and British Columbia	23	16	19	25	18	23	30	22	22	31
Eastern Canada	35	38	35	30	26	24	22	22	24	25
Of which—										
Dehydrated	220	212	252	300	264	292	346	316	347	333
Sun-cured	44	30	83	81	61	55	52	119	100	124
Cubes	43	47	57	65	85	106	121	169	238	169

Note.—June 1-May 31 crop year.

Source: Alberta Agriculture, in *Proceedings of the 12th Annual Canadian Dehy Conference and Trade Show*, Nov. 18-20, 1991, p. 9.

Costs of Production

Five firms, accounting for about 30 percent of the quantity of Canadian production of dehydrated and sun-cured alfalfa products (i.e., dehydrated and sun-cured pellets and meal, sun-cured cubes, and other compressed/chopped alfalfa products combined) in 1990, provided the break down of cost of goods sold data on their dehydrated and sun-cured alfalfa products operations (table 3-4). Monetary values have been converted to U.S. dollars to facilitate comparisons.

Weighted-average total costs of goods sold of dehydrated and sun-cured alfalfa products per metric ton increased each year from $85.41 in 1987 to $137.21 in 1990, or by 61 percent. The four major components—raw materials, direct labor, energy costs, and repair and maintenance—accounted for an average of 87 percent of total cost of goods sold during the reporting periods. From 1987 to 1990, on a per metric ton basis, raw materials costs rose by 79 percent from $31.36 to $56.18, direct labor increased irregularly by 71 percent from $17.29 to $29.49, and repair and maintenance climbed by 66 percent from $11.31 to $18.73. Energy costs per metric ton declined by 24 percent from $15.34 in 1987 to $11.71 in 1988 and then rose by 49 percent to $17.40 in 1990.

As transportation-out costs for export sales were not reported by each responding firm, this cost category is not comparable. Depreciation and amortization expenses generally increased by 38 percent from $5.36 in 1987 to $7.42 in 1990.

The cost of producing alfalfa hay varies throughout Canada, depending primarily on climate. As a result of cool weather and a short growing season, yields are generally low, which would tend to increase the costs of the hay input to processors. However, there are relatively few alternative uses for much of the alfalfa

Table 3-4
Cost-of-goods-sold experience of Canadian producers on their operations producing dehydrated and sun-cured alfalfa products, fiscal years 1986-90[1]

Item	*1986*	*1987*	*1988*	*1989*	*1990*
	Quantity (metric tons)				
Total net sales	101,932	150,878	211,798	216,721	177,602
	Value (per metric ton)				
Raw materials/purchases	$16.97	$31.36	$37.88	$47.93	$56.18
Direct labor	14.22	17.29	16.56	21.83	29.49
Energy costs	9.27	15.34	11.71	13.58	17.40
Repair and maintenance	9.17	11.31	9.73	13.65	18.73
Depreciation and amortization	3.65	5.36	5.16	5.26	7.42
Storage costs	0.00	0.00	0.00	0.00	0.00
Transportation-out costs for domestic sales	0.00	0.00	0.00	0.00	0.00
Transportation-out costs for export sales	0.31	1.58	1.55	2.26	8.23
Other factory costs	3.88	3.17	8.98	6.87	(2)
Total	57.47	85.41	91.57	111.38	137.21
	Share of total cost of goods sold (percent)				
Raw materials/purchases	29.5	36.7	41.4	43.0	40.9
Direct labor	24.7	20.2	18.1	19.6	21.5
Energy costs	16.1	18.0	12.8	12.2	12.7
Repair and maintenance	16.0	13.2	10.6	12.3	13.7
Depreciation and amortization	6.4	6.3	5.6	4.7	5.4
Storage costs	0.0	0.0	0.0	0.0	0.0
Transportation-out costs for domestic sales	0.0	0.0	0.0	0.0	0.0
Transportation-out costs for export sales	0.5	1.8	1.7	2.0	6.0
Other factory costs	6.7	3.7	9.8	6.2	(2)
Total	100.0	100.0	100.0	100.0	100.0

[1] The data reported in Canadian dollars are converted to U.S. dollars per annual average exchange rate reported by International Monetary Fund.
[2] Negative figure because two firms reported negative numbers. Negative numbers for these firms may be due to large inventory adjustments in 1990.

Note.—Because of rounding, figures may not add to the totals shown. Calculated from data of firms providing both cost-of-goods-sold breakout and sales quantity and therefore may not match data presented elsewhere.

Source: Compiled from data submitted in response to questionnaires of the Canadian Dehydrators Association.

hay that is produced, according to industry sources. Alfalfa is grown as a part of the plant rotation to provide an alternative crop, to break up plant disease and insect pest cycles, to control weeds, to add nitrogen to the soil, and to condition the soil; thus, processed alfalfa industry sources state that these factors maintain low input costs for raw materials.

Raw material is usually acquired through multiple-year contracts with growers in a well defined region. Generally, the processor handles the harvesting and pays the farmer on the basis of in-plant dry weight of the alfalfa. Under such arrangements, the typical alfalfa-processing plant may control 40,000 acres or more. Alfalfa cube producers also acquire raw material (baled hay) through spot purchases.

Energy is a key element in the production of alfalfa products in Canada. Virtually all alfalfa, whether sun-cured in the field or processed as a dehydrated product, is run through a gas-fired, rotating, heated drum to reduce the moisture content of the product. The demand for natural gas is seasonal in Canada, and during the summer months there are few other requirements for the natural gas. Thus, alfalfa processors tend to benefit from off-season rates, although some—particularly in the more southern regions—pay "peak demand" charges for the capacity requirements they create. Although the actual price paid for gas by an individual plant depends on terms of the particular arrangement, estimates of natural gas rates for selected Provinces are shown in the following tabulation:[10]

Province	US$/thousand cubic feet
Alberta	1.49
Saskatchewan	1.44
Ontario	2.88

On the average, Canadian alfalfa dehydrating plants operate at about 50 percent capacity: 100 percent for half the year, and zero output the other half. However, alfalfa dehydrating plants require extensive maintenance and yearly overhaul, since for several months they tend to run at full capacity 24 hours a day, Shipment from storage also goes on all year. Thus, a year-round labor supply is necessary, although labor demands are highest during the harvesting season.

Since many plants handle all the harvesting (swathing and chopping) of the alfalfa, including the baling of that which is sun cured, the plants also incur fuel and maintenance costs for the trucks and the field equipment.

Financial Experience of Canadian Industry

Information supplied by Canadian firms indicates positive returns for the alfalfa processors. Few Canadian firms reported financial information on their individual operations, so the analysis cannot be completed by product type. Most of the Canadian respondents produced both dehydrated and sun-cured pellets and cubes and very little baled alfalfa.

Five firms, accounting for 30 percent of Canadian production of dehydrated and sun-cured alfalfa products (i.e. dehydrated and sun-cured pellets and meal, sun-cured cubes, and other compressed/chopped alfalfa products combined) in 1990, supplied income-and-loss data on their dehydrated and sun-cured alfalfa products operations.

Aggregate domestic net sales of dehydrated and sun-cured alfalfa products of these reporting firms declined by 3 percent from [**] million in 1987 to [**] million in 1988, rose by [**] percent to $2.5 million in 1989 and then dropped by [**] percent to $2.46 million in 1990 (table 3-5). Export net sales more than [** [**]] million in 1987 to $27.8 million in 1989 and then fell by 5 percent to $26.4 million in 1990.

Aggregate operating income increased more than three times from $874,000 million, or 5.6 percent of sales in 1987, to $3.1 million, or 12.4 percent of net sales in 1988. Then income dropped by 10 percent to $2.8 million, or 9.3 percent of net sales, in 1989 and by 69 percent to $885,000, or 3.1 percent of net sales, in 1990. Net income before income taxes and cash flow generally followed the same trend as operating income. Two firms reported operating losses in 1990 compared with only one firm in 1987 and none in 1988 and 1989.

Canadian Prices

Information on Canadian domestic prices of alfalfa products was not available during the course of this investigation. Information on prices of Canadian exported alfalfa products has been compiled from Canadian questionnaires and is presented below.

Canadian Export Prices from Questionnaires

All sales prices were provided on an annual basis, and no information was supplied on whether the values were f.o.b. or delivered. Canadian respondents provided sales values for all exports, not by individual markets. Of the Canadian marketing firms that handle export transactions, only one responded. Therefore the values reported here are mainly those reported by processing firms and may understate any additional costs or markups included in moving the product from the processor level to the marketing firm.

On average, the price of Canadian exported alfalfa products increased at an average annual rate of over 10 percent between 1986 and 1990 (table 3-6). Trends for each product type are shown in fig. 3-2. Six firms, accounting for over two-thirds of Canadian exports of dehydrated alfalfa pellets to Japan, reported average export prices for dehydrated pellets. The price increased by more than 50 percent over the period, from $77.51 to $120.40 ($U.S.) per metric ton. Two

[10] Harvest Foods, Ltd., *Infrastructure Requirements*, 1990, p. 88.

Table 3-5
Income-and-loss experience of Canadian producers on their operations producing dehydrated and sun-cured alfalfa products, fiscal years 1986-90[1]

Item	*1986*	*1987*	*1988*	*1989*	*1990*
	Value (1,000 dollars)				
Net sales:					
Domestic trade sales	[**]	[**]	[**]	2,524	2,456
Export trade sales	[**]	[**]	[**]	27,825	26,405
Total	8,724	15,657	25,116	30,349	28,860
Cost of goods sold	5,860	12,889	19,395	24,139	24,365
Gross profit	2,864	2,768	5,721	6,210	4,495
Selling, general, and administrative expenses	1,132	1,894	2,610	3,395	3,610
Operating income	1,732	874	3,111	2,815	885
Interest expense	[**]	329	[**]	465	523
Other income or (expense), net	[(**)]	111	[(**)]	181	8
Net income before income taxes	1,206	656	2,605	2,531	370
Depreciation and amortization	372	808	1,093	1,140	1,318
Cash flow[2]	1,578	1,464	3,698	3,671	1,688
	Ratio to net sales (percent)				
Cost of goods sold	67.2	82.3	77.2	79.5	84.4
Gross profit	32.8	17.7	22.8	20.5	15.6
Selling, general, and administrative expenses	13.0	12.1	10.4	11.2	12.5
Operating income	19.9	5.6	12.4	9.3	3.1
Net income before income taxes	13.8	4.2	10.4	8.3	1.3
	Number of firms reporting				
Operating losses	0	1	0	0	2
Net losses	0	2	0	0	3
Data	3	5	5	5	5

[1] Fiscal year of one firm each ended Feb. 28, Apr. 30, and Dec. 31. Fiscal year of two firms ended May 31. The data reported in Canadian dollars are converted to U.S. dollars per annual average exchange rate reported by International Monetary Fund.
[2] Cash flow is defined as net income or loss plus depreciation and amortization.

Source: Compiled from data submitted in response to questionnaires of the Canadian Dehydrators Association.

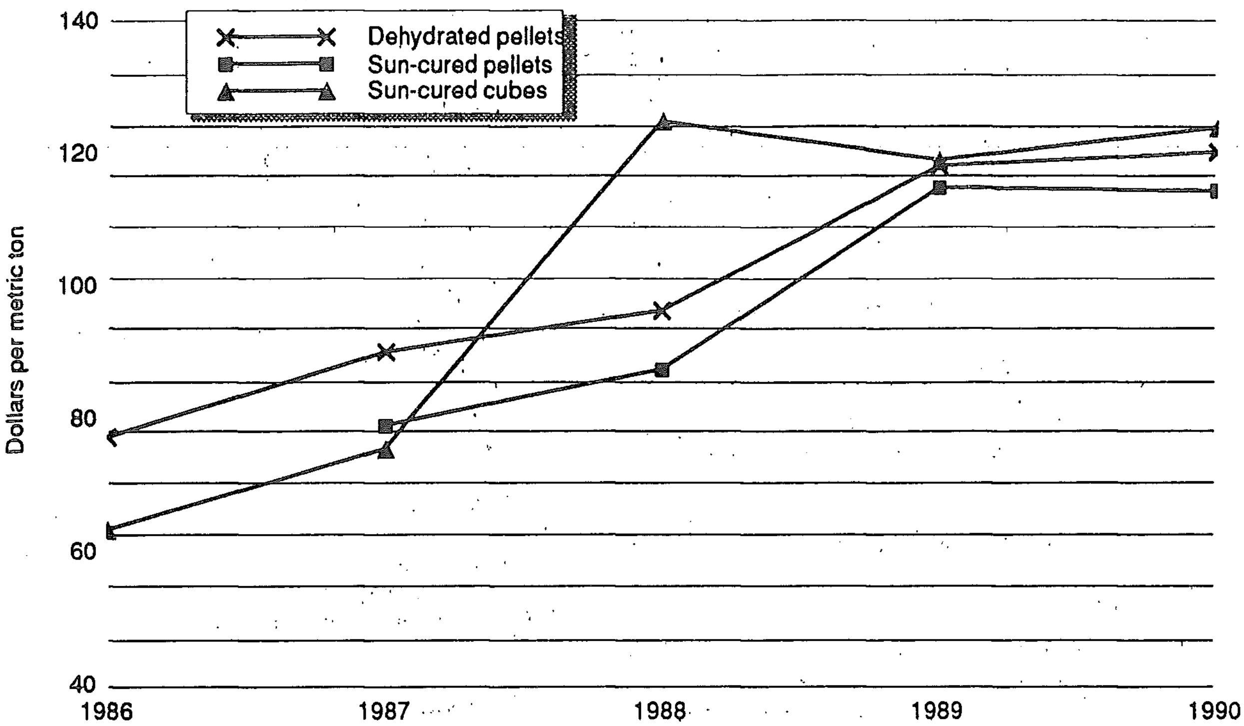
Table 3-6
Canadian alfalfa products: Average export prices, by product type, 1986-90
(In U.S. dollars per metric ton)

Year	*Dehydrated pellets*	*Sun-cured pellets[1]*	*Sun-cured cubes*
1986	$77.51	([2])	$63.58
1987	90.31	$79.24	75.72
1988	96.57	87.68	125.07
1989	118.32	115.06	119.18
1990	120.40	114.55	124.09

[1] Minicubes are included in this classification.
[2] Not available.

Source: Compiled from data submitted in response to questionnaires of the Canadian Dehydrators Association.

Figure 3-2
Alfalfa: Average Canadian export price, by product types, 1986-90



Source: Compiled from data submitted in response to questionnaires of the Canadian Dehydrators Association.

firms reported price information for sun-cured pellets, including minicubes in this classification; it is not known what share of total Canadian exports in this category are covered by these respondents. The export price of sun-cured pellets increased by 44 percent, from $79.24 in 1987 to $114.55 per metric ton in 1990. According to the firms responding, the export price of alfalfa cubes increased at the fastest rate, by 95 percent over the 5-year period. Prices for cubes increased from $63.58 in 1986 to $124.09 in 1990. Six firms reported price information for cubes, accounting for over 70 percent of Canadian exports of alfalfa cubes to Japan.

Canadian Market

There is a relatively small domestic market for processed alfalfa in Canada. The demand for dehydrated pellets is primarily for use in the compound feed industry (for poultry and hog feeds). This demand is principally in the Eastern part of the country and is satisfied by domestic production in Ontario and Quebec. There is a small demand for sun-cured pellets for use in feeding sheep and for alfalfa cubes in feeding beef cattle in the Western Provinces. Some custom produced cubes containing alfalfa are consumed; such cubes are made of alfalfa-barley, alfalfa-corn, or alfalfa-canola mixtures. These are produced primarily for feeding prize horses or breeding cattle.

Animal feed consumption, including alfalfa, depends on livestock and poultry numbers and their nutritional demands. Production of feed may be affected by changes in the structure of the livestock industry, such as increased efficiency of production and changes in market demand, or by economic developments in the feed industry itself.

As table 3-7 indicates, between 1981 and 1990 Canadian livestock numbers of dairy cows and beef cattle overall declined, while swine and poultry inventories increased. However, while the decline was relatively steady in the dairy sector, the beef cattle and swine sectors showed more fluctuation yearly, with beef cattle stocks increasing since 1987. The livestock numbers suggest that the overall domestic market for alfalfa remained relatively stable or contracted in the 1980s. But as the following tabulation shows, the value of domestically consumed processed alfalfa varied irregularly in recent years (in millions of U.S. dollars, for the latest year available):

1982/83	*1983/84*	*1984/85*	*1985/86*	*1986/87*
7.3	9.7	14.7	8.1	7.2

Table 3-7
Canadian livestock numbers, as of January 1, 1981-90
(1,000 head)

Year	Dairy cows	Beef cattle	Swine	Poultry
1981	1,764	10,402	10,190	382,645
1982	1,780	10,383	9,970	381,424
1983	1,736	10,125	9,890	374,416
1984	1,679	9,950	10,346	400,068
1985	1,618	9,712	10,573	411,197
1986	1,547	9,409	9,967	431,666
1987	1,486	9,316	9,996	475,508
1988	1,467	9,359	10,748	474,724
1989	1,449	9,493	11,018	470,613
1990	1,429	9,717	10,737	(1)

[1] Not available.

Source: Agriculture Canada.

Information is not available on domestic consumption of specific types of processed alfalfa products.

Canadian Imports of Alfalfa Products

Tariff Treatment

Under the *Schedule of Canada*, and the provisions of the Canada-U.S. Free Trade Agreement, forage products are classified and subject to duties as shown at the bottom of the page.

Under the provisions of the U.S.-Canada Free Trade Agreement, the base rates of duty on alfalfa meal and pellets and on grass meal imported from the United States are being reduced in 10 equal annual stages, with the first stage reduction effective January 1, 1989, and becoming duty-free on January 1, 1998.

Trends in Imports

The United States is virtually the only source of Canadian imports of alfalfa and alfalfa products (table 3-8). These imports are believed to be mostly baled hay. The quantity imported fluctuates considerably from year to year.

Imports of alfalfa hay and cubes were highest in 1988, reaching 161,033 metric tons, valued at $13.3 million. Imports were lowest in 1984, amounting to 65,962 metric tons, valued at $6.5 million. In 1990, Canadian imports of alfalfa hay and cubes from the United States were 72,909 metric tons, valued at $7.4 million.

Canadian Exports of Alfalfa Products

Canadian exports of alfalfa pellets and cubes were equivalent to about 80 percent of total Canadian production of these products during crop years 1982/1983 through 1986/1987. For 1990, Canadian exports of alfalfa products reached about 86 percent of production.

Canadian exports of alfalfa products are reported in two categories: (1) alfalfa pellets and meal, and (2) hay and cubes (alfalfa and other forage products). Exports of alfalfa pellets and meal rose from 143,871 metric tons, valued at $19.2 million, in 1981 to 454,111 metric tons, valued at $63.4 million, in 1990 (table 3-9). During the same period, Canadian exports of hay and cubes rose from 70,587 metric tons, valued at $4.2 million, to 132,864 metric tons, valued at $20.3 million.

Exports of alfalfa pellets were primarily to Japan. Exports of pellets and meal to Korea essentially started in 1988 with 5,463 metric tons, valued at $605,000, and rose to 54,876 metric tons in 1990, valued at $7.6 million. Exports to Taiwan fluctuated from a low of 1,386 metric tons in 1982, valued at $160,000, to a high of 30,221 metric tons in 1989, valued at $4.7 million. Canada also exported relatively small amounts of pellets and meal to EC countries, including Portugal, Spain, West Germany, the United Kingdom, and the Netherlands. Exports of pellets and meal to the United States rose from 1,799 metric tons in 1981, valued at $263,000, to 56,345 metric tons in 1989,

Item	Article Description	Base Rate
12.14	Swedes, mangolds, fodder roots, hay, lucerne (alfalfa), clover, sainfoin, forage kale, lupines, vetches and similar forage products, whether or not in the form of pellets.	
1214.10.00	Lucerne (alfalfa) meal and pellets	10% ad val.
1214.90	Other	
1214.90.10	Grass meal	10% ad val.
1214.90.90	Other	Free

Table 3-8
Alfalfa products: Canadian imports, by product types and primary sources, 1981-90

Item and source	*1981*	*1982*	*1983*	*1984*	*1985*	*1986*	*1987*	*1988*	*1989*	*1990*
	Quantity (metric tons)									
Alfalfa pellets/meal:										
United States	0	0	0	0	0	0	0	86	220	0
Other	0	0	0	0	0	0	0	0	0	876
Total	0	0	0	0	0	0	0	86	220	876
Hay and cubes[1]										
United States	111,344	151,357	143,055	65,962	83,987	89,500	110,683	161,033	89,240	72,909
Japan	0	0	0	0	0	0	67	0	0	0
Other	0	0	0	0	0	0	0	242	313	75
Total	111,344	151,357	143,055	65,962	83,987	89,500	110,750	161,275	89,553	72,984
	Value (1,000 U.S. dollars)									
Alfalfa pellets/meal:										
United States	0	0	0	0	0	0	0	10	41	0
Other	0	0	0	0	0	0	0	0	0	18
Total	0	0	0	0	0	0	0	10	41	18
Hay and cubes[1]										
United States	8,574	11,332	13,926	6,494	7,637	9,694	8,574	13,340	9,130	7,372
Japan	0	0	0	0	0	0	15	0	0	0
Other	0	0	0	0	0	0	0	21	48	8
Total	8,574	11,332	13,926	6,494	7,637	9,694	8,589	13,361	9,178	7,380
	Unit value (Per metric ton)									
Alfalfa pellets/meal:										
United States	(2)	(2)	(2)	(2)	(2)	(2)	(2)	116	186	(2)
Other	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	21
Average	(2)	(2)	(2)	(2)	(2)	(2)	(2)	116	186	21
Hay and cubes[1]										
United States	77	75	97	98	91	108	77	83	102	101
Japan	(2)	(2)	(2)	(2)	(2)	(2)	225	(2)	(2)	(2)
Other	(2)	(2)	(2)	(2)	(2)	(2)	(2)	87	154	107
Average	77	75	97	98	91	108	78	83	102	101

[1] For 1981-87, classification includes hay, forage and straw. For 1988-90, classification includes cubes, baled hay, forage, and clover.
[2] Not applicable.

Source: Compiled from official statistics of the Canadian government.

Table 3-9
Alfalfa products: Canadian exports, by product types and primary markets, 1981-90

Item and market	*1981*	*1982*	*1983*	*1984*	*1985*	*1986*	*1987*	*1988*	*1989*	*1990*
	Quantity (metric tons)									
Alfalfa pellets/ meal:										
Japan	132,828	182,519	247,877	288,735	279,220	324,550	276,288	304,475	278,038	357,703
Korea	0	22	0	20	0	0	0	5,463	37,605	54,876
Taiwan	7,834	1,386	2,395	2,760	9,268	4,823	8,877	16,943	30,221	24,913
Portugal	0	0	0	0	0	0	0	25,941	10,565	8,218
United States	1,799	7,439	5,019	5,574	5,083	14,689	19,080	29,470	56,345	6,626
Cuba	0	0	0	0	0	0	0	0	0	1,300
Spain	0	0	0	0	0	366	32,908	0	32,009	0
West Germany	0	5,397	54	6,881	5	0	2,379	0	0	0
United Kingdom	0	0	0	36	0	26	599	2,483	0	0
Netherlands	0	8,766	0	0	0	0	4,630	5,156	0	0
Other	1,410	847	165	736	179	40	2,597	2,528	3,890	475
Total	143,871	206,376	255,510	304,742	293,755	344,494	347,358	392,459	448,673	454,111
Hay and cubes:										
United States	69,134	66,584	47,952	73,708	69,700	70,999	47,611	119,028	92,840	69,710
Japan	1,360	1,972	3,398	6,037	5,675	2,489	4,873	87,234	54,228	58,195
Korea	0	0	152	0	0	0	0	0	2,194	1,633
United Kingdom	0	15	243	1,781	5,650	3,693	1,061	2,387	1,053	1,333
Taiwan	0	0	0	0	0	0	438	7,728	2,962	0
Other	93	175	149	495	104	1,736	1,110	106,398	1,896	1,993
Total	70,587	68,746	51,894	82,021	81,129	78,917	55,093	322,775	155,173	132,864

See footnotes at end of table.

Table 3-9—Continued
Alfalfa products: Canadian exports, by product types and primary markets, 1981-90

Item and market	*1981*	*1982*	*1983*	*1984*	*1985*	*1986*	*1987*	*1988*	*1989*	*1990*
	Value (1,000 U.S. dollars)									
Alfalfa pellets/ meal:										
Japan	17,514	23,228	35,933	38,818	29,870	35,678	30,502	32,717	38,986	49,899
Korea	0	4	0	5	0	0	0	605	3,406	7,571
Taiwan	1,092	160	369	435	1,169	560	1,049	2,196	4,709	3,530
Portugal	0	0	0	0	0	0	0	2,304	1,146	968
United States	263	972	674	686	549	1,668	2,190	3,455	9,178	960
Cuba	0	0	0	0	0	0	0	0	0	318
Spain	0	0	0	0	0	27	3,173	0	3,980	0
West Germany	0	491	6	751	1	0	168	0	0	0
United Kingdom	0	0	0	12	0	6	93	580	0	0
Netherlands	0	798	0	0	0	0	332	377	0	0
Other	284	167	28	130	45	14	437	1,123	2,241	123
Total	19,153	25,822	37,012	40,836	31,635	37,953	37,943	43,357	63,646	63,368
Hay and cubes:										
United States	4,054	4,876	3,957	6,277	5,374	5,881	3,784	8,524	10,719	9,666
Japan	163	225	388	686	447	348	673	6,978	8,171	9,427
Korea	0	0	27	0	0	0	0	0	406	294
United Kingdom	0	2	63	289	765	723	306	521	363	482
Taiwan	0	0	0	0	0	0	41	1,067	479	0
Other	10	36	9	100	17	340	245	603	426	439
Total	4,227	5,139	4,444	7,351	6,603	7,292	5,050	17,693	20,564	20,308

See footnotes at end of table.

Table 3-9—Continued
Alfalfa products: Canadian exports, by product types and primary markets, 1981-90

Item and market	*1981*	*1982*	*1983*	*1984*	*1985*	*1986*	*1987*	*1988*	*1989*	*1990*
	Unit value (Per metric ton)									
Alfalfa pellets/ meal:										
Japan	$132	$127	$145	$134	$107	$110	$110	$107	$140	$139
Korea	(1)	184	(1)	232	(1)	(1)	(1)	111	91	138
Taiwan	139	116	154	158	126	116	118	130	156	142
Portugal	(1)	(1)	(1)	(1)	(1)	(1)	(1)	89	108	118
United States	146	131	134	123	108	114	115	117	163	145
Cuba	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	245
Spain	(1)	(1)	(1)	(1)	(1)	73	96	(1)	124	(1)
West Germany	(1)	91	120	109	293	(1)	71	(1)	(1)	(1)
United Kingdom	(1)	(1)	(1)	343	(1)	249	155	234	(1)	(1)
Netherlands	(1)	91	(1)	(1)	(1)	(1)	72	73	(1)	(1)
Other	202	197	172	176	254	360	168	444	576	258
Average	133	125	145	134	108	110	109	110	142	140
Hay and cubes:										
United States	59	73	83	85	77	83	79	72	115	139
Japan	120	114	114	114	79	140	138	80	151	162
Korea	(1)	(1)	176	(1)	(1)	(1)	(1)	(1)	185	180
United Kingdom	(1)	108	260	162	135	196	289	218	345	361
Taiwan	(1)	(1)	(1)	(1)	(1)	(1)	95	138	162	(1)
Other	108	204	60	201	162	196	221	6	225	220
Average	60	75	86	90	81	92	92	55	133	153

[1] Not applicable.

Source: Statistics Canada.

valued at $9.2 million. Exports to the United States declined sharply in 1990 to 6,626 metric tons, valued at $960,000.

Exports of hay and cubes were largely to the United States, Japan, and the United Kingdom, with smaller amounts to Korea and Taiwan. During 1981-90, shipments to the United States fluctuated from a low of 47,611 metric tons in 1987, valued at $3.8 million, to a high of 119,028 metric tons the next year, valued at $8.5 million. Exports to the United States are believed to almost entirely of baled hay (mostly alfalfa). Exports of hay and cubes to Japan fluctuated from a low of 1,360 metric tons in 1981, valued at $163,000, to a high of 87,234 metric tons in 1988, valued at $7.0 million. Exports to Japan are believed to be nearly all in the form of alfalfa cubes, with exports of double-compressed hay (much of it being timothy) amounting to about 10,000 tons annually.[11]

During 1981-90, hay and cubes were exported to Korea essentially only in 1989 and 1990: 2,194 metric tons, valued at $406,000; and 1,633 metric tons, valued at $294,000, respectively (virtually all of which is believed to have been alfalfa cubes). Hay and cube exports (also believed to have been alfalfa cubes) to Taiwan were only during 1987-89, with no shipments in 1990. Cube exports to Taiwan ranged from 438 metric tons in 1987, valued at $41,000, to a high of 7,728 metric tons the next year, valued at $1.1 million, with a sharp decline to 2,962 metric tons in 1989, valued at $479,000.

Marketing Practices

Nearly all of the processed alfalfa produced in Western Canada is destined for export markets in Asia. The alfalfa product exports are by only four major marketing companies or groups: WestCan Alfalfa Inc. of Regina, Saskatchewan; Kapt-Al Services Ltd. of Vancouver; Tirol International Marketing of Tilley, Alberta; and NEPCAN Agricultural Commodity Storage of Edmonton, Alberta. Most of the Canadian plants producing alfalfa pellets or cubes are affiliated with one of these marketing groups in one way or another.

Ownership of these marketing companies generally lies with the alfalfa processing industry, often with the processing companies having direct ownership in their marketing company. Product ownership normally remains with the processor until the product is sold to an off-shore buyer.[12]

Alfalfa processors (dehydrators) produce dehydrated pellets during a 100-110 day season, followed by production of sun-cured pellets and cubes during another 3-month period. Output of dehydrated pellets is stored in large bins separated according to certain product characteristics. For example, pellets made from the first cutting of hay during the season, which generally have relatively low protein and high fiber, are stored together. Pellets made from second and third cuttings, which usually have high protein and low fiber, are stored separately. When a shipment is made, these product types are blended together to meet contract specifications for particular protein and fiber levels. Alfalfa cubes are also stored (in large covered sheds) with similar products being stored separately from other products.

Dehydrators are located along or very close to a rail siding. Export shipments are made in response to orders received by the marketing company; shipments are usually in bulk hopper cars for pellets, minicubes, and some cubes, and in containers for other cubes, chopped bagged hay, and double-compressed bales. Virtually all export shipments of processed alfalfa products to Pacific Rim countries go through the Neptune Bulk Terminal at Vancouver, passing through loading facilities that are owned in part by some of the marketing companies.

Most alfalfa products exported to Japan from Canada are sold under unpriced long-term contracts. Prices are negotiated with the buyers on a monthly or quarterly basis.[13] The contracts typically provide for product specifications with minimum protein content, minimum vitamin A content (for dehydrated pellets), maximum moisture content, and maximum ash content. The contracts also specify penalty amounts for products failing to meet the specifications.

Each of the marketing groups works with overseas buying agencies or responds individually to international tenders. The overseas importers funnel their requirements and their feedback through the marketers, who in turn pass on processing recommendations to the plants. The marketing groups sponsor tours for the client countries, and seminars where processors can meet clients. The marketing groups also are active in the overseas markets: lobbying for regulatory changes, contributing to research and education programs in animal nutrition and forages, and working with farmer groups and cooperatives.

Government Programs

Canada provides assistance to alfalfa processors through Federal and Provincial programs. The Canadian Government and several Provinces also maintain a variety of programs at the farm level, including price supports and marketing controls for wheat, feed grains, and livestock and dairy. Many of these programs, while not targeted at alfalfa production in particular, affect alfalfa growers to the extent that they participate in the program for other commodities produced in their operations. Canadian Government assistance for transportation of alfalfa products is discussed in chapter 5.

[11] Submission of the Canadian Dehydrators Association, Aug. 6, 1991, p.13.

[12] Submission of the Canadian Dehydrators Association, Aug. 6, 1991, p.14.

[13] Submission of the Canadian Dehydrators Association, Aug. 6, 1991, p. 23.

Western Diversification[14]

This program was started in 1987 to promote economic development in western Canada. A fund of Can$1.2 billion was established to support a variety of projects. Projects involving alfalfa products were eligible if they: (1) were designed to serve new markets, such as Taiwan or Korea; (2) involved new products for the region, such as compressed bales or alfalfa cubes; (3) involved new technologies; (4) improved productivity; or (5) produced a product presently being imported. Through 1989, 17 forage-processing projects were supported under this program, including 11 firms in Alberta, 4 in Saskatchewan, and 2 in Manitoba. Twelve firms were supported regarding cube production; most were existing firms that were expanding into cube production or converting existing pellet capacity into cubes. Three projects were for the actual establishment of new operations for cube production. The additional cube production capacity resulting from the projects supported is approximately 100,000 metric tons annually. Four projects related to production of double-compressed bales were supported, resulting in an additional 15,000 metric tons of capacity. Two research and development projects were supported. One involved support for modifying an existing dehydrating plant to allow production of minicubes (WestCan Alfalfa) and the second involved the design and building of a pilot plant dry-compactor system for densifying long fiber hay products (White Fox Forage). One market development project involved assistance in development of brochures, a packaged product for presentation, and assistance in a marketing campaign for minicubes.

[14] Maley, "Western Diversification Policies and Activities in the Dehy Industry."

The Alberta Processing and Marketing Agreement (APMA) has a program with objectives similar to those of Western Diversification—to diversify the western Canadian economy and to promote the production of value-added products. Under the APMA, the Canadian Federal Government matches the Alberta Government's contribution to a project and the Federal Government's contribution is administered by Western Diversification. Total Western Diversification and APMA funds committed to the 17 projects involving alfalfa amounted to Can$1,981,000, or 13 percent of the $Can15,438,000 total cost of the projects.

There are no other known Federal Canadian programs that directly target processed alfalfa. Programs such as the Tripartite Stabilization programs, the Canadian Wheat Board (and its system of delivery quotas), Agriculture Canada's Farm Credit Corporation, and the Livestock Feed Board of Canada all influence production of alfalfa at the farm level. However, inasmuch as these programs do not directly impact the production of processed alfalfa products, these programs are not examined in further detail in this report.

Provincial Programs

The only known Provincial program directly affecting processed alfalfa production is the Alberta Processing and Marketing Agreement (discussed previously). Several Provinces have programs involving financial assistance or credit to agriculture at the farm level, crop insurance, or irrigation programs. Since these programs also do not directly affect processed alfalfa production, they are not examined further here.

Chapter 4
Major Foreign Markets

The North American alfalfa products industries export primarily to the Pacific Rim countries of Japan, South Korea, and Taiwan. Japan is by far the largest export market for alfalfa products because of (1) its developed livestock industry and (2) its limited land available for feed and forage production. Only three Pacific Rim countries are described in this chapter, because of their significance to the North American alfalfa products industries. Other regions of the world do not offer significant export opportunities now or in the near future because they lack a large livestock industry or because these countries meet their demand for forage with domestically produced supplies.[1]

Japan

Japanese Imports of Alfalfa Products

Japan is the leading market for U.S. and Canadian exports of alfalfa products. A comparison of Japanese imports of the major types of alfalfa products is shown in figure 4-1. In 1990, Japan imported 298,000 metric tons of alfalfa meal and pellets, valued at more than $48 million.[2] Nearly all of Japan's alfalfa meal and pellet imports originated in Canada. Alfalfa cube imports in 1990 amounted to 713,000 metric tons, valued at $159 million. More than three-fourths of Japanese imports of cubes was supplied by the United States. Japanese imports of baled alfalfa hay were 202,000 metric tons, valued at about $58 million, in 1990. Most of the baled alfalfa hay is believed to be from the United States.

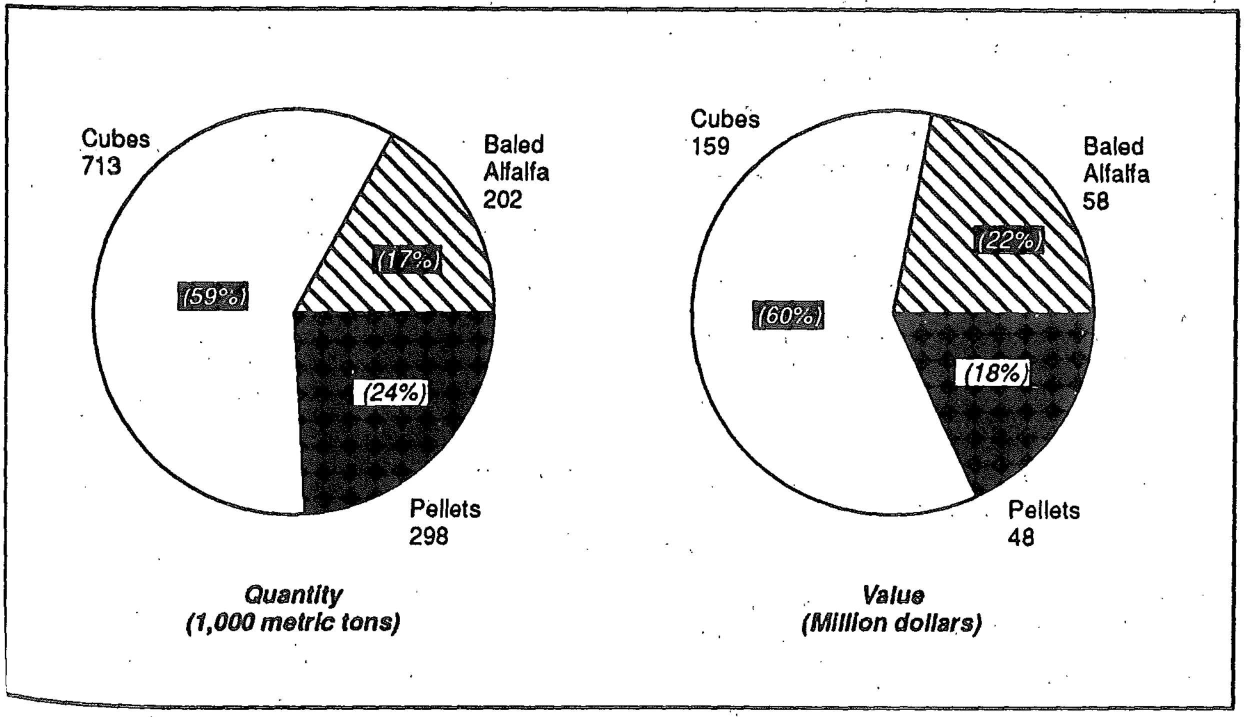
All alfalfa products are used for animal feed in Japan, but differences in the form and feed value of the products have led to a degree of market segmentation. The different trends in imports of the three main types of alfalfa products during the 1980s suggest different market demands for the three products (fig. 4-2). According to industry sources, the demand for alfalfa by the feed-manufacturing industry in Japan is the main factor establishing the market for pellets.[3] The compound feeds produced by the feed mills are

[1] Some U.S. firms in the Midwest stated in their response to USITC questionnaires that EC subsidies on production of alfalfa products have reduced the competitiveness of U.S. products in EC export markets.

[2] Values are c.i.f. Japan (inclusive of costs, insurance, and freight) and have been converted into U.S. dollars using annual average exchange rates published by the International Monetary Fund. Japanese import data for 1981-90, in quantity, value, and unit value, may be found in appendix C, table C-4.

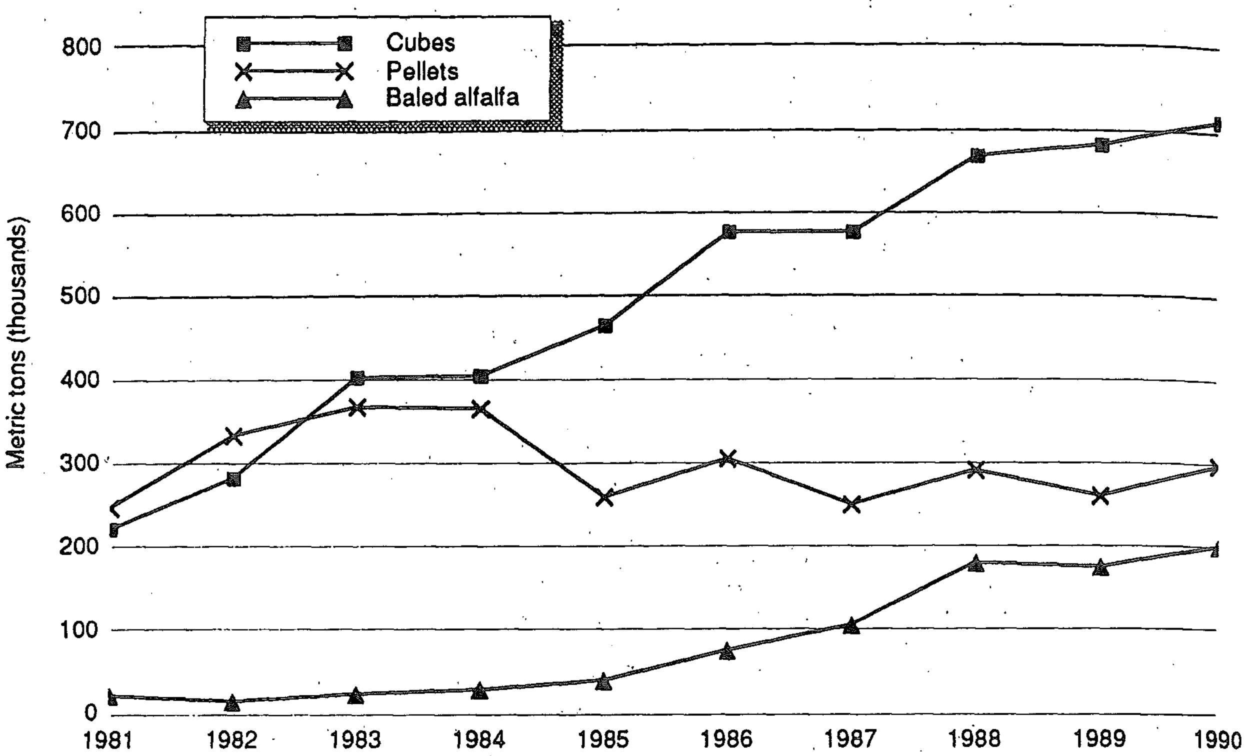
[3] About 98 percent of the sun-cured pellets imported are ground and used in compound feed; between 70 and 80 percent of dehydrated pellets are used in feed mills, with the rest used as direct feed on farms.

Figure 4-1
Alfalfa products: Japanese import market, by product types, 1990



Source: Japan Tariff Association and Zen-Noh.

Figure 4-2
Alfalfa products: Japanese import market, by product types, 1981-90



Source: Japan Tariff Association, Zen-Noh, and USITC estimates.

consumed by all types of livestock in Japan, although poultry and swine rations are cited as the most important feed types in terms of alfalfa product use. The Japanese market for pellets has been stable during the 1980s. Alfalfa cubes, the product that had the largest growth in quantity consumed in the Japanese market during the 1980s, are used to some extent in manufactured feed. But because cubes also satisfy more of the ruminant's fiber requirements, they are usually sold directly to the farm without further processing.[4] Dairies are the principal market for baled alfalfa hay and other long-fiber roughages, with some sales also made to beef cattle and racehorse operations.[5] The Japanese market for long-fiber products, including alfalfa cubes and baled alfalfa, increased significantly during the last decade.

Trends in Market Share

Because nearly all of the alfalfa pellets and cubes utilized in Japan are supplied by imports, Japanese import data for these products reveal trends in market shares held by the United States and Canada. The market share for baled alfalfa hay is examined below in relation to domestic supplies of pasture and grasses and imports of other types of hay that are substituted for alfalfa. The most significant change in market share for U.S. and Canadian alfalfa products during the period of this study occurred in alfalfa pellets. The United States lost nearly all of its Japanese market to Canada between 1981 and 1990. At the same time, the United States maintained the dominant share of the Japanese market for cubes and baled hay.

Pellets

During 1981-90, Canada increased its market share from a roughly equal level with the United States to nearly complete dominance of the market (fig. 4-3). The figures on market shares presented below are based on quantities imported by Japan, although the pattern is the same whether market shares are based on quantity or value. In 1981, the U.S. share of the quantity of Japanese imports was about 46 percent and the Canadian share was 43 percent.[6] The decline in U.S. market share began after 1982. By 1985, the U.S. share of the Japanese pellet market was below 10 percent. In 1990, the U.S. share of the Japanese market had declined to less than 1 percent.

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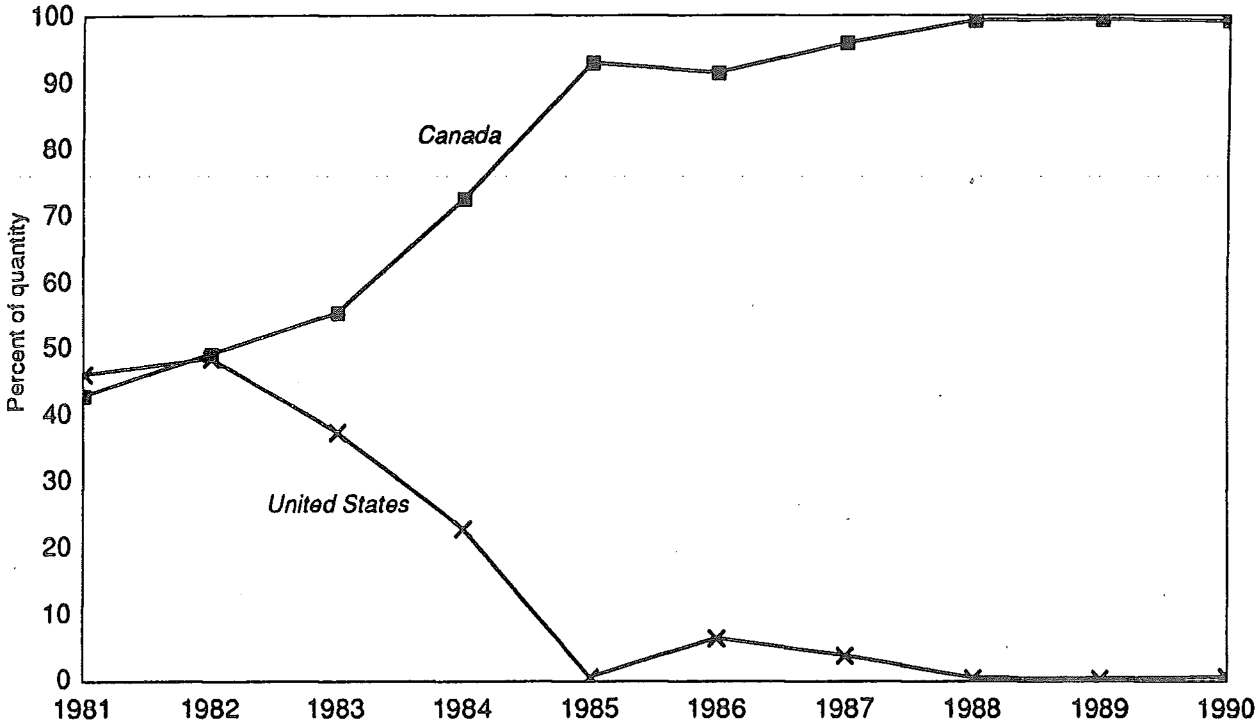
[4] Japanese trade sources state that about 50,000-60,000 metric tons of imported alfalfa cubes (about 7 percent of the total) are used in compound feed each year.

[5] According to reports of the U.S. agricultural attache from Tokyo, about 60 percent of baled hay and 90 percent of hay cubes are fed to dairy cows. About 20 percent of baled hay imports go to beef cattle and racehorses.

[6] The remaining 11 percent of the market was shared by Taiwan, the Philippines, Chile, and New Zealand.

Figure 4-3
Alfalfa pellets: Share of Japanese market held by United States and Canada, 1981-90



Source: Japan Tariff Association statistics.

This change in market share took place during a period of little overall growth in the Japanese market for imported alfalfa pellets. However, there were irregular annual variations in total Japanese imports of alfalfa pellets during this time. The Japanese market for imported alfalfa pellets increased during the early 1980s, then fluctuated in the latter part of the decade. Between 1986 and 1990, imports of pellets showed a year-to-year variation of between 11 and 24 percent, with each year of growth in imports followed by a year of decline (fig. 4-2). In 1990, Japan imported 20-percent more pellets than in 1981, but 19-percent less than the level imported in 1983, the peak year for imports of alfalfa pellets.

The percentage of the Japanese pellet market that is supplied by dehydrated alfalfa versus sun-cured alfalfa varied during the 1980s, according to industry sources. While no official statistics are available, it is believed that sun-cured pellets accounted for about 35 percent of Japanese pellet consumption during the early 1980s. The share of sun-cured alfalfa pellets has declined to about 10-15 percent of the total pellet imports in recent years.

Cubes

Between 1981 and 1990, the Japanese market for alfalfa cubes was supplied mainly by the United States, although U.S. market share in cubes declined toward the end of the period (fig. 4-4). The U.S. market share was 95 percent in 1981 and 78 percent in 1990. Canada increased its share of the Japanese market for alfalfa cubes from 3 percent in 1981 to 20 percent in 1990. Canadian market share in cubes rose gradually in the early 1980s, then increased in 1988 to a 15 percent share. In 1989, Canada held 22 percent of the Japanese cube market before falling back to 20 percent in 1990.

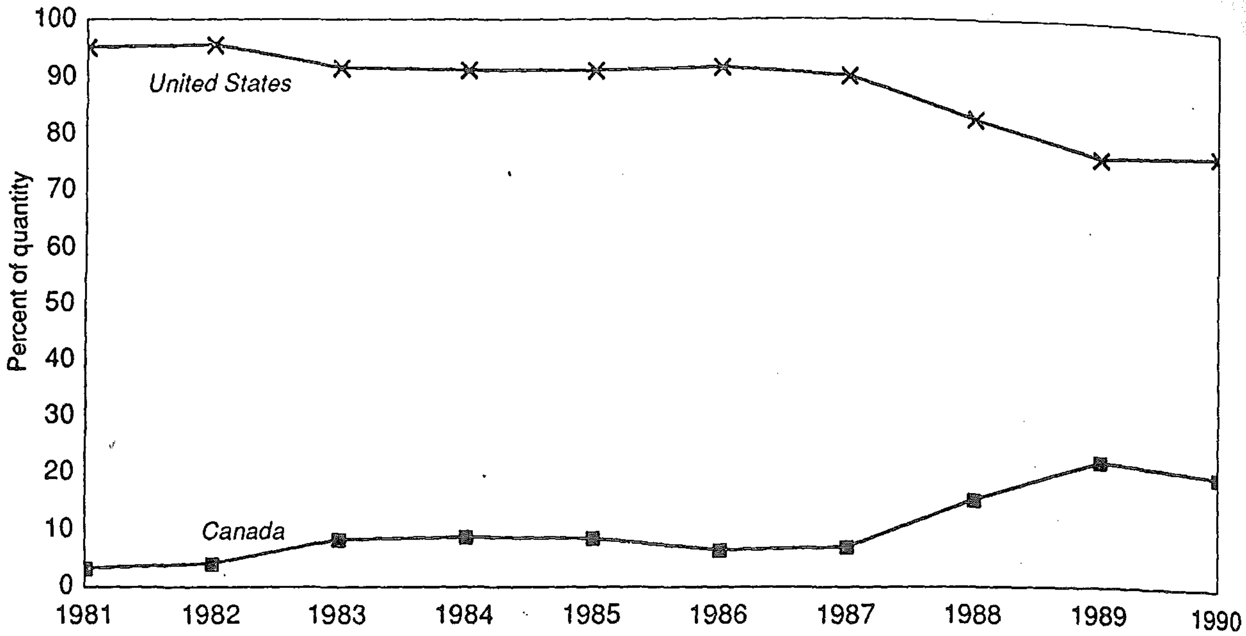
During the 1980s, the Japanese market for alfalfa cubes more than tripled in size. Japanese imports of alfalfa cubes grew from 222,000 metric tons in 1981 to 713,000 metric tons in 1990. Therefore the decline in U.S. market share on a percentage basis, from 95 percent in 1981 to 78 percent in 1990, did not imply a decline in the quantity of U.S. export sales. U.S. shipments of cubes to Japan increased from 211,000 metric tons in 1981 to 555,000 metric tons in 1990.

Baled hay

The total market share held by hay imported into Japan in comparison with domestic grasses is relatively small, around 10 percent when measured on a total digestible nutrient basis (fig. 4-5).[7] Domestic

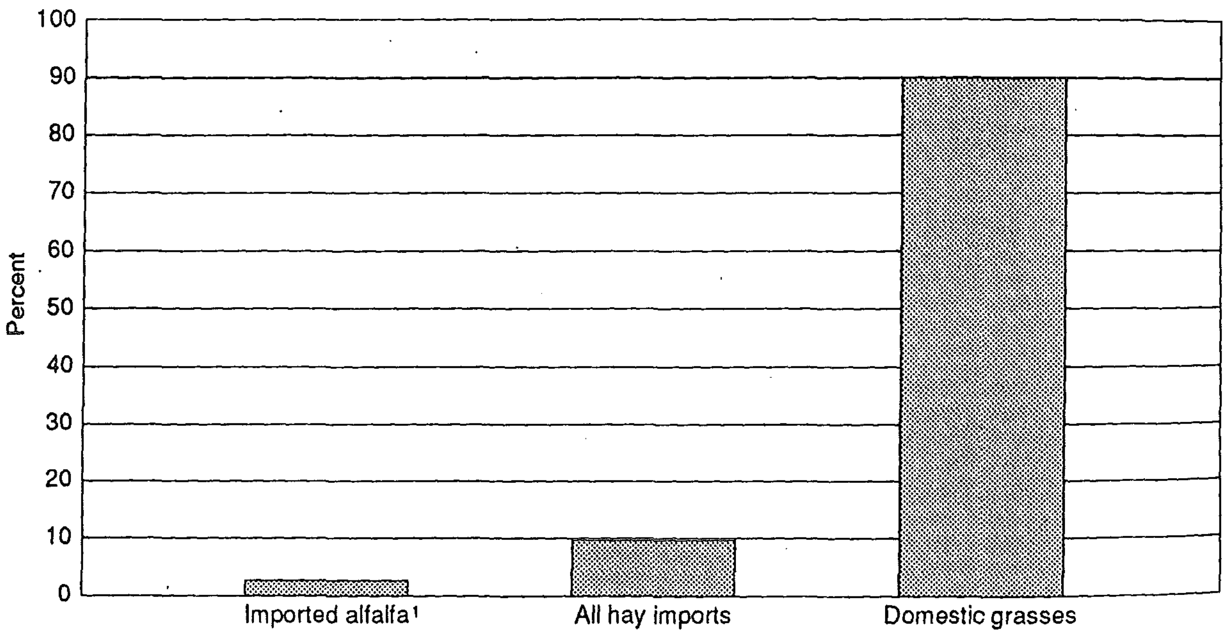
[7] Estimated by the staff of the USITC, based on reports of the agricultural attache in Tokyo and Japanese import statistics. Total digestible nutrients are measures of the usable content of a feed product. Alfalfa hay typically is between 45-60 percent TDN; most other hays are lower in TDN than alfalfa.

Figure 4-4
Alfalfa cubes: Share of Japanese market held by United States and Canada, 1981-90



Source: Japan Tariff Association statistics.

Figure 4-5
Roughage supplies in Japan: Domestic grasses, imported hay, and imported alfalfa[1], 1990



[1] Imported alfalfa also included in category for all hay.

Note.—Total digestible nutrient basis.

Source: USITC staff estimates.

roughage supplies have been stable during the 1980s,[8] while total tonnage of hay imported has increased (fig. 4-6). Alfalfa hay accounted for only 22-25 percent of total Japanese hay imports in 1988-90. Baled alfalfa hay is believed to have declined slightly as a share of total hay imports into Japan during the 1980s, although the U.S. market share of all hay imported into Japan increased from 77 percent to 90 percent. Other types of hay imported into Japan include sudan grass supplied by the United States, rice straw supplied by other Pacific countries, and timothy hay supplied by the United States and Canada.

Demand for Alfalfa Products in Japan

The Japanese livestock industry depends heavily on imported feedstuffs. Domestically produced pasture, forage crops, and food-processing byproducts provide only about 30 percent of Japan's animal feed requirements.[9] Alfalfa products are used as minor ingredients in the manufacture of compound feeds in Japan; they are also fed directly to livestock. Therefore, the size of the Japanese livestock herd, economic conditions in the livestock sector, and the availability of alternative feedstuffs affect the demand for imported alfalfa products. Some of the key trends that affected market demand in Japan in recent years, apart from pricing issues discussed in chapters 2 and 3, have been nonprice considerations of Japanese purchasers with regard to particular alfalfa products, the economic structure of the compound feed industry, and economic pressures facing Japanese producers.

Nonprice Considerations of Japanese Alfalfa Purchasers

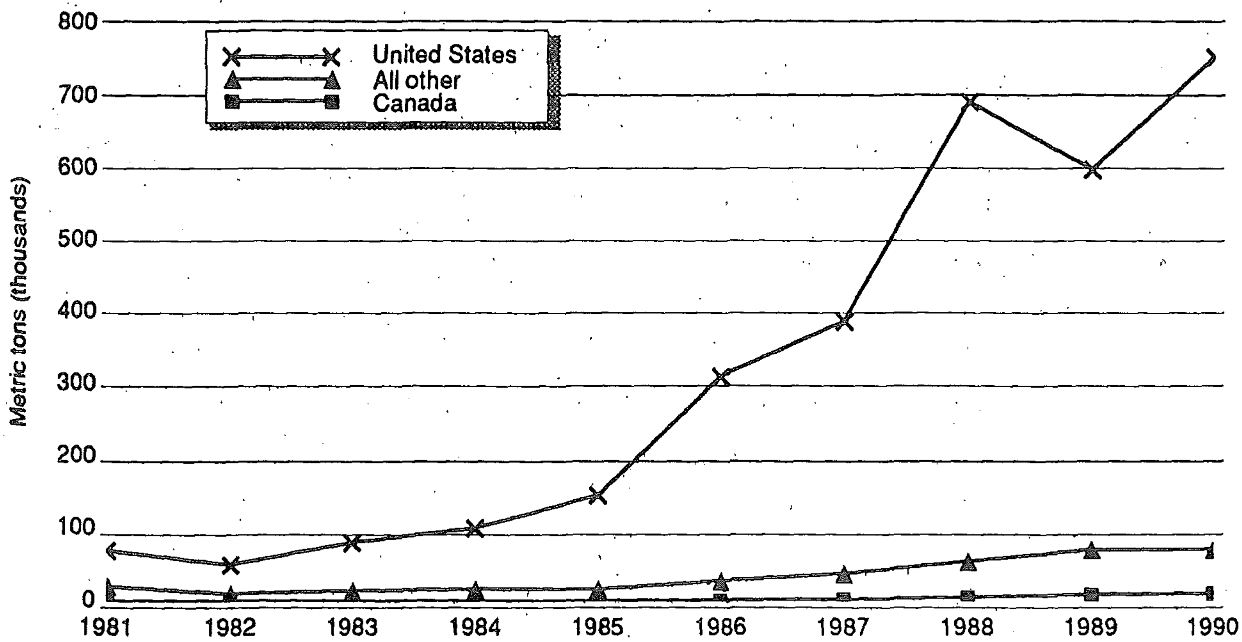
Because Japanese buyers import alfalfa for animal feed, demand is related to trends in livestock inventories. However, preferences for certain types of feed and forage products have played an important role in shaping the market for alfalfa products, so that consumption has not necessarily depended on livestock numbers. Data on livestock inventories are shown in table 4-1.

For example, the dairy industry in Japan, which is the leading consumer of the imported alfalfa hay and cubes, has shifted toward more consumption of alfalfa, a high-quality forage, in place of domestic or other imported forages. Therefore, consumption of alfalfa hay and cubes has grown even as inventories of dairy cows have contracted. The alfalfa pellet market in Japan has been stable during the 1980s, while, except for dairy, the number of animals has increased moderately. Most animal feed mixes manufactured in feed mills contain a small percentage of alfalfa pellets, particularly poultry and swine rations. Poultry feed manufacturers are believed to be steady consumers of dehydrated alfalfa pellets, but apparently the increase in poultry inventories has not been sufficient to counter the reduction in demand for pellets for other uses. Part of the reduction in consumption of alfalfa pellets may have been among farmers who chose to feed hay or cubes rather than pellets, or by compound feed manufacturers switching to lower priced protein sources in their rations.

[8] USDA, Foreign Agricultural Service (FAS), agricultural attache reports from Tokyo.

[9] William T. Coyle, *Japan's Feed-Livestock Economy*, USDA, FAER-177, Feb. 1983, p. 33.

Figure 4-6
Hay: Japanese imports, by primary sources, 1981-90



Source: Japan Tariff Association statistics.

Table 4-1
Japan: Livestock and poultry inventories, by animal type, 1981-90
(1,000 head)

Year	Dairy cows	Beef cattle	Pigs	Horses	Chickens	
					Layers	Broilers
1981	2,104	2,281	10,065	24	122	131
1982	2,103	2,382	10,040	23	123	131
1983	2,098	2,492	10,273	24	125	135
1984	2,110	2,572	10,423	24	127	143
1985	2,111	2,587	10,718	23	128	150
1986	2,103	2,639	11,061	23	130	156
1987	2,049	2,645	11,354	22	135	155
1988	2,017	2,650	11,725	22	138	155
1989	2,031	2,651	11,866	22	139	153
1990	2,058	2,702	11,816	23	137	150

Source: Japan Ministry of Agriculture, Forestry, and Fisheries (MAFF).

While price is considered by trade sources to be the primary factor in purchases, nonprice factors such as reliability of supply and appearance of the product influence purchase decisions by some of the major buyers in the Japanese compound feed industry. Perceived dietary needs of the animal and preferences of Japanese consumers are important considerations in the purchase of alfalfa products. For example, chickens raised for egg production require carotene, supplied in Japan by dehydrated alfalfa pellets, in order to produce the deep orange-colored egg yolk preferred in Japan.[10] Dehydrated pellets are imported under contract terms guaranteeing a minimum amount of vitamin A to supply the carotene. Japanese trade sources also have stated that alfalfa pellets are preferred feed ingredients in rations for breeding swine. Japanese feed manufacturers reportedly prefer deep green color alfalfa pellets, which generally are dehydrated pellets, so that the feed produced has a green tint.[11]

Long-fiber forages have become more attractive to Japanese farmers in recent years, in part because the Japanese dairy cooperative federation, Zen-Raku-Ren, has encouraged farmers to feed larger amounts of long fiber and because of Government policy changes. The Japanese milk price support system was changed in 1987 to require a higher fat content for milk to qualify for price supports.[12] Feeding more long fiber to dairy animals provides the higher butterfat and also contributes to more milking periods over the life of the cow, an important factor in Japan owing to the substantially higher investment cost of dairy calves in Japan than the United States. However, Japanese purchasers generally have less concern for other nutritional characteristics of the roughage than typically is paid in the U.S. market. Thus protein content of the alfalfa hay is less important than fiber length, and competing grasses such as sudan, rice straw, or ryegrass straw are considered close substitutes for alfalfa hay, particularly when protein needs can be met using compound feed or other sources.

Structure of the Japanese Feed Industry

Concentration in the Japanese feed industry may give buyers the potential to affect the market, both at the level of the export transaction and within the Japanese market. This section describes the structure of the Japanese feed industry and the potential effects on trade in alfalfa products. Animal feed ingredients are imported into Japan by the major Japanese trading companies and by agricultural cooperative organizations. Most of the nine general trading companies are involved in feed imports and have purchasing offices in North America. The Japanese agricultural cooperatives are believed to be more influential purchasers of alfalfa products than the trading companies, given the cooperatives' extensive distribution network in the Japanese countryside. Part-time farmers in particular depend on the cooperatives for supplies and assistance. The National Federation of Agricultural Cooperatives, known as Zen-Noh, holds a 37-percent share of the Japanese compound feed market. Zen-Noh purchases directly from North American producers of alfalfa products and from the general trading companies.[13] The federation of dairy farmer cooperatives, Zen-Raku-Ren, is a major buyer of baled hay, with about 25 percent of the import market,[14] and also owns some feed mills.

There are about 200 compound-feed-manufacturing establishments in Japan. About 50 compound-feed mills are affiliated with Zen-Noh, and another 7 with Zen-Raku-Ren; the remainder are owned by private firms. Production of feed in Zen-Noh-affiliated mills is about 9 million tons per year, compared with total feed production of about 26

[10] USITC staff discussion with Japanese purchasers.
[11] Canadian Dehydrators Association, submission to USITC, Aug. 6, 1991, p. 4.
[12] USDA, ERS, *Pacific Rim Agriculture and Trade Report,* July 1990, p. 72.
[13] Tatsuo Matsuura and Morio Morisaki, *The Japanese Feed Market: An Extensive and Dynamic System of Distribution and Consumption,* Japan International Agricultural Council, Mar. 1985.
[14] FAS attache report from Tokyo.

million tons.[15] About 90 percent (by weight) of the ingredients in the compound feed are imported;[16] corn and wheat are the leading components. Alfalfa pellets and meal make up most of the imported roughage component of compound feed, but comprise less than 1 percent by weight of the total ingredients used. The data suggest that the share of alfalfa in compound feed ingredients has declined steadily over the past 30 years.[17] In 1960, for example, alfalfa pellets accounted for 5 percent of compound feed ingredients. The share declined to less than 1 percent in 1989. Alfalfa products consumed by the feed industry are most often in the form of pellets, but mills also produce a feed mix that combines grains with alfalfa cubes broken into pieces.

The compound feed industry is considered to be an oligopoly in Japan.[18] Zen-Noh has the power to set prices for output, and the remainder of the industry follows suit. While Zen-Noh cannot explicitly set prices for inputs purchased, in the case of alfalfa pellets Zen-Noh is considered to be the dominant force in the market. Using long-term contracts with suppliers, Zen-Noh has established sources of supply. Prices are generally negotiated on a monthly or quarterly basis.

Relative prices of feed ingredients determine the mix of products used in the manufacture of compound feed. Japanese feed mills use linear programming techniques (mathematical procedures for minimizing or maximizing a function of certain variables) to produce rations with the necessary nutritional characteristics at the lowest cost. The literature suggests that corn, sorghum, brans, and barley have been the principal price-dependent ingredients in feed production in Japan.[19] It is believed that alfalfa products, when used for protein in the ration, are highly substitutable with other protein sources. However, dehydrated alfalfa pellets have desirable characteristics in providing color and carotene that are not easily supplied by alternative products in Japan. Similarly, alfalfa cubes provide roughage that cannot easily be supplied by other types of feed ingredients. Data on prices of some substitute products are shown below.

Economic Conditions for Japanese Farmers

In recent years, Japanese agricultural policies have begun to change from the traditional protectionist measures that isolated Japanese farmers from international market forces and the need to face international competition.[20] High land and input costs combined with trade liberalization measures are placing new pressures on Japanese farmers, leaving farm income stagnant.[21] While the Government has provided compensation to some sectors, and price support programs for most major crops continue to support the agricultural economy, the adjustment process has affected the market for imported feeds. The dairy industry, the largest consumer of alfalfa products, has faced declining milk price support levels each year since 1986.[22]

The 1988 U.S.-Japan beef and citrus agreement, in which Japan agreed to remove its quotas on imported beef as of March 1991, has significantly affected the livestock industry's consumption of feed. Slow growth in Japan's livestock sector is dampening animal feed production in Japan.[23] Dairy farmers' incomes also have been squeezed by the change in beef import policy. The beef industry is an important source of income to dairy farmers, who sell dairy steers to beef fatteners and culled cows for slaughter. The elimination of the quota on beef imports has reportedly caused the market for dairy steers to plummet, from about $1,000 per calf to about $300.[24]

The predominantly small-farm structure of Japanese agriculture also affects demand for animal feeds. Most Japanese farmers have small or part-time operations; Japanese farm families derive over three-fourths of their total household income from nonfarm sources.[25] Feed costs are among the highest cash production costs to Japanese farmers,[26] giving them a strong incentive to use the least-cost rations available. At the same time, however, the small or part-time farmer relies on labor-saving methods that generally add to costs. Many of these farmers depend on the distribution system, often through the cooperatives, which provides conveniently packaged feeds.[27] Japanese farmers rarely purchase large lots of alfalfa products, so the flow of imports must be consistent throughout the year[28] and quantity discounts are rarely obtained.

The dairy sector is increasingly concentrated in the Hokkaido region, which accounts for about 35 percent of total Japanese milk production. Dairy production

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15 Zen-Noh publication, Jan. 1988.

16 Matsuura, p. 9.

17 USDA database, from MAFF and OECD sources.

18 Coyle, p. 36, Matsuura, p. 20.

19 Coyle, p. 34.

20 Australian Bureau of Agricultural and Resource Economics (ABARE), *Japanese Agricultural Policies*, Oct. 1988, p. 51.

21 USDA, ERS, *Pacific Rim Agriculture and Trade Report*, RS-90-2, July 1990, p. 12.

22 USDA, *Pacific Rim Agriculture and Trade Report*, p. 72.

23 USDA, *Pacific Rim Agriculture and Trade Report*, p. 10.

24 Zen-Raku-Ren.

25 USDA, *Pacific Rim Agriculture and Trade Report*, p. 12.

26 Excluding labor, feeds and straw were between 41 and 74 percent of production costs in 1982, depending on the type of livestock. Rothacher, *Japan's Agro-Food Industry*.

27 Some new alfalfa products have been developed in response to the needs of Japanese farmers, such as bales of hay cut lengthwise into a 40-pound size rather than the usual 80-100 pound bale and alfalfa cubes premixed with other feedgrains to provide a feed with roughage included.

28 Storage is the responsibility of North American producers or exporters, because of the cost of warehouse space at Japanese ports and the small size of most farm purchases.

has been rising in that northern region and in remote areas of the south. In the 1960s, about one-half of the total output of milk was produced on farms close to cities. These farms relied almost entirely on feed concentrates. Urbanization and declining transportation costs made it profitable for dairying to locate further away. In Hokkaido, farms are larger than in other regions of Japan, so there is some pasture grazing, and costs of production are lower. However, distance from the major Japanese ports has affected the cost of imported alfalfa products shipped to Hokkaido (see ch. 5).

Recent trends in the alfalfa trade suggest that relative price patterns, combined with income constraints in the Japanese dairy sector, have encouraged farmers to substitute lower-cost roughages for alfalfa. Shipments of ryegrass straw and fescue straw, which have lower feed value than alfalfa, reportedly have increased. Trends in relative prices of these products are described further below.

Roughages in Japan

Japanese supplies of forage products, both imported and domestic, are shown in figure 4-7. Japan has no domestic production of alfalfa pellets or cubes. The area planted to forage crops has been stable, increasing only 2 percent between 1982 and 1990. Production of forage crops rose 6 percent in the same period because of higher yields.[29] Total forage production in Japan was 44 million metric tons (green basis) in 1990, primarily in mixed grasses.[30] Rice straw produced domestically and used for feed amounted to about 2 million metric tons in that year. Other feeds available to dairy farmers located close to urban areas are food by-products, including rice bran, wheat bran, and fish meal. Some producers grow a portion of their roughage needs, using rice straw, whole-corn-crop silage, or pasture. Pasture is more available in the dairying region of Hokkaido than in regions closer to urban centers.[31]

Price of Substitutes in Japan

Alfalfa pellets compete with several other types of feed ingredients in the Japanese market. The available data suggest that the price of alfalfa pellets has increased in recent years, relative to the price of these substitutes. Beet pulp pellets are one of the feed ingredients competing with alfalfa products, according to industry sources. Brans remaining from processing of grains are also used to add protein in compound feed. Canadian trade sources indicate wheat bran is a close substitute for sun-cured alfalfa.[32]

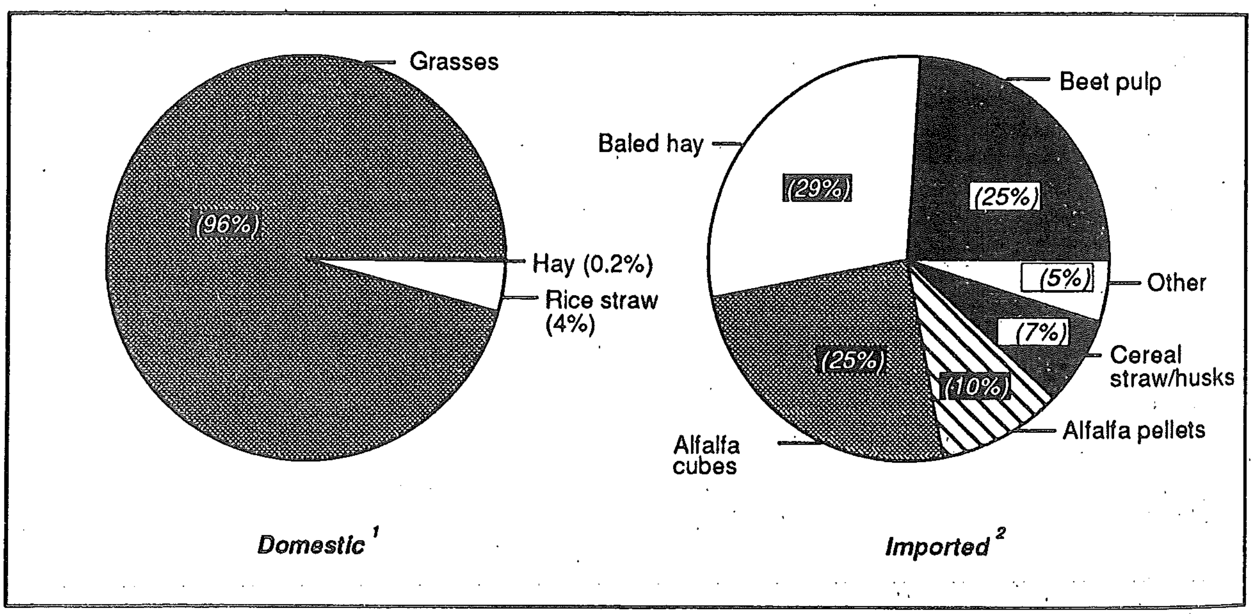
[29] MAFF, *Monthly Statistics of Agriculture, Forestry, and Fisheries*, various issues.

[30] USDA, FAS, agricultural attache report from Tokyo.

[31] Matsuura, pp. 42-43.

[32] Submission of the Canadian Dehydrators Association, Aug. 6, 1991, p. 22.

Figure 4-7
Japanese supplies of forage products, by types, 1989[1] and 1990[2]



[1] Crop year 1989.

[2] Calendar year 1990.

Source: USDA, FAS, agricultural attache report from Tokyo, July 12, 1991.

The data suggest that prices of beet pulp pellets and alfalfa pellets have moved closer together since 1988, as the landed value of alfalfa has risen (fig. 4-8). However, beet pulp pellets are still apparently higher priced than alfalfa. See appendix C for complete data on Japanese imports of beet pulp.

While the available price data on brans (price paid by farmers for small bags) are not comparable with the statistics on landed value of alfalfa pellets, the trends suggest that bran prices have been stable or declining between 1985 and 1990 (fig. 4-9). During the latter part of the period, landed value of alfalfa pellets has increased.

Alfalfa hay competes with domestic roughages, a variety of imported hays, and imported rice straw.[33] The relative feed value of these roughages varies, making them imperfect substitutes. However, industry sources indicate that relative prices of these products are key factors in consumption, so that an effect on price may be expected in the long run. The available price data suggest that alfalfa hay has been increasing in price faster than other types of hay and forage available in Japan. During 1989 and 1990, imported rice straw and oat husks had lower landed value than alfalfa hay in the Japanese market (fig. 4-10).

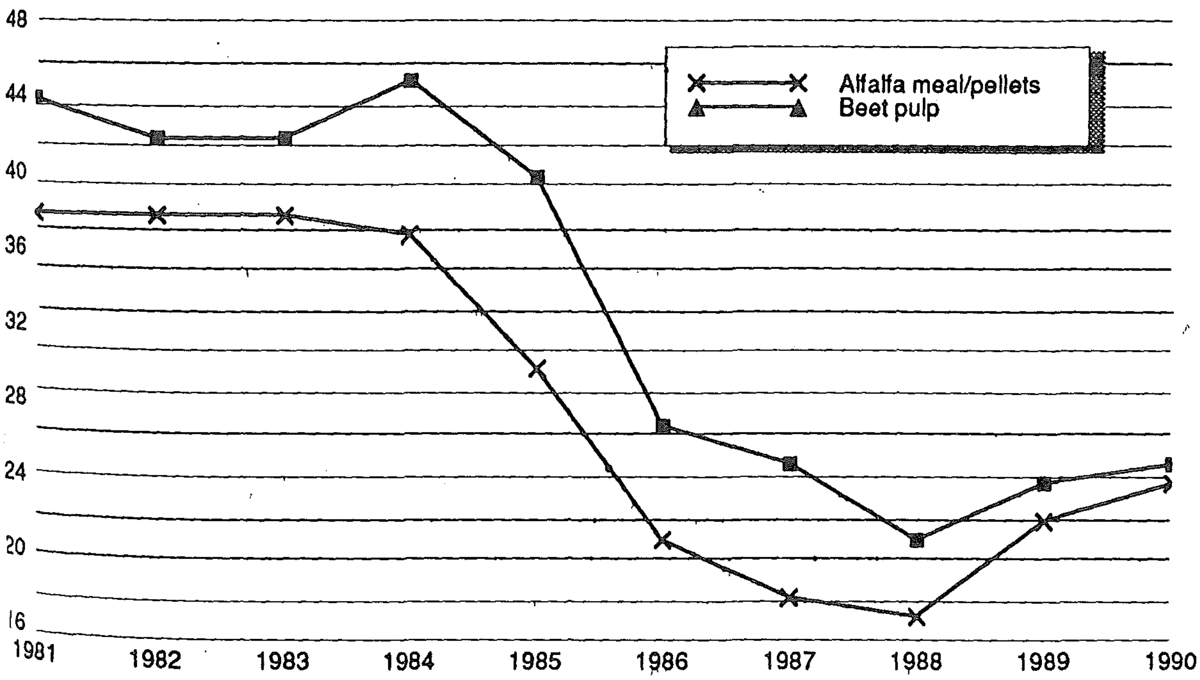
[33] Some Japanese farmers have access to rice straw from their own production of rice, but this is not generally a significant source of roughage for most dairy farms.

Tables on imports of rice straw and oat husks are shown in the appendix. Reports from the U.S. agricultural attache in Tokyo indicate that alfalfa hay prices in Japan increased faster than prices of other imported forages between 1988 and 1990. Alfalfa hay rose 40-percent in price during the period, while sudan, timothy, ryegrass straw, and hay cubes increased less rapidly. These prices are ex-warehouse in Japan.

Tariff Treatment and Phytosanitary Requirements

Alfalfa products enter duty-free into Japan. Japanese phytosanitary requirements for the importation of alfalfa products are not considered significant barriers to trade. Japan prohibits the importation of plant materials that are hosts of the Hessian fly (*Mayetiola destructor*). Such host plants are culms and leaves of *Agropyron spp.* grasses (quack or couch grass, wheat grasses), and straw from wheat and barley. Alfalfa is not one of the host plants, but it is possible for alfalfa hay to contain weeds or other hosts if such crops are grown in the vicinity. Alfalfa cubes and pellets are not considered potential sources of the Hessian fly as a result of the temperatures attained during processing. Although no official requirement exists, some Japanese purchasers request that U.S. shippers fumigate alfalfa cubes before

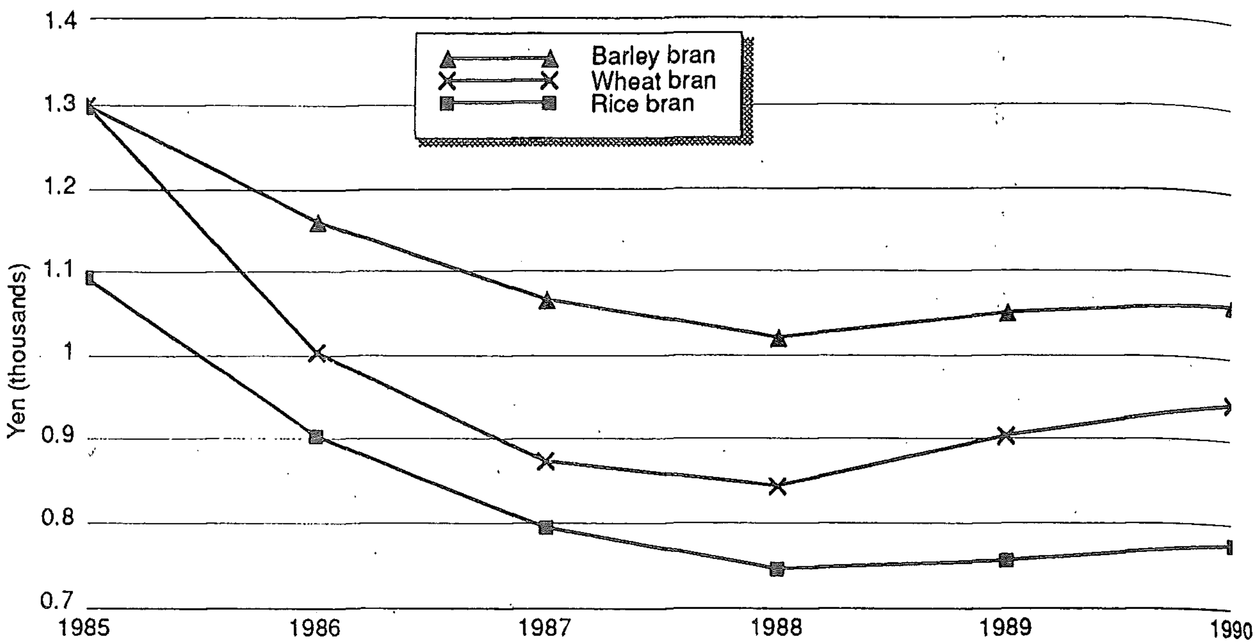
gure 4-8
nimal feed prices in Japan: Landed values of alfalfa pellets compared with beet pulp pellets, 1981-90



–Values shown are c.i.f. import unit values.

: Derived from statistics of Japan Tariff Association and USDA, FAS.

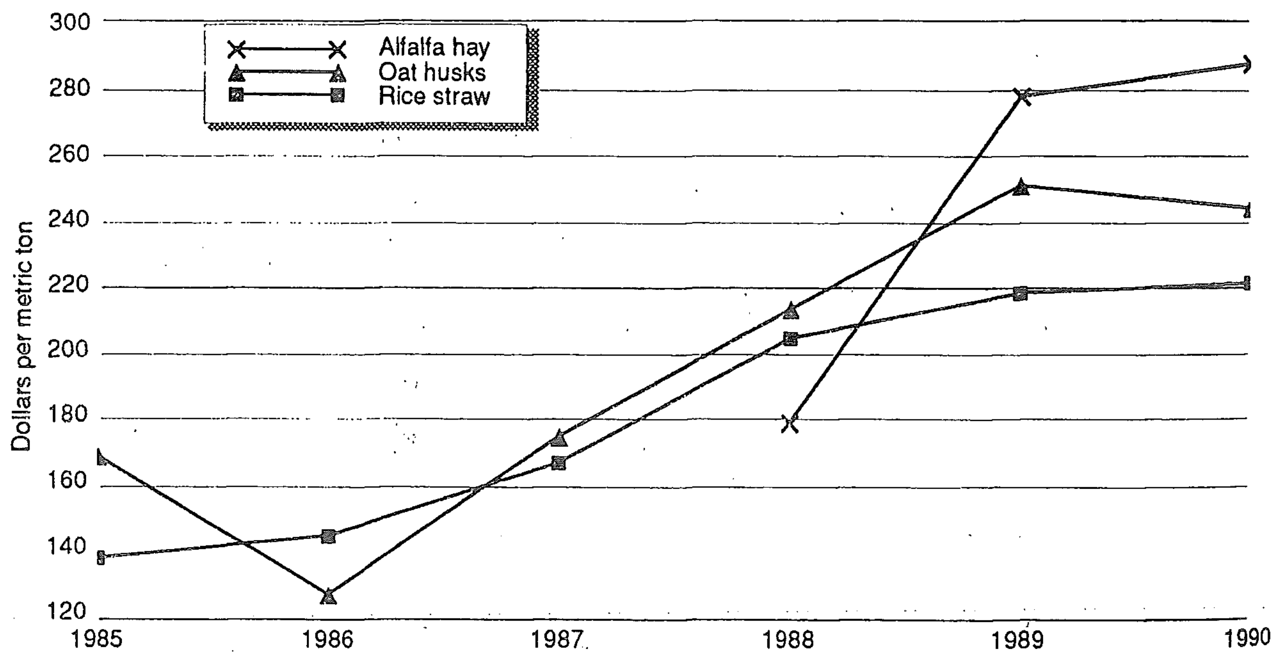
Figure 4-9
Animal feed prices in Japan: Prices paid by farmers for bran, by type, 1985-90



Note.—Values shown are for 30-kilogram size.

Source: MAFF.

Figure 4-10
Forage product prices in Japan: Landed value of alfalfa hay compared with rice straw and oat husks, 1985-90



Note.—Values shown for rice straw and oat husks are c.i.f. import unit values. Price for alfalfa hay is average annual delivered value reported by respondents to USITC questionnaires. Data before 1988 are not available for alfalfa hay.

Source: Japan Ministry of Finance statistics and responses to USITC questionnaires.

shipment. Some U.S. shippers choose to fumigate all of their products, without a contract specification for fumigation, to ensure that the cubes do not harbor live insects upon arrival in Japan.

Japan, like most other countries, prohibits the importation of soil. Good management practices at the farm and transfer points are considered acceptable methods to assure that hay shipments are free of soil.

Imported products are inspected, and if found free of host materials, soil, and insects, are accepted by Japanese authorities. The presence of host materials and soil can be grounds for rejection of the shipment. Most shippers state that they are able to export alfalfa hay and products that are free of Hessian fly hosts and soils, and can pass the visual inspection by Japanese authorities. However, a report from the U.S. Embassy in Tokyo stated that during the last part of 1989 and early 1990, rejections by Japanese authorities were a major concern for U.S. baled hay shippers.[34]

If certain prescribed treatment measures have been followed, the Japanese inspectors accept the shipment is free of viable Hessian flies regardless of the presence of agropyrons and other hosts. The acceptable treatment measures are subjects of agreements between the Governments involved.

The U.S. and the Japanese Governments have agreed to a protocol for fumigation of hay for export to Japan. The fumigation protocol is accepted for single-compressed bales only, not the double-compressed bales more commonly used to ship alfalfa. This protocol is used most often for timothy hay, a variety not considered to be a Hessian fly host. However, for practical reasons, volunteer wheat or other hosts could not be eliminated from the timothy hay.[35] U.S. shippers of baled alfalfa generally compress the bales after assuring the hay to be free of host materials; the fumigation protocol is not generally used for alfalfa.

The Canadian and the Japanese Governments have negotiated a method of heat treatment to meet the phytosanitary requirement for chopped, dehydrated hay. Products heat-treated to 90 degrees Celsius for 3 minutes are considered free of viable Hessian flies. The method does not apply to sun-cured hay.[36] The Canadian industry is also pursuing a fumigation protocol that applies to double-compressed bales of hay; research and negotiations are still in progress. Most Canadian shipments of compressed bales are carried out under the normal inspection procedure and are not fumigated.

South Korea

South Korean imports of alfalfa products have been ‹, primarily because of import restrictions and livestock production policies that limited the incentive to use imported feeds. In recent years, however, Korea has liberalized its trade policies, streamlined import procedures, and reduced tariffs.[37] These changes have led many industry experts to believe that South Korea is a significant potential market for alfalfa products from the United States and Canada. However, the Korean market currently is dwarfed by the Japanese market for alfalfa. Japan imported about 8 times more pellets and about 70 times the quantity of cubes that Korea imported in 1990. Korean imports of baled alfalfa are believed to be negligible.

Korean imports of alfalfa pellets and cubes from the United States and Canada are shown in table 4-2. Significant imports of alfalfa products did not begin until 1987.

In 1987, the United States supplied 81 percent of Korean imports of alfalfa pellets. After that year, Canada supplied nearly all of Korean alfalfa pellet imports, taking 100 percent of the market in 1988 and 1990 and 98 percent in 1989.

Between 1988 and 1990, the U.S. market share in cubes fell from 100 percent to 10 percent. Canada began its shipments of cubes to Korea in 1989, supplying one-third of the market, and then provided 90 percent of Korea's cube imports in 1990.

Alfalfa product imports into Korea were subject to a 20-percent rate of duty for most of the 1980s. In an agricultural agreement signed by the United States and Korea in May 1989, Korea agreed to reduce tariffs on alfalfa.[38] The duty on pellets and cubes was subsequently reduced to 15 percent. In July 1991, Korea reduced the duty to 10 percent, applicable to the first 100,000 tons imported, for a period of 1 year.[39]

Korea requires licenses for imports of most agricultural products; the licensing requirement is believed to block shipments of baled hay.[40] The licenses are issued after consultation with Government agencies and, sometimes, with producer organizations. Imports are permitted if considered necessary to supplement domestic production.

Korean imports of alfalfa products are conducted using a public tender system in which suppliers bid for sales to a few buyers. There are also sales through private contracts, but these are relatively rare. The tender offers generally request the same product specifications requested by Japanese buyers (described

[34] USDA, FAS, agricultural attache report from Tokyo, y 16, 1990.
[35] C.L. Storey and others, "Required Fumigation ·cedures for Timothy Hay Exports to Japan," USDA, mal and Plant Health Inspection Service, Jan. 1982.
[36] Harvest Foods, *Infrastructure Requirements*, p. 41.

[37] Ministry of Trade and Industry, Republic of Korea, *Free and Fair Trade*, March 1989.
[38] USDA, FAS, *Trade Policies and Market Opportunities for U.S. Farm Exports: 1989 Annual Report*, p. 159.
[39] Report from U.S. Embassy Agricultural Affairs Office, Seoul, Aug. 1991.
[40] USDA, FAS, *Trade Policies and Market Opportunities for U.S. Farm Exports: 1989 Annual Report*, p. 163.

Table 4-2
Alfalfa pellets and cubes: South Korean imports, by product type and source, 1981-90
(In metric tons)

Product/year	Source: *United States*	*Canada*	*All other*	*Total*
Alfalfa pellets:				
1981	0	0	0	0
1982	0	0	8	8
1983	0	0	2	2
1984	0	20	1	21
1985	20	0	0	20
1986	0	0	18	18
1987	8,345	2,019	0	10,364
1988	0	5,623	0	5,623
1989	675	39,246	0	39,921
1990	0	36,286	0	36,286
Alfalfa cubes:				
1981	0	0	0	0
1982	0	0	0	0
1983	0	0	0	0
1984	0	0	0	0
1985	0	0	0	0
1986	0	0	0	0
1987	0	0	0	0
1988	1,795	0	0	1,795
1989	4,493	2,247	0	6,740
1990	1,008	9,039	0	10,047

Source: U.S. Department of Agriculture, Foreign Agricultural Service.

in chapters 2 and 3), with provisions for price reductions if the specifications are not met. The National Livestock Cooperatives Federation and the Korean Dairy Association, both organizations of a semi-public character,[41] are major buyers of alfalfa products. The Korean Feed Association has also issued tender offers for alfalfa products.

The tendering system emphasizes prices, and most bidders will supply the minimum quality to meet the specifications. Thus, price is the key factor in determining a sale under this system.

Exporting companies must obtain bid bonds and performance bonds at a cost of between $200 and $400 in order to bid on a tender offer. Industry sources state that South Korean purchasers often reject all bids and issue another tender offer at a later date, in which case the bidders lose the amount spent on obtaining the necessary bonds for the first tender.

Average prices of imported alfalfa products originating in the United States and Canada are shown in the following tabulation in dollars per metric ton, c.&f.:

	1987	*1988*	*1989*	*1990*
Pellets:				
United States	$132.24	(1)	$133.93	(1)
Canada	125.00	$139.33	124.54	$113.88
Cubes:				
United States	(1)	193.54	187.82	204.46
Canada	(1)	(1)	178.81	202.46

[1] Not available.

Source: USDA, FAS, agricultural attache report from Seoul, Aug. 16, 1991.

[41] J. Albert Evans, "Government Intervention in South Korean Agriculture," *World Agriculture*, June 1991, p. 40.

Korea requires a Federal phytosanitary certificate to accompany each shipment of alfalfa products.[42] The Government of Canada provides the certificates for alfalfa pellets and cubes. The U.S. Department of Agriculture (USDA) does not provide a certificate for alfalfa pellets, because it considers the processing to eliminate the threat of pests or disease transmission. The USDA provides phytosanitary certificates for alfalfa cubes.

Korean production of compound feeds has grown rapidly since 1985, outpacing livestock inventories in most sectors (table 4-3). About 85 percent of the raw material used in these feeds is grain and bran.[43] Rice bran and barley bran are the main types of bran from domestic sources. Vegetable proteins, which would likely include oilseed meal or pellets and a small amount of alfalfa pellets or meal, account for 15 percent of the materials used in manufactured feed. Data are not available to indicate what percentage of imported alfalfa pellets is used as an ingredient in such feeds, but compound feed production is believed to be the primary use for imported alfalfa pellets.

Rice straw is one of the leading domestic forages supplied in South Korea (table 4-4). In 1988, rice was planted on 3.1 million acres in Korea, with production of rice straw amounting to 8.2 million metric tons.[44] While alfalfa hay is considered a higher quality roughage than rice straw, particularly for dairy cows, the ready availability and low price of rice straw means that most South Korean dairy producers meet the roughage needs of their animals with rice straw. In many cases, a rice farmer will raise a few dairy cows and have supplies of rice straw on the farm. For imported alfalfa hay or cubes to become widely used in South Korea, some of the rice straw would have to be displaced. The South Korean price support programs for rice and barley may play a role in providing domestic supplies of rice and barley straw and dampening the demand for imported alfalfa.[45]

The Korean livestock industry is not now a large consumer of imported alfalfa products, but is considered a potential source of demand. Urbanization and industrialization have shifted Korean consumption patterns toward higher quality foods, including meat and dairy products. The anticipated consumer demand for meat and dairy products is expected to provide an incentive for Korean farmers to use higher quality feeds to increase production.

[42] USDA, FAS, agricultural attache report from Seoul, Aug. 16, 1991.

[43] Korea Agriculture and Fisheries Statistics Bureau, *Statistical Yearbook of Agriculture Forestry and Fisheries*, 1989.

[44] Korean Ministry of Agriculture, *Statistical Yearbook*, p. 102.

[45] Song Dae Hee and Ryu Byung Seo, "Agricultural Policies and Structural Adjustment in NICs: Lessons from Korea," Korea Development Institute, Working Paper 8611, Dec. 1986.

Table 4-3
Korea: Production of compound feeds, by type of consuming livestock, 1985-89
(1,000 metric tons)

Type	*1985*	*1986*	*1987*	*1988*	*1989*
Beef cattle	1,209	1,624	1,673	1,512	1,561
Dairy cows	994	1,208	1,404	1,608	1,719
Swine	1,924	2,178	2,953	3,604	4,071
Poultry	2,310	2,639	2,933	2,947	2,923
Other	14	25	54	155	129
Total	6,451	7,675	9,018	9,826	10,403

Source: Korea Agriculture and Fisheries Statistics Bureau, *Statistical Yearbook of Agriculture, Forestry and Fisheries*, 1989; Korea Feed Association, in Canadian submission to USITC, p. 24.

Table 4-4
Rice straw: South Korean area and production, 1983-88

Year	*Area*	*Production*
	1,000 acres	*1,000 metric tons*
1983	3,015	7,347
1984	3,027	7,872
1985	3,047	7,448
1986	3,047	7,644
1987	3,111	7,298
1988	3,106	8,219

Source: Korean MAFF, *Statistical Yearbook of Agriculture, Forestry and Fisheries*, 1989.

Table 4-5
Korea: Livestock inventories, by type, 1985-88

(1,000 head)

Type	*1985*	*1986*	*1987*	*1988*
Beef cattle	2,553	2,370	1,923	1,559
Dairy cattle	390	437	463	480
Horses	3	3	3	4
Swine	2,853	3,347	4,281	4,852
Poultry	51,778	56,930	59,919	58,976

Source: Korea Agriculture and Fisheries Statistics Bureau, *Statistical Year-book of Agriculture, Forestry, and Fisheries*, 1989.

With the exception of beef cattle, livestock inventories in Korea have expanded in recent years (table 4-5). Dairy cattle stocks increased by 23 percent between 1985 and 1988.

Recent changes in policy may increase Korean beef imports and affect the market for animal feeds in Korea. The United States and Korea reached an agreement on beef trade in April 1990, following a General Agreement on Tariffs and Trade (GATT) panel ruling that Korean import quotas were inconsistent with the GATT.[46] This is expected to increase beef imports and may dampen some of the anticipated growth in Korean beef production and the market for feed imports.

Taiwan

Imports of alfalfa products into Taiwan have increased in recent years, and are expected to continue this trend. This is due to an increased demand in Taiwan for compound feed for the dairy industry.

Trends in Taiwanese imports of alfalfa products from the United States and Canada are shown in table 4-6. The United States supplied 60 percent of the imports in 1987, but by 1989 the U.S. share had dropped to 41 percent. During the same time period, the Canadian share of Taiwanese imports increased from 39 percent to 59 percent.

Alfalfa pellets account for a small portion of Taiwanese imports of alfalfa products (only 15 percent). Canada is the primary supplier of Taiwanese alfalfa pellet imports.

Alfalfa cubes make up about 25 percent of the Taiwanese import market of alfalfa products. Canada is the major supplier of cubes into Taiwan.

The majority of alfalfa products imported into Taiwan consists of compressed baled hay (60 percent). The United States is the leading supplier of compressed hay to Taiwan.

[46] USTR, *1991 National Trade Estimate Report on Foreign Trade Barriers*, p. 141.

Table 4-6
Alfalfa products: Taiwanese imports, by source, 1984-89

(In metric tons)

	Source			
Year	*United States*	*Canada*	*All other*	*Total*
1984	4,618	2,499	409	7,526
1985	1,177	8,538	34	9,749
1986	4,637	4,609	52	9,298
1987	15,121	9,947	450	25,518
1988	19,592	24,963	212	44,767
1989	17,478	25,609	0	43,087

Chapter 5
Transportation

Transportation, both inland and ocean freight, is a key item in the cost of alfalfa products exported from North America, accounting for up to 35 percent of the value of the product landed in Japan. The U.S. alfalfa products industry has contended that the reduced inland rail transportation rates for processed alfalfa products provided since 1984 under the Canadian Western Grain Transportation Act (WGTA) have played a major role in the competition for Pacific Rim markets. The WGTA reduces the cost of inland rail freight to Canadian alfalfa shippers by about 70 percent, compared with rail freight for products that do not receive the benefit. This section will examine the WGTA in connection with U.S. legal rights under the U.S.-Canada Free-Trade Agreement and the WGTA under article 10 of the GATT subsidies code. The legal issues are followed by a description of the major modes of transportation used for shipment of alfalfa products from Canada and the United States to Japan. Finally, in order to assess the effects of the WGTA on the U.S. and Canadian industries, results are presented of an economic model on potential effects of removing the WGTA.

The Western Grain Transportation Act

The Canadian Government began to furnish benefits for rail shipments of processed alfalfa with the 1984 enactment of the WGTA.[1] The principal purpose of the WGTA was to remedy problems caused by the grain transportation rate regime established by the Crow's Nest Pass Act of 1897. That law established statutory rates for shipments of wheat by rail to Thunder Bay, Ontario and Vancouver, British Columbia. The statutory rates, which were unchanged for many years, became seriously unremunerative for Canadian railroads by the 1970s. As a result, rail transportation deteriorated and the government was forced to subsidize the railroads' branch line operations.[2] WGTA proponents indicated that revising the Crow's Nest system would help Canadian grain growers compete in foreign markets with U.S., Australian, and Argentine grain growers.[3]

The WGTA revamped the Crow's Nest rate system in a number of respects. First, the WGTA regime covered additional crops including "alfalfa meal, pellets, or cubes, dehydrated."[4] Canadian Government and industry sources indicate that this provision has been interpreted to mean that alfalfa pellets and cubes are covered, but compressed bales are excluded. Second, the WGTA provided for direct Government payments to Canadian railroads for certain rail shipments of grain within Canada. Rail shipments of grain subject to the statute are those on Canadian railroads:

1. From any point west of Thunder Bay, Ontario or Armstrong, Ontario to Thunder Bay or Armstrong;

2. From any point west of Thunder Bay or Armstrong to any port in British Columbia for export (except to the United States); and

3. From any point west of Thunder Bay or Armstrong to Churchill, Manitoba for export.[5]

Under the WGTA, the Canadian Government directly pays the Canadian railroad companies a portion of the transportation costs attributable to the covered commodity movements.[6] The payment consists of two components. One is a fixed payment called the "Crow Benefit."[7] The other component represents the Government's portion of increased rail costs. The precise method the statute provides for calculating this component is complex. The component is roughly equivalent to the product of: (1) the percentage by which the annual increase in rail rates exceeds 6 percent; (2) an annually-determined average cost of transporting one ton of grain; and (3) the amount of grain transported by rail in that year.[8] The calculation implies that the benefit can vary from year to year and that the Government share is less than the full cost of rail freight. Shippers, however, are assured that their average cost per ton of covered commodity movements cannot exceed 10 percent of the average price per ton of commodity.[9]

The statute directs the Canadian Transport Commission to establish an annual scale of freight rates for commodity movements subject to the

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[1] The WGTA is codified in ch. W-8 of the Revised Statutes of Canada (1985), as amended by the following two session laws: 1985, c. 40 and 1987, c. 28, §§ 355-358. Subsequent citations will be to the section of the WGTA only.

[2] See Organization for Economic Cooperation and Development, (OECD), *National Policies and Agricultural Trade: Country Study, Canada*, 1987, pp. 34-36.

[3] House of Commons Debates, p. 25409 (May 12, 1983); p. 26520 (June 20, 1983).

[4] See schedule I to ch. W-8. The WGTA, as originally introduced in the Canadian parliament, covered only six types of wheat. See House of Commons Debates, p. 26647 (June 22, 1983). The exclusion of new and specialty crops was especially controversial. See *id.*, p. 25387 (May 12, 1983). The legislation was amended at an early stage to add alfalfa products to the list of subject commodities. See *id.*, p. 26553 (June 20, 1983).

[5] *See* WGTA, § 2(1); U.S.-Canada Free Trade Agreement, Art. 701(5) (excluding grain shipped via Canadian west coast ports for U.S. consumption from the WGTA). Should grain be transported by rail east beyond Thunder Bay, that portion of the transportation from the point of origin to Thunder Bay would be subject to the WGTA.

[6] *See* WGTA, § 56(1).

[7] *See* WGTA, §§ 55(1), 34(1).

[8] *See* WGTA, § 55.

[9] WGTA, §§ 63, 37(2)(a).

WGTA.[10] Moreover, the Commission is to calculate, based on an estimate of the amount of Government payment, what percentage of rates is to be borne by the Government and what percentage is to be borne by shippers.[11] Tariffs published by the railroad are to reflect this apportionment between the Government and the shippers.[12] Thus, the tariff rate that the shipper must pay the railway is less than what the railroad receives from the Government for the shipment. The shipper's rate is reduced by the Government payment, although the payment is made to the railroad rather than to the shipper directly.

For the 1990/1991 fiscal year (the 12 months beginning April 1, 1990), total payments to the railroads under the WGTA amounted to Can$644.9 million. Total WGTA payments are expected to increase to Can$723.5 million in the 1991-92 fiscal year. WGTA expenditures attributable to westbound shipments of alfalfa products were Can$11.96 million in the 1990/1991 fiscal year. During that period, 527,843 metric tons of alfalfa products received WGTA benefits; the benefit per metric ton was Can$22.65.[13] Over 95 percent of the alfalfa products receiving WGTA benefits in the 1990-91 fiscal year traveled westbound,[14] and were therefore export shipments destined for countries other than the United States. Information on the share of total transportation costs paid by the shipper is provided later in this chapter.

The WGTA as an "Export Subsidy" under the FTA

In article 701(2) of the U.S.-Canada Free Trade Agreement (FTA), the United States and Canada represent that neither country will "introduce or maintain any export subsidy on any agricultural goods originating in, or shipped from, its territory that are exported directly or indirectly to the territory of the other Party." Such an "export subsidy" is defined as "a subsidy that is conditional upon the exportation of agricultural goods."[15] Thus, the FTA proscribes Canadian export subsidies only on goods exported to the United States; it does not purport to prohibit export subsidies on goods exported to other countries.[16]

[10] WGTA, § 35(1).

[11] WGTA, § 37.

[12] WGTA, § 44.

[13] Letter from Canadian Wheat Board to USITC (Sept. 19, 1991). Alfalfa meal (pellets or cubed) constituted over 99 percent of the alfalfa products receiving the WGTA benefit in the 1990-91 fiscal year. *Id.*

[14] Ibid.

[15] FTA, art. 711.

[16] With respect to such subsidies, the FTA merely states that "[e]ach Party shall take into account the export interests of the other Party in the use of any export subsidy on any agricultural good exported to third countries, recognizing that such subsidies may have prejudicial effects on the export interests of the other Party." FTA, art. 701(4).

The Office of the United States Trade Representative (USTR) has discussed on numerous occasions whether the WGTA constitutes an "export subsidy" forbidden by the FTA.[17] On October 10, 1989, in response to a request made by the U.S. Wheat Growers Association under section 308 of the Trade Act of 1974,[18] USTR's general counsel concluded that "subsidies [under the WGTA] would not appear to be classified as 'export subsidies'" proscribed by the FTA. He noted that Canada had eliminated the WGTA payment for grain shipped to the United States from Canadian west coast ports and that the only remaining WGTA provision that could be applicable to grain shipped to the United States—that for eastbound rail transportation to Thunder Bay or Armstrong—applied to domestic Canadian shipments as well.[19]

Similarly, on July 22, 1991, testimony by another USTR official to the Subcommittee on Trade of the House Committee on Ways and Means indicated that the WGTA did not constitute the type of "export subsidy" proscribed by the FTA. The written testimony noted that the WGTA benefits on westbound export shipments destined for the United States had been eliminated and that "WGTA subsidies on shipments moving through eastern ports are not conditional on export, and therefore, do not meet the FTA definition of export subsidies and are considered domestic subsidies."[20]

The WGTA as an Export Subsidy under the GATT Subsidies Code

Part II of the GATT Subsidies Code restricts the right of signatories to grant export subsidies. The

[17] USTR is the Federal agency that oversees trade agreements on behalf of the U.S. Government and that enforces U.S. rights under such agreements. Interested persons who believe that U.S. rights under a trade agreement are being denied, or that a foreign country's actions violate or deny benefits to the United States under a trade agreement, may petition USTR and request that it take action to enforce U.S. rights under the agreement. *See* 19 U.S.C. §§ 2411, 2412.

[18] Section 308, 19 U.S.C. § 2418, states that upon written request, USTR shall make available information concerning the nature and extent of a specific trade policy or practice with respect to particular goods, services, investment, or intellectual property rights, U.S. rights and remedies under any trade agreement, and past or present domestic and international proceedings and actions with respect to the policy or practice concerned. USTR does not consider its responses to section 308 requests for information to be official interpretations or rulings. *See* USITC, *Durum Wheat: Conditions of Competition between the U.S. and Canadian Industries*, investigation No. 332-285, USITC Publication 2274, p. 8-4 n.36 (June 1990).

[19] Joshua B. Bolton, USTR General Counsel, letter to Winston Wilson, president, U.S. Wheat Growers Association, Oct. 10, 1989, pp. 1-2 ("USTR Letter").

[20] Statement of Suzanne Early, Assistant U.S. Trade Representative for Agriculture, before the Subcommittee on Trade, House Committee on Ways and Means, p. 2 (July 22, 1991).

Subsidies Code defines the term "export subsidies" to include "[i]nternal transport and freight charges on export shipments, provided or mandated by governments, on terms more favourable than for domestic shipments."[21]

Article 10 of the GATT Subsidies Code requires signatories "not to grant directly or indirectly any export subsidy on certain primary products which results in the signatory granting such subsidy having more than an equitable share of world export trade in such product. . . ."[22] The USTR general counsel, in his letter to the U.S. Wheat Growers Association, stated that because the WGTA benefit on eastbound rail transportation applied equally to domestic and export grain shipments, it "would not appear to be covered by Article 10 of the Subsidies Code."[23] The general counsel was not requested to and did not address whether the westbound subsidy for exports to markets other than the United States might violate article 10 insofar as it affects competition between U.S. and Canadian exports in third-country markets.

Additionally, article 8 of the Subsidies Code requires signatories to "seek to avoid causing, through the use of any subsidy . . . serious prejudice to the interests of another signatory." The code further states that "serious prejudice" may arise through "the effects of the subsidized exports in displacing the exports of like products of another signatory from a third country market."[24] The USTR general counsel's letter to the U.S. Wheat Growers Association concerning the WGTA noted that article 8 was not a *per se* prohibition of the use of subsidies.[25]

Transportation Methods and Costs

This section describes the different transportation and handling methods used by the U.S. and Canadian industries to ship alfalfa products to Pacific Rim markets and concludes with a comparison of typical transportation costs for the two industries. The difference in methods used results from (a) the different product mix of U.S. and Canadian alfalfa product exports and (b) the relative costs of the different methods in the United States and Canada. As was mentioned in chapter 3, the Canadian industry supplies mostly alfalfa pellets that are suited to bulk shipment, and in recent years has developed cost-effective bulk shipment methods for some of its alfalfa cube exports. The Canadian industry uses rail for most of its inland transportation, primarily because railroad infrastructure is well-developed and low rates are available under the WGTA. The U.S. industry, which exports mostly alfalfa cubes and baled hay, ships primarily in containers rather than bulk. The nature of the cubes and bales makes them more suited for container shipment than bulk handling.[26] Moreover, the small quantity of U.S. sales of alfalfa pellets to Japan in recent years has resulted in the United States utilizing container shipment almost exclusively rather than bulk shipment.[27] In the United States, in contrast to Canada, trucking is the main method for inland transportation of alfalfa products, although rail and barge can also be utilized.

Transportation cost differences are key factors in the relative competitiveness in export markets of the U.S. and Canadian alfalfa products industries. Inland transportation accounts for 4-10 percent of total costs landed in Japan of alfalfa products from the United States and Canada; ocean freight is about 14-26 percent of landed value. Variations in transportation costs result from a number of factors, including different distances traveled and modes used. The Canadian industry has a significant advantage in inland transportation costs as a result of reduced rail rates offered under the WGTA. Unsubsidized rail shipment rates in Canada are close to truck and rail rates in the United States. The Canadian industry also has an advantage in ocean freight, by shipping product types that are suited to less costly bulk shipping methods.

United States

U.S. alfalfa products exported to the Pacific Rim primarily are in the form of cubes and baled hay. These products usually are containerized, and fumigated if necessary, at the point of processing. The cargos are then trucked or barged to port, where they are loaded on container ships. Bulk shipments of alfalfa cubes, which are not common in the United States, are generally loaded in railcars at the point of origin and carried by rail to the port.[28]

Inland Transportation

In the western United States, most alfalfa products produced for export to Pacific Rim markets are trucked to the point of export. Some is shipped by rail, but only if a railhead is conveniently located. Otherwise, the cost of trucking to the railhead and associated transshipment charges make shipping by a combination of truck and rail uneconomical for alfalfa products.

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[21] GATT Subsidies Code, Annex A, par. (c).

[22] The term "primary products" is defined to encompass any agricultural product in its "natural form or which has undergone such processing as is customarily required to prepare it for marketing in substantial volume in international trade." GATT Subsidies Code, art. 9, n. 7; GATT, Annex I, ad art. XVI, § B, ¶ 2. The Subsidies Code flatly prohibits export subsidies on products other than "primary products." GATT Subsidies Code, art. 9.

[23] USTR letter, p. 2.

[24] GATT Subsidies Code, art. 8, ¶ 4 (footnotes deleted).

[25] USTR letter, p. 2.

[26] Alfalfa cubes and baled hay generally are more fragile than pellets and may break apart, clog equipment, or experience moisture problems when handled in bulk.

[27] Industry sources have stated that U.S. firms shipped pellets in bulk during the early and mid-1980's, when pellet sales to Japan were in larger quantities.

[28] Industry representatives described one such shipment to analysts from the USITC. This particular shipment was destined to be loaded on a vessel using the bulk handling facility in Longview, WA.

Alfalfa products produced in Oregon and Washington State generally are trucked to Seattle/Tacoma or Portland and shipped out; some may be barged. Alfalfa products grown in the San Joaquin Valley (northern California) are generally shipped out through the Oakland area and alfalfa products produced in the Imperial Valley (southern California) are trucked to Long Beach. One large exporter produces alfalfa products at Long Beach from raw material trucked from the southwestern region; another trucks raw material from several States in the Pacific Northwest to processing facilities in Washington State. Alfalfa products produced in other Western States, such as Utah, are often shipped out through California ports. Most of the alfalfa products exported to the Pacific Rim leaves through the Port of Long Beach.

The following table details both truck and rail rates from various U.S. points of origin to Long Beach; these rates are fairly representative. There is no great observable discrepancy between truck and rail rates. The majority of rates are at or just under 4 cents per ton-mile,[29] and the average, prorated for different quantities at different rates, equals 3.97 cents per ton-mile. The rate per ton-mile declines with the distance the commodity is trucked, generally up to at least 600 miles.

For shipment of baled hay, rates are somewhat higher. From Milford, UT, the truck rates are approximately $30 per ton, as there is no backhaul commodity readily available. There is also no convenient railhead. For a distance of 500 miles, freight rates are therefore approximately 6 cents per ton-mile. For baled hay originating in the Imperial Valley, a distance of 250 miles from Long Beach, trucking rates are around $23 per metric ton. This is a much more expensive 10 cents per ton-mile when compared with the typical rates shown in table 5-1, again because there is no backhaul. U.S. inland freight rates from the Imperial Valley to Long Beach generally are not backhaul rates; it is reportedly quite difficult to arrange backhauls on these routes. While the rates paid by most producers are flat stand-alone rates, one-way shipments cost significantly more if there is no empty container to return.

Trucking rates represent the major portion of the cost of transporting the commodity to port, and the stated 4-cents-per-ton-mile figure is fairly representative. However, the larger U.S. picture is complicated by trucking regulations that vary from State to State. For example, in California, the load limits per axle effectively restrict the amount of alfalfa that may be trucked in a single load to 40,000 pounds. In most areas in the United States, trucks can haul up to 80,000 pounds. Violations of these load limits can be costly; an overweight ticket in the Long Beach area can amount to $8,000.[30] Thus, there is a freight disadvantage in the Southwest with respect to trucking; the California weight limits translate into 20-percent higher freight charges for trucking to port.

However, Oakland and Long Beach are less expensive ports to ship out of than Pacific Northwest ports in terms of better container availability. Because of the container shortage, ocean freight costs to the Pacific Rim are about $60 higher per container from Seattle, and $50 higher from Portland than from the Pacific Southwest.[31] However, on a container yard (c.y.) basis, which includes costs of inland freight but excludes ocean freight, freight is less costly in the Pacific Northwest because the higher load limits reduce the inland component of transportation costs. This has the effect of leveling the transportation

[29] References made to rates per ton-mile are calculated on the basis of metric tons.

[30] USITC staff interview with alfalfa exporter, Aug. 1991.

[31] The current lack of available containers and the resulting increase in shipping costs was attributed by one source to the fact that, with many Japanese firms locating in the United States, there is less opportunity for lower backhaul rates. Bulk shipping costs are not directly affected by the container shortage.

Table 5-1
Alfalfa cubes: U.S. inland freight rates, distances, and modes, Long Beach destination, 1991

Point of origin	*Mode*	*Distance*	*Rate*	*Adjusted rate*
		Miles	*Dollars per metric ton*	*Dollars per ton-mile*
Central WY	Truck	1,000	42.00	.0420
Delta, UT	Rail	550-600	21.00	.0365
Delta, UT	Truck	550-600	22.00	.0382
Milford, UT	Truck	500	20.00	.0400
Milford, UT	Rail	500	19.50	.0390
St. George, UT	Truck	400	16.00	.0400
Burlington, UT	Truck	460	18.00	.0391
Las Vegas, NV	Truck	250	13.00	.0520

Source: USITC staff estimates, based on data provided during fieldwork.

differential between firms exporting from the Pacific Northwest and the Southwestern United States.

Handling[32]

Most cubes and baled hay are loaded into containers at the processing point, which in the United States is generally close to ports. Information on handling costs is not available separately from total freight costs.

Baled hay for export is usually double-compressed—handling systems compress conventional bales into denser, 80- to 100-pound bales. Some shippers load these bales onto pallets, and the loaded pallets are wrapped in stretch plastic for weather protection and stability. For alfalfa shipped to Japan, such bundles are usually comprised of about 12 bales. Because Japanese ports often do not have the equipment necessary to handle larger sized bundles and the products are destined for smaller size purchases by the farm, many Japanese buyers now specifically request such unitized pallet packages. In Japan, without the unitized package, unloading one container of about 500 stacked compressed bales takes between 5 and 10 people and an estimated 3-4 hours. With the use of the unitized pallets or "pulli-packs," unloading can be accomplished in 1 hour, resulting in significantly lower handling charges. Cubes may also be handled in a variety of ways; the Japanese generally handle cubes using a fairly technologically advanced but conceptually simple "clamshell." Other methods include using a front-end loader.

Ocean Freight

Of the price for alfalfa products landed in Japan, approximately 20-30 percent is attributable to ocean freight costs.[33] At one time, inland freight in the United States was more expensive than the ocean freight. However, there has been a significant increase in outbound freight costs over the last 5 years.

Because U.S. exports of alfalfa products are primarily containerized cargo, they are carried by container ships, either conference or nonconference. Conference ships belong to a rate-setting organization that controls the supply of ships available to carry cargo at a given rate.[34] The conference for such cargo to Japan is the Trans-Pacific Westbound Rate Agreement, or the TWRA. Nonconference container ships also are available to carry cargo, and usually at lower rates. However, most shippers must use conference carriers as well as nonconference carriers in order to have sufficient space to ship all of their cargo or to respond in a timely fashion with respect to individual purchases.[35] Conference rates average approximately $1,500 (per container) to Tokyo, all in;[36] nonconference rates are approximately $1,200 (per container) to the Japanese base ports near Tokyo.

Alfalfa product exporting companies may have an agreement or service contract with a particular liner company that guarantees a favorable rate in exchange for a promised quantity shipped over a set period, usually 3 months. Most firms sign service contracts with nonconference lines, also known as independents, but the shipper must guarantee a minimum quantity to be shipped. Using a service contract can save a shipper around 20 percent over nonconference rates, although terms can vary considerably.[37]

U.S. firms handling alfalfa products for export to Japan generally do not attempt bulk shipping, not only because it is difficult to safely ship bales and cubes by bulk methods but also because bulk ocean shipping is based on space availability and the occurrence of a charter going to the desired destination area. The major destination ports for U.S. cargo are Tokyo, Yokohama, Hakata, Nagoya, Osaka, and Kobe; these are referred to as the Japanese base ports.[38] Bulk shipping is available for cubes from the United States, although use has been limited.[39]

The terms of sale are either c.y. or c.&f. (container yard, which includes inland freight but not ocean freight; or in the case of c.&f., landed in Japan, inclusive of costs and freight. Most alfalfa product shippers do not pay insurance, making the term c.&f. rather than c.i.f.). The largest Japanese purchasers usually buy on a c.y. basis and make arrangements for ocean freight. Most alfalfa sold on a c.&f. basis by U.S. shippers goes on nonconference carriers.

Canada

Canadian exports of alfalfa products to the Pacific Rim consist primarily of pellets and a smaller amount of cubes. Alfalfa pellets are handled and shipped by bulk methods almost exclusively; about one-half to two-thirds of Canadian cubes are also shipped in bulk. Rail is the primary mode of inland transportation used in Canada. Ocean shipping is usually break-bulk, using charter ships with divided holds to provide cost

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[32] Information in this section is based on fieldwork by USITC staff in July-Aug. 1991.

[33] USITC staff interviews with alfalfa exporters, June-Aug. 1991. C.i.f. valuation includes ocean freight costs; it is the same as c.&f. when insurance costs are zero.

[34] In certain circumstances, conference carriers may also take independent action, that is, set a rate below the agreed-upon conference rate.

[35] Major conference liner companies are APL and Sea-Land; nonconference lines include Hanjin, Yangming, Evergreen, and Cosco.

[36] All inclusive; including the fuel surcharge (BAF) and currency adjustment factor (CAF) commonly added to the cost per container.

[37] USITC staff interview with alfalfa exporter, July 1991.

[38] More information on ports of entry in Japan is provided below.

[39] Industry representatives described one such shipment to analysts from the USITC. This particular shipment was to be loaded on a vessel using the bulk handling facility at Longview, WA.

savings. The remaining cubes exported from Canada that are not shipped in bulk are in containers using conference carriers.

Inland Transportation

Canadian alfalfa is grown and processed mainly in Alberta and parts of Saskatchewan, and shipped by rail to Vancouver under the WGTA. Most of the product is shipped a minimum distance of 700 miles to reach the departure port.

Reduced rail rates under the WGTA offer a substantial inland transportation cost advantage to Canadian shippers of alfalfa pellets and cubes (baled hay is not covered by the WGTA). For fiscal year 1990-91, WGTA expenditures for processed alfalfa shipped to either Vancouver or Prince Rupert for export, along with the share paid by the alfalfa shipper, are presented in the following tabulation:[40].

Volume (metric tons)	527,843
Subsidy (U.S. dollars)	10,246,794
Subsidy rate (U.S. dollars per metric ton)	19.41
Shipper's share (U.S. dollars per metric ton)	7.81

The shipper's share on a shipment of alfalfa pellets or cubes amounts to $7.81 per metric ton on average, with the remaining share of the rail cost paid by the Government. The rail freight to Vancouver varies with distance, but $7.84 per metric ton from Northern Alberta and $9.45 per metric ton from Saskatchewan are representative examples.[41] The WGTA contribution, which makes up the difference in shipping costs, amounts to $19.41 per metric ton on average, or about 71 percent of total shipping costs. The total shipping cost per metric ton is $27.22. For a distance of 700 miles, the total unsubsidized transportation cost, which would apply for domestic shipments or those destined for U.S. markets, would be equal to just under 4 cents per ton-mile. The alfalfa shipper pays approximately 1.1 cents per ton-mile of this cost under the WGTA rate.

Handling

Alfalfa pellets are shipped by grain hopper car from a number of locations in Western Canada. These pellets then pass through the Neptune Bulk Terminal in Vancouver and are loaded onto ships. Pellets are usually loaded directly into rail cars from storage because the pellet plants in Canada are located at or near rail sidings. At Neptune, the pellets are usually loaded directly from rail cars to ships or stored for a very short time. Total plant-to-vessel handling costs for alfalfa pellets were approximately $9.79 per metric ton in 1990. This figure includes costs for loading rail cars at plant, oiling, analysis, and freight-forwarding services.

The Canadian industry uses a combination of bulk and container shipment for alfalfa cubes.[42] For containerized shipment, the cubes are loaded in containers at the plant whenever possible because this is the most cost-effective method and better from a quality perspective. However, containers are often loaded at the port because of the container availability problem.[43] Much of the cube production is shipped by rail to Vancouver to be "stuffed" into containers or to be loaded into bulk ships at the Neptune terminal. Bulk methods are generally only suitable for producers shipping somewhat larger quantities of cubes.

Handling charges vary considerably depending on whether cubes are shipped by bulk methods and the site at which the containers are stuffed. Plant-to-vessel costs, excluding rail freight, for containerized cubes stuffed at the plant are $17.06 per metric ton, and handling costs for cargo shipped bulk by rail to Vancouver and stuffed into containers at Vancouver are $19.05 per metric ton. Plant-to-vessel charges for bulk shipment of cubes are approximately $12.00 per metric ton (including handling but excluding rail freight).

Baled hay for export, a minor export product, averages about $14.27 per metric ton, total handling costs for a container stuffed at the plant site. Baled hay is always shipped in containers.

Ocean Freight

Canadian exporters often can take advantage of low cost bulk shipping for their cargo. Nearly all pellets and one-half or more of Canadian cubes are shipped bulk at substantial savings in ocean freight. For the portion of Canadian cubes that is shipped in containers, costs are slightly higher than the U.S. average container rate. Trade sources indicate that from Vancouver, overall, container ocean freight is approximately $72 per metric ton, bulk ocean freight for cubes averages $50 per metric ton, and bulk ocean freight for pellets is currently $31 per metric ton. Slightly different rates were published in a report prepared for Agriculture Canada, shown in table 5-2. Bulk ocean freight rates for pellets are less than those for cubes because pellets are more efficiently stored in a given cargo space.

Pellets and cubes are bulk loaded into ships, generally at the Neptune facility in Vancouver. These shipments are assembled using the "grocery" or parcel program concept. The purchasers, Japanese traders or multinational companies operating from Canada, generally charter an entire vessel and arrange for the ship to call at Vancouver, thus enabling the product to be shipped at very low bulk rates. The alfalfa pellets or cubes occupy only one or two separations in the vessel, which is also loaded with grains and oilseeds such as canola (fig. 5-1). Such a vessel is

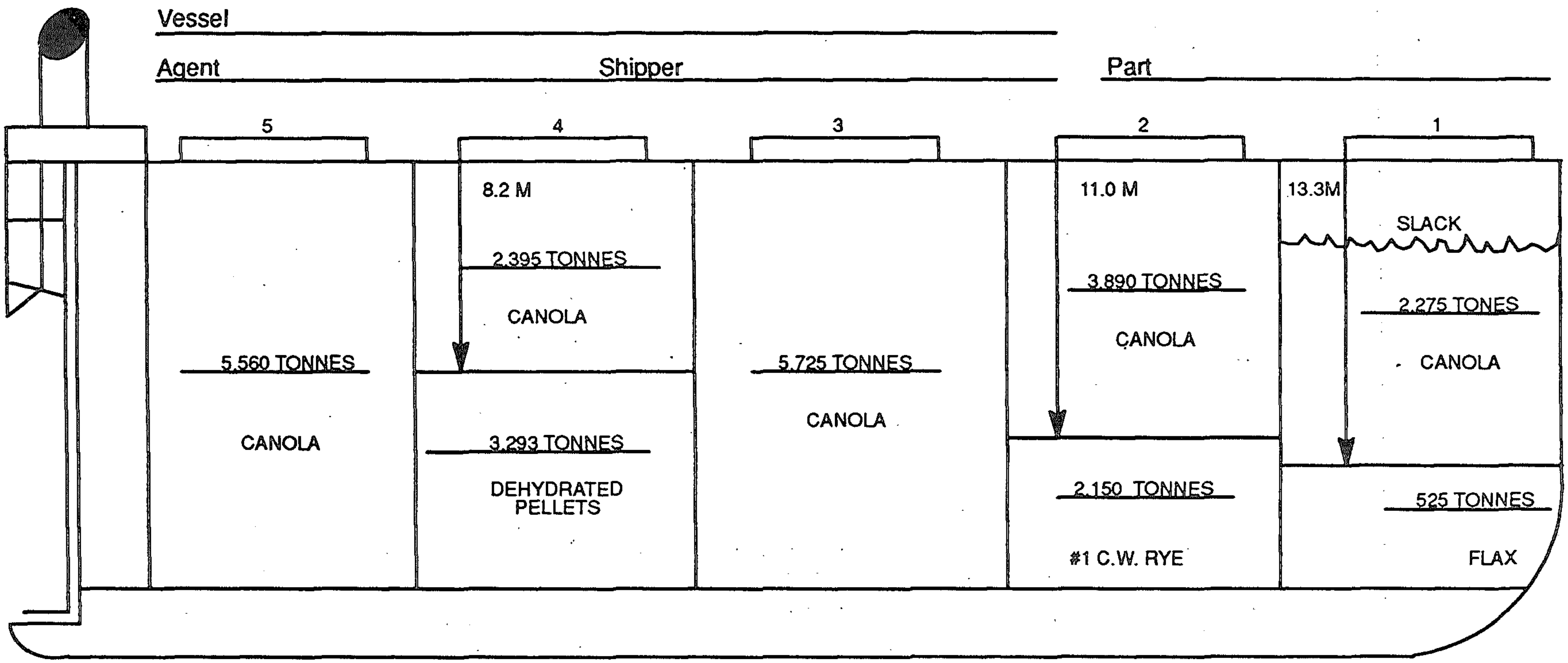
[40] Canadian Wheat Board letter to USITC, Sept. 19, 1991.

[41] Harvest Foods, *Infrastructure Requirements for the Movement of Forage Products to Foreign Markets*, 1990, pp. 28-36.

[42] According to industry estimates, about one-half to two-thirds of Canadian cubes are shipped in containers.

[43] Agriculture Canada, *Infrastructure Requirements*, pp. 28-36.

Figure 5-1
Stow plan for parcel ship



Source: Kapt-Al Services, Ltd.

Table 5-2
Alfalfa products: Stowage factors and ocean freight rates from Vancouver to Japan, 1989

Product	Stowage factor	Ocean freight rate
	Cubic feet per metric ton[1]	*U.S. dollars per metric ton*
Bulk method:		
Alfalfa pellets	55	28-30
Minicubes	65	33-35
Cubes	78	40-45
Container shipped:		
Cubes	100	65-68
Compressed bales	120	74-77

[1] Represents a factor of the number of metric tons of product that can be loaded into a locked 40-foot container. A high stowage factor implies fewer metric tons can fit into the container.

Source: Harvest Foods, *Infrastructure Requirements*, p. 92.

usually a 30,000-ton vessel with 5 to 7 holds of varying size.

In this manner, alfalfa product shipments receive the cost reduction benefit of a large bulk shipment, even though an individual alfalfa shipment is seldom in excess of several thousand tons, which would not normally be of sufficient quantity to warrant chartering a vessel. Under the parcel program, shipping charges from Vancouver to port of destination range from a low of $25 per metric ton to a high of $38 per metric ton. At the present time the cost is in the low $30's. Without the parcel program, the cost to ship alfalfa products is estimated at $45 per metric ton by bulk methods, using space charters for the typical quantity of alfalfa products shipped.[44] Bulk shipping using the parcel program is $15 to $20 per metric ton less than conventional bulk shipping, including the cost of building the separations in the ship.

A number of firms ship minicubes in containers. Even though minicubes were developed to facilitate bulk shipping, they are often not shipped bulk for two reasons: (1) there may not be sufficient quantity in the shipment, and (2) the discharge at port would be very slow. Canadian producers are attempting to develop improved bulk shipping methods for all cubes. It is difficult to ship cubes by bulk methods because of the breakage and the damage that can result from improper handling of cubes. The current method of building the separations in a bulk ship is extremely hard on cubes, and results in some crushing of the product. After the product is loaded, a small vehicle is driven over the product to flatten the surface inside the hold, so that the separation may be put down. (Because of the resulting product damage, Neptune tries to avoid putting separations on top of cubes.) Other difficulties in shipping cubes by bulk methods involve loading the product on the ship. Chokefeeders are often employed to load the product; cubes, which are larger than pellets, may clog the feeder.

[44] USITC staff interview with Canadian alfalfa exporter, Vancouver, British Columbia, July 1991.

Transportation and Handling Within Japan

Transportation within Japan accounts for a substantial portion of the price of alfalfa products at the farm gate. Although U.S. and Canadian firms generally do not pay the costs of distribution in Japan, such costs affect total consumption of imported alfalfa. Moreover, representatives of the Canadian alfalfa products industry state that, through bulk shipping of cubes directly to outlying ports, Canadians obtain a cost advantage in Japan.[45] The end-users of alfalfa products in Japan are dispersed throughout the country, although the majority of imports arrive at the Japanese base ports near Tokyo. Shipments intended for other destinations, such as Hokkaido in the north or Kyushu in the south, must be trucked or barged from the base ports.[46] This additional transportation within Japan is reportedly very costly.[47] The map in figure 5-2 shows the location of ports of entry for alfalfa products entering Japan in 1990.

The distribution of shipments among the Japanese ports for alfalfa cubes from the United States and Canada is shown in table 5-3. The table also indicates which ports within Japan are equipped to handle bulk or containerized cargo, or both.

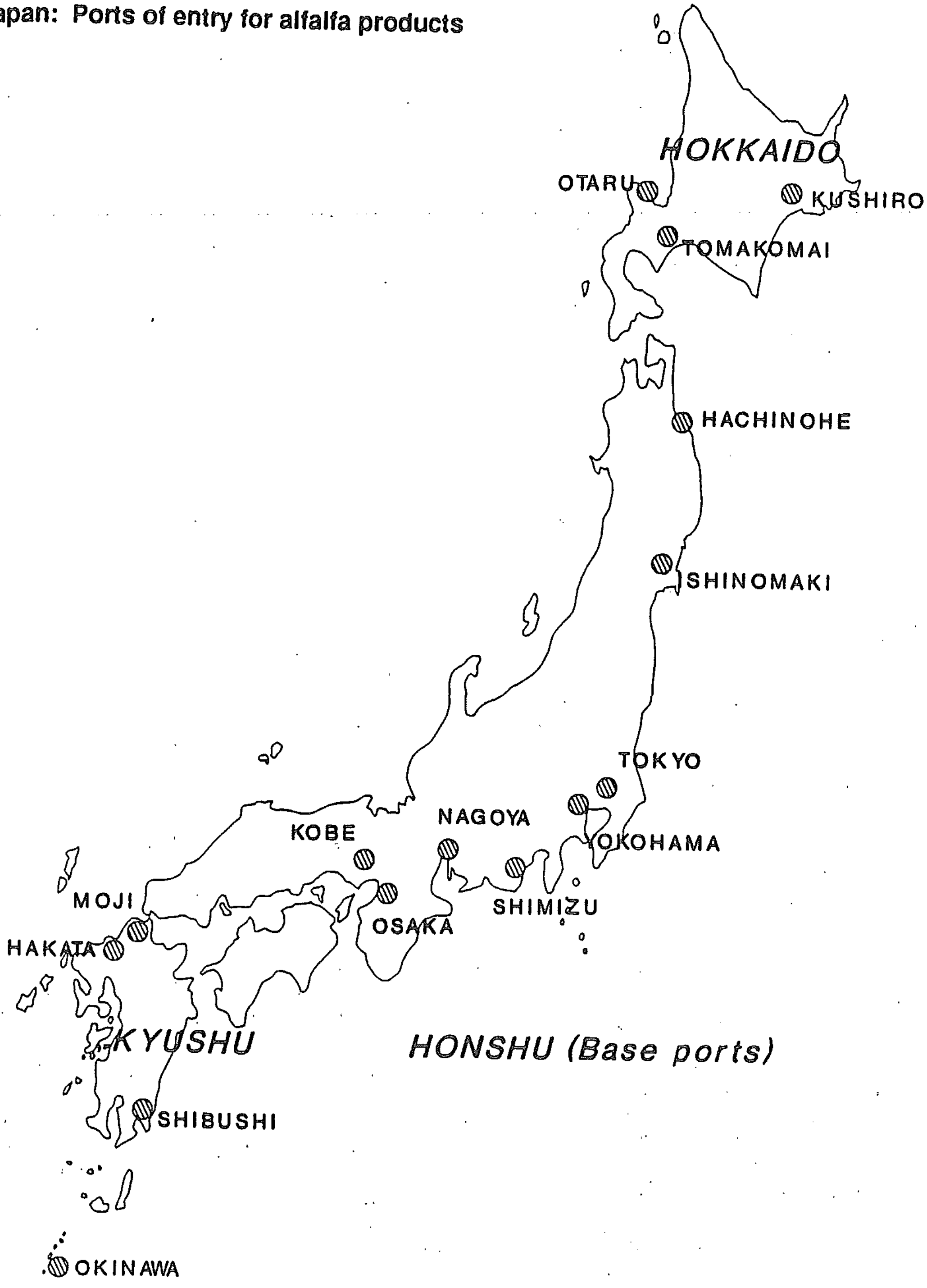
The breakdown of imports by port suggests that 30 percent or more of the Canadian cubes enters Japan at ports that handle only bulk shipments. Canadian shippers state that although exporting cubes in bulk causes some problems such as breakage and moisture, the market in these areas requires that the cubes be shipped bulk, using mainly the parcel method, because of insufficient container-handling facilities at the Japanese ports. The major purchasers charter entire vessels for the parcel shipments, often 20,000-ton

[45] Canadian Dehydrators Association, submission to USITC, Aug. 6, 1991, p. 30.

[46] As noted in chapter 4, about 35 percent of the Japanese dairy herd is in the northern island of Hokkaido.

[47] One Japanese trade source estimated that transportation within Japan is double the cost of ocean freight. Canadian industry sources estimate that transshipment within Japan costs about Can$60-70 per metric ton, roughly the same as ocean freight.

Figure 5-2
Japan: Ports of entry for alfalfa products



Source: *The New Oxford Atlas*, Oxford University Press.

Table 5-3
Alfalfa cubes: Japanese imports from the United States and Canada, by ports, 1990

Port	Canada		United States	
	Metric tons	Percent	Metric tons	Percent
Container ports:				
Tokyo	5.0	3.5	28.5	5.1
Yokohama	25.0	17.5	236.6	42.6
Kobe	11.4	8.0	149.6	26.9
Osaka	.1	.1	13.5	2.4
Nagoya	6.9	4.8	65.5	11.8
Okinawa	0	0	.5	.1
Subtotal	48.4	33.9	494.2	88.9
Bulk ports:				
Ishinomaki	19.1	13.4	1.8	.3
Shibushi	3.6	2.5	0	.0
Kushiro	11.3	7.9	2.1	.4
Hachinohe	8.5	5.9	2.3	.4
Otaru	.1	.1	0	0
Subtotal	42.6	29.8	6.2	1.1
Mixed ports:				
Hakata (Kyushu)	34.8	24.4	39.9	7.2
Tomakomai (Hokkaido; 90% bulk)	14.8	10.4	1.3	.2
Shimizu (Central Japan)	2.2	1.5	10.3	1.9
Moji	0	0	3.3	.6
Subtotal	51.8	36.3	54.8	9.9
Total	142.8	100.0	555.2	100.0

Source: Japan Ministry of Finance statistics.

vessels. Such a vessel may call at only two or three local ports, with pellets reportedly destined for the larger mills, while cubes go to wholesalers, farmers, cooperatives, and other end users. It costs an additional $25,000 for an additional port of call. Bulk freight rates to Hokkaido are several dollars per metric ton higher than rates to other ports because of vessel congestion.

For container freight, there are some available means of shipment directly to the outlying ports. One alternative, to ship via Westwood Lines to Hokkaido, is approximately $300-$500 per container (up to $20 per metric ton) higher than to the base ports. Most of the lines do not call at Hokkaido because of the lack of sufficient storage there. As a result, handling is a problem, and firms may be forced to pay high demurrage rates. One U.S. firm ships to Hakata by container, thus competing with the Canadian charter bulk carriers.

Once the cargo has reached port, all warehousing, labor, bagging, and inland freight are additional and reportedly extremely costly. Methods of domestic distribution vary. Bags of 50 kilograms may be transported to retail outlets or directly to farms by 2-ton truck. More Japanese farms now are taking delivery of a full container-load of alfalfa products, thereby saving on distribution costs. The price difference between ex-warehouse and farm gate for small-lot purchases is 6,000-8,000 yen per ton, around 15-20 percent of the total farm gate price, according to spot prices reported in USDA attache reports from Tokyo.[48] Delivery of a full container-load, rather than the small-lot purchase, reduces the farm gate price by about 10 percent per metric ton. Canadian industry sources report slightly higher distribution costs as a percent of product price, probably because the price used as a base is dehydrated pellets, which are generally less expensive than cubes or baled hay. The farm gate price in Japan for dehydrated pellets is reportedly 96 percent above the landed value at the Japanese port.[49] The price difference between ex-warehouse and farm gate is about 34 percent for dehydrated pellets.

Comparison of U.S. and Canadian Transportation Costs

The differences between U.S. and Canadian inland transportation costs are accounted for mainly by the use of different modes of shipment and, to a lesser degree,

[48] These reports do not specify whether the destination is close to the base ports, or if this price includes any shipments between base ports and the far northern or southern islands.

[49] Stuart Garven, "Quality: Its Role in Our Past and Future," presented at 12th Annual Canadian Dehy Conference and Trade Show, Nov. 18-20, 1991, p. 19.

varying distances from the production point to the port. In this section, U.S. and Canadian inland freight charges for the different types of alfalfa products are contrasted on a U.S. dollar per ton-mile basis. The ocean shipping component of costs is expressed in U.S. dollars per ton, rather than per ton-mile, for the different modes commonly used by the U.S. and Canadian industries because both U.S. and Canadian production travels roughly the same distance to reach the Japanese market. Additional variations in total freight costs may derive from inland freight and handling charges in Japan; however, data are not available to compare these components of transportation costs beyond that discussed in the previous section.

No U.S. producers regularly export pellets using bulk methods because of the small quantity of U.S. shipments; an average freight rate per ton-mile is therefore not easily calculated, and a direct comparison of U.S. and Canadian rates cannot be shown (tables 5-4 and 5-5). Canadian producers export cubes using bulk and container methods, therefore, both bulk and container rates are shown for Canada (table 5-4). Because both U.S. and Canadian producers ship baled hay in containers and hay is not eligible for the WGTA rate, U.S. and Canadian freight rates for baled hay are comparable. Therefore the major direct comparison between U.S. and Canadian transportation costs is in alfalfa cubes, shown in table 5-5.

Table 5-4
Alfalfa products: Average freight rates for U.S. and Canadian products exported to Japan, 1991
(In U.S. cents per ton-mile)

	Inland	*Ocean freight*
Pellets (bulk):		
U.S	(1)	(1)
Canada	1.1	0.5
Cubes:		
U.S. (container)	4.0	1.0
Canada (bulk)	1.1	.5
Canada (container)	1.1	1.0
Baled hay:		
U.S. (container)	8.0	1.0
Canada (container)	8.0	1.0

[1] Not available.

Note.—For example, inland freight for U.S. cubes traveling 500 miles by truck would be about $20 per metric ton. The ocean component of roughly 6,000 miles adds about $61 per metric ton for containerized cargo.
Source: USITC staff.

Table 5-5
Alfalfa products: Average transportation costs, by primary sources and modes, in U.S. dollars and as share of landed value, 1991

Source and mode	*Landed value[2]*	*Inland freight[3]*	*Ocean freight[4]*	*Total freight*
Pellets:				
U.S.	256	(5)	(5)	(5)
Canadian:				
U.S. dollars	160	9	31	40
Percent of landed value	(5)	6	19	25
Cubes:				
U.S:				
U.S. dollars	225	21	61	82
Percent of landed value	(5)	9	27	36
Canadian:				
Bulk:				
U.S. dollars	216	9	31	40
Percent of landed value	(5)	4	14	19
Container:				
U.S. dollars	216	9	61	70
Percent of landed value	(5)	4	28	32
Average:				
U.S. dollars	216	9	46	55
Percent of landed value	(5)	4	21	25

[1] Canadian alfalfa products move a minimum of 700 miles to reach port; U.S. products average 500 miles.
[2] Figures shown are 1990 average import unit values, compiled from Japan Tariff Association statistics.
[3] Inland transportation figures exclude handling charges.
[4] Ocean freight represents charges to Japanese base ports.
[5] Not applicable.

One major difference in rates occurs in inland transportation, where the rates Canadian shippers pay under the WGTA are significantly lower per ton-mile than are rates paid by U.S. shippers. There is also a smaller but observable differential between the rates paid per ton-mile using bulk ocean shipping methods as opposed to container rates. However, the total cost savings from bulk shipment outweigh the inland cost advantage provided by the WGTA, because of the greater distance traveled in the ocean component of total transportation. For example, when U.S. cube freight costs (container) are contrasted with the average costs for Canadian cubes, the ocean shipping advantage accounts for approximately 56 percent of the total freight differential of $27 between the two. This cost differential applies to one-half to two-thirds of Canadian cube shipments, roughly 70,000-95,000 metric tons in 1990. The remainder of the Canadian cost advantage, 44 percent of the total freight differential, is accounted for by the WGTA on inland transportation, where U.S. shippers pay approximately 4 cents per ton-mile and Canadian shippers pay 1.1 cents per ton-mile. The farther the Canadian producer is from the port of departure, then the cost advantage from the WGTA is a greater proportion of the total transportation cost differential.

Economic Effects on Alfalfa Product Markets of Removing Canadian Transportation Subsidies

This section presents an economic model that quantifies the impact on the U.S. and Canadian alfalfa products industries of removing the WGTA. This is in response to a request by the United States Trade Representative. Among the government programs discussed earlier, the WGTA was selected because it is considered to be the most significant government program affecting competitive conditions for alfalfa product exports from North America. The alfalfa products examined in this section include cubes and pellets only, because exports of baled hay do not benefit from the transportation subsidy. The model is partial equilibrium in nature since it formally captures only the structure of the U.S., Canadian, and world alfalfa markets. A technical description of the model is presented in the appendix.

The Model

In order to calculate the effects on production, consumption, and trade in alfalfa products of removing the Canadian transportation subsidy, the model examines the domestic and export markets for alfalfa products in both the United States and Canada. The rest-of-the-world is divided into Rest-of-World Importers and Rest-of-World Exporters and treated in less detail than the United States and Canada since there is relatively little production and consumption of alfalfa cubes and pellets in other countries. The model delineates three exporting regions: the United States, Canada, and Rest-of-World Exporters; and two importing regions: Japan and Rest-of-World Importers. The world price is determined when the quantity demanded by all importing countries equals the quantity supplied by all exporting countries. This world price equals the export price (f.o.b. west coast ports) in the United States and Canada. The price of exportable alfalfa products at the port equals the price received by the alfalfa producer plus the price of inland transportation.

The price of inland transportation paid by Canadian shippers reflects the subsidy received by the suppliers of transportation services. In the model, the subsidy rate is calculated as an ad valorem percentage of the initial price of transportation paid by the alfalfa exporter.[50] That is, the difference between the rate users pay for transportation services and the rate received by suppliers is measured by the subsidy rate. Transportation services are assumed to be provided at a fixed price, so that when the subsidy is removed, the price of transportation services paid by the producers and exporters of alfalfa products is expected to rise by the full amount of the subsidy.

Hence, for a given world price, the increase in the price of transportation after removal of the WGTA is expected to lower the price received by the producer, net of transportation costs. This reduction in the producer price is expected to result in a fall in Canadian production, which in turn, reduces total world supply. As a consequence of the reduced world supply of alfalfa cubes and pellets, the world price of these products is expected to rise, and equilibrium will be restored when total world consumption of alfalfa products falls sufficiently to match the lower level of total world supply. Hence, removing the transportation subsidy is expected to result in a lower level of Canadian production and exports. In contrast, in the United States the higher world price is expected to increase U.S. production and reduce U.S. consumption, and thereby result in a higher level of U.S. exports of alfalfa products. The higher world price also is expected to reduce consumption of cubes and pellets in the importing regions, Japan and Rest-of-World Importers.

Prior to presenting the results of the model, the assumptions and data used in estimating the impact of subsidy removal are presented below.

Assumptions Regarding Allocation Among Importing Countries

In this model, alfalfa pellets from the United States, Canada, and other countries are assumed to be identical from the point of view of the consumer; similarly for alfalfa cubes from different supplying countries. As such, the model establishes one,

[50] Using the initial data, the subsidy rate used in the model is approximately 248.5 percent. This value was obtained by using an initial price of transportation equal to $7.81 per ton and a price of $27.22 per metric ton to represent the transportation rate without the rail subsidy in place. The $27.22 is the current administered rate paid by Canadian shippers of products not eligible for WGTA benefits.

common world price for each product that guides both production and consumption decisions.[51] Since alfalfa products are treated as identical regardless of the supplier, and there is only one world price related to each of these products, the allocation of supply from a given exporting region to each importing region is indeterminate without further information. The exact allocation of supply would likely depend upon factors such as the reliability of supply from a given exporting country, the proximity of a supplier, or quality considerations.

A number of assumptions are embodied in the model in order to make the allocation of supply determinate among exporters. For each of the three exporting regions, total exports equal exports to Japan plus exports to the Rest-of-World Importers. The model also assumes that exports from the United States and the Rest-of-World Exporters to the Rest-of-World Importers remain constant. In effect, this assumption will allow the model to calculate the maximum displacement of Canadian exports from the Japanese market when the transportation subsidy is removed. In a sense, this assumption then provides an "upper bound" set of estimates on the effects of removing the subsidy.

[51] As has been shown in earlier chapters, there is a differential between U.S. and Canadian prices and hence there is no one common world price. For purposes of modeling, one world price has been assumed. This in turn would lead the results presented here to be over-estimates because quality differences and product differentiation that affect price would tend to prevent a price change such as the removal of the WGTA from being passed through to the fullest extent.

Table 5-6 indicates the values of demand and supply elasticities used for calculating the impact on consumption, production, and trade in alfalfa products if the WGTA subsidy is removed in Canada. The Commission imputed baseline values for the demand and supply elasticities after discussion with industry experts and academic researchers. In addition, sensitivity analysis was conducted by using lower and upper bound values for the demand and supply elasticities. The sensitivity analysis focused on values for domestic supply in the United States and Canada and Japanese import demand. The domestic supply elasticity for the United States and Canada used in the experiments ranged from a low estimate of 0.5 to a high estimate of 1.9. Japanese import demand for cubes ranged from 1.0 to 3.0. Expected Japanese import demand for pellets ranged from a low of 0.5 to a high of 2.5. The remaining data requirements are indicated in the appendix.

Results

Tables 5-7 and 5-8 present the estimated effects of removing the Canadian transportation subsidy. As was mentioned above, for each type of alfalfa product, removal of the Canadian transportation subsidy raises the price of transportation to the Canadian shipper.

Table 5-6
Elasticities used in economic model on removing Canadian transportation subsidy on alfalfa cubes and pellets

	Baseline
Cubes:	
Domestic supply:	
United States	1.2
Canada	1.2
Domestic demand:	
United States	0.5
Canada	0.5
Japanese import demand[1]	2.0
Rest-of-world import demand	2.0
Rest-of-world supply[2]	1.5
Transportation supply	([3])
Pellets:	
Domestic supply:	
United States	1.2
Canada	1.2
Domestic demand:	
United States	0.5
Canada	0.5
Japanese import demand[1]	1.5
Rest-of-world import demand	2.0
Rest-of-world supply[2]	1.6
Transportation supply	([3])

[1] Japanese import demand elasticities are believed to be different for pellets and cubes. The products go to different markets in Japan, and the number of available substitutes differs for each. Japanese trade sources state that the value for import demand elasticity for pellets is lower than that for cubes.
[2] Calculated in the model.
[3] Infinite.

Table 5-7
Results of removing Canadian transportation subsidy on alfalfa cubes and pellets, where domestic supply elasticities vary

	Low ε_s=0.5	*Baseline* ε_s=1.2	*High* ε_s=1.9
Cubes:			
Percentage change in domestic output:			
United States	0.4	1.6	3.0
Canada	-8.3	-18.1	-26.6
Percentage change in exports:			
United States	0.5	1.9	3.7
Canada	-10.9	-23.8	-35.0
Percentage change in exports to Japan:			
United States	0.5	2.0	3.8
Canada	-13.0	-28.9	-42.9
Percentage change in Japanese imports (total)	-1.5	-2.6	-3.1
Percentage change in world price	0.8	1.3	1.6
Pellets:			
Percentage change in domestic output:			
United States	1.4	5.1	9.4
Canada	-7.4	-15.0	-21.7
Percentage change in exports:			
United States	369.4	964.6	1,576.4
Canada	-8.7	-17.8	-25.8
Percentage change in exports to Japan:			
United States	369.4	964.6	1,576.4
Canada	-9.6	-20.4	-30.3
Percentage change in Japanese imports (total)	-4.0	-6.0	-6.8
Percentage change in world price	2.8	4.2	4.8

Table 5-8
Results of removing Canadian transportation subsidy on alfalfa cubes and pellets, where Japanese import demand varies

	Low	*Baseline*	*High*
Cubes:			
	η=1.0	η=2.0	η=3.0
Percentage change in domestic output:			
United States	2.2	1.6	1.2
Canada	-17.4	-18.1	-18.4
Percentage change in exports:			
United States	2.7	1.9	1.5
Canada	-22.9	-23.8	-24.3
Percentage change in exports to Japan:			
United States	2.8	2.0	1.6
Canada	-28.2	-28.9	-29.2
Percentage change in Japanese imports (total)	-1.8	-2.6	-3.0
Percentage change in world price	1.8	1.3	1.0
Pellets:			
	η=0.5	η=1.5	η=2.5
Percentage change in domestic output:			
United States	6.1	5.1	4.4
Canada	-14.0	-15.0	-15.8
Percentage change in exports:			
United States	1,152.9	964.6	831.4
Canada	-16.4	-17.8	-18.7
Percentage change in exports to Japan:			
United States	1,152.9	964.6	831.4
Canada	-19.6	-20.4	-21.0
Percentage change in Japanese imports (total)	-2.4	-6.0	-8.6
Percentage change in world price	5.1	4.2	3.7

This increase in the cost of transportation lowers the producer price of alfalfa products in Canada for a given world price, that is, the f.o.b. plant price of alfalfa products falls. The lower producer price results in a decrease in Canadian production and a decrease in Canadian exports. The reduction in Canadian exports raises the world price, since Canada is a major exporter of alfalfa products. This increase in the world price, as shown in tables 5-7 and 5-8, is expected to range from about 3 percent to about 5 percent for pellets and from 1 percent to 2 percent for cubes and will be greater the larger the share of Canadian exports in total world supply. Imports of alfalfa by Japan and the Rest-of-World Importers falls, given the higher world price. For both alfalfa cubes and pellets, table 5-7 shows a reduction in Canadian output and exports when the subsidy is removed. The percentage reduction in both output and exports will be larger the greater the elasticity of domestic supply.

In the United States, removal of the Canadian transportation subsidy results in an increase in both production and exports of alfalfa. This occurs because removal of the Canadian subsidy raises the world price, thus U.S. production and exports expand. As shown in table 5-7, the responsiveness of U.S. production to changes in the world price will depend on the elasticity of domestic supply. Other things equal, the larger the elasticity of domestic supply, the greater will be the percentage change in U.S. output from a given increase in the world price. For the case of pellets, the percentage increase in U.S. exports which results from removal of the subsidy is quite sensitive to the domestic supply elasticity. This occurs because the initial level of exports is very small relative to domestic production. Thus, the percentage change in exports, measured relative to the base quantity, will be quite sensitive to changes in the domestic supply elasticity.

Note that the increase in U.S. production and exports cannot be larger than the reduction in Canadian output and exports. This is because when the Canadian subsidy is removed, the world price rises and total consumption of alfalfa must fall. Therefore, the total reduction in Canadian exports must be greater than the total increase in U.S. exports. Furthermore, when the world price rises, exports from third-country suppliers rise as well, which mitigates the increase in U.S. production and exports.

Concerning the issue of allocation of supply between importing regions, tables 5-7 and 5-8 show the changes in U.S. and Canadian exports to Japan. As already mentioned, exports from each of the three exporting regions to the rest of the world are assumed to remain constant. Therefore, exports from both the United States and Rest-of-World Exporters to Japan must rise because the world price rises. Of course, Canadian exports to Japan must fall when the subsidy is removed. With respect to the allocation of supply across importing regions, other results are possible, depending upon assumptions concerning the behavior of importers and exporters. However, regardless of those assumptions, exports of alfalfa from both the U.S. and the Rest-of-World Exporters will increase when the Canadian subsidy is removed, and Canadian exports will fall. The allocation of these supply changes between importing regions will depend, in general, on factors not considered here. Therefore, the results reported here are meant to be suggestive about the kinds of results obtained under a given set of assumptions.

The outcome for alfalfa pellets differs from that for alfalfa cubes because the two products are destined for different end-uses within Japan and the current trade patterns between Japan and the supplying countries are different for pellets than for cubes. Canada is currently the major supplier of pellets and the United States is the major supplier of cubes. Upon removal of the WGTA, the percentage decline in Canadian production and exports of cubes would be slightly larger than the percentage decline for pellets. The results suggest that for the United States, however, the percentage increase in production and exports in pellets would be far greater than the percentage increase in production and exports of cubes because the United States initially exports only a small amount of pellets. A large percentage increase over this small base yields an increase in exports that is not large in absolute quantity.

Although the table presents markedly different percentage changes in exports for the United States and Canada, the shift in trade experienced by each country is much closer in terms of quantity. This is a result of the United States and Canada having much different base quantities for different products. For example, a 28.9-percent decline in Canadian exports of cubes shown in table 5-8 represents approximately 41,000 metric tons in exports to Japan, based on 1990 data. The corresponding increase in U.S. cube exports is only about 2.0 percent, but because U.S. cube exports are large, 2.0 percent represents about 11,000 metric tons. This result occurs because the model assumes that the supply of exports from the United States and the Rest-of-World Exporters to the Rest-of-World Importers remains constant. The United States is expected to absorb most of the market share decline in Japan experienced by Canadian exporters, reduced by the decline in Japanese consumption that results from the higher world price.

Chapter 6
Competitive Conditions

Introduction

The alfalfa products industries of the United States and Canada are competing directly for the export market. Over the past decade these two competitors have vied for shares of a growing market in the Pacific Rim countries. Korea, Taiwan, and especially Japan have imported growing quantities of alfalfa pellets, cubes, and bales to supply beef, dairy, poultry, and swine industries. As shown in the earlier chapters, differences in raw materials, infrastructure, and government role have led to a degree of specialization by product. The U.S. industry dominates these export markets for cubes and baled hay, while the Canadian industry dominates these markets for pellets. There is little direct competition for these markets from either local producers or other exporters. However, alfalfa pellets, cubes, and bales do compete against other forage products in these markets.

This chapter begins with a brief discussion of the Japanese import market for alfalfa products, first in the aggregate and then separately for pellets, cubes, and double-compressed bales. Market share, defined as the share of the Japanese import market held by each supplier, is measured in terms of quantity, not value, of the products. Financial conditions are examined next, using data supplied for this investigation by U.S. and Canadian firms. The levels and trends in the costs of production and the prices of the products are also presented since these two factors are keys to the long-run competitiveness of the U.S. industry. The chapter ends with a look at currency exchange rates and government programs.

Market Share

As shown in chapter 4, the Japanese market for alfalfa products increased from approximately 500,000 metric tons in 1981 to over 1.2 million metric tons in 1990 (fig. 6-1a). Imports of alfalfa pellets rose from 248,000 metric tons in 1981 to a high of 368,000 metric tons in 1983, and have since varied somewhat with a 1990 level of 298,000 metric tons. Alfalfa cubes showed the largest growth of the three products examined, increasing steadily from 222,000 metric tons in 1981 to 713,000 metric tons in 1990. Over the 10-year period, imports of double-compressed alfalfa bales rose from an estimated 23,000 metric tons to 202,000 metric tons.

The alfalfa products industries of both the United States and Canada benefited from the significant growth in the Japanese market. Imports of all alfalfa products from the United States increased from 347,000 metric tons in 1981 to 756,000 metric tons in 1990 for an average annual growth rate of 9.0 percent (fig. 6-1b). Japanese imports of U.S. alfalfa cubes rose from 211,000 in 1981 to 555,000 metric tons in 1990. Over the same period, imports of U.S. double-compressed alfalfa bales rose from an estimated 22,000 metric tons to 199,000 metric tons. These increases more than offset the decline in imports of U.S. alfalfa pellets from 114,000 metric tons in 1981 to less than 2 metric tons in 1990.

Japanese imports of all alfalfa products from Canada increased from 113,000 metric tons in 1981 to 440,000 in 1990, for an average annual growth rate of 16.3 percent (fig 6-1c). Imports of Canadian alfalfa pellets rose from 106,000 metric tons in 1981 to 296,000 metric tons in 1990. Over the same period, imports of Canadian alfalfa cubes increased from 7,000 metric tons in 1981 to 143,000 metric tons in 1990.

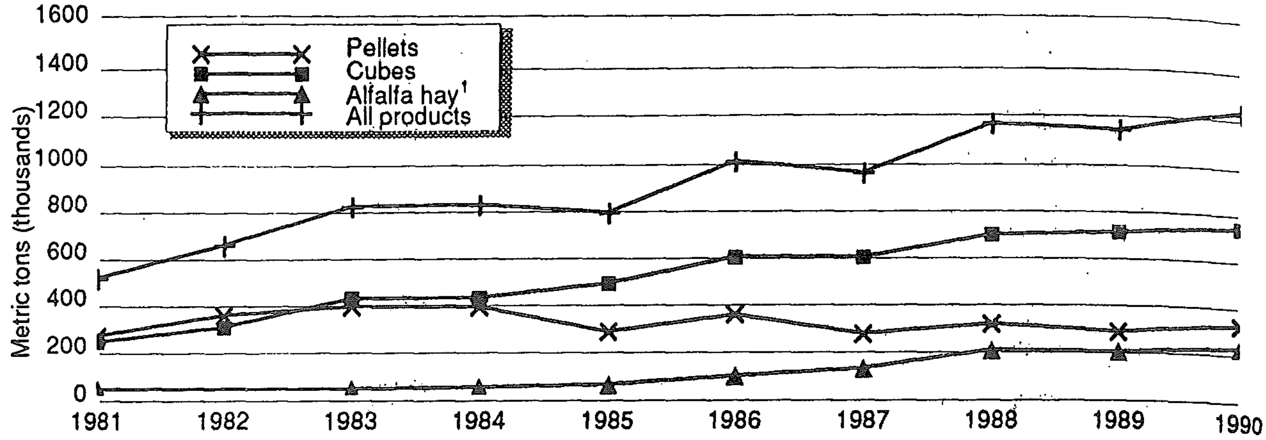
While the U.S. and Canadian industries have both gained export volume over the past decade, the distribution of these gains differed. The U.S. share of the Japanese market for alfalfa pellets, cubes, and bales combined decreased from about 70 percent in 1981 to about 62 percent in 1990, while the Canadian share increased from about 23 percent to about 37 percent over the same period (fig. 6-2a and fig. 6-2b).

The U.S. industry's drop in share of the Japanese market for all alfalfa products somewhat masks the changes that have occurred in the markets for the individual alfalfa products. The United States lost nearly all of its Japanese market for alfalfa pellets to Canada over the decade with the loss occurring essentially between 1982 and 1985. The reasons for the rapid decline in U.S. pellet exports to Japan are not entirely clear. While the inclusion of alfalfa pellets and cubes under the provisions of the Canadian Western Grain Transportation Act (WGTA) in 1984 no doubt contributed to the decline, an increase in energy prices in the United States in 1982 and 1983 (see ch. 2) that was translated into price increases for dehydrated alfalfa pellets was probably partially responsible. Canada increased its share of the Japanese alfalfa pellet market from a level roughly equal with the United States in 1981 to about 99 percent by 1990.

The United States consistently held the majority of the expanding Japanese market for alfalfa cubes between 1981 and 1990. However, the U.S. market share in cubes declined toward the end of the period, from 92 percent in 1986 to 78 percent in 1990. Canada increased its share of the Japanese market for alfalfa cubes from 3 percent in 1981 to 20 percent in 1990, with more than two-thirds of the increase occurring between 1987 and 1989. The reason for the increasing Canadian share of the cube market is not clear. Canadian exports of cubes were steady between 1984, when the WGTA went into effect, and 1987. They then increased in 1988 and 1989.

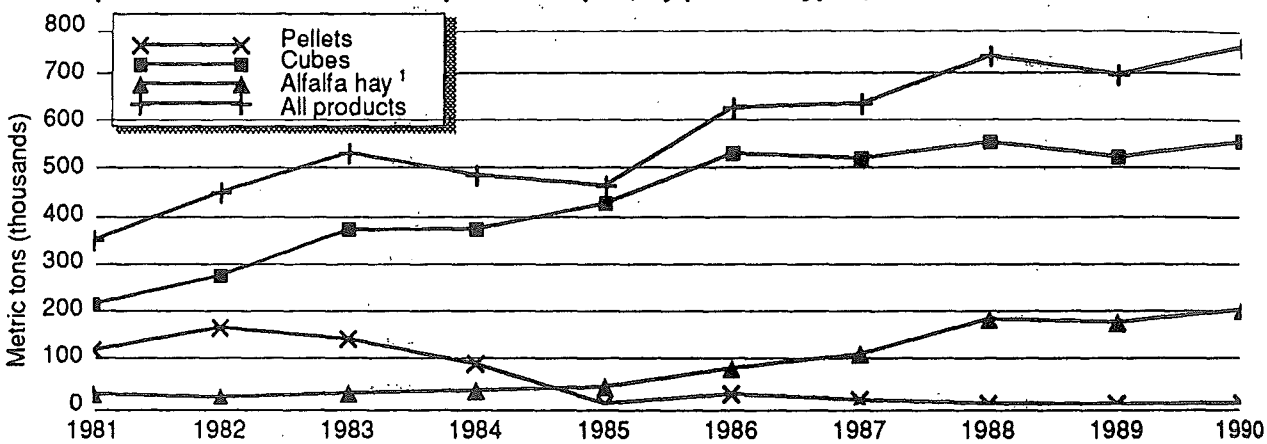
The U.S. holds the dominant share of the Japanese market for alfalfa hay. The U.S. market share of all hay imported into Japan, of which alfalfa accounts for about one-fourth, increased from 81 percent to 91 percent over the decade. Canadian market share for hay imported into Japan is believed to be less than 1 percent. Although official statistics on market share for alfalfa hay from the U.S. and Canada are not

Figure 6-1a
Alfalfa: Japanese imports of alfalfa products, by product types, 1981-90



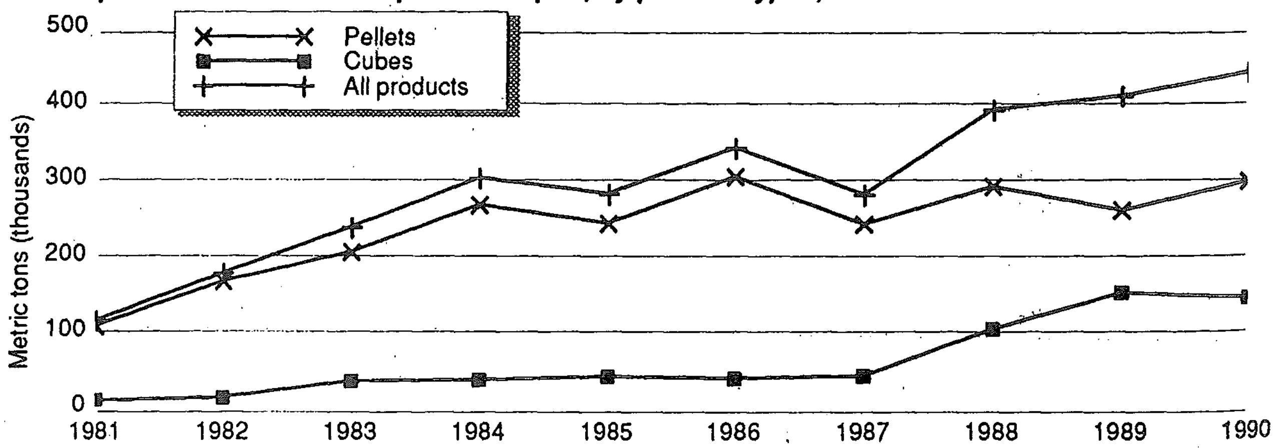
[1] Alfalfa hay data are USITC staff estimates.

Figure 6-1b
Alfalfa products: United States exports to Japan, by product types, 1981-90



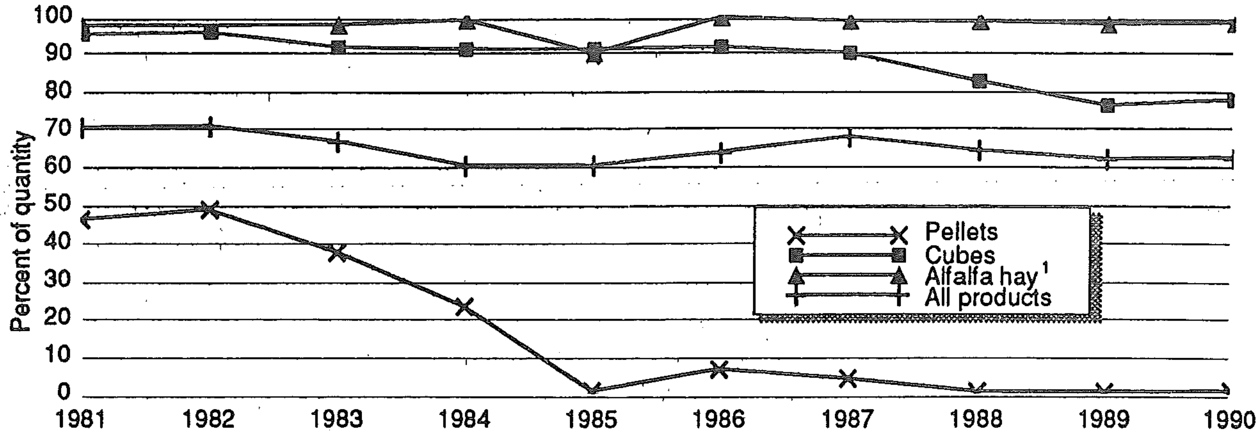
[1] Alfalfa hay data are USITC staff estimates.

Figure 6-1c
Alfalfa products: Canadian exports to Japan, by product types, 1981-90



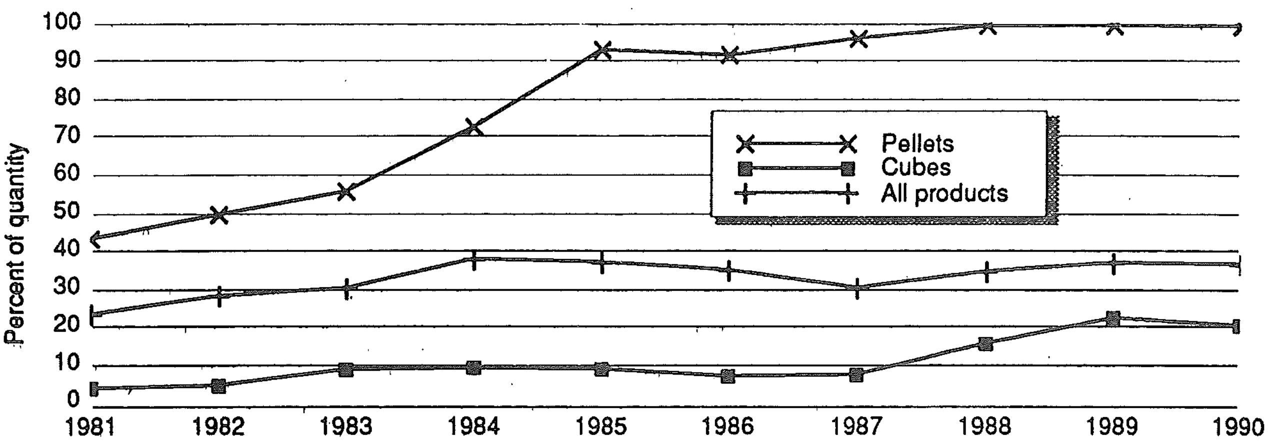
Note.—Canadian exports of alfalfa hay are insignificant.
Source: Japan Tariff Association.

Figure 6-2a
Alfalfa: Share of Japanese market held by the United States, by product types, 1981-90



[1] Alfalfa hay data are USITC staff estimates.

Figure 6-2b
Alfalfa[1]: Share of Japanese market held by Canada, by product types, 1981-90



[1] Canadian share of alfalfa hay is estimated to be less than 1 percent.

Source: Japan Tariff Association.

available, baled alfalfa hay is believed to have declined slightly as a share of total hay imports into Japan during the 1980s. Industry sources estimate the U.S. share of the alfalfa hay market to be about 99 percent.

By the market share measure, the U.S. industry has become less competitive with the Canadian industry in the aggregate Japanese market for alfalfa products. The United States is essentially out of the alfalfa pellet market and appears to be losing its lead in the cube market. Information available suggests little change in competitiveness in the Japanese market for baled alfalfa hay because the U.S. maintains virtual domination.

The economic model presented in chapter 5 suggests that the WGTA has affected both the price of U.S. and Canadian exports to Japan and the shares of the Japanese market held by the United States and Canada. The baseline estimates indicate that, in the absence of the rail freight subsidy,[1] world prices for pellets and cubes would have been 4.2 and 1.3 percent higher, respectively. These higher prices would have caused Japanese imports of cubes and pellets to decline by 2.6 percent and 6.0 percent, respectively. The U.S. share of the reduced Japanese market for alfalfa cubes would have been 85 percent instead of 81 percent while the Canadian share of the cube market would have been 11 percent instead of 15 percent. In the reduced Japanese market for alfalfa pellets, the U.S. share would have been 17 percent instead of 1 percent,

[1] If the WGTA were removed, the analysis assumes that shippers would pay $27.22 per metric ton, which is the current administered rate paid by Canadian shippers of products not eligible for the WGTA.

while the Canadian market share would have been 83 percent instead of 99 percent.

Financial Conditions

The profitability of an industry is a familiar indicator of its financial health and its ability to compete with foreign rivals. For example, an increase in net returns could be due to improved efficiency (which reduces costs) or to the marketing of higher quality products (which increases revenues) or to increased demand (which increases sales). Likewise, a decline in net returns may be attributable to a failure either to take full advantage of new technology or to correctly assess consumer demand for a particular product. Trends in revenues and costs, changes in the prices of alfalfa products or the productivity of inputs, and increasing or decreasing financial support from the government, are all factors that can produce changes in an industry's profitability and thus its ability to compete for market share.

Public data on recent industry profitability are not available. However, U.S. firms responded to USITC questionnaires, and representatives of the Canadian Dehydrators Association issued a questionnaire to association members that is similar in many respects to the questionnaire sent to the U.S. industry.

The U.S. alfalfa products industry showed mixed results for the sample period 1986-90 (table 6-1). Those producing dehydrated pellets and meal reported positive net income in each year, while those producing double-compressed bales reported net losses in 1987, 1989, and 1990. Producers of sun-cured pellets and meal reported net losses from 1986 through 1988 and then positive net income in both 1989 and 1990. Producers of sun-cured cubes reported losses in 1986 and then positive net income the remainder of the period. The Canadian alfalfa processing industry reported positive net income during the entire sample period 1986-90.

Costs of Production

The leading cost elements in alfalfa processing are raw material, labor, and energy. These items are compared for U.S. and Canadian processors in 1990 in fig. 6-3. Unless otherwise specified, the data presented in the following section are for U.S. producers of pellets and cubes in the aggregate, as shown in chapter 2, excluding double-compressed bales. This is the best available industry segment to compare with the Canadian industry, since Canada produces very little compressed alfalfa. Data are shown in U.S. dollars; it should be noted that depreciation of the U.S. dollar against the Canadian dollar over the period may account for part of the apparent faster rate of increase in Canadian costs.

Information submitted by both U.S. and Canadian processors, shown in chapters 2 and 3, indicates that total production costs for alfalfa products were higher in the United States than in Canada in 1986 through 1988, but that in 1989 and 1990, costs to Canadian producers exceeded those for U.S. producers. U.S. and Canadian processors of pellets and cubes reported total costs as shown in the tabulation at the bottom of the page (in U.S. dollars per metric ton).

These data include a larger number of responding firms from the United States than for Canada, but the respondents for the respective industries represent a similar share of total industry production. The five Canadian firms responding accounted for 30 percent of the total quantity produced in 1990; the 21 U.S. firms accounted for an estimated 23 percent of the value of domestic shipments in 1990.

Raw materials accounted for the largest share of total costs for both the U.S. and Canadian industries, and the costs increased rapidly during the period examined. More than one-half of total costs incurred by producers in the United States was for raw materials; raw materials costs were around 40 percent of the total for Canadian producers. Costs for alfalfa hay purchased for processing increased at an average annual rate of 12 percent for U.S. producers and 35 percent for Canadian producers, as shown in the tabulation at the top of the next page (in U.S. dollars per metric ton).

The difference between costs of alfalfa hay in the United States and Canada would be larger if the export-oriented segment of the U.S. industry were separated from that which produces primarily for the U.S. domestic market. The data shown above for the United States include a large number of firms in the Midwestern United States, where alfalfa hay is relatively lower cost than on the west coast. Firms that produce primarily dehydrated pellets (mainly in the Midwest) reported raw material costs in 1990 of $39.34 per metric ton on average.

The best available comparison for raw material cost is for U.S. firms on the west coast compared with the Canadian industry. The questionnaire responses indicate that U.S. exporting firms have significantly higher raw material costs than those for Canadian exporting firms. Raw material costs for a sample of west coast pelleters and cubers averaged $89.64 per metric ton in 1990. Firms that produce double-compressed bales, which are located exclusively in the Western States, reported raw material costs of $84.70 per metric ton in 1989 and $97.71 per metric ton in 1990.[2]

[2] Some of the higher cost for producing double-compressed bales may result from the need to use top quality hay for this product, whereas cubes or pellets may be produced using less exacting standards for the hay input.

	1986	1987	1988	1989	1990
United States	$85.63	$86.16	$100.21	$109.21	$109.62
Canada	57.47	85.41	91.57	111.38	137.21

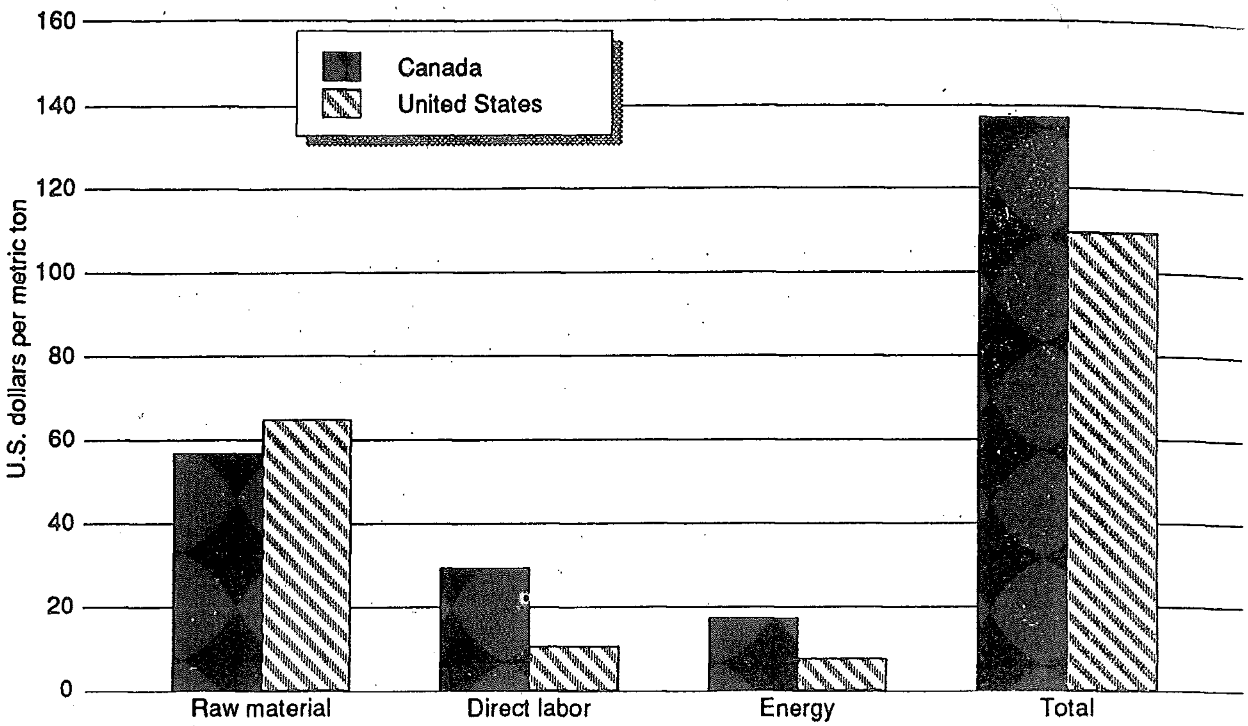
	1986	1987	1988	1989	1990
United States	$40.86	$42.56	$56.53	$67.08	$64.87
Canada	16.97	31.36	37.88	47.93	56.18

Table 6-1
Profitability of U.S. and Canadian firms producing alfalfa products, fiscal years 1986-90

	1986	1987	1988	1989	1990
	Ratio to total net sales (percent)				
U.S. dehydrated pellets:					
Cost of goods sold	92.0	92.0	86.4	85.0	89.7
Gross profit	8.0	8.0	13.6	15.0	10.3
Selling, general, and administrative expenses	5.4	6.2	6.8	5.8	5.6
Operating income	2.6	1.9	6.8	9.2	4.7
Net income before income taxes	4.1	3.8	9.1	9.2	4.0
U.S. sun-cured pellets:					
Cost of goods sold	100.6	104.7	102.9	89.0	84.3
Gross profit or (loss)	(0.6)	(4.7)	(2.9)	11.0	15.7
Selling, general, and administrative expenses	3.7	4.4	3.6	2.9	3.2
Operating income or (loss)	(4.4)	(9.0)	(6.5)	8.1	12.6
Net income or (loss) before income taxes	(9.9)	(15.0)	(6.5)	10.0	11.5
U.S. sun-cured cubes:					
Cost of goods sold	89.2	85.8	87.3	87.7	88.3
Gross profit	10.8	14.2	12.7	12.3	11.7
Selling, general, and administrative expenses	12.0	9.1	6.1	7.0	8.2
Operating income or (loss)	(1.2)	5.1	6.6	5.3	3.5
Net income or (loss) before income taxes	(1.4)	4.9	6.5	5.8	5.1
U.S. double-compressed bales:					
Cost of goods sold	(1)	[**]	95.9	97.2	97.9
Gross profit	(1)	[**]	4.1	2.8	2.1
Selling, general, and administrative expenses	(1)	[**]	2.3	2.0	2.2
Operating income or (loss)	(1)	[(**)]	1.9	0.7	(0.2)
Net income or (loss) before income taxes	(1)	[(**)]	0.6	(0.2)	(1.8)
U.S. dehydrated and sun-cured aggregate[1]:					
Cost of goods sold	92.1	91.0	89.2	88.3	90.3
Gross profit	7.9	9.0	10.8	11.7	9.7
Selling, general, and administrative expenses	7.1	6.9	5.9	5.7	6.0
Operating income	0.8	2.0	4.8	6.0	3.7
Net income or (loss) before income taxes	(0.1)	1.5	5.7	6.3	3.9
Canadian dehydrated and sun-cured aggregate[1]:					
Cost of goods sold	67.2	82.3	77.2	79.5	84.4
Gross profit	32.8	17.7	22.8	20.5	15.6
Selling, general, and administrative expenses	13.0	12.1	10.4	11.2	12.5
Operating income	19.9	5.6	12.4	9.3	3.1
Net income or (loss) before income taxes	13.8	4.2	10.4	8.3	1.3

[1] Includes operations on dehydrated pellets and meal, sun-cured pellets and meal, sun-cured cubes, and other alfalfa products.

Figure 6-3
Alfalfa products production costs, United States and Canada, 1990



Note.—Excludes U.S. producers of double-compressed bales.

Source: Industry responses to USITC questionnaires, and questionnaires of the Canadian Dehydrators Association.

Raw material costs increased rapidly for both industries, in part because of the increasing production of alfalfa cubes relative to pellets. The share of cubes in total production is increasing in response to export markets. Because export-quality cubes are made from a higher quality hay, the average cost of the raw material increases as cubes take a larger share of total production. In the United States, the relative increase is magnified because the exporting firms are on the west coast, where costs of alfalfa hay are higher than in other locations, thus weighting the average cost for the entire industry.

Labor costs reported by alfalfa processors were lower in the United States than in Canada, as shown in the tabulation at the bottom of the page (in U.S. dollars per metric ton).

Industry sources were not able to explain the rapid increase in Canadian labor costs. The fact that total labor costs were higher in Canada may be attributable in part to the tendency of Canadian processors to hire labor year-round and use the labor for maintenance during the winter. Also, Canadian processors may report higher labor costs because more firms handle harvesting of a large amount of acreage, thereby attributing costs to labor while more U.S. firms may purchase hay and attribute the cost to raw material.

Energy expenses are a major factor in the cost of producing alfalfa products, particularly the dehydrated pellets. Natural gas, the primary fuel used to dehydrate alfalfa in Canada and the Midwestern United States, is available at lower cost in Canada than in the United States. However, many firms in the U.S. alfalfa product industry do not use the energy-intensive dehydrating process; instead, firms produce sun-cured alfalfa products. Thus total energy costs are higher in Canada than in the United States. The energy costs shown in the tabulation at the top of the next page (in U.S. dollars per metric ton) are for all U.S. pelleters and cubers, which have a higher proportion of their production in sun-cured products than does Canada:

	1986	*1987*	*1988*	*1989*	*1990*
United States	$9.95	$10.16	$10.58	$10.14	$10.57
Canada	14.22	17.29	16.56	21.83	29.49

	1986	1987	1988	1989	1990
United States	$8.90	$8.61	$7.63	$7.04	$7.71
Canada	9.27	15.34	11.71	13.58	17.40

A better comparison is the costs of energy for U.S. dehydrators compared with the total Canadian industry that produces mostly dehydrated products. When the costs of energy to U.S. dehydrators alone are examined, the U.S. and Canadian firms have similar expenditures. Energy costs for U.S. dehydrators represented about 14 percent of total costs for producing dehydrated alfalfa pellets in 1989-90 (down from 18-22 percent in 1986-88). This is equivalent to about $14 per metric ton, about the same as that reported by Canadian firms and about double the U.S. average compiled from firms that produce both sun-cured and dehydrated products. Energy costs reported by U.S. firms for their operations on dehydrated products are shown in the tabulation at the bottom of the page.

Transportation Costs

The ratio of transportation costs to the delivered price of alfalfa products is relatively high. Inland transportation accounts for between 4 and 9 percent of total costs of alfalfa products from North America landed in Japan; ocean freight is about 14-26 percent of landed value.[2] Therefore, differences in transportation costs for the respective industries result in a sizable effect on the price.

Inland transportation costs per ton-mile for alfalfa products are lower in Canada than in the United States because of reduced rail transportation rates provided under the Western Grain Transportation Act (WGTA), as shown in chapter 5. The costs of U.S. trucking and rail are about 4 cents per ton-mile, which is the same as the unsubsidized Canadian rail rate. Canadian shippers using the WGTA rate pay about 1.1 cents per ton-mile, obtaining benefits of more than two-thirds of inland freight costs. This benefit is approximately $19 per metric ton of alfalfa product shipped.

Part of the Canadian advantage in total transportation costs results from the use of bulk shipping methods that reduce the ocean freight component of transportation costs. A larger share of Canadian cubes than U.S. cubes exported to Japan is shipped bulk; all of Canadian pellets are shipped bulk. Bulk rates are at least $20 per metric ton less than containerized rates, providing the Canadian industry with a transportation cost advantage for those products shipped in bulk.[3] This advantage applies to about 70,000-95,000 metric tons of alfalfa cubes from Canada shipped in bulk that compete in Japanese markets with about 555,000 metric tons of U.S. cubes shipped mostly in containers. The remaining 50,000-70,000 metric tons of Canadian cubes are shipped in containers at rates comparable to those for U.S. shippers. Overall, the ocean freight advantage from bulk shipping accounts for 50-60 percent of the total transportation cost differential between the United States and Canada. The rest is the result of reduced inland rail freight under the WGTA.

Price Levels and Trends

U.S. export prices were consistently higher than Canadian export prices, as data from questionnaires submitted by U.S. and Canadian firms and from official Japanese import statistics indicate (shown in chapters 2 and 3). Using the public Japanese statistics, an average import unit value (c.i.f. Japan, that is, landed in Japan and including cost, insurance, and freight) has been calculated. While the import unit value technically is not a price, it provides the best available comparison of products from U.S. and Canadian sources and is not subject to the type of small-sample variations that may occur with questionnaire responses.

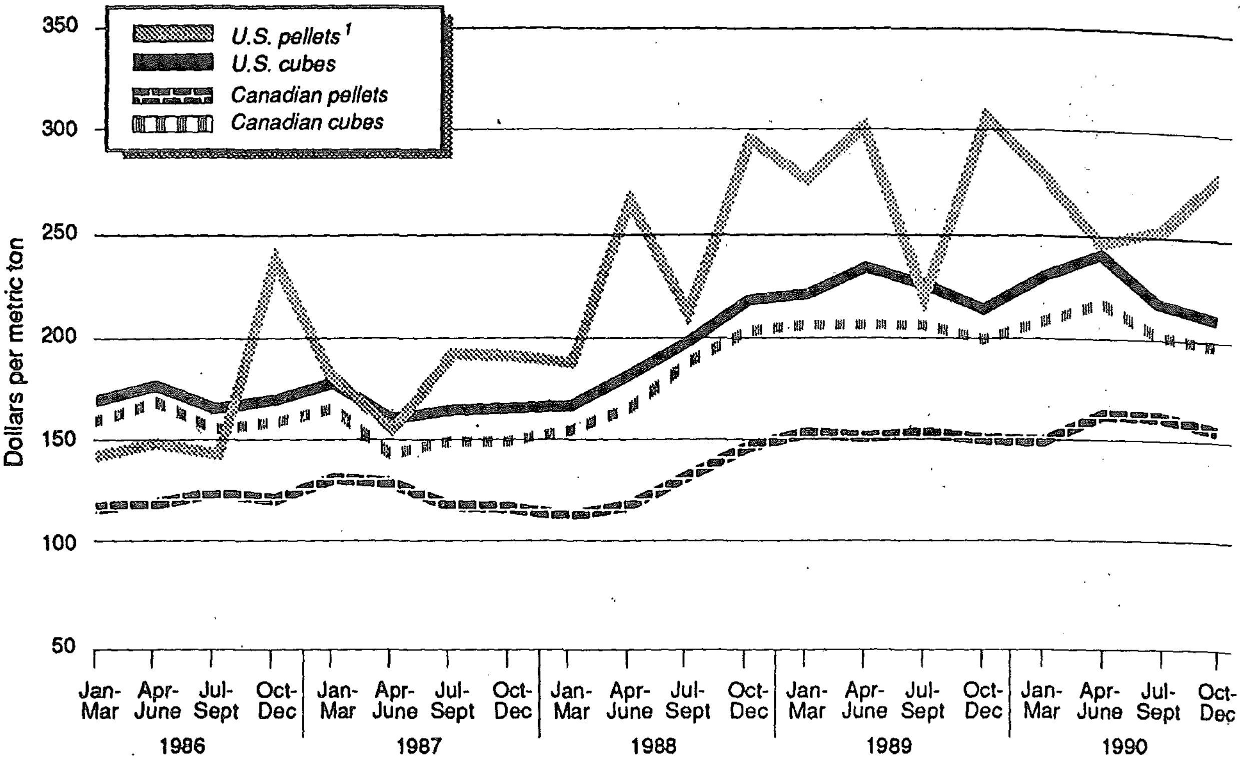
Figure 6-4 shows trends in U.S. and Canadian prices for alfalfa pellets and cubes, using the Japanese data. The Japanese import unit values for alfalfa pellets from the United States showed substantial variation over time and were much higher than Canadian values. Trade sources have not been able to explain this high and variable price.

[2] Data in this section are derived from interviews with industry experts and published rates. Although transportation costs were collected in questionnaires, the data are not used for direct comparison here because of differences in terms of sale commonly used in the industry. For example, many U.S. processors sell in domestic markets on an f.o.b. plant basis, and therefore would have no reported transportation cost. This factor appears to have affected the average transportation costs reported in chapters 2 and 3.

[3] Bulk shipping using the grocery concept (described in ch. 5) is not used for all cubes, because of the risk of product damage, limitations in port infrastructure for loading and unloading, and less availability of complementary types of cargo in some U.S. ports. Bulk shipping is not used for U.S. pellets because the small shipments do not fill a bulk hold.

	1986	1987	1988	1989	1990
Per metric ton	$15.77	$18.61	$16.90	$14.89	$14.67
Share of total (percent) ..	21.9	21.3	18.2	14.1	13.6

Figure 6-4
Alfalfa: Import unit values of U.S. and Canadian alfalfa products in Japan, by types, January 1986-December 1990



[1] The high value and variability for U.S. pellets may be explained by the small quantity of such shipments, or by a record-keeping error. Trade sources were not able to account for the unusual trend in the data.

Note.—Values shown are c.i.f. import unit values.

Source: Compiled from *Japan's Monthly Exports and Imports Statistics.*

Given the apparent problems with import unit values for alfalfa pellets recorded in the Japanese statistics and since information is not available on Canadian prices of baled alfalfa, price comparisons will focus on alfalfa cubes. Moreover, the most direct competition between the U.S. and Canadian industries currently is in the Japanese market for cubes.

During the last 5 years, the gap between the values of imported alfalfa cubes from the United States and Canada, c.i.f. Japan, was smallest in 1986 ($7 per metric ton at its lowest), then increased to its largest point ($28 per metric ton) in 1989 (fig. 6-4). In the four quarters of 1990, the import unit value of Canadian cubes ranged from $14 per metric ton below that for U.S. cubes to $22 below U.S. cubes.

Figure 6-5 shows the average annual import unit values for U.S. and Canadian alfalfa cubes imported by Japan from 1981 through 1990. This series shows a consistent spread between the values of U.S. and Canadian cubes emerging in 1986. According to industry sources, U.S. cubes generally are higher quality than Canadian cubes, and this quality difference may account for the difference in unit values. As described by a Canadian consultant, "...American product [cubes] consistently achieves a higher price than Canadian product. Quality is an important factor in this price difference."[4] While the quality difference is believed to apply to all cubes, it is particularly noticeable with the minicubes, which are made only in Canada. Minicubes have a shorter fiber length than standard cubes and are made harder and drier to withstand bulk shipping.

Currency Exchange Rates

For alfalfa products, Canada is a major competitor of the United States in Japan's market as well as in the other East Asia markets. Thus, changes in the exchange rates between the U.S. dollar and the Canadian dollar could alter the competitive status of the two exporting countries in alfalfa markets. Since 1985, the U.S. currency has depreciated substantially with respect to the major world currencies, including the Canadian dollar.

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[4] Stuart Garven, "Quality: Its Role in Our Past and Future," 12th annual Canadian Dehy Conference and Trade Show, Nov.18-20, 1991, p. 22.

During January 1986 through December 1990, the U.S. dollar depreciated with respect to the Canadian dollar by 20.9 percent, or from US$0.7124 per Canadian dollar to US$0.8613 per Canadian dollar, in nominal terms.[5] In real terms, the U.S. dollar depreciated with respect to the Canadian currency by 12.7 percent. The changes in the exchange rates (holding everything else constant) indicate that U.S. alfalfa exporters most likely gained a competitive edge against Canadian alfalfa suppliers in East Asian markets during 1986-90.

Government Programs

The only U.S. or Canadian Government programs that directly affect processed alfalfa product exports or production are the Canadian Western Grain Transportation Act and Western Economic Diversification Act and U.S. research and export promotion programs.

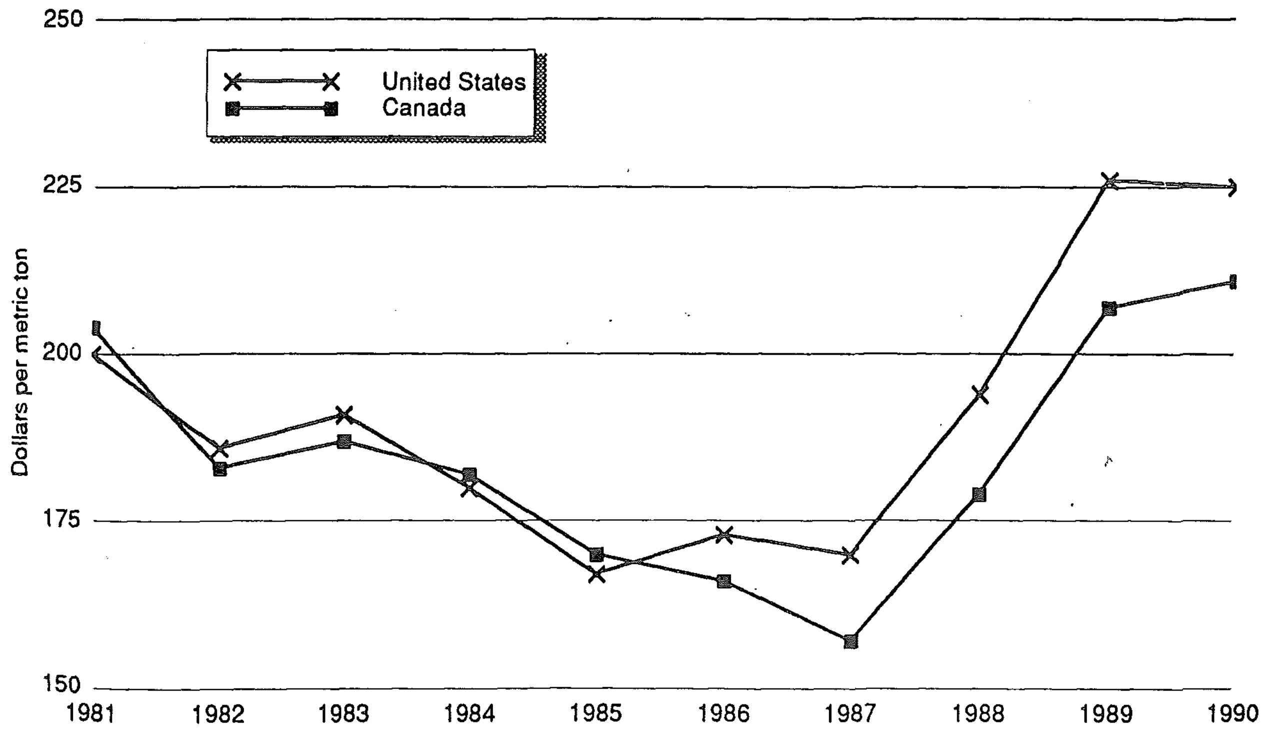
Since 1984, the Canadian Government has furnished benefits for rail shipments of alfalfa pellets and cubes shipped westbound for export under the Western Grain Transportation Act (WGTA). Expenditures attributable to alfalfa products under the WGTA totaled $10.2 million (U.S.) during the 1990/91 fiscal year.

In 1987, the Canadian Government established a fund under the Western Economic Diversification Act to promote economic development in Western Canada. The Alberta Processing and Marketing Agreement (APMA), at the Provincial level, has similar objectives to Western Diversification. Total Western Diversification and APMA funds committed to 17 projects involving alfalfa processing was Can$1,981,000, or 13 percent of the total cost of the projects.

The United States provides a small amount of funding for research on alfalfa product production and for promotion of exports of processed alfalfa. Irrigation water supplied by Federal and State water projects in the United States benefits alfalfa growers and thus has an indirect effect on the processing industry. The net effect of the water subsidy on production and exports of processed alfalfa is not known; however, U.S. processors probably pay lower prices for raw materials as a result of irrigation programs.

[5] International Monetary Fund, *International Financial Statistics*, various issues.

Figure 6-5
Alfalfa cubes: Landed value in Japan, by primary sources, 1981-90



Note.—Values shown are c.i.f. import unit values.

Source: Japan Tariff Association statistics.

APPENDIX A
LETTER FROM THE UNITED STATES TRADE REPRESENTATIVE
AND
UNITED STATES INTERNATIONAL TRADE COMMISSION
NOTICE OF INSTITUTION OF INVESTIGATION

THE UNITED STATES TRADE REPRESENTATIVE
Executive Office of the President
Washington, D.C. 20506

MAR 22 1991

The Honorable Anne E. Brunsdale
Chairman
U.S. International Trade Commission
500 E Street, S.W.
Washington, D.C. 20436

Dear Madam Chairman:

It has recently come to my attention that the U.S. alfalfa products industry is concerned about Canadian Government policies that may have a negative effect on the U.S. industry's ability to compete internationally. Therefore, under the authority delegated by the President and pursuant to section 332 (g) of the Tariff Act of 1930, as amended, I am writing to request that the Commission institute an investigation for the purpose of providing me with a report on the conditions of competition between the United States and Canada in hay products, including alfalfa pellets and cubes (dehydrated and sun-cured).

Specifically, we are interested in the competitive conditions of the U.S. and Canadian alfalfa industries in overseas markets, especially in the Pacific Rim countries, and the effect of Canadian Government programs on those competitive conditions.

We are particularly interested in receiving as much of the following information as the Commission can provide:

1. A description of the U.S. and Canadian dehydrated and sun-cured alfalfa products industries, including patterns of production, processing and consumption since 1981.

2. A description of the current conditions of trade in dehydrated and sun-cured alfalfa products between the United States, Canada and the rest of the world, especially the Pacific Rim countries, and any recent changes in such conditions, including information on prices, exchange rates, transportation costs and marketing practices (to the extent such practices have measurable effects).

3. A description of the purpose, nature and use of Federal, State or Provincial Government (either U.S. or Canadian) programs and policies to assist alfalfa products, producers and processors. Examples of such programs include programs that reduce fixed costs, programs that enhance revenues and transportation assistance programs. When examining Canadian programs and policies, special attention should be given to:

(a) programs affecting transportation costs, including the Western Grain Transportation Act;

(b) Government-funded assistance for conversion of processing facilities, including the Western Economic Diversification Act;

(c) tax rebates available to Canadian exporters of alfalfa products;

(d) Government-subsidized loans to Canadian alfalfa growers, processors or exporters; and

(e) other production, processing, transportation and export assistance offered by Canada's national or Provincial Governments.

4. An analysis of the competitive factors in the U.S. and Canadian industries, including a comparison by market regions wherever obtainable, of prices and production costs.

We request that the Commission provide a report on this matter no later than December 31, 1991.

In accordance with USTR policy, I direct you to mark as "Confidential" such portions of the Commission's report and its working papers as my Office will identify in a classification guide. Information Security Oversight Office Directive No. 1, section 2001.21 (implementing Executive Order 12356, sections 2.1 and 2.2) requires that classification guides identify or categorize the elements of information which require protection. Accordingly, I request that you provide my Office with a preliminary outline of this report as soon as possible. Based on this outline, and my Office's knowledge of the information to be covered in the report, a USTR official with classification authority will provide detailed instructions.

We appreciate the Commission's assistance.

Sincerely,

Carla A. Hills

CAH:mlh

UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, D.C.

(Investigation No. 332-310)

ALFALFA PRODUCTS: CONDITIONS OF COMPETITION BETWEEN THE U.S. AND CANADIAN INDUSTRIES

AGENCY: United States International Trade Commission

ACTION: Institution of investigation

SUMMARY: Following receipt on March 27, 1991 of a request from the U.S. Trade Representative (USTR), the Commission instituted investigation No. 332-310, Alfalfa Products: Conditions of Competition Between the U.S. and Canadian Industries in Overseas Markets, under section 332(g) of the Tariff Act of 1930 (19 U.S.C. 1332(g)). As requested, the study will focus on the conditions of competition between the United States and Canada in hay products, including alfalfa pellets and cubes (dehydrated and sun-cured). The letter said that USTR was specifically interestecd in receiving information regarding the competitive conditions of the U.S. and Canadian alfalfa industries in overseas markets, especially in the Pacific Rim countries, and the effects of Canadian government programs on those competitive conditions. As requested by the USTR, the Commission will submit its report not later than December 31, 1991.

EFFECTIVE DATE: April 23, 1991

FOR FURTHER INFORMATION CONTACT: For information on other than the legal aspects of the study, contact John Pierre-Benoist (202-252-1320) or David Ingersoll (202-252-1309), Agriculture Division, Office of Industries, U.S. International Trade Commission. For information on the legal aspects of the study, contact William Gearhart (202-252-1091), Office of the General Counsel, U.S. International Trade Commission.

BACKGROUND: As requested by the USTR, the Commission will seek to provide in its report, to the extent possible, the following information:

(1) A description of the U.S. and Canadian dehydrated and sun-cured alfalfa products industries, including patterns of production, processing, and consumption since 1981;

(2) A description of the current conditions of trade in dehydrated and sun-cured alfalfa products between the United States, Canada, and the rest of the world, especially the Pacific Rim countries, and any recent changes in such conditions, including information on prices, exchange rates, transportation costs, and marketing practices (to the extent such practices have measurable effects);

(3) A description of the purpose, nature, and use of Federal, State, or Provincial Government (either U.S. or Canadian) programs and policies to assist alfalfa products producers and processors.

(Examples of such programs identified by the USTR) include programs that reduce fixed costs, programs that enhance revenues, and transportation assistance programs. When examining Canadian programs and policies, the Commission, as requested by the USTR, will give special attention to:

(a) programs affecting transportation costs, including the Western Grain Transportation Act;

(b) Government-funded assistance for conversion of processing facilities, including the Western Economic Diversification Act;

(c) tax rebates available to Canadian exporters of alfalfa products;

(d) Government-subsidized loans to Canadian alfalfa growers, processors, or exporters; and

(e) other production, processing, transportation, and export assistance offered by Canada's national or Provincial Governments.

(4) An analysis of the competitive factors in the U.S. and Canadian industries, including a comparison by market regions wherever obtainable, of prices and production costs.

WRITTEN SUBMISSIONS: No public hearing is planned in this investigation. However, interested persons are invited to submit written statements concerning the investigation. Written submissions to be considered by the Commission should be received by the close of business on August 2, 1991. Commercial or financial information which a submitter desires the Commission to treat as confidential must be submitted on separate sheets of paper, each marked "Confidential Business Information" at the top. All submissions requesting confidential treatment must conform with the requirements of section 201.6 of the Commission's Rules of Practice and Procedure (19 CFR 201.6). All written submissions, except for confidential business information, will be available for inspection by interested persons. All submissions should be addressed to the Secretary, U.S. International Trade Commission, 500 E Street SW., Washington, D.C. 20436.

Hearing impaired persons may obtain information on this study by contacting the Commission's TDD terminal on (202-252-1810).

By order of the Commission.

Kenneth R. Mason
Secretary

Issued: April 26, 1991

APPENDIX B
SUMMARY OF QUESTIONNAIRE RESPONSES

SUMMARY OF QUESTIONNAIRE RESPONSES

A total of 105 questionnaires were mailed out for the alfalfa investigation to members on a list of national hay producers. Forty-eight were returned filled out and five more were returned partially filled out. Another 15 were returned by firms that stated they did not grow, process, or export any alfalfa products. One response stated that the company closed down and another stated that a fire destroyed its records. In five instances questionnaires were mailed to companies that had several affiliates in which cases a single questionnaire was returned for all affiliates.

APPENDIX C
APPENDIX TABLES

Table C-1
Alfalfa products: U.S. production, capacity, and capacity utilization, 1986-90

Item	*1986*	*1987*	*1988*	*1989*	*1990*
			Quantity (Metric tons)		
Production:					
Dehydrated pellets and meal	287,905	215,392	197,755	195,365	227,828
Dehydrated cubes	0	0	0	0	471
Sun-cured pellets and meal	141,542	145,544	136,303	149,147	147,209
Sun-cured cubes	196,624	208,261	247,092	269,986	260,893
Double-compressed bales	172	3,822	158,111	314,807	165,521
			Quantity (Metric tons)		
Capacity:					
Dehydrated pellets and meal	389,799	353,604	345,870	344,395	346,237
Dehydrated cubes	0	0	0	0	471
Sun-cured pellets and meal	233,997	233,997	245,597	256,226	216,226
Sun-cured cubes	427,987	427,987	433,987	432,987	426,987
Double-compressed bales	25,850	37,850	465,359	487,302	501,302
			Percent		
Capacity utilization:					
Dehydrated pellets and meal	73.9	60.9	57.2	56.7	65.8
Dehydrated cubes	([1])	([1])	([1])	([1])	100.0
Sun-cured pellets and meal	60.5	62.2	55.5	58.2	68.1
Sun-cured cubes	45.9	48.7	56.9	62.4	61.1
Double-compressed bales	7	10.1	34.0	64.6	33.0

[1] Not applicable.

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

Table C-2
Alfalfa products: Average number of production and related workers employed in U.S. establishments in which alfalfa is produced and wages paid, 1986-90

Item	1986	1987	1988	1989	1990
	(Number)				
Production and related workers producing—					
All products	401	380	443	464	526
Dehydrated pellets, meal and cubes	266	239	211	224	233
Sun-cured pellets, meal and cubes	112	115	159	152	197
Double-compressed bales	-	3	48	64	71
Other products	23	23	24	24	25
	(1,000 dollars)				
Wages paid to production and related workers—					
All products	4,389	4,504	5,088	6,360	6,768
Dehydrated pellets, meal and cubes	3,097	2,829	2,696	3,433	3,315
Sun-cured pellets, meal and cubes	1,090	1,183	1,636	1,889	2,340
Double-compressed bales	-	33	505	635	673
Other products	198	460	250	403	441

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

Table C-3
Alfalfa products: U.S. production by product types, 1981-90

Year	Dehydrated pellets and meal	Dehydrated cubes	Sun-cured pellets and meal	Sun-cured cubes	Double-compressed bales	Other products[1]	Total
	Quantity (Metric tons)						
1981	397,534	0	72,207	22,525	0	58,968	551,234
1982	320,865	0	97,891	23,525	0	56,246	498,527
1983	362,715	0	110,070	32,998	0	44,997	550,780
1984	345,863	1,485	126,653	63,737	0	52,001	589,738
1985	273,965	855	106,417	72,162	164	62,801	516,365
1986	287,905	0	141,542	196,624	172	68,168	694,411
1987	215,392	0	145,544	208,261	3,822	67,253	640,271
1988	197,755	0	136,303	247,092	158,111	70,257	809,518
1989	195,365	0	149,147	269,986	314,807	76,012	1,005,317
1990	227,828	471	147,209	260,893	165,521	78,850	880,773

[1] Other products are primarily single bales of alfalfa hay.

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

Table C-4
Japanese imports of alfalfa products, by product types and primary sources, 1981-90

Item	*United States*	*Canada*	*China*	*Thailand*	*Australia*	*All other*	*Total*
				(1,000 metric tons)			
Quantity:							
Alfalfa meal/pellets:							
1981	114	106	2	0	0	26	248
1982	162	165	1	0	0	6	334
1983	138	204	3	([1])	0	23	368
1984	85	266	1	0	0	14	366
1985	2	242	([1])	0	([1])	16	260
1986	22	303	([1])	([1])	1	5	331
1987	10	241	([1])	0	([1])	0	251
1988	2	290	([1])	0	([1])	([1])	292
1989	1	259	([1])	0	([1])	([1])	261
1990	2	296	([1])	0	0	([1])	298
Alfalfa cubes:[2]							
1981	211	7	3	0	([1])	1	222
1982	271	11	1	0	1	0	283
1983	369	33	0	([1])	0	([1])	403
1984	370	35	([1])	0	([1])	([1])	405
1985	424	39	0	0	2	([1])	465
1986	529	37	1	0	9	([1])	576
1987	519	40	3	([1])	14	([1])	576
1988	552	102	0	([1])	14	([1])	668
1989	521	150	([1])	([1])	11	([1])	682
1990	555	143	([1])	0	15	([1])	713
Baled hay:[3]							
1981	70	([1])	17	2	2	([1])	91
1982	51	0	10	1	0	([1])	62
1983	81	1	14	1	0	([1])	97
1984	101	([1])	16	([1])	([1])	([1])	118
1985	146	([1])	([1])	([1])	2	15	163
1986	281	1	13	0	10	([1])	305
1987	387	3	23	0	15	([1])	428
1988	692	6	32	([1])	20	3	753
1989	599	10	36	1	31	4	680
1990	754	11	50	([1])	20	2	837

See footnotes at end of table.

Table C-4—Continued
Japanese imports of alfalfa products, by product types and primary sources, 1981-90

Item	*United States*	*Canada*	*China*	*Thailand*	*Australia*	*All other*	*Total*
				(1,000 dollars)			
Value:							
Alfalfa meal/pellets:							
1981	19,586	17,933	320	0	0	4,572	42,411
1982	25,036	24,492	130	0	0	841	50,499
1983	21,614	33,705	363	(4)	0	3,572	59,254
1984	13,125	41,271	153	0	0	2,049	56,598
1985	284	30,272	65	0	21	1,952	32,594
1986	3,255	37,500	28	12	188	566	41,549
1987	1,306	30,626	4	0	12	0	31,948
1988	409	37,821	13	0	40	13	38,296
1989	309	40,277	21	0	70	3	40,680
1990	521	47,481	7	0	0	41	48,050
Alfalfa cubes:[2]							
1981	42,142	1,459	720	0	72	(4)	44,393
1982	50,293	2,066	127	0	97	0	52,583
1983	70,352	6,238	0	14	0	24	76,628
1984	66,689	6,378	17	0	56	5	73,145
1985	70,945	6,670	0	0	277	9	77,901
1986	91,284	6,182	253	0	1,522	5	99,246
1987	88,197	6,222	503	(4)	2,347	6	97,275
1988	106,915	18,233	0	4	2,385	10	127,547
1989	117,741	31,049	15	72	2,279	89	151,245
1990	124,952	30,837	60	0	3,618	87	159,554
Baled hay:[3]							
1981	18,587	3	3,444	298	510	140	22,982
1982	12,668	0	1,770	140	0	31	14,609
1983	18,487	117	2,280	132	0	26	21,042
1984	21,527	53	2,727	31	65	127	24,530
1985	26,788	81	11	52	266	2,313	29,511
1986	57,802	245	2,154	0	1,737	66	62,004
1987	85,768	653	3,877	0	2,691	98	93,108
1988	181,029	1,578	4,904	40	4,174	439	192,164
1989	167,023	2,803	6,835	178	7,500	941	185,280
1990	195,830	3,058	9,669	63	5,158	503	214,281

See footnotes at end of table.

Table C-4—Continued

Japanese imports of alfalfa products, by product types and primary sources, 1981-90

Item	*United States*	*Canada*	*China*	*Thailand*	*Australia*	*All other*	*Total*
	(Per metric ton)						
Unit value:							
Alfalfa meal/pellets:							
1981	$172	$169	$183	(5)	(5)	$176	$171
1982	154	149	143	(5)	(5)	140	151
1983	157	165	142	$184	(5)	155	161
1984	155	155	157	(5)	(5)	146	155
1985	163	125	162	(5)	$169	122	125
1986	151	124	140	154	191	113	126
1987	131	127	128	(5)	172	(5)	127
1988	241	131	138	(5)	202	(5)	131
1989	286	155	134	(5)	207	(5)	156
1990	256	160	153	(5)	(5)	(5)	161
Alfalfa cubes:[2]							
1981	200	204	219	(5)	214	(5)	200
1982	186	183	231	(5)	186	(5)	186
1983	190	187	(5)	162	(5)	192	190
1984	180	182	193	(5)	180	(5)	180
1985	167	170	(5)	(5)	164	(5)	168
1986	173	166	185	(5)	169	(5)	172
1987	170	157	164	190	171	(5)	169
1988	194	179	(5)	191	169	(5)	191
1989	226	207	182	209	215	(5)	222
1990	225	216	211	(5)	245	204	223
Baled hay:[3]							
1981	264	193	208	198	253	(5)	252
1982	249	(5)	183	148	(5)	(5)	237
1983	227	220	164	147	(5)	(5)	217
1984	213	200	173	156	221	(5)	207
1985	183	182	452	165	135	154	181
1986	206	214	165	(5)	178	(5)	203
1987	222	230	168	(5)	184	218	218
1988	262	271	152	153	205	146	255
1989	279	292	191	192	244	245	273
1990	260	279	193	237	263	252	256

[1] Less than 500 metric tons.
[2] This item is all forage products in cube; it is believed that all of this item is alfalfa cubes.
[3] This item is for all hay.
[4] Less than $500.
[5] Not applicable.

Unit values are calculated from unrounded data.

Source: Japan Tariff Association.

Table C-5
Alfalfa hay: Japanese imports, from United States and total, 1981-90

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
	(Metric tons)									
United States	22,188	15,110	23,626	29,311	36,763	76,049	105,516	179,529	173,242	198,513
Total	22,827	15,403	24,207	29,607	40,802	76,354	106,906	181,894	176,778	201,946
	$1,000									
United States	(1)	(1)	(1)	(1)	(1)	(1)	(1)	31,920	48,089	57,134
Total	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
	Unit value (per metric ton)									
United States	(1)	(1)	(1)	(1)	(1)	(1)	(1)	178	278	288
Average	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)

[1] Not available.

Sources: USITC staff estimates.

Table C-6
Beet pulp, bagasse, and waste of sugar manufacture: Japanese imports, by primary sources, 1981-90

Source	*1981*	*1982*	*1983*	*1984*	*1985*	*1986*	*1987*	*1988*	*1989*	*1990*
	Quantity (Metric tons)									
United States	381,620	409,370	400,913	448,634	446,535	468,395	510,968	373,746	417,217	452,912
China	15,409	15,783	39,443	74,203	105,595	149,496	128,719	128,888	161,958	146,566
Chile	51,043	15,772	51,277	82,460	62,870	101,632	78,451	127,927	116,677	72,526
Canada	1,569	6,413	14,641	10,158	4,852	7,873	8,868	9,269	10,852	14,622
Other	22,351	25,086	46,920	30,561	39,913	13,901	11,988	12,743	10,747	12,173
Total	471,992	472,424	553,194	646,016	659,765	741,297	738,994	652,573	717,451	698,799
	Value (1,000 dollars)									
United States	76,338	68,876	71,593	87,088	78,310	79,093	91,895	60,118	72,751	78,814
China	2,708	2,547	6,949	13,570	16,753	23,058	19,677	19,450	27,807	22,518
Chile	9,424	2,883	9,337	15,546	8,630	14,327	12,738	21,916	21,302	13,092
Canada	300	1,087	2,393	1,729	799	1,140	1,382	1,570	1,933	2,589
Other	4,690	4,199	8,307	5,197	6,447	2,470	2,031	1,917	2,054	2,382
Total	93,460	79,592	98,579	123,130	110,939	120,088	127,723	104,971	125,847	119,395
	Unit Value (per metric ton)									
United States	$200	$168	$179	$194	$175	$169	$180	$161	$174	$174
China	176	161	176	183	159	154	153	151	172	154
Chile	185	183	182	189	137	141	162	171	183	181
Canada	191	169	163	170	165	145	156	169	178	177
Other	210	167	177	170	162	178	169	150	191	196
Average	198	168	178	191	168	162	173	161	175	171

Source: Japan Ministry of Finance.

Table C-7
Cereal straw and husks:[1] Japanese imports, by primary sources, 1981-90

Source	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
					Quantity (Metric tons)					
South Korea	4,216	4,264	3,995	6,426	12,084	12,745	26,490	45,998	76,383	41,330
North Korea	68	29	60	30	48	0	1,920	4,905	21,636	11,830
Taiwan	63,013	44,574	81,029	99,210	69,556	97,266	83,609	109,180	85,148	104,300
Australia	16	10	37	18	143	174	2,239	13,116	26,135	31,648
Other	6,794	4,345	4,224	4,384	4,790	3,525	5,152	11,642	17,840	16,481
Total	74,107	53,222	89,345	110,068	86,621	113,710	119,410	184,841	227,142	205,589
					Value (1,000 dollars)					
South Korea	751	688	596	987	1,753	2,005	4,569	9,987	17,788	10,280
North Korea	23	8	15	7	11	0	235	699	3,233	1,986
Taiwan	11,290	6,457	11,133	14,186	9,438	13,844	13,776	21,901	18,847	22,477
Australia	5	3	9	4	24	22	390	2,791	6,558	7,728
Other	2,580	1,310	1,022	993	928	710	1,149	2,687	4,636	3,344
Total	14,649	8,466	12,775	16,177	12,154	16,581	20,119	38,065	51,062	45,815
					Unit Value (per metric ton)					
South Korea	$178	$161	$149	$154	$145	$157	$172	$217	$233	$249
North Korea	338	276	250	233	229	(2)	122	143	149	168
Taiwan	179	145	137	143	136	142	165	201	221	216
Australia	313	300	243	222	168	126	174	213	251	244
Other	380	301	242	227	194	201	223	231	260	203
Average	198	159	143	147	140	146	168	206	225	223

[1] According to trade sources, imports from Taiwan and Korea primarily consist of rice straw while product imported from Australia is primarily oat husks.
[2] Not applicable.

Source: Japan Ministry of Finance.

Table C-8
Japan: Prices of feed paid by farmers (in yen)

Year	Wheat bran	Rice bran	Barley bran	Compound feed: Broiler	Layer	Hog	Dairy cow	Beef cattle
	30 kg			*20 kg*				
1982	1,398	1,041	1,307	1,675	1,519	1,527	1,374	1,364
1983	1,415	1,066	1,323	1,701	1,566	1,561	1,406	1,384
1984	1,385	1,093	1,305	1,714	1,582	1,575	1,407	1,394
	30 kg			*bulk 1 ton*				
1985	1,300	1,091	1,312	70,000	62,460	61,840	59,700	57,850
1986	1,037	904	1,159	57,360	50,890	50,660	49,600	47,120
1987	877	792	1,064	53,680	47,430	47,320	46,880	44,530
1988	847	741	1,018	54,380	48,750	48,010	47,730	44,720
1989	902	757	1,048	58,980	53,340	51,720	52,040	48,960
1990[1]	945	770	1,060	59,957	55,018	53,182	53,567	50,690

[1] Estimated by USITC staff.
Source: MAFF.

APPENDIX D
ECONOMIC MODEL

This appendix contains the equations which comprise the model. The Canadian and U.S. markets will be described first, and then their links to the world market will be specified.

Canadian Transportation Subsidies

In Canada, transportation subsidies provided under the Western Grain Transportation Act affect the production, and ultimately, the exports of Canadian alfalfa indirectly by altering transportation costs. The transportation subsidy lowers the rail rate to the users of rail transportation shipping to a western port. The consumption of transportation services is jointly determined by the volume of exports, since all alfalfa transported by rail is exported. Demand for transportation services must then equal the quantity of alfalfa shipped for export by volume:

$$DA_T = ES_{CAN} \tag{1}$$

where DA_T is the demand for transportation services by alfalfa producers, and ES_{CAN} is Canadian exports of alfalfa. The supply of transportation services is assumed to be infinitely elastic, since the amount of transportation supplied for transporting alfalfa is considered to be small in the total transportation market. This assumption implies:

$$PS_T = ES_{TO} \tag{2}$$

where PS_T is the supply price of transportation services. As usual, a subsidy drives a wedge between the demand price and the supply price:

$$PS_T = PD_T\ (1 + S) \tag{3}$$

where S is the subsidy rate applied to transportation. Of course, equilibrium in the market for transportation services requires that the quantity of transportation services demanded equal the quantity supplied (S_T):

$$DA_T = S_T \tag{4}$$

Linking the Transportation Subsidy to the Production of Alfalfa

In order to link the transportation subsidy to the production of alfalfa, define the good called alfalfa to be "alfalfa for export", that is, in order to be ready for export, alfalfa requires processed alfalfa and transportation services. In effect, this treatment means transportation services are used jointly with processed alfalfa to produce "alfalfa for export". Demand for transportation services must then equal the amount of alfalfa exports by volume. Processed alfalfa, referred to as value-added (VA), is assumed to have a constant elasticity of supply curve given by:

$$VA_{CAN} = VAO_{CAN}\ (PS)^{\varepsilon} \tag{6}$$

where $VA0_{CAN}$ is the initial supply of processed alfalfa, PS is the value-added price, and ε is the price elasticity of domestic supply. Therefore, the f.o.b export price of alfalfa must equal the producer price plus the price of transportation:

$$P_{FOB} = PS + PD_T \tag{7}$$

where P_{FOB} is f.o.b. export price, equal to the world price. This treatment highlights the role of jointness in the consumption of transportation services.

Domestic Production and Consumption

Within each country, domestic demand and supply are described by constant elasticity functions. Production for Canada has already been described. For the United States, the domestic supply curve for alfalfa takes the following form:

$$X_{US} = XO_{US}\ (PS_{US}\ )^{\epsilon}\ US \tag{8}$$

where X_{US} is production of alfalfa in the United States, XO_{US} is initial production in the United States, PS_{US} is the supply price, and ε_{US} is the price elasticity of domestic supply. Similarly, demand is modelled by constant elasticity functions:

$$D_k = DO_k\ (PD_K)\eta \tag{9}$$

where D_k is domestic consumption in country k, $D0_k$ is initial consumption in country k, PD_k is the demand or consumption price of alfalfa, and η_k is the uncompensated own-price elasticity of domestic demand. For both countries, the consumption price must equal the world price:

$$PD_k = PW \tag{10}$$

For producers, in the United States, PS_{US} must equal the world price, while in Canada, the f.o.b export price must equal the world price:

$$PS_{US} = PW \tag{11}$$

and

$$P_{FOB} = PW \tag{12}$$

Each country's supply of alfalfa to the rest of the world is just the residual of domestic production over domestic consumption:

$$ES_k = X_k - D_k \tag{11}$$

where ES_k is excess supply (export supply) from country k.

Equilibrium in the World Market

In this model, there are five regions of the world: Canada, the United States, Rest-of-World Exporters, Japan, and Rest-of-World Importers. Canada, the United States, and Rest-of-World Exporters sell alfalfa to Japan and the Rest-of-World Importers. Equilibrium in the world market is achieved when total demand by Japan and the Rest-of-World Importers equals total excess supply, excess supply from Canada, the United States, and the Rest-of-the-World Exporters. This equilibrium condition determines the world price:

$$D^{US}_{JAP} + D^{CAN}_{JAP} + D^{ROWEX}_{JAP} + D_{ROWI} = ES_{US} + ES_{CAN} = ES_{ROWEK} \tag{12}$$

where is D^{US}_{JAP} demand for alfalfa by Japan from the United States, D^{CAN}_{JAP} is Japanese demand for alfalfa from Canada, D^{ROWEX}_{JAP} is demand for alfalfa by Japan from the Rest-of-World Exporters, D_{ROWI} is demand for alfalfa by countries other than Japan, and ES_{ROWEX} is the supply of alfalfa from the Rest-of-the-World exporters. Each importing regin posses a demand function for alfalfa, which is a function of the world price, PW:

$$D^{US}_{JAP} = DO^{US}_{JAP}\ (PW)^{\beta US} \tag{13}$$

$$D^{CAN}_{JAP} = DO^{CAN}_{JAP}\ (PW)^{\beta can} \tag{14}$$

$$D^{ROWEX}_{JAP} = DO^{ROWEX}_{JAP}\ (PW)^{\beta row} \tag{15}$$

$$D_{ROWEX} = DO_{ROWEX} \ (PW)^{-} \tag{16}$$

where β is the Japanese import demand elasticity from all sources, and γ is the elasticity of demand for alfalfa by the Rest-of-the-World Importers. The supply behavior of the Rest-of-the-World exporters is characterized by a constant elasticity function:

$$ES_{ROWEX} = ESO_{ROWEX} \ (PW) \tag{17}$$

where $ES0_{ROWEX}$ is the initial supply of exports from the Rest-of-the-World exporters, and ρ is the supply elasticity.

Allocation of Supply Across Countries

To address the issue of allocation of supply between importing regions, the following additional structure is included in the model. As noted before, each country's export supply is the excess of domestic production over consumption. It is difficult to be precise about the exact allocation of export supply across countries because this issue is likely to be determined by non-economic factors. The allocation of each exporting region's supply of exports among importing countries is indeterminate without more information, since the market establishes a common world price for the homogeneous good alfalfa. A given importer, faced with the same price from three suppliers, may choose to purchase from only one or any combination of the three suppliers, based on other considerations such as reliability of supply and the proximity of the supplier.

In this model, the supply of exports from each exporting region must equal the supply of exports to Japan plus the supply of exports to the Rest-of-the-World Importers. Specifically:

$$ES_{US} = ES_{US}^{JAP} + ES_{US}^{ROWI} \tag{18}$$

$$ES_{CAN} = ES_{CAN}^{JAP} + ES_{CAN}^{ROWI} \tag{19}$$

$$ES_{ROWEX} = ES_{ROWEX}^{JAP} + ES_{ROWEX}^{ROWI} \tag{20}$$

where ES_{US}^{JAP} is the supply of exports from the United States to Japan, ES_{US}^{ROWI} is the supply of exports from the United States to the Rest-of-the-World Importers, ES_{CAN}^{JAP} is the supply of exports from Canada to Japan, ES_{CAN}^{ROWI} is the supply of exports from Canada to the Rest-of-the-World Importers, ES_{ROWEX}^{JAP} is the supply of exports from the Rest-of-the-World Exporters to Japan, and ES_{ROWEX}^{ROWI} is the supply of exports from the Rest-of-the-World Exporters to the Rest-of-the-World Importers. In order to determine allocation, the model assumes that ES_{US}^{ROWI}, the supply of exports from the United States to the Rest-of-the-World Importers, and ES_{ROWEX}^{ROWI} remain constant after the transportation subsidy is removed. This assumption allows for calculation of the maximum increase in United States exports to Japan after the subsidy is removed, and thus, generates upper bound estimates. Finally, in order to close the model, demand by Japan from the United States, Canada, and the Rest-of-the-World Exporters must equal the supply from each of these sources:

$$D_{JAP}^{US} + D_{JAP}^{CAN} + D_{JAP}^{ROWEX} = ES_{US}^{JAP} + ES_{CAN}^{JAP} + ES_{ROWEX}^{JAP} \tag{21}$$

Equation (21) determines ES_{CAN}^{JAP}, since fixing ES_{US}^{ROWI} and ES_{ROWEX}^{ROWI} determines ES_{US}^{JAP} and ES_{ROWEX}^{JAP} from equations (18) and (20) respectively. Note that when equations (12) and (21) are satisfied, then the demand by the Rest-of-the-World Importers will automatically equal the supply from the Rest-of-the-World Exporters to the Rest-of-the World Importers.

As written here, the model is a system of simultaneous equations in an equal number of endogenous variables. Using initial data, the model is benchmarked so as to reproduce the initial values for all the endogenous variables. That is, the solution for all the equations will match the observed values for all endogenous variables exactly. To perform an experiment, a parameter is altered and the system of equations is solved again, producing a new set of values for all the endogenous variables. The results from this new solution can then be compared to the initial values to determine the effect of the change in the parameter (policy change) on all endogenous variables.

Parameter Requirements:

I. Elasticity Values

1. Uncompensated own-price elasticity of domestic demand for alfalfa in both United States and Canada: (ηk)
2. Price elasticity of domestic supply for alfalfa in both the United States and Canada: (ε_k)
3. Japanese Import Demand elasticity: (β).
4. Import Demand elasticity for Rest-of-World Importers: (γ).
5. Export Supply elasticity from Rest-of-World Exporters: (ρ).
6. Supply elasticity of transportation services in Canada: (ηT)

II. Transportation Subsidy Parameters

1. Ad-Valorem subsidy rate applied to the consumption of Canadian transportation services: (S).
2. Expenditures by alfalfa producers on transportation.
3. Total Railroad subsidy payments.

III. Initial Data

Initial data, shown in table A-9, is required for the following variables:

1. Initial US dollar value of domestic production in the United States and Canada: ($X0_k$)
2. Initial US dollar value of domestic consumption in the United States and Canada: ($D0_k$)
3. Initial total excess supply from both the U.S and Canada: ($EXS0_k$).
   Note that $EXS0_k = X0_k - D0_k$.
4. Initial exports from region k to Japan: (ES_k^{JAP})
5. Initial exports from region k to Rest-of-World Importers: (ES_k^{ROWI})

   Note that $ES_k^{ROWI} = EXS0_k - ES_k^{JAP}$.
6. Initial exports from the Rest-of-World Exporters to Rest-of-World Importers: (ES_{ROWEX}^{ROWI})

APPENDIX E
POSITION OF INTERESTED PARTIES

Bryan Davidson prepared a written submission on behalf of the Canadian Dehydrators Association (CDA). The CDA maintains that the U.S. alfalfa industry is not injured by Canadian alfalfa industry. The CDA also states that the reason for Canada's success in the Pacific Rim market for alfalfa products is because Canada supplies this market (especially the Japanese) with the type of product that is in demand there (dehydrated alfalfa pellets). The CDA further credits Canadian shipping methods with increasing the demand for Canadian alfalfa products. According to the CDA, the U.S. dehydrated alfalfa pellet industry is suffering because of the high cost of land and energy, and a chronic shortage of water. The U.S. also uses different methods of transportation, which are not price-competitive with those used by the Canadians.

Dehydrated pellets are popular in Japan because of the high level of carotenoids and their rich green color. U.S. production of dehydrated pellets declined rapidly in the late 1970s because of a dramatic increase in energy costs, a severe water shortage, and the high cost of land. Consequently, the U.S. industry switched over to producing sun-cured pellets, and the production of dehydrated pellets moved north into Canada, where cheap, local market-priced natural gas is available. At the same time, the Japanese demand for dehydrated pellets increased, and Canadian exports of pellets increased. Most of the U.S. pellet production is located in the Midwest, too far away from the Asian market to be competitive with the Canadians.

While the U.S. still dominates the Pacific Rim market for alfalfa cubes and baled hay, the Canadian have been able to make some inroads into these areas. The CDA attributes this recent success to their method of bulk shipping, their recognition of the changing need of the Japanese, and their process of front-end drying (which reduces spoilage). Although Canadian exports of cubes and hay increased in 1988 and 1989, they have decreased in 1990 and the first part of 1991.

The U.S. alfalfa industry relies almost exclusively on containers for shipping. This is in contrast to the Canadians who do most of their transportation in bulk. According to the CDA, shipping in bulk has the advantages of direct access to the alfalfa-consuming areas in Japan and low transportation costs, both on ocean and on land. Since the U.S. industry ships its products in containers, it can only ship to the main ports. Since most of the Japanese alfalfa consumers have moved away from the main ports, the U.S. must then transship its products across land. The Canadians, on the other hand, can ship directly to the more remote areas of Japan, thus lowering the transportation costs. Also, since most of the Japanese market for alfalfa products is in the livestock feed sector, the Japanese prefer to buy their products in bulk.

The CDA claims that the Canadian alfalfa industry does not benefit from Western Grain Transportation Act (WGTA) benefits, and that the U.S. alfalfa industry is not injured by the WGTA. Since the WGTA ensures that the railroads receive adequate compensation to cover costs, and since most of Canada's pellet production occurs in the western part of Canada, the CDA asserts that the alfalfa export industry is not affected by the WGTA. The CDA cites the new plant opening in Ontario as an example supporting this claim. This new plant is the only instance of growth in the Canadian alfalfa industry in recent years, and because of its location it will not be eligible for WGTA benefits. The CDA further states that the U.S. industry is not injured by the WGTA because they abandoned the dehydrated pellet market. The CDA goes on to claim that U.S. alfalfa producers benefit because of a number of U.S. Government programs. The CDA cites the U.S. irrigation subsidies, the Export Enhancement Program, the regulatory and taxation policy advantages that railroads in the U.S. have over their Canadian counterparts, and the low price of fuel in the United States as advantages that the U.S. alfalfa industry has over the Canadian.

Anne Chadwick prepared a written submission on behalf of the National Hay Association (NHA). The NHA claims that the WGTA saves Canadian alfalfa exporters over $20 per metric ton in transportation across Canada to western ports. The NHA also states that 99 percent of Canadian alfalfa exports are subsidized. The NHA further asserts that the U.S. alfalfa industry receives no direct government assistance. The NHA feels that the Canadian, government-subsidized, alfalfa products are forcing the U.S. alfalfa exporters out of the Pacific Rim. When the U.S. share of Japan's alfalfa pellet market slipped from 49 percent in 1982 to under 1 percent in 1990, Canada made up the difference. Sales of alfalfa cubes also fell, while Canadian sales of these products increased. The NHA claims that the Pacific Rim market is large enough to accommodate both countries, but that the Canadians' predatory policies have driven down prices to the detriment of U.S. suppliers and to the benefit of Asian buyers.

Frank G. Lamb prepared a written submission on behalf of the Eastern Oregon Farming Company. The Eastern Oregon Farming Company was an alfalfa pellet producing and exporting operation from 1977 until 1990. The Company accounted for approximately 6 percent of Japan's total alfalfa pellet purchases between 1979 and 1984. The Company claims that it had to quit producing pellets, however, because its Japanese market was taken away and the domestic market is too small to sustain such an operation. The Company blames the enactment of the WGTA for the problems it has faced in the pellet industry. The Company states that had it not been for the WGTA, it would still be major exporter of alfalfa pellets to the Orient.

The American Farm Bureau Federation submitted a statement claiming that the best prices U.S. hay producers can get are determined by the subsidies that foreign governments provide their country's hay and hay products. The WGTA has led to a price reduction for Canadian alfalfa products in foreign markets of over $20 per metric ton. Farm Bureau believes that without the WGTA subsidies, Canadian alfalfa would not have been able to take over important U.S. markets overseas (i.e., Japan).

Lon G. Wadekamper prepared a written submission on behalf of Western Alfalfa, Inc. Western Alfalfa states that the WGTA has caused the U.S. export market for alfalfa products to disappear. Western Alfalfa could not compete with the $20 per metric ton rail subsidy that the WGTA provided to the Canadian competitors. Western Alfalfa has lost some of their share of the Asian market to the Canadians. Western Alfalfa claims that if it were not for the government subsidies being given to the Canadian producers, their product would be competitive overseas.

U.S.
INTERNATIONAL
TRADE
COMMISSION

PUBLICATION
2467-2473
1991