Department of Agriculture, Trade and Consumer Protection
Division of Marketing
Agricultural Development & Diversification Program (ADD)

1999 Grant Project Final Report

Contract Number: 14035

Grant Project Title: A Study of the Market for New Alfalfa Products

Project Beginning Date: 7-01-99 Project End Date: 1-01-01

Amount of Funding Awarded: $14,000

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A Study of the Market for New Alfalfa Products

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1) Describe the original intent of the grant project.

The original intent of this project was to partner with other states (MN, ND, SD, MI) in the North Central region to investigate the market potential for value added processing of alfalfa. This could offer a number of positive attributes including a positive economic benefit to farmers and their local communities, lower requirements of non-renewable resources, improved soil and water conservation and the ability to reduce pest build-up and to increase yields when produced in rotation with cash crops. Green protein, white protein, xanthophyll, and pelleted and dehydrated premium grade feed products were to be evaluated. Information was to be disseminated to producers and potential industry processors and users.

South Dakota chose not to participate in this study, resulting in a 4-state partnership rather than 5.

2) Describe the work conducted in this project.

The firm of Senechal, Jorgenson, Hale And Company, Inc. (SJH) as described in the project proposal, conducted the market study. ~~A copy of the report is attached~~. The current market situation was evaluated, and it was determined that there is potential for new market materials with the greatest potential in the area of monogastric nutrition including xanthophyll, protein supplements and milk replacer. Green protein for human consumption was not found to have potential without considerable market building. White protein for human consumption, nutraceuticals or cosmetics offers potential, but must overcome the acceptance of soy products.

Considerable time was spent trying to identify potential adopters of the fractionation value added processing approach for alfalfa, and to promote this process with producers.

3) Describe the public outreach efforts of this project.

The project was promoted via a variety of efforts, including contacts with producers or potential adopters through the USDA Dairy Forage Research Center (located at the University of Wisconsin-Madison) through their field days, our groups, individual visits. Similar efforts were initiated through UW-Madison events and programs including presentation at the UW-Madison Open House Weekend event, the Future Fair hosted at the Monona Terrace Convention Center and field day events. Companies such as New Holland, Deere and Company, Land O Lakes, Cenex, Archer Daniels Midland, and Purina were contacted and were given presentations and or provided materials on this processes. Several dehydrators including Emerald Acres were contacted and provided information. The project was highlighted in articles in Hay and Forage Grower magazine and in the UW-Madison College of Agricultural and Life Sciences' Science publication. Presentations were give to several national groups including American Society of Agricultural Engineers and the Agricultural Equipment Technology Conference.

4) Describe the results of this project.

Results of this project were mixed. The marketing study was completed as previously referenced ~~(and attached)~~. Results were promising, but not as promising as originally hoped. While potential markets were identified relating to monogastric nutrition and to white alfalfa protein concentrate, the competitiveness of the market will probably require a commitment by a larger player in the market, such as a Land O Lakes or an Archer Daniels Midland to insure the market source needed for adoption. Efforts are still underway to try to interest a smaller cooperative or producer group in the process. The inertia of the existing market has proven harder to overcome than originally anticipated. We believe that the possibility of higher value products such as enzymes or organic acids that can be produced in alfalfa offer attractive future possibilities, as does the potential for coupling this with bio-fuel production. We continue to be optimistic that this approach can and will be used, and will have a positive impact on Wisconsin and Midwest agriculture.

5) How will the Wisconsin agriculture industry be able to use the information from this project?

Wisconsin agriculture will benefit from the information from this project as it makes future decisions regarding investment and adoption of this technology.

6) Include any research data that support your conclusions for this project.

See report.

7) Include any other information you feel is appropriate.

See report

Alfalfa New Products Initiative

Alfalfa Market Review and
Potential Opportunities

Presented by:

SJH & Company, Inc.
11 Cherry St. Danvers, MA 01923

A Note On Context

The following document is incomplete without the accompanying oral presentation.

Structure of Today's Presentation

1. Executive Summary

2. The Alfalfa Market – Supply Analysis

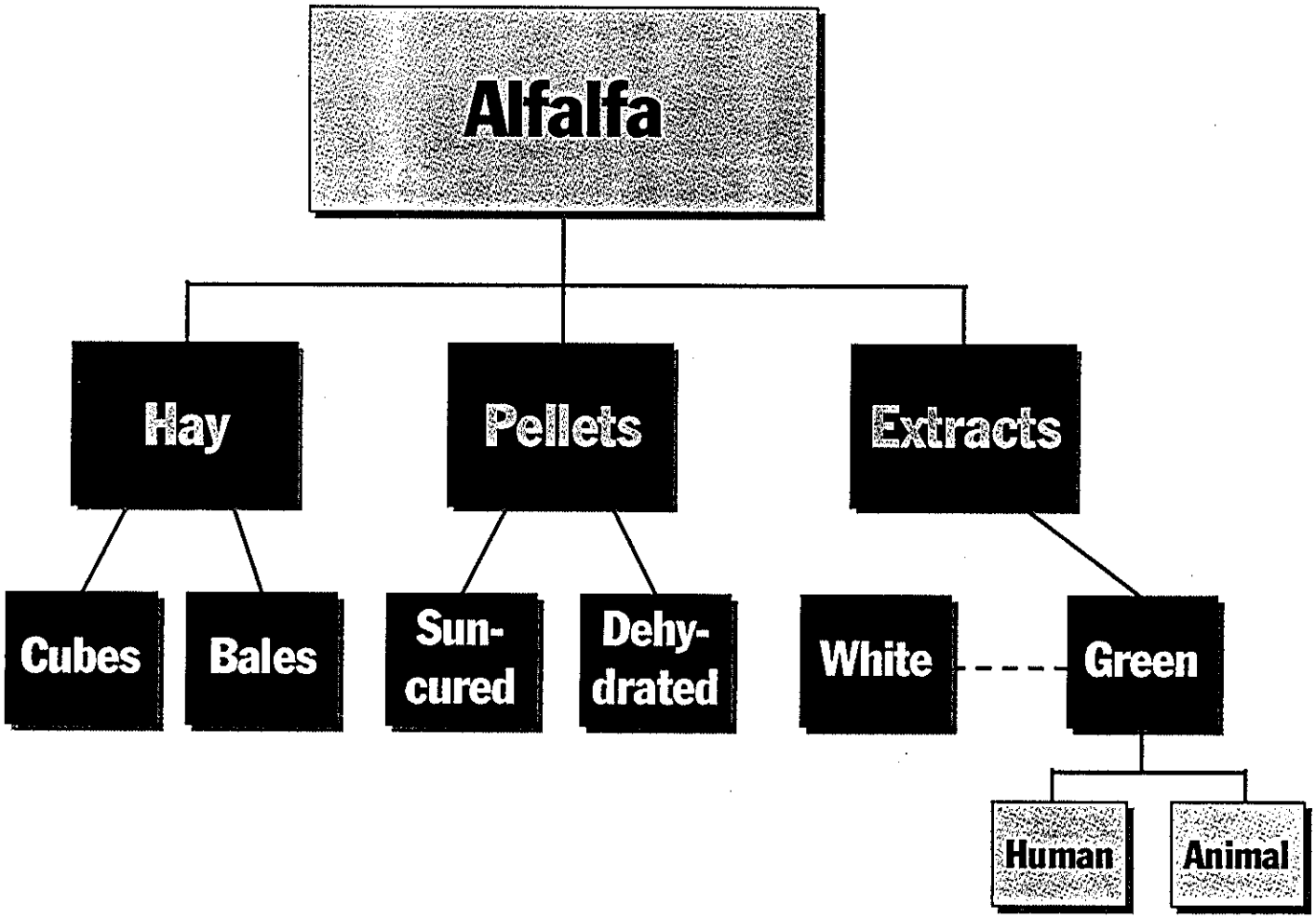
3. Alfalfa Pellets

   A. The Pellet Market
   B. Pellets: Estimated Market Potential and Summary
   C. Pellets: Competitive Analysis

4. Alfalfa Extracts

   A. Extracts: An Overview
   B. Green Protein: Animal Grade
   C. Green Protein: Human Grade
   D. White Protein
   E. Competition from Soy

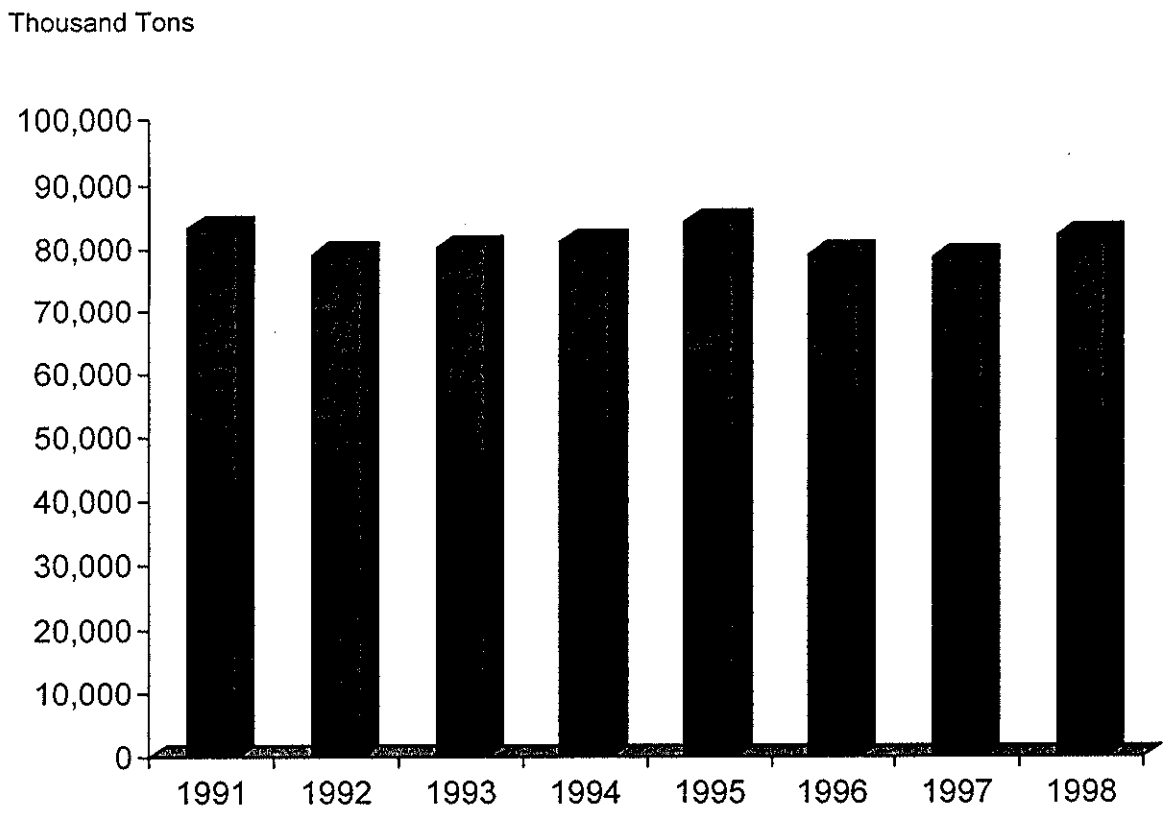
Executive Summary


Alfalfa
Hay
Pellets
Extracts
Cubes
Bales
Sun-cured
Dehy-drated
White
Green
Human
Animal

Historic U.S. Alfalfa Production

Executive Summary

The total amount of alfalfa grown in the U.S. has been relatively flat for the last eight years, decreasing at a CAGR of 0.2%.[1]

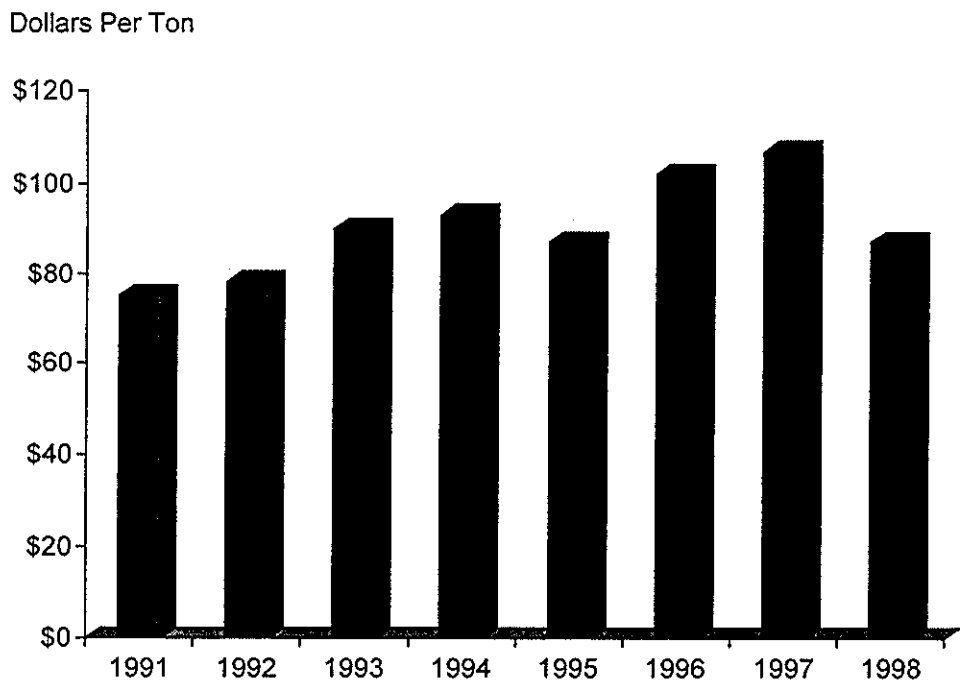


[1] Source: USDA

Historic U.S. Alfalfa Prices

Executive Summary

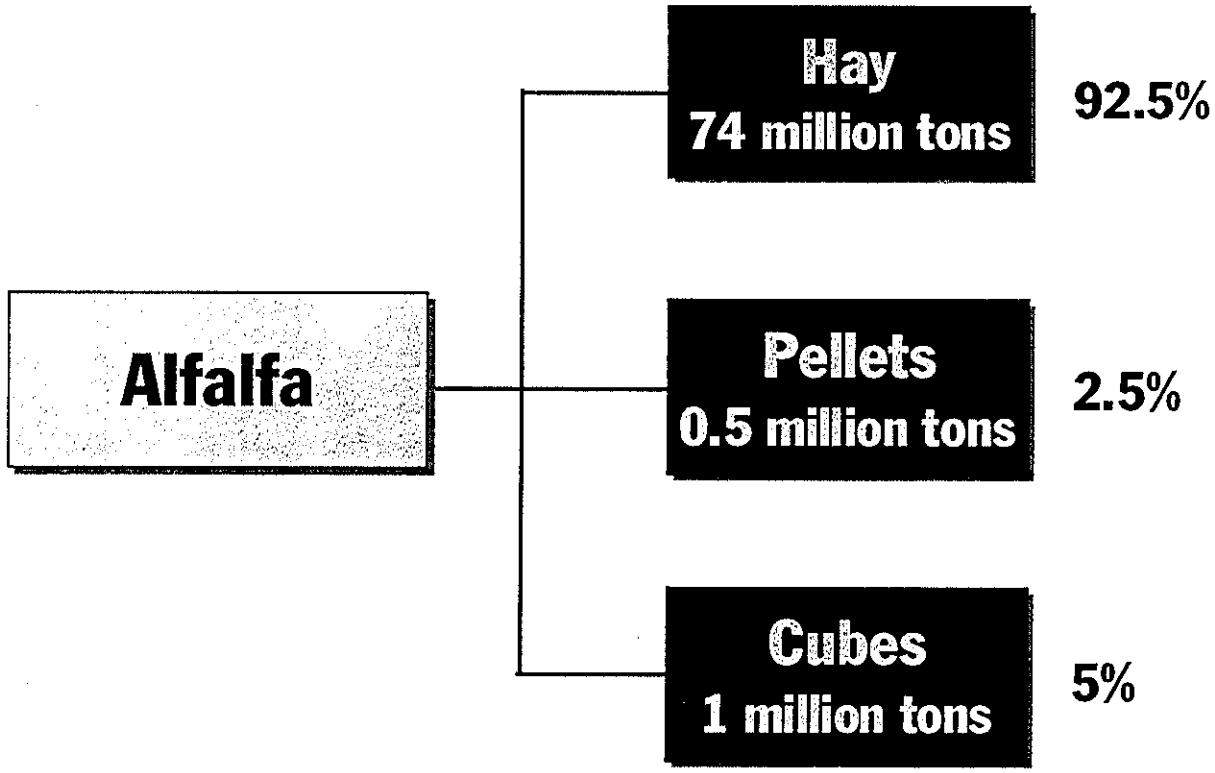
After peaking in 1997, prices for unprocessed alfalfa fell off sharply towards the end of 1998. So far, prices for 1999 have been at historic lows, reaching $76 per ton in Kansas.[2]



Overall, prices have risen at a CAGR of 1.9% over the past 8 years.

[2] Source: USDA

The U.S. alfalfa market can be divided into three primary segments: hay, cubes, and pellets (meal).[3,4,5,6]



[3] Source: AAPA
[4] Almost all pellets start out as meal, and are then formed into pellets. For the remainder of this report, pellets and meal will be treated as synonymous.
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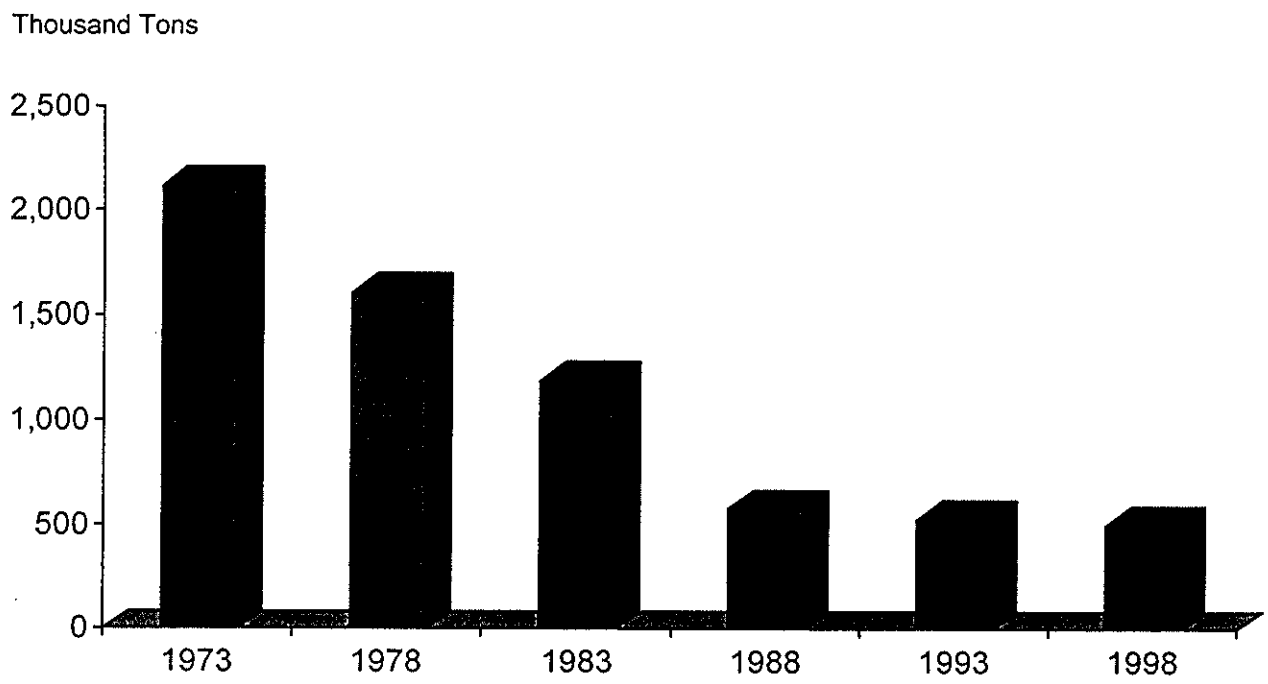
Historic U.S. Production of Pellets

Executive Summary

Over the past 25 years, U.S. production of alfalfa meal and pellets has contracted by 76%. This represents an annual compound decrease of 5.4%.[7]



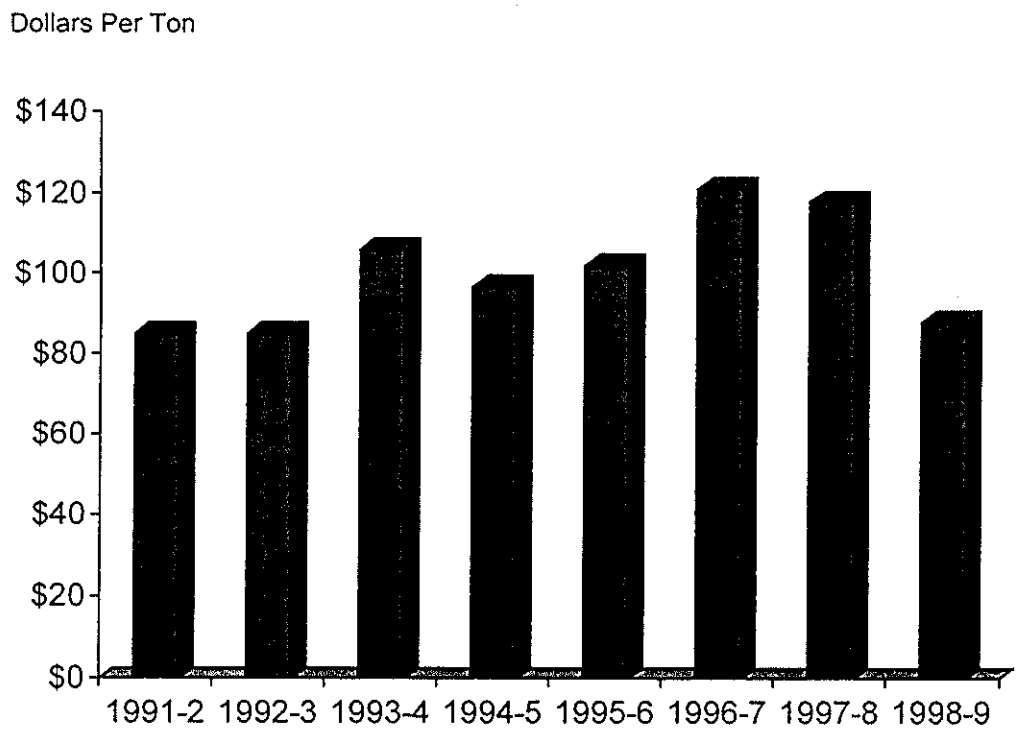
In 1998, sales of pellets in the U.S. were valued at approximately $41million.

[7] Source: USDA

Historic U.S. Pellet Prices

Executive Summary

Prices for alfalfa pellets today are at the same level as 9 years ago, after having risen sharply from 1996 to 1998.[8]



[8] Source: AAPA

U.S. History of Xanthophyll Use

Executive Summary

- Historically, the most significant application for alfalfa pellets was as a source of xanthophyll, providing yellow pigment to the poultry industry.
- From the 1950 to the 1970s, as much as 50% of all pellet production was absorbed by the poultry industry, driving alfalfa pellet sales.
- Due to the high fuel needs of the dehydrating process, the fuel crisis of the 1970s prompted pellet producers to switch from fuel dehydrated to suncured pellets.
- The shift to suncuring produced a pellet that was lower in nitrution and higher in fiber than its dehydrated predecessor.
- As a result, poultry farmers began to seek other more nutritive, more easily digested sources of yellow pigmentation.
- The entire poultry industry now uses marigolds or synthetics (such as Cromophyl) for pigment, and uses other food supplements to replace the protein and nutrients which alfalfa used to provide.

Market Applications

Executive Summary

Following are the current markets for alfalfa pellets in the U.S., in order of importance:

- Feed for dairy cattle
- Rabbit feed
- Feed for other cattle
- Sheep and goat feed
- Horse feed
- Feed for zoo animals
- Specialty animal feed (iguana, emu, camel, etc)
- Fertilizer and other

Total Pellet Market Potential

Executive Summary

By taking advantage of the various unexploited applications for alfalfa pellets, a new entrant might be able to able to secure a sizeable market.

Potential cattle feed market	Potential sheep and goat feed market	Potential pet food market	Potential xanthophyll market	**Total potential market**
$12-24 million	$1.7-3.4 million	$5-12.5 million	$1.6-8.2 million	**$20-48 million**

The U.S. Pellet Market Environment

Executive Summary

- The pelleted alfalfa market has been controlled by the same 2 or 3 families and companies for the past 50 years.
- This market has been characterized by a lack of innovation with respect to methods of processing and potential avenues for cost saving.
- The industry has been characterized by a lack of marketing efforts.
- Little attempt has been made to recapture lost markets, and little attention appears to have been has been paid to the active development of new applications.
- Most of the processors with whom we spoke had a dismal view of the future of the U.S. market for pelleted alfalfa.
- For example, two of the top four processors of alfalfa pellets offered to sell us plants during the course of our interviews with them.

Assessment of the Future of the U.S. Pellet Market

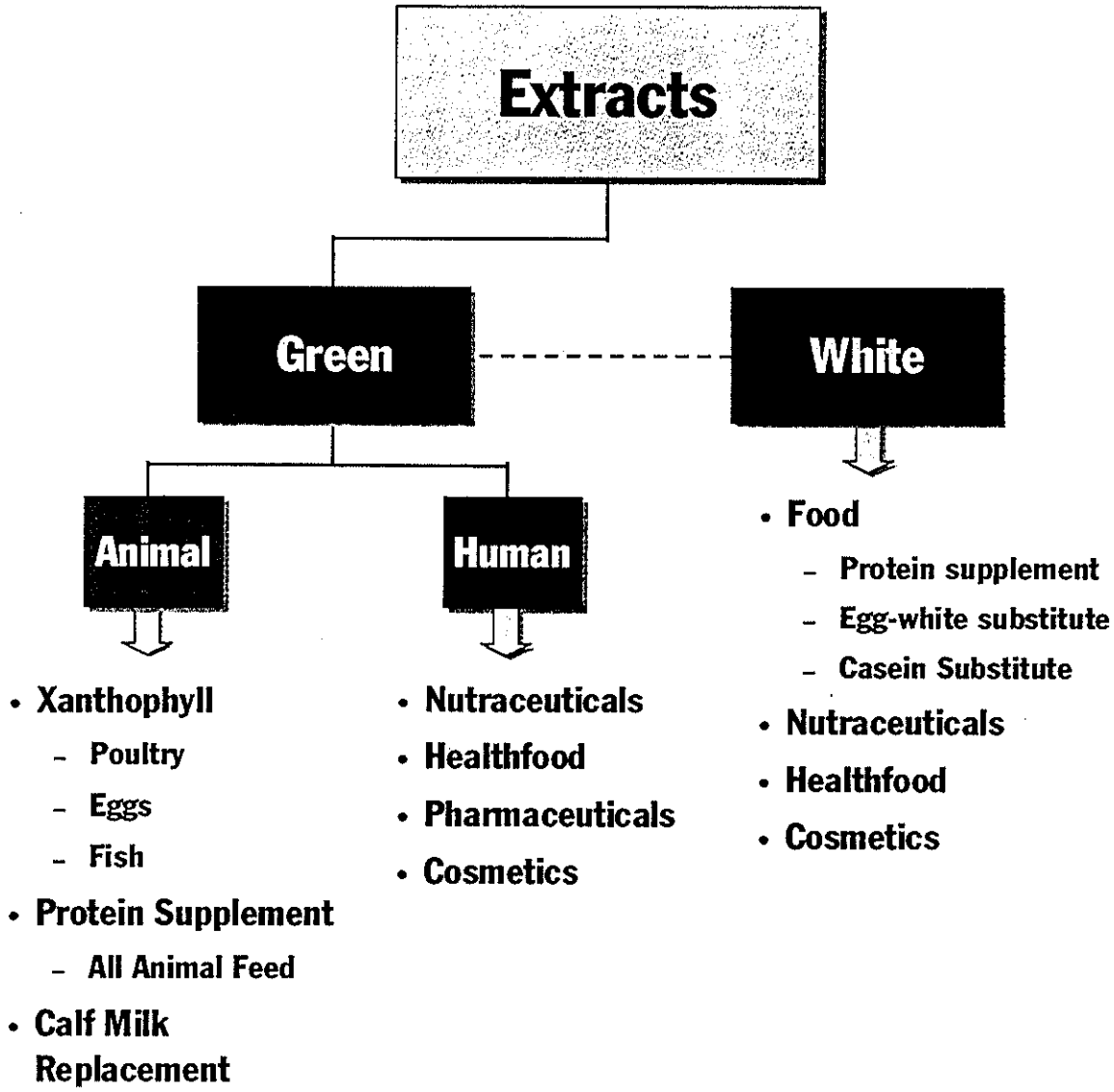
Executive Summary

In the course of interviews with leading experts on alfalfa processing, a number of possible directions emerged as the most promising opportunities for revitalizing U.S. market for processed alfalfa products.

- Separation of leaves and stems will become an essential part of the production of premium alfalfa products.
- Stems should be used to produce quality roughage while leaves should be used to produce high nutrient feed supplements.
- Providing feed for simple stomach animals (non-ruminants) will be the future of the pelleted alfalfa business.
- Producers must find more efficient ways to dehydrate, enabling them to produce higher quality alfalfa products without incurring additional costs.

The Extract Market

Executive Summary



Green Animal-Grade Protein: Market Assessment

Executive Summary

- Green animal-grade alfalfa proteins are not currently sold for commercial uses in the U.S. market.
- All of the potential applications for green animal-grade alfalfa proteins are currently served by other products and ingredients.
- Alfalfa proteins can function as superior replacements for most of the products against which they would compete.
- Cost will be a key factor in attracting customers to alfalfa-based products.
- Extensive consumer education will be required to convince customers to switch from their current products to alfalfa.
- Focussing on numerous applications of green alfalfa proteins is a critical element to achieving commercial success in the U.S. market.

Green Animal-Grade Protein: Market Potential

Executive Summary

Following is an estimate of the potential value of these applications for the alfalfa extract market.[9]

Product	U.S. Market	% to Capture	Potential Value
Xanthophyll[10]	$82 million	2 - 10	$1.6 - 8.2 million
Fish Feed Supplement	$12 million	10 - 25	$1.2 - 4 million
Animal Feed Supplement	$550 million	10	$55 million
Calf Milk Replacement	$350 million	10	$35 million
Potential Market			**$93 - 102 million**

[9] Source: SJH estimates

[10] Extracts and pellets can both serve the xanthophyll market. The figures here for xanthophyll duplicate the figures already presented in the segment on the pellet market.

- Health supplements, nutraceuticals and pharmaceuticals represent the most significant potential applications for green human-grade protein.
- Applications for these proteins will require the development of new products.
- The market for nutritive supplements in the U.S. is growing rapidly.
- While U.S. consumers are receptive to nutritive supplements, marketing green proteins successfully will require extensive consumer education concerning the benefits of alfalfa products.
- FDA approval is required in order to make any claims concerning the health benefits of alfalfa.
- The successful introduction of green human-grade alfalfa proteins into the U.S. market will require extensive market building.

White Protein

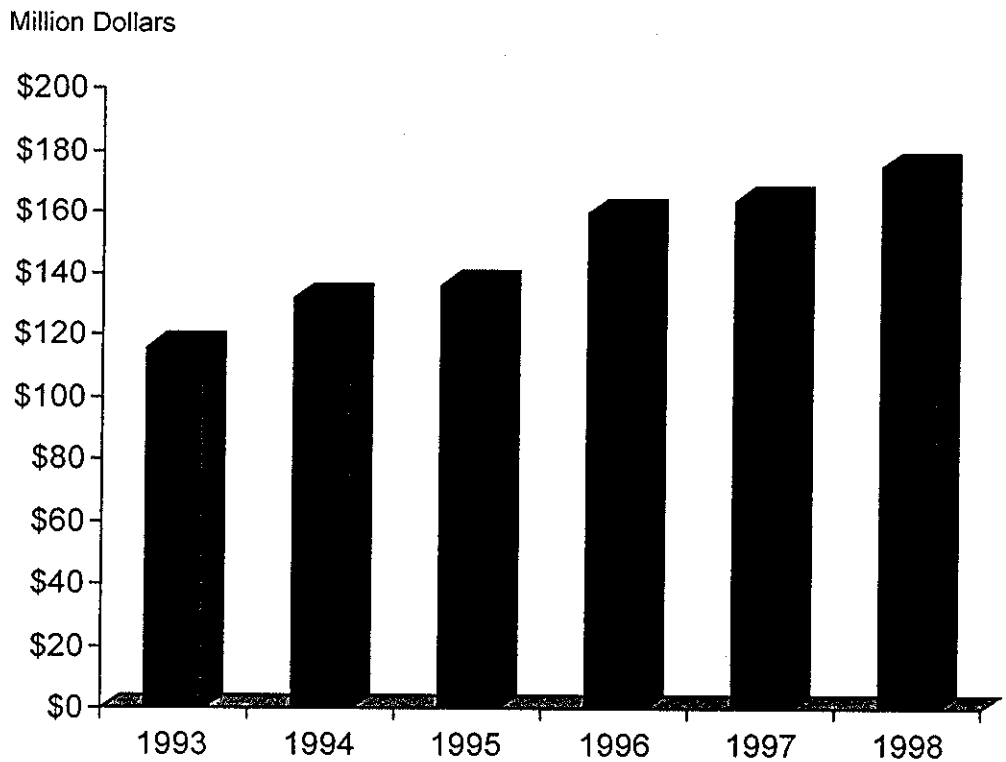
Executive Summary

- The main uses for white protein are:
  - Food
    - Egg white substitute
    - Casein substitute
    - Protein supplement
  - Nutraceuticals
  - Health food
  - Cosmetics

White Protein and Egg Whites: Historic U.S. Egg White Sales

Executive Summary

White protein can be whipped into a stable foam that serves as an excellent substitute for egg whites. The US market for egg whites is healthy and has grown at a CAGR of 7.1% since 1993.[11]



[11] Source: SJH Estimate

White Protein and Casein

Executive Summary

The high protein content of white alfalfa protein makes it a suitable replacement for casein.

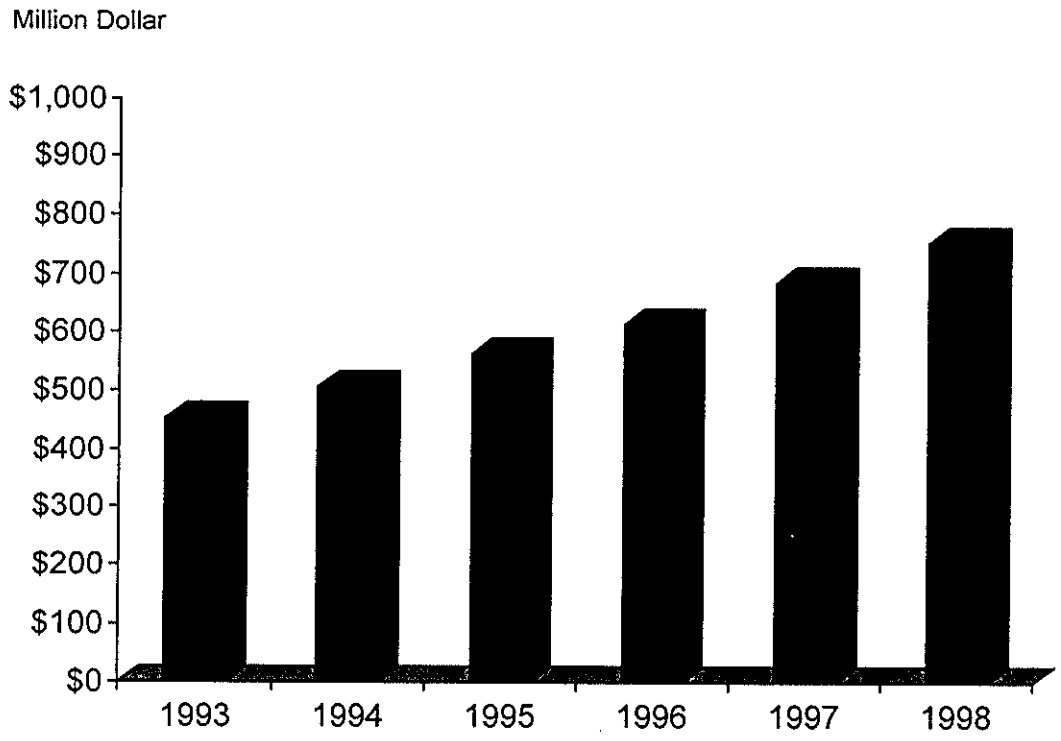
However:

- The U.S. government currently buys all excess skim milk powder from U.S. dairy farmers and processors. As a result, dairymen have no incentive to produce casein.
- At present there is no casein produced in the U.S.
- All casein in the U.S, is imported.
- Casein imports are allowed only for industrial, chemical uses, such as glue manufacturing.
- It is suspected that the next year will bring a liberalization of the laws controlling casein imports into the U.S.

Alfalfa Extracts' Biggest Competitor: Soy

Executive Summary

The biggest competitor products facing white and green alfalfa proteins are soy protein isolates and soy protein concentrates. Soy proteins are well established in the U.S. market, and have been growing at a CAGR of 8.8% since 1993.[12]



[12] Source: SJH & Company Inc.

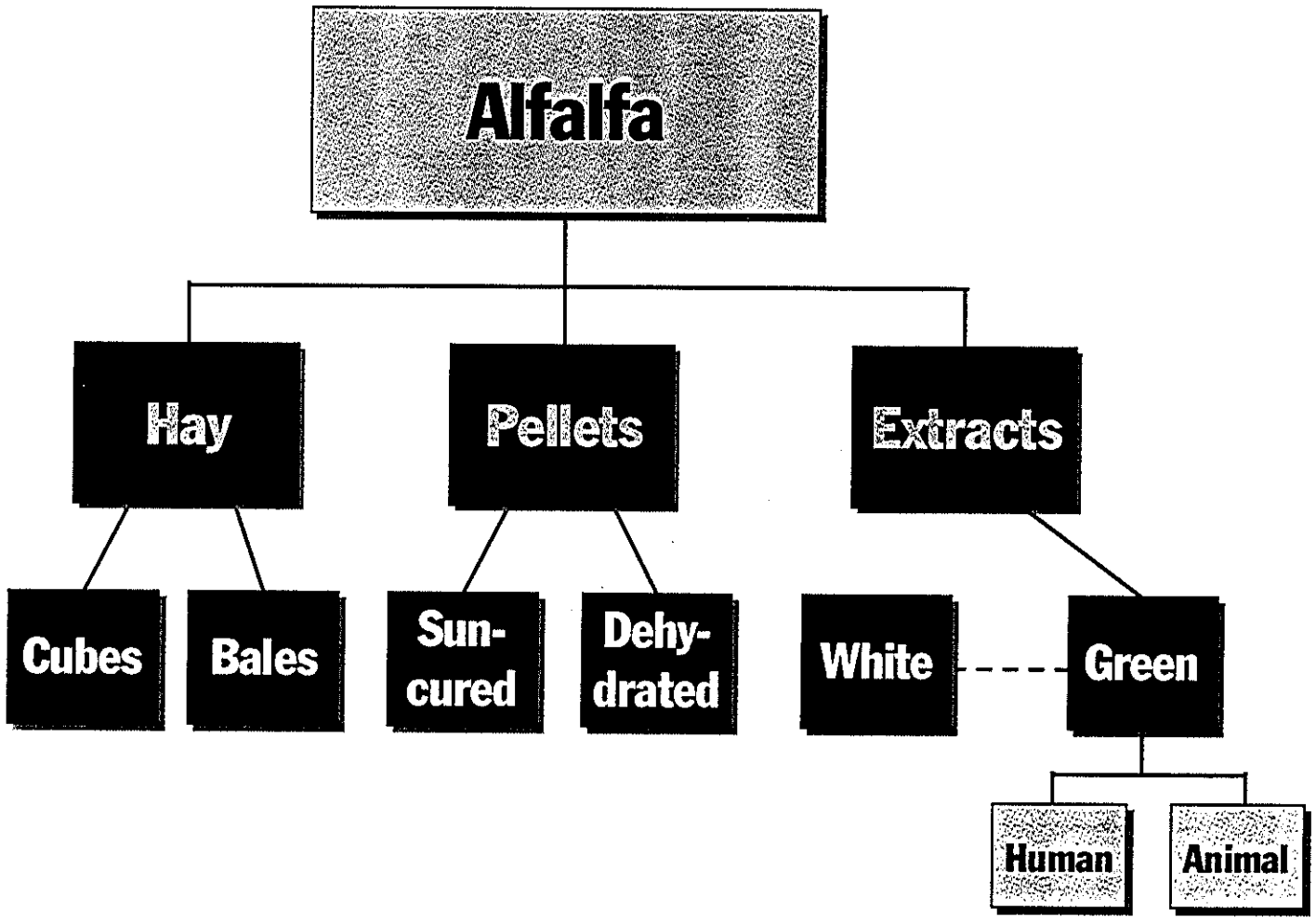
Total Extract Market: Competitive Assessment

Executive Summary

- Alfalfa crops produce more protein per acre than any other crop.
- On the basis of price, alfalfa proteins should be able to compete with soy proteins.
- Soy products and soy proteins have been produced in the U.S. for three decades and have gained wide-spread acceptance.
- Competing with soy will require two courses of action:
    - Developing an alternative product that is cheaper than soy but offers the same benefits.
    - Actively educating customers about alfalfa-based products and the benefits they offer.
    - Convincing food manufacturers to adopt alfalfa-based products in place of soy-based products will require aggressive marketing.

Supply Analysis

The Alfalfa Market



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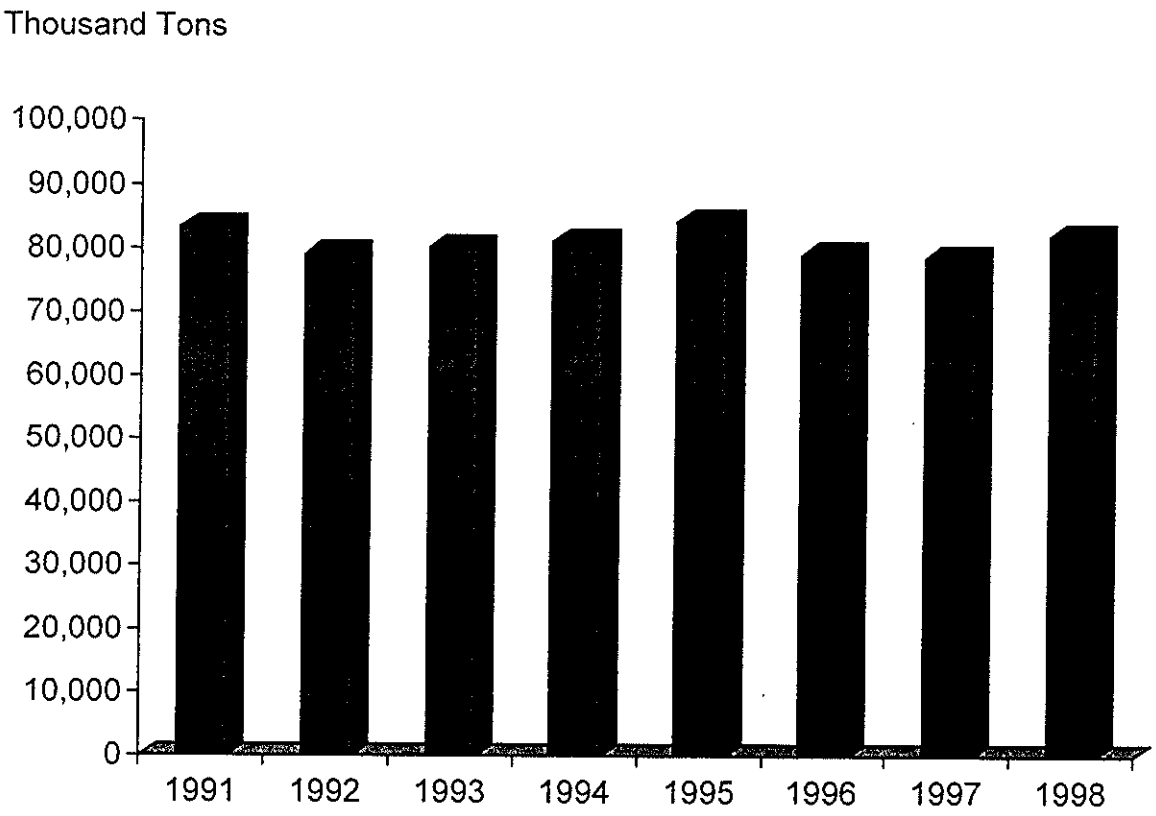

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Historic U.S. Alfalfa Prices

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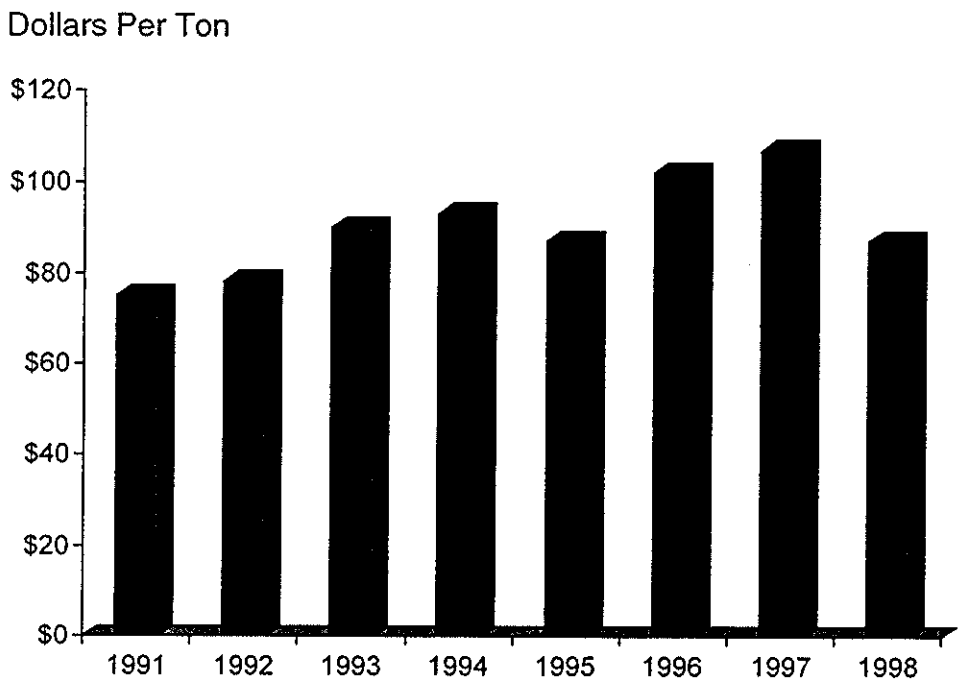


Overall, prices have risen at a CAGR of 1.9% over the past 8 years.

[2] Source: USDA

Analysis of Prices

Supply Analysis

Why did alfalfa prices drop between 1997 and 1999?

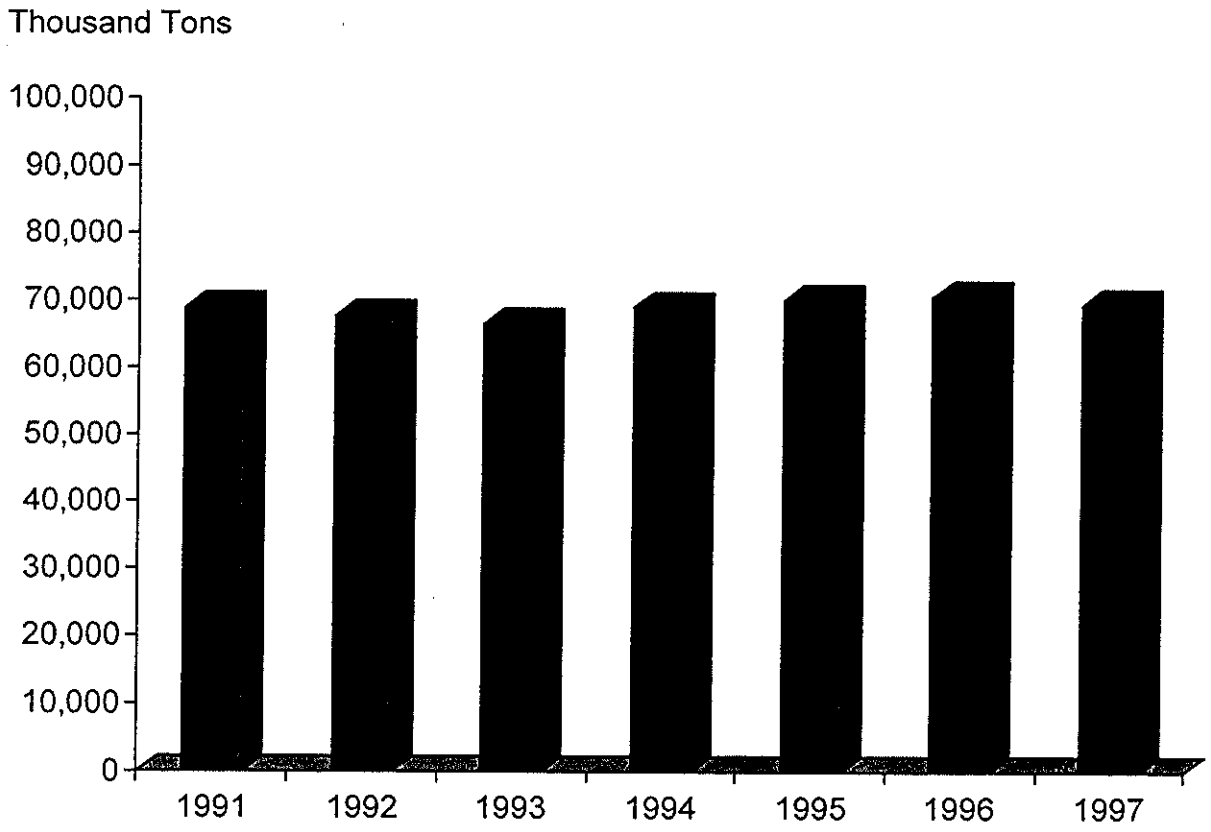
- All commodity prices dropped during this period
- There was slight over-production among alfalfa producers in 1998
- Producers carried over too much of their product from 1998 to 1999[3]

[3] Source: Industry experts, analysis of commodity prices

Historic U.S. Production of Other Hay

Supply Analysis

Production of all other hay[4] in the U.S has been steady over the past seven years.[5]

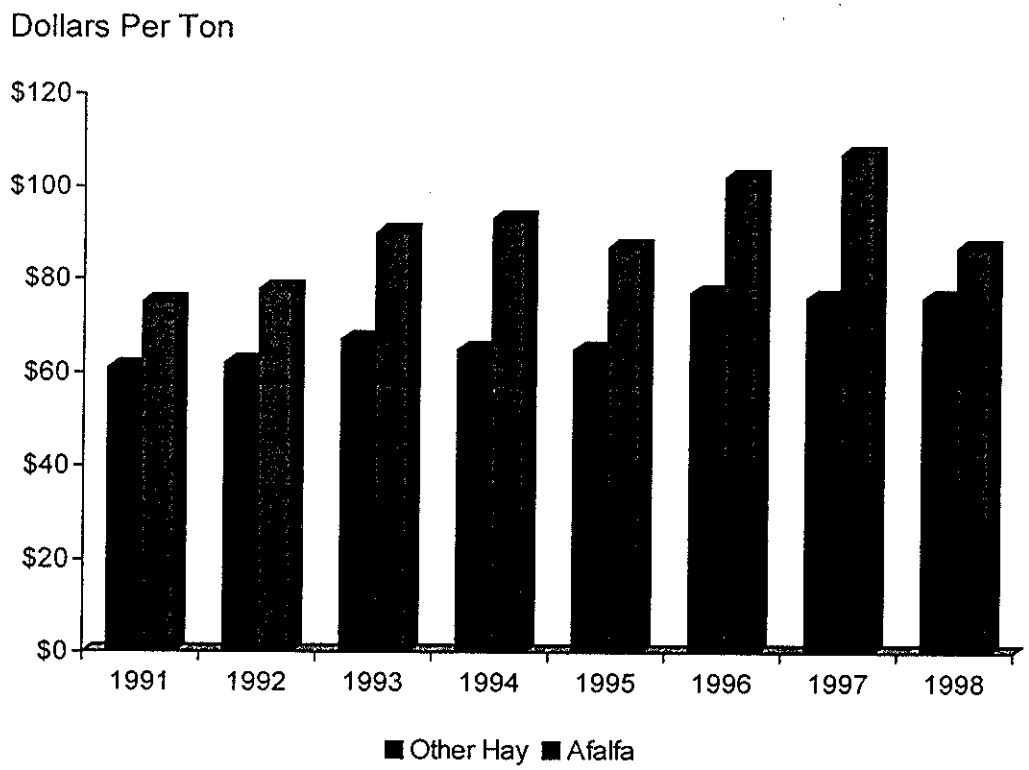


[4] Other hay includes Bermuda Grass, Rye Grass, Orchard Grass, Brome, Timothy, Clover, and various mixes.
[5] Source: USDA

Historic U.S. Prices of Other Hay

Supply Analysis

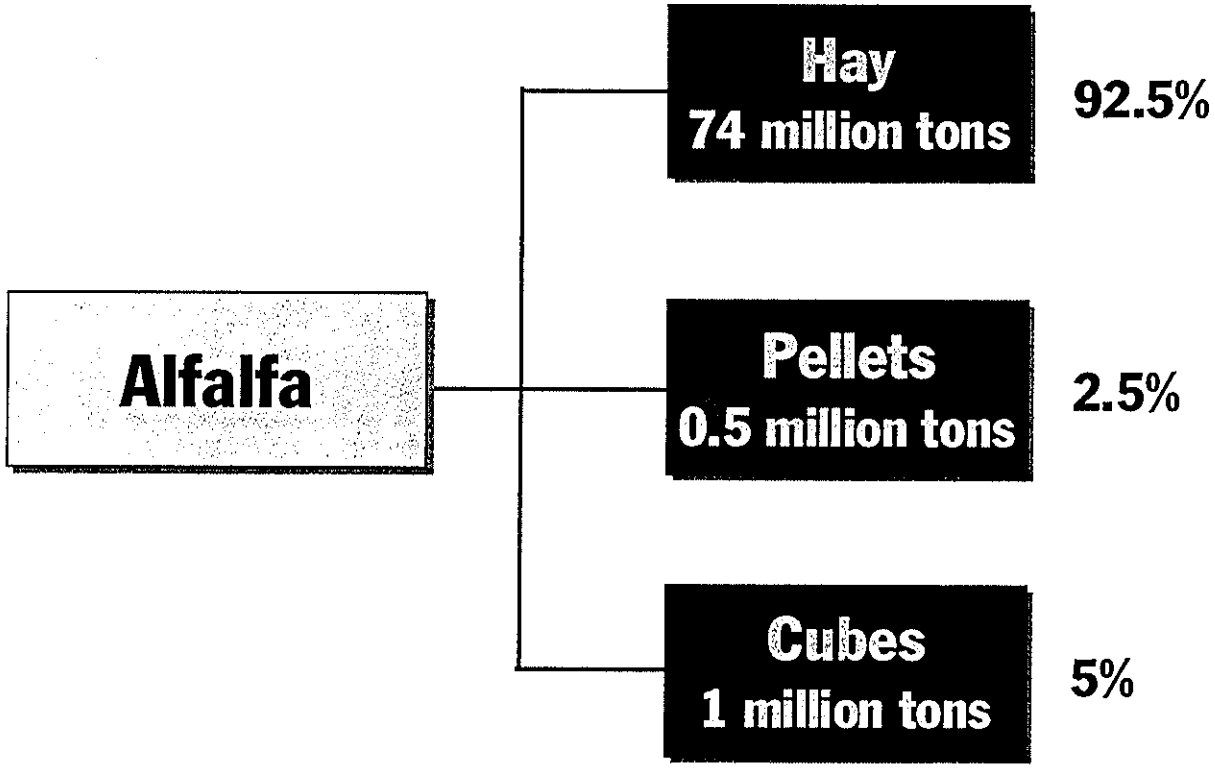
Alfalfa has consistently been more expensive than other hay on the U.S. market.[6] Over the past eight years, prices for alfalfa have been 31% higher than other hay prices on average.[7]



6 Alfalfa commands a price premium because it has more nutrients and protein than other varieties of hay.
7 Source: USDA

The Pellet Market

The U.S. alfalfa market can be divided into three primary segments: hay, cubes, and pellets (meal).[1,2,3,4]



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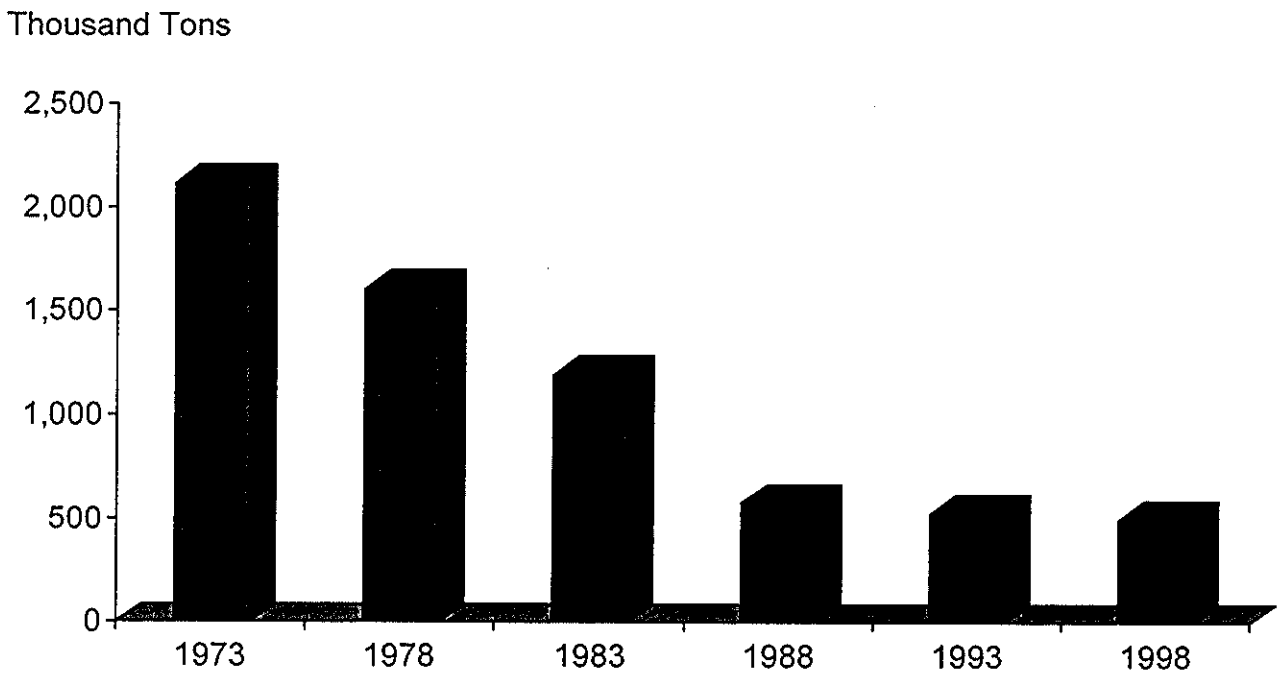

In 1998, sales of pellets in the U.S. were valued at approximately $41million.

[5] Source: USDA

Historic U.S. Pellet Prices

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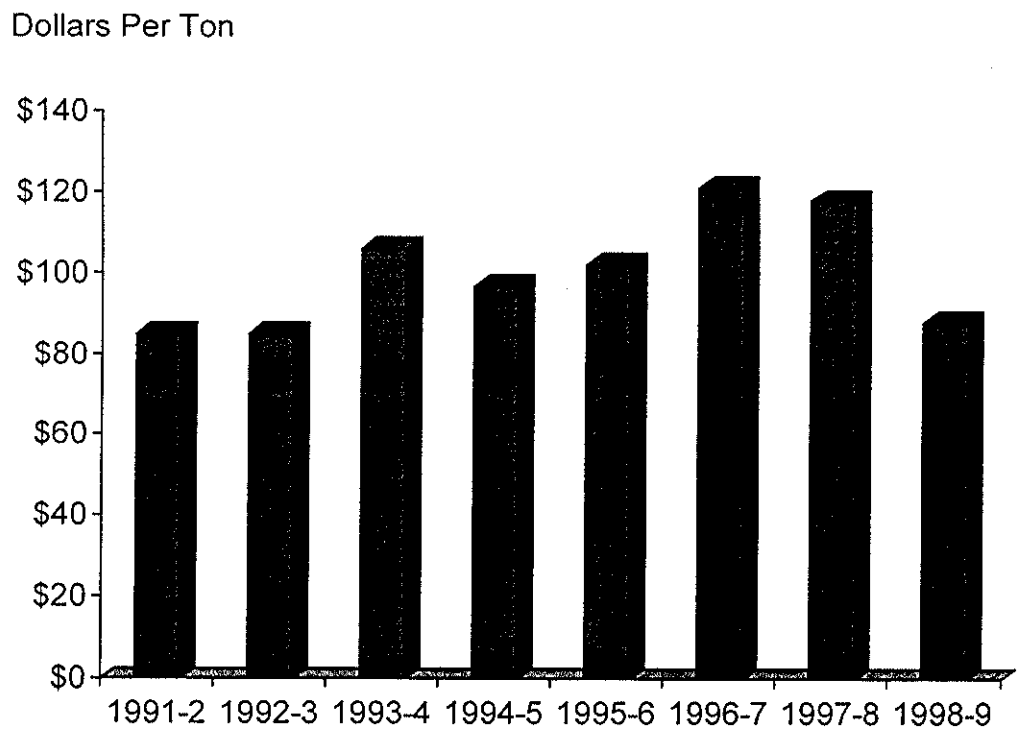


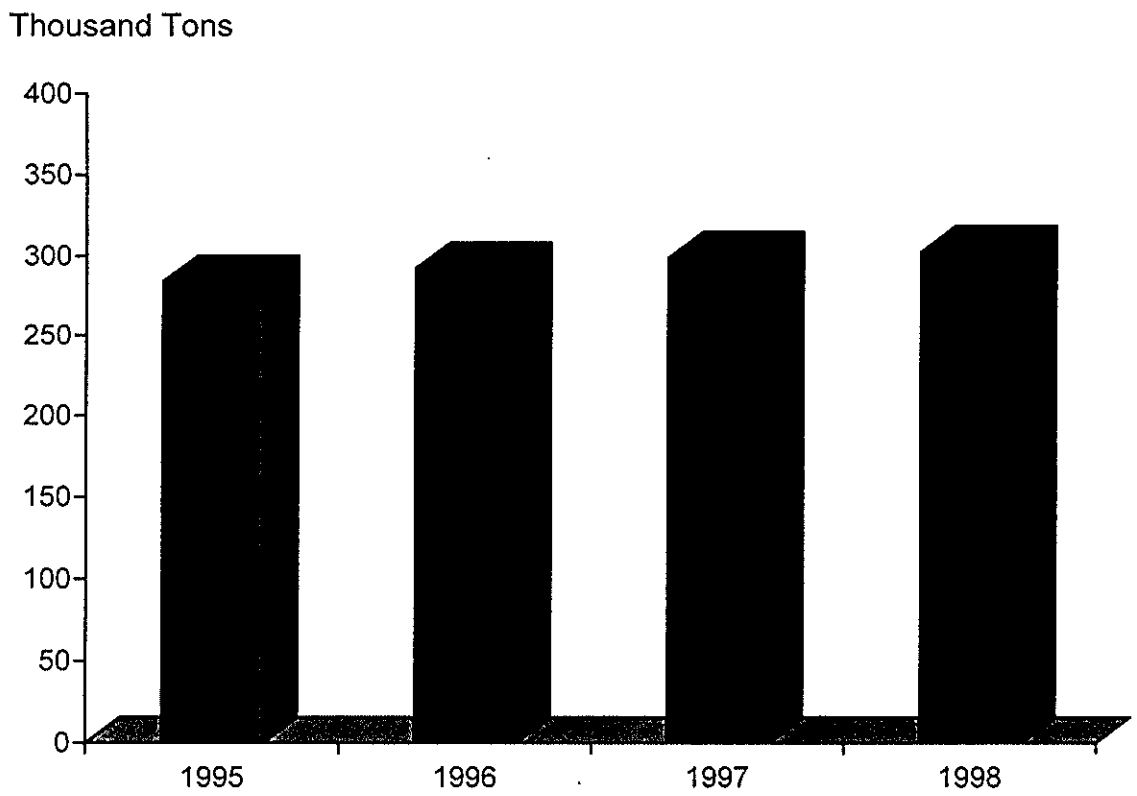
Reasons for the recent decline in the price of pellets mirror the reasons for the decline in overall alfalfa prices.

[6] Source: AAPA

Historic U.S. Pellet Exports

The Pellet Market

The U.S. does not import any processed alfalfa products. A small quantity of processed alfalfa products is exported every year, consisting mostly of alfalfa cubes, not pellets. These exports have grown at a CAGR of 1.6%. Almost all U.S. exports of alfalfa (96%) go to Japan.[7]



[7] Source: USDA

U.S. History of Xanthophyll Use

The Pellet Market

Historically, the most significant application for alfalfa pellets was as a source of xanthophyll.

- Xanthophyll is an active ingredient in "green protein" processed alflafa products, and it works as a yellow coloring agent. It is widely fed to poultry in order to:
  - Provide a yellow color to commercial broiler chickens
  - Provide a deep yellow color to the yolks of eggs

- From the 1950s to the 1980s, xanthophyll was added to all poultry feed. The poultry industry drove alfalfa sales, providing a large market for dehydrators, and absorbing as much as 50% of all alfalfa pellets produced.

U.S. History of Xanthophyll Use (continued)

The Pellet Market

In the 1970s, the energy crisis prompted changes in alfalfa pellet production.

- The typical dehydrating process requires the use of significant amounts of fuel.
- Manufacturers changed their processes in order to conserve fuel and save money.
  - Alfalfa crops were placed in wind rows after being cut.
  - Suncuring replaced dehydration as the main drying method.

U.S. History of Xanthophyll Use (continued)

The Pellet Market

The shift from dehydrating to wind rowing and suncuring resulted in:

- Evaporation of protein and xanthophyll from the drying alfalfa, which harmed the quality of the pellets

- Leaf loss, which raised the proportion of stems to leaves in the final product. This increased the fiber content of alfalfa products, rendering them less digestible

■ Deterioration in the quality of alfalfa products made competing products more attractive. Poultry farmers sought other ways to satisfy their pigmentation needs.

U.S. History of Xanthophyll Use (continued)

The Pellet Market

Marigolds emerged as a viable alternative source of yellow pigmentation for poultry farmers and egg producers. Mexico produced a powder made from the petals of the marigold flower. This powder:

- Is much more potent as a pigmenting agent than xanthophyll
- Can be digested more easily by chickens than the newly inferior
- Is more expensive than alfalfa pellets (currently $380/ton)
- Lacks the nutrient profile of alfalfa products

U.S. History of Xanthophyll Use (continued)

The Pellet Market

By the early 1980s, virtually the entire poultry industry had switched from alfalfa to marigold powder as their primary pigmenting agent. As a result:

- The poultry industry now uses marigolds or synthetics (such as Cromophyl) for pigment, and uses other food supplements to replace the protein and nutrients which alfalfa used to provide.

Dehydrated and Suncured Pellets

The Pellet Market

There are two main types of alfalfa pellets produced in the U.S.

- Dehydrated (Premium): The alfalfa is gathered from the field immediately after being cut, or after being winrowed.[8] This leaves it with a moisture content of 30-60%. Then it is dehydrated to 6-8% moisture, using powered dehydrators.

- Suncured (Standard): The alfalfa is cut, winrowed, and then left to dry naturally. The resulting product usually has a moisture content of 8-10%.

[8] Maximum winrowing time is one day.

Dehydrated and Suncured Pellets (continued)

The Pellet Market

A comparison between suncured and dehydrated reveals that dehydrated pellets:

- Have more protein and more nutrients
- Have a lower fiber content due to a lower ratio of stems to leaves. This makes it less fibrous and more digestible
- Are used for specialty markets (see below). Suncured is used as roughage and filler for cattle feed
- Command a price premium of up to 10%, depending on the market for suncured and other feed products

Applications of Dehydrated and Suncured Pellets

The Pellet Market

For most applications, one can use dehydrated or suncured alfalfa pellets. The choice to use one or the other depends primarily on:

- The protein needs of the animal being fed, and the protein profile of the other ingredients in an animal's feed
- The digestive ability of the animals being fed
- Whether one is using the alfalfa pellets primarily as a supply of roughage or of nutrients.

Protein Levels

The Pellet Market

The other main characteristic of differentiation among pelleted alfalfa products is protein content.

- Protein contents for alfalfa pellets range from 15% to 22%.
- The younger the alfalfa is when it's harvested, the higher the protein content.
- The desired protein content for alfalfa pellets depends on the other feed ingredients with which they will be mixed.
- 17% is by far the most common grade of protein, and most alfalfa data is quoted on the basis of 17% protein.

Protein Levels (continued)

The Pellet Market

- 17% pellets command a price premium of approximately $10-15/ton over 15% pellets.

- Most 20-22% pellets do not command a price premium over lower grades. They are available only early in the season, from the first cuts of the year.

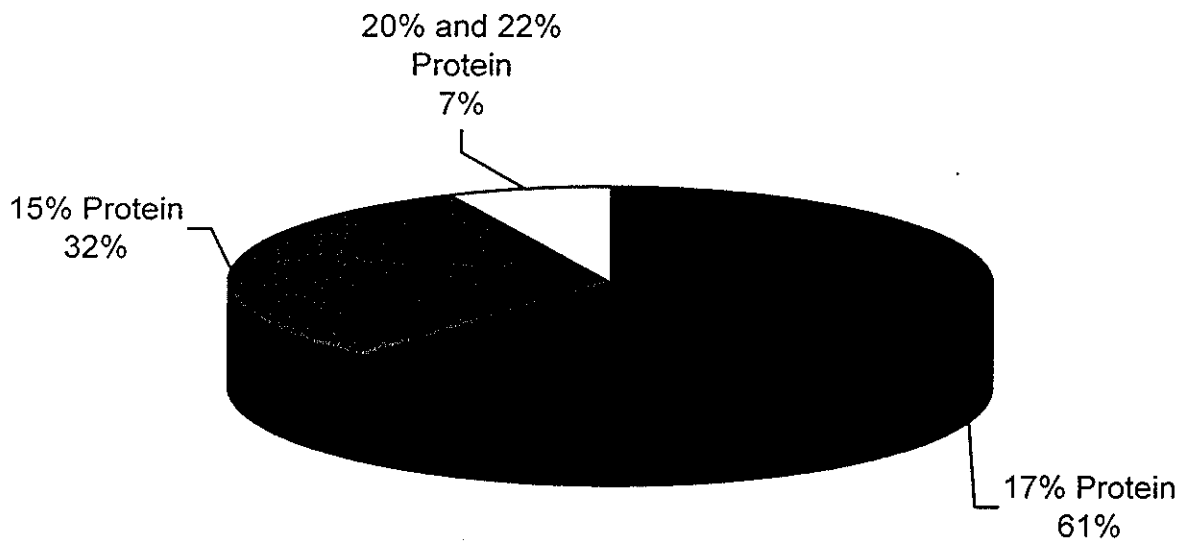
- Numerous manufacturers do not produce pellets with protein content over 17%.

- Most 17% pellets, and all pellets with a protein content over 17%, come from dehydrated alfalfa (not suncured).

Protein and Product Mix

The Pellet Market

The following is an estimate of the product mix for pellets among the country's largest alfalfa dehydrators.[9]



[9] Source: SJH estimates

Market Applications

The Pellet Market

Following are the current markets for alfalfa pellets in the U.S., in order of importance:

- Feed for dairy cattle
- Rabbit feed
- Feed for other cattle
- Sheep and goat feed
- Horse feed
- Feed for zoo animals
- Specialty animal feed (iguana, emu, camel, etc)
- Fertilizer and other

Non-Feed Uses

The Pellet Market

While the majority of alfalfa goes into feed rations, alfalfa pellets are also considered an excellent fertilizer. They are recommended by the American Rose Society for bringing the following benefits to roses and other flowering bushes:

- Strengthening the root system by providing additional nutrients
- Stimulating the growth of beneficial soil organisms
- Promoting more brightly-colored flowers
- Stimulating more abundant blooming

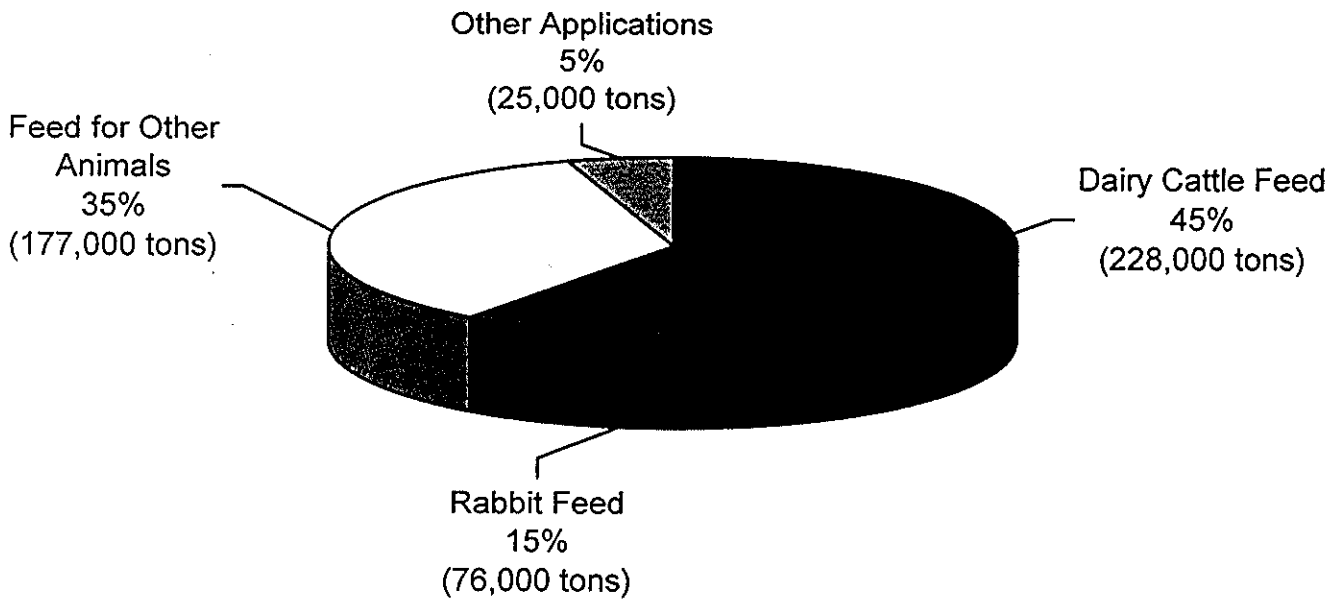
Applications of alfalfa as a rose fertilizer include:

- Sprinkling pellets at the base of each rose bush in the spring
- Brewing an alfalfa tea – 2 cups of pellets to 2 ½ gallons of water – and applying one gallon per bush in the fall to enhance growth.

Market Applications By Market Share

The Pellet Market

The market for pellets is broken down approximately as follows. Feed for dairy cattle and rabbits account for 60% of the U.S. market, which totaled 506,000 tons in 1998.[10]



[10] Source: SJH estimates

Competing Products

The Pellet Market

There are many other products which are used to make pellets and meal for feed supplements. Among the direct competitors to alfalfa are:

- Soybean meal
- Corn gluten meal
- Wheat middlings
- Distillers grains
- Brewers grains
- Beet pulp
- Cottonseed meal
- Canola meal
- Bakery waste

Theses products all have different protein and nutrient profiles. Each is better suited for certain applications. However, they can all be used for similar purposes.

Competing Products — Characteristics

The Pellet Market

The following table shows the levels of fiber, protein and energy in alfalfa and its competitor products:[11]

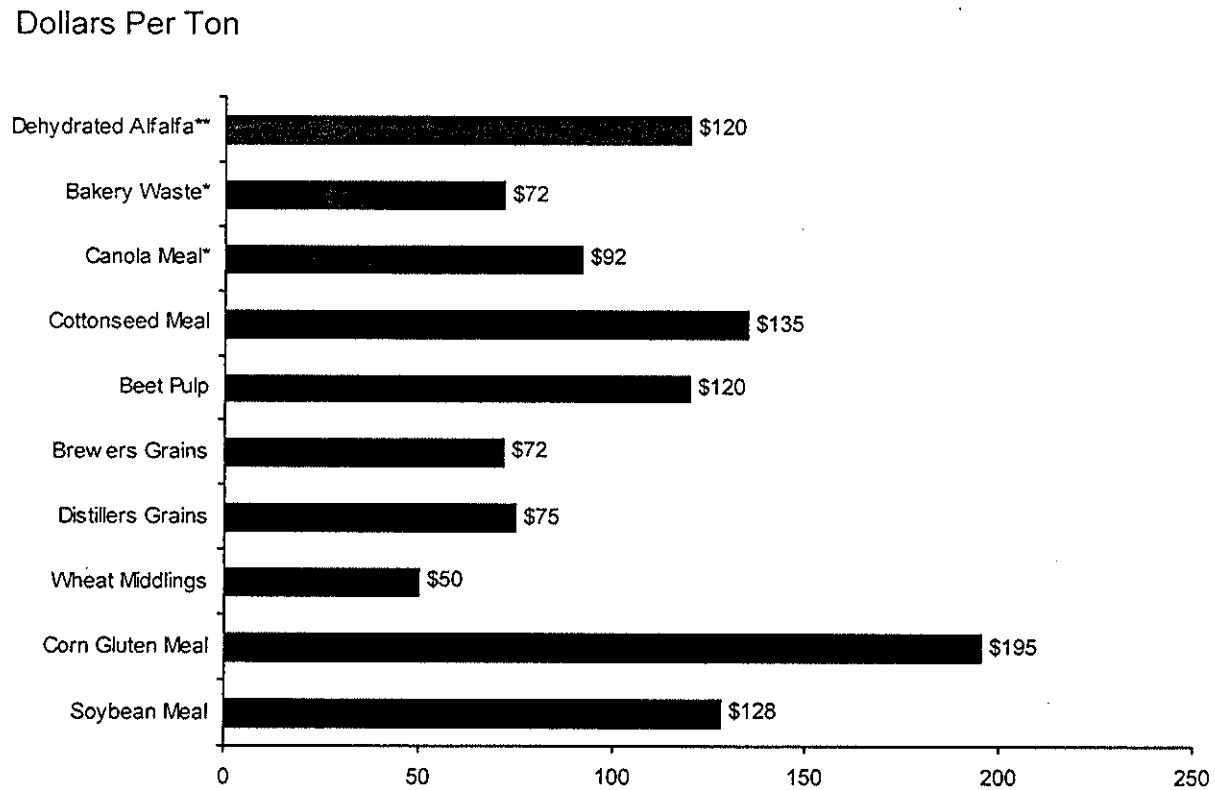
Product	Crude Fiber (%)	Crude Protein (%)	Net Energy (Mcal/lb)
Shelled Corn	3	10	0.92
Hominy Feed	5	12	**0.97**
Alfalfa Pellets (17%)	**25**	**20**	**0.64**
Wheat Middlings	5	19	0.84
Dry Brewers Grain	12	26	0.68
Dry Distillers Grain	8	30	0.92
Cottonseed Meal	**26**	45	0.78
Soybean Meal	3	**50**	0.85

[11] Source: Feedstuffs Magazine

Competing Products — Prices

The Pellet Market

Below are prices – including delivery – of the ingredients which compete directly with alfalfa in the feed market.[12,13]



[12] All prices, except bakery waste (Minneapolis) are from Chicago.
[13] The price for alfalfa represents price to customer. All other alfalfa prices represent price received by producer.

Competing Products — Comparison

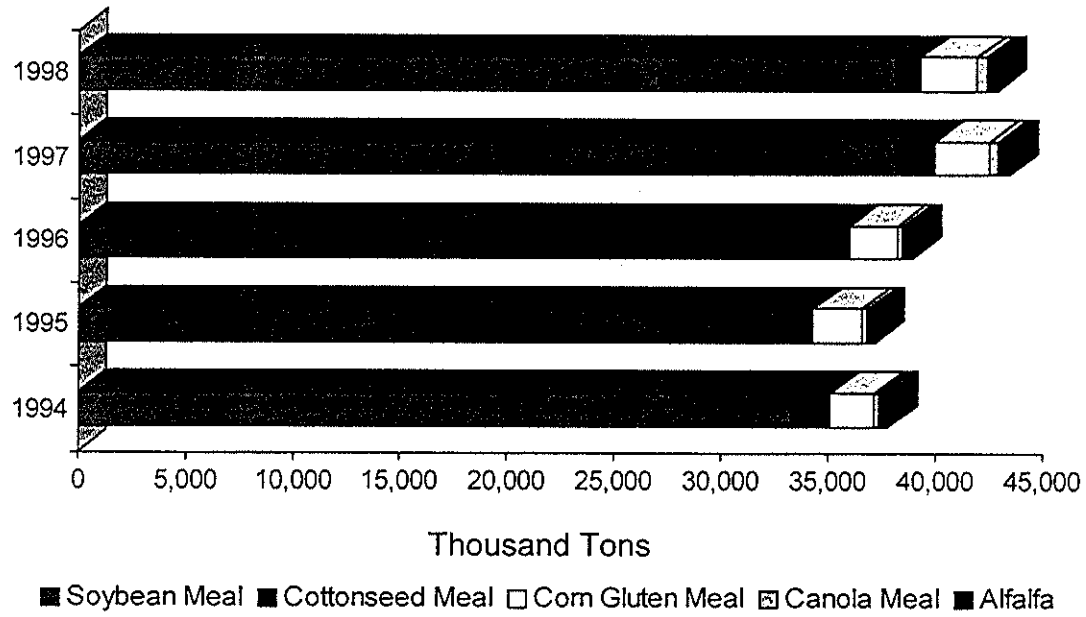
The Pellet Market

- Alfalfa falls in the middle of the range of prices for similar competing products.
- Alfalfa produces more protein per acre than any other crop.
- Growing Alfalfa requires less tillage and less fertilizer than growing soybeans or corn. This results in less soil erosion.
- Alfalfa has a more complete amino acid profile than any of its competitors.
- Soybean meal, corn gluten meal, canola meal, distillers grain and cottonseed are all richer in protein than alfalfa.
- Alfalfa is more fibrous than all its competitors except cottonseed.
- Alfalfa has a very low fat content.

Competing Products — Historic U.S. Production

The Pellet Market

Following are historical production levels for a select group of products which compete with alfalfa meal.[14]



Production of almost all types of meal has grown steadily in recent years, increasing at a CAGR of 2.5% since 1994.

[14] Source: USDA, Feedstuffs, Corn Refiners Assn

Pellets: Estimated Market Potential and Summary

A Note on Potential Markets

Pellets: Estimated Market Potential and Summary

- SJH has made estimates of the long-term market potential for various applications of processed alfalfa products.
- Alfalfa products may compete in markets in which competing products are already well established.
- Economics of transportation as well as the availability and prices of competing products would have a significant effect on the success of a potential new entrant into feed markets.
- Wherever possible, SJH has focussed its market potential analysis on market conditions in the upper Midwest.[1]
- Expectations for market potential and market share need to be reviewed with potential alliance partners.

[1] For the purposes of this report, upper Midwest includes IA, IL, MI, MN, ND and WI.

Xanthophyll

Pellets: Estimated Market Potential and Summary

The U.S. xanthophyll market is worth $82 million annually. It will take a concerted effort for alfalfa processors to win back the trust of poultry producers.

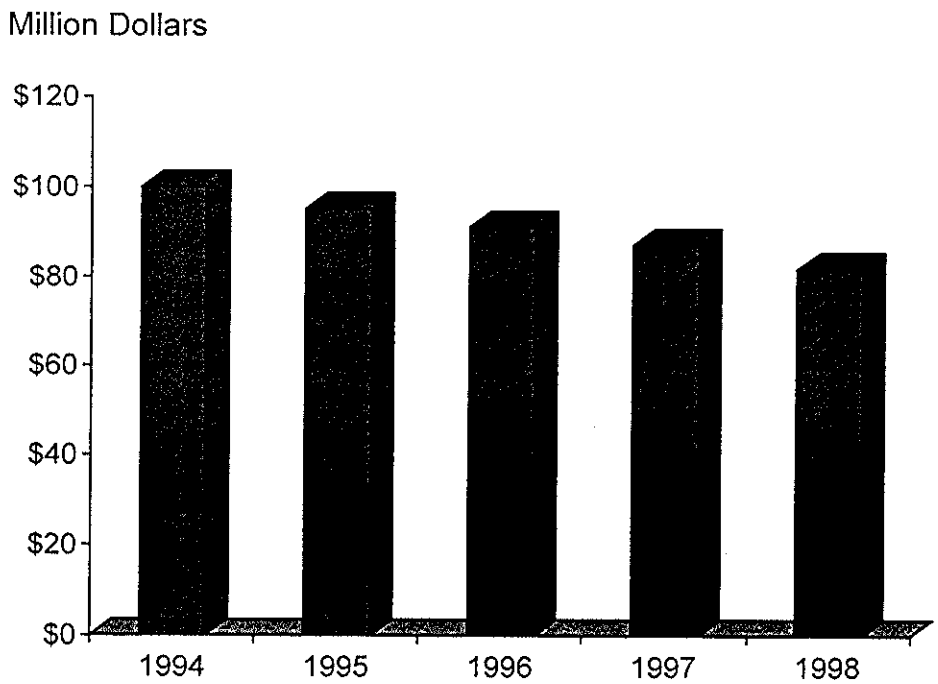
Total U.S. xanthophyll market	% of market	Potential value of market share
$82 million	2	**$1.6 million**
$82 million	10	**$8.2 million**

SJH believes that by offering a high quality product, alfalfa processors could recapture 2-10% of the U.S. xanthophyll market, worth $1.6-8.2 million.

Estimated Historic Xanthophyll Sales

Pellets: Estimated Market Potential and Summary

Over the past five years, the U.S. market for xanthophyll has been contracting at a compound annual rate of 4%, measured in terms of annual sales.[2]



Reasons for the contraction include increased consumer preference for "natural" colored chickens, and increasing use of young corn to supply yellow coloring.

[2] Source: SJH interview with feed consultant

Dairy Cow Feed

Pellets: Estimated Market Potential and Summary

Based on the number of dairy cows currently in the upper Midwest, the potential market for alfalfa pellet sales for dairy feed in that region is almost 3 million tons per year.[3]

Total # of dairy cows in upper Midwest	Alfalfa pellet per animal per day	Potential pellets per day	Potential pellets per year
2,659,000	6 lbs.[4]	15,954,000 lbs.	**2,912,000 tons**

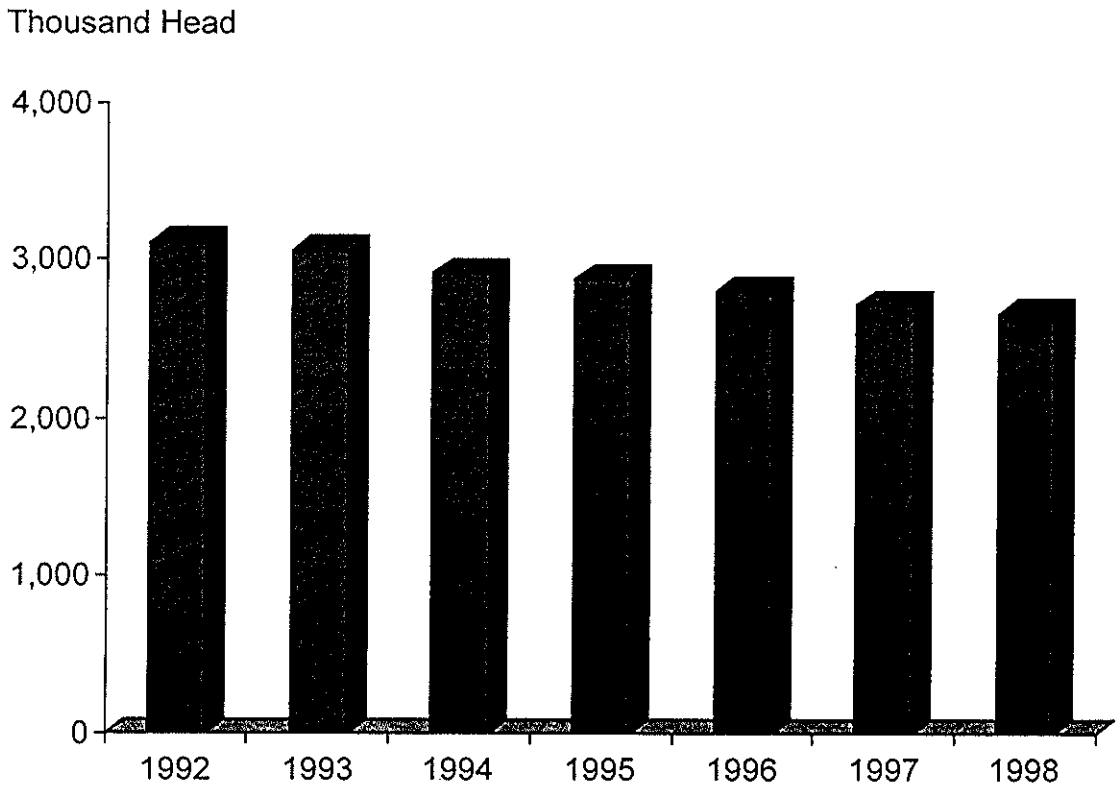
At current prices[5], capturing 5-10% of this market would be worth $12-24 million annually.

[3] Source: USDA and SJH estimates
4 Based on 0.4 lbs. Of alfalfa per 100 lbs. of body weight, with an average cow weight of 1,500 lbs.
5 $85 per ton

Upper Midwest Dairy Cows

Pellets: Estimated Market Potential and Summary

The number of dairy cows in the upper Midwest has been decreasing at an annual compound rate of 2.2% since 1992.[6]



[6] Source: USDA

Goat and Sheep Feed

Pellets: Estimated Market Potential and Summary

Sheep and goats represent a largely unexploited market for alfalfa pellet sales. Based on the number of sheep and goats in the upper Midwest, the potential market for alfalfa pellets for sheep and goat feed in that region is .[7]

Total # of sheep and goats in upper Midwest	Alfalfa pellets per animal per day	Potential pellets per day	Potential pellets per year
871,000	2.5 lbs.[8]	2,176,000 lbs.	**397,000 tons**

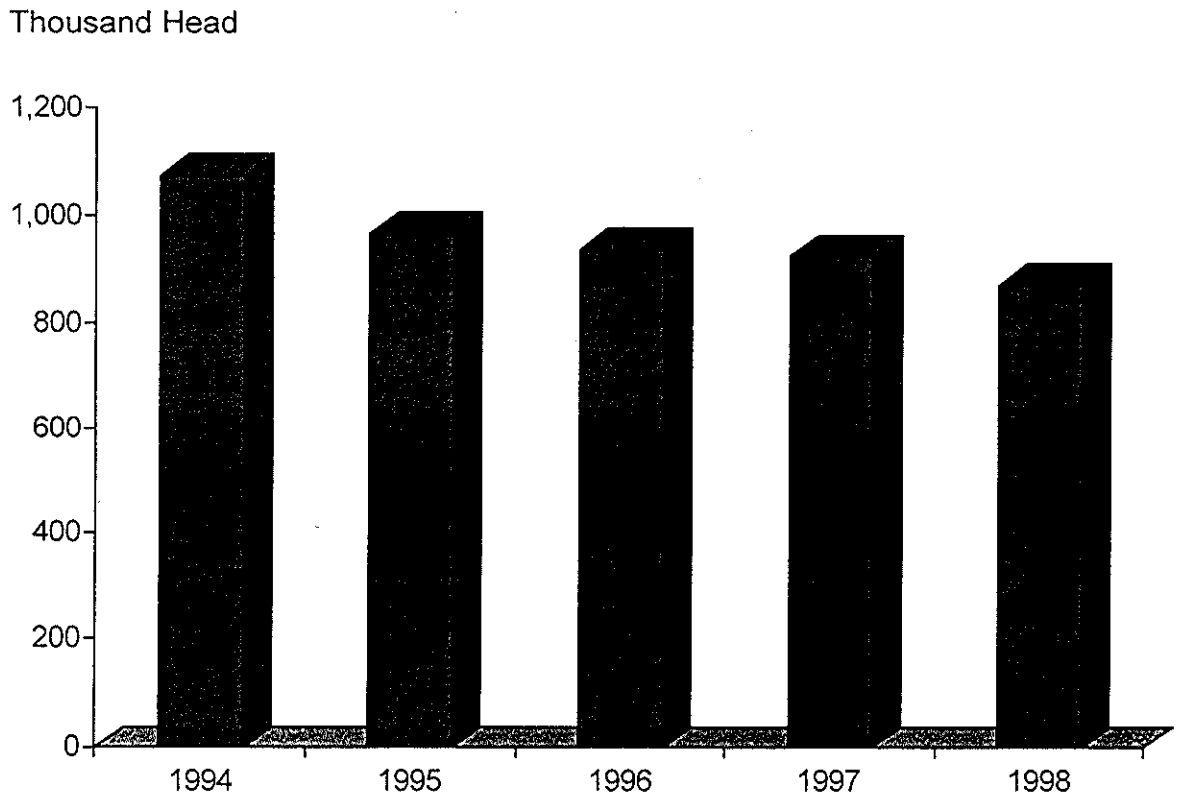
At current prices[9], capturing 5-10% of this market would be worth $1.7-3.4 million annually.

[7] Source: USDA and SJH estimates
8 Based on a recommended 2-3 lbs. per animal per day
9 $85 per ton

Upper Midwest Sheep and Goats

Pellets: Estimated Market Potential and Summary

The number of sheep and goats in the upper Midwest has been decreasing at a compound annual rate of 4.1% since 1994.[10]



[10] Source: USDA

Pet Food

Pellets: Estimated Market Potential and Summary

Alfalfa can be used as a protein, nutrient and/or roughage supplement to the feed for almost any animal. While rabbit food may be up to 50% alfalfa pellets, alfalfa meal can also be used to replace 10-20% of the content of dog and cat food. This provides an enormous potential market for alfalfa pellets and alfalfa meal.[11]

Current purchases of raw materials for U.S. pet food market	% of market which could be replaced by alfalfa products	Potential market for alfalfa products in pet food
$2.5 billion per year	10%	**$250 million**

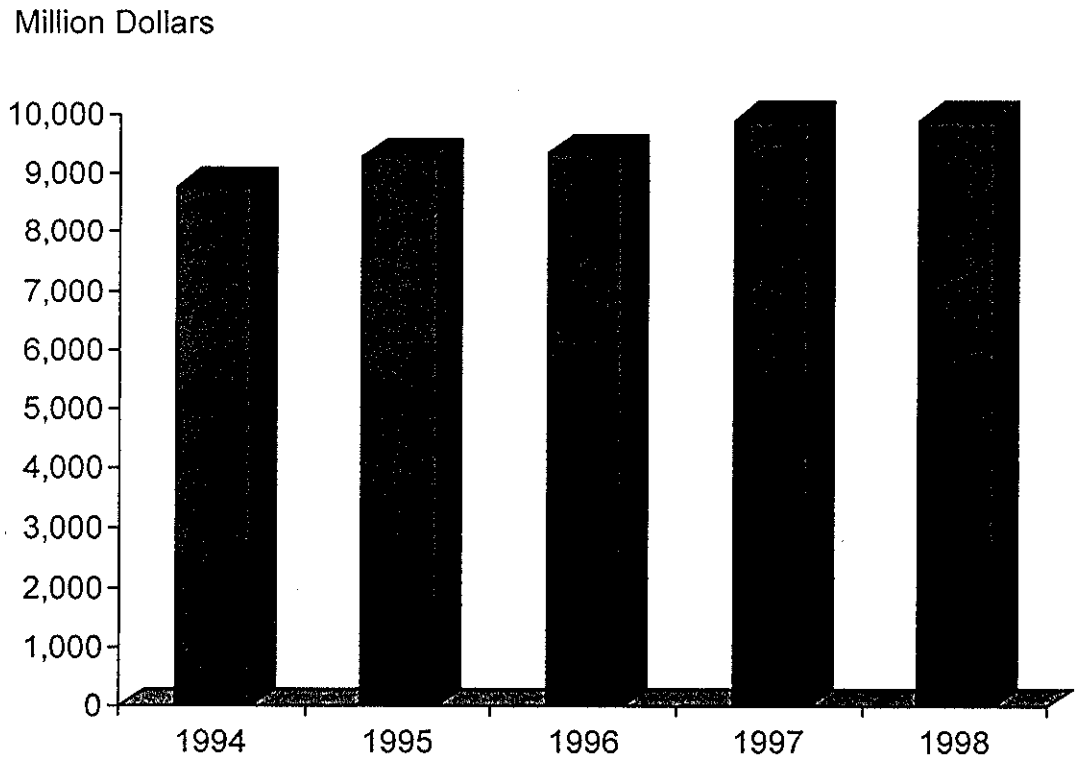
Capturing 2-5% of this potential market would yield annual sales of $5-12.5 million.

[11] Pet Food Institute and SJH estimates

U.S. Pet Food Sales

Pellets: Estimated Market Potential and Summary

Sales of pet food in the U.S. have been increasing at a CAGR of 2.5% since 1994.[12]



[12] Source: Pet Food Institute

Total Market Potential

Pellets: Estimated Market Potential and Summary

By taking advantage of the various unexploited applications for alfalfa pellets, a new entrant might be able to able to secure a sizeable market.

Potential cattle feed market	Potential sheep and goat feed market	Potential pet food market	Potential xanthophyll market	**Total potential market**
$12-24 million	$1.7-3.4 million	$5-12.5 million	$1.6-8.2 million	**$20-48 million**

Competitive Assessment

Pellets: Estimated Market Potential and Summary

- The U.S. market for pelleted alfalfa products has been stagnant or declining for years.
- Production of pelleted alfalfa products has contracted by 76% over the past two decades.
- The loss of the poultry market was the single biggest factor in the decline of the U.S. alfalfa pellet industry.
- The level and types of nutrients in alfalfa products is what differentiates them from other competing products.
- Dehydration costs are a major factor in the financial feasibility of alfalfa pelleting operations.

The viability of the pelleted alfalfa products industry depends on the creation and recapture of broad-based applications for alfalfa products.

Competitive Assessment (continued)

Pellets: Estimated Market Potential and Summary

The future of the alfalfa pellet market will depend on:

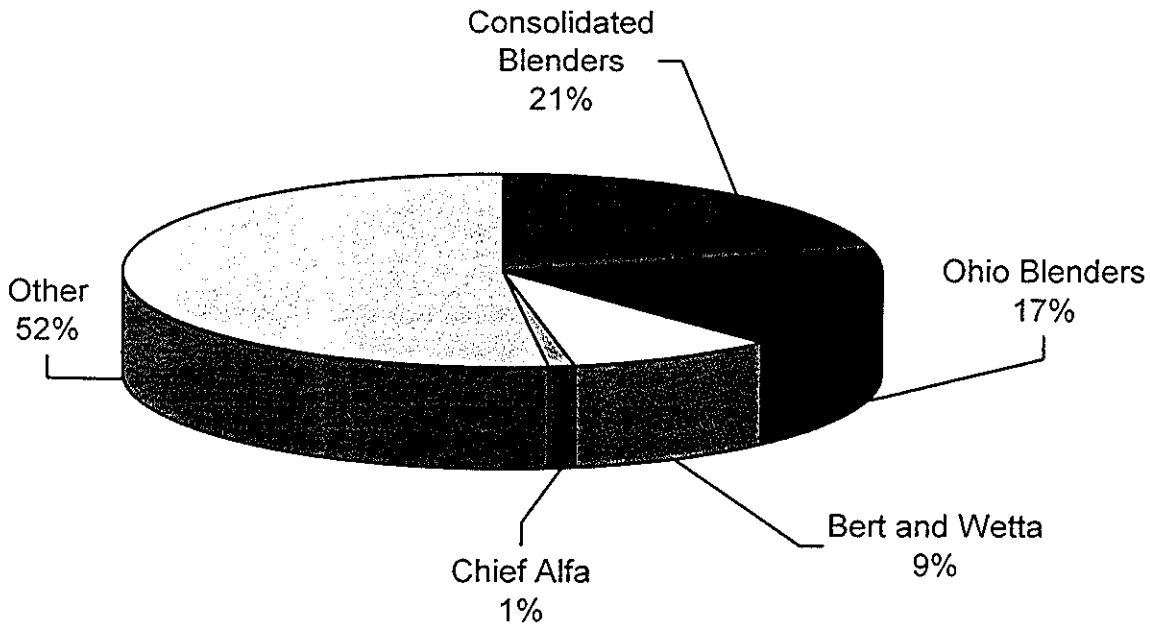
- Segmenting the market into roughage products and nutrient products
- Separating leaves and stems to achieve the above segmentation
- Finding new, cheaper ways to dehydrate alfalfa while preserving its nutritional content
- Re-establishing alfalfa as the premier source of xanthophyll in order to recapture the poultry market
- Finding the poultry industry's price point for pigmenting products, to help make this possible
- Expanding the applications of alfalfa pellets as a food source for specialty animals
- Marketing alfalfa more aggressively to cattle, sheep and goat ranchers in order to increase alfalfa's share of the feed market

Pellets: Competitive Analysis

Estimated Market Share

Pellets: Competitive Analysis

Following are the market shares of the most significant dehydrators in the U.S. The four largest players account for almost half of all U.S. production.[1,2]



[1] Source: SJH Data
[2] "Other" (see graphic) includes dozens of tiny firms producing under 1,000 tons per year

Consolidated Blenders, Inc. — Hastings, NE

Pellets: Competitive Analysis

Sales:	• Approximately $13.5 million
Annual Alfalfa Pellet Production	• 90,000-120,000 tons
Apparent Strategy:	• Increase volume / commodity sales
Company Focus:	• Wholesaler (50%), Alfalfa dehydrator (50%)
Major Products:	• Alfalfa meal; dehydrated alfalfa pellets
Plant Locations:	• Grand Island, NE — Dehydrating • Elm Creek, NE — Dehydrating • Odessa, NE — Dehydrating • Blair, NE — Storage facility • Gunterville, AL — Storage facility
Major Customers:	• Feed manufacturers (600 accounts)
Major Markets:	• United States and Mexico

Ohio Blenders, Inc. — Toledo, OH

Pellets: Competitive Analysis

Sales:	•	Approximately $12.4 million
Annual Alfalfa Pellet Production	•	75,000-100,000 tons
Apparent Strategy:	•	Focus on high protein content, premium pellet market.
	•	Focus on organic products
Company Focus:	•	Manufacturer of alfalfa pellets
Major Products:	•	Dehydrated alfalfa pellets
Plant Locations:	•	Toledo, OH — Dehydrating
	•	Has 6 storage facilities throughout Ohio
Subsidiaries:	•	Ohio Blenders of Pennsylvania, Inc., York, PA
	•	Wholly-owned subsidiary.
	•	Manufacturer of alfalfa pellets
Major Customers:	•	Feed manufacturers
Major Markets:	•	Eastern United States

Bert & Wetta Sales, Inc. — Maize, KS

Pellets: Competitive Analysis

Sales:	•	Approximately $7.8 million
Annual Alfalfa Pellet Production	•	40,000-50,000 tons
Apparent Strategy:	•	Focus on commodity sales.
	•	Intends to scale back his operations
Company Focus:	•	Manufacturer of prepared alfalfa feeds
Major Products:	•	Dehydrated alfalfa feeds and feed ingredients
Plant Locations:	•	Maize, KS — Dehydrating / manufacturing
	•	Mt. Hope, KS — Dehydrating / manufacturing
	•	Larned, KS — Dehydrating / manufacturing
	•	Stafford, KS — Dehydrating / manufacturing
	•	Abilene, KS — Dehydrating / manufacturing
	•	Overland Park, KS — Sales office
Major Customers:	•	Farmers and feed mixers (200 accounts)
Major Markets:	•	United States, few international accounts

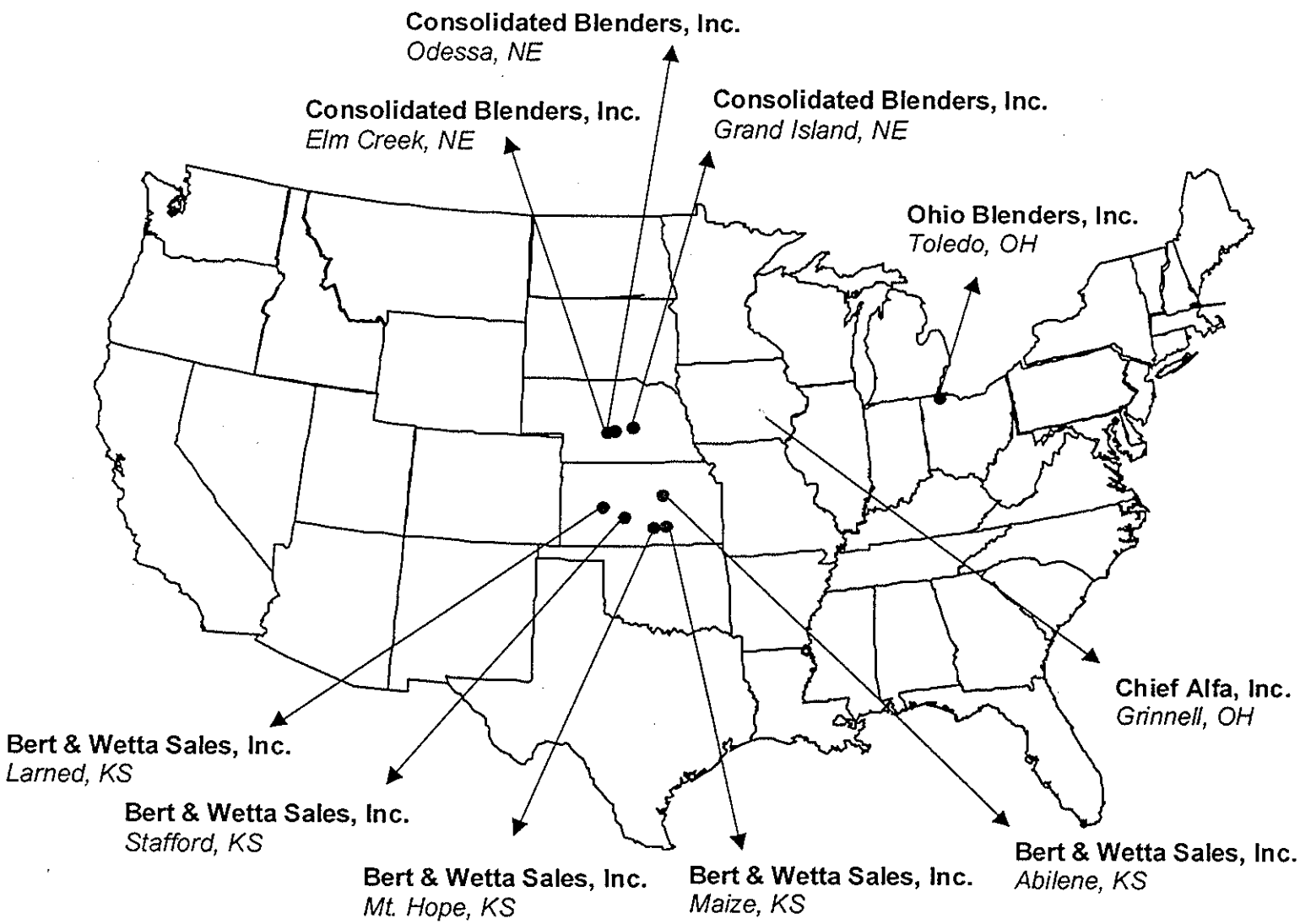
Chief Alfa, Inc.— Grinnell, IA

Pellets: Competitive Analysis

Sales:	•	Approximately $2.0 million
Annual Alfalfa Pellet Production	•	6,000-7,000 tons
Apparent Strategy:	•	Moving into more value-added products.
	•	Switching to soy processing
Company Focus:	•	Manufacturer of dehydrated alfalfa meal
	•	Grower of alfalfa, corn and beans
Major Products:	•	Dehydrated alfalfa meal
Plant Locations:	•	Grinnell, IA — Dehydrating / manufacturing
Major Customers:	•	Farmers and feed manufacturers (40 accounts)
Major Markets:	•	Midwest United States

Major U.S. Alfalfa Dehydrators: Plant Locations

Pellets: Competitive Analysis



The Canadian Market

Pellets: Competitive Analysis

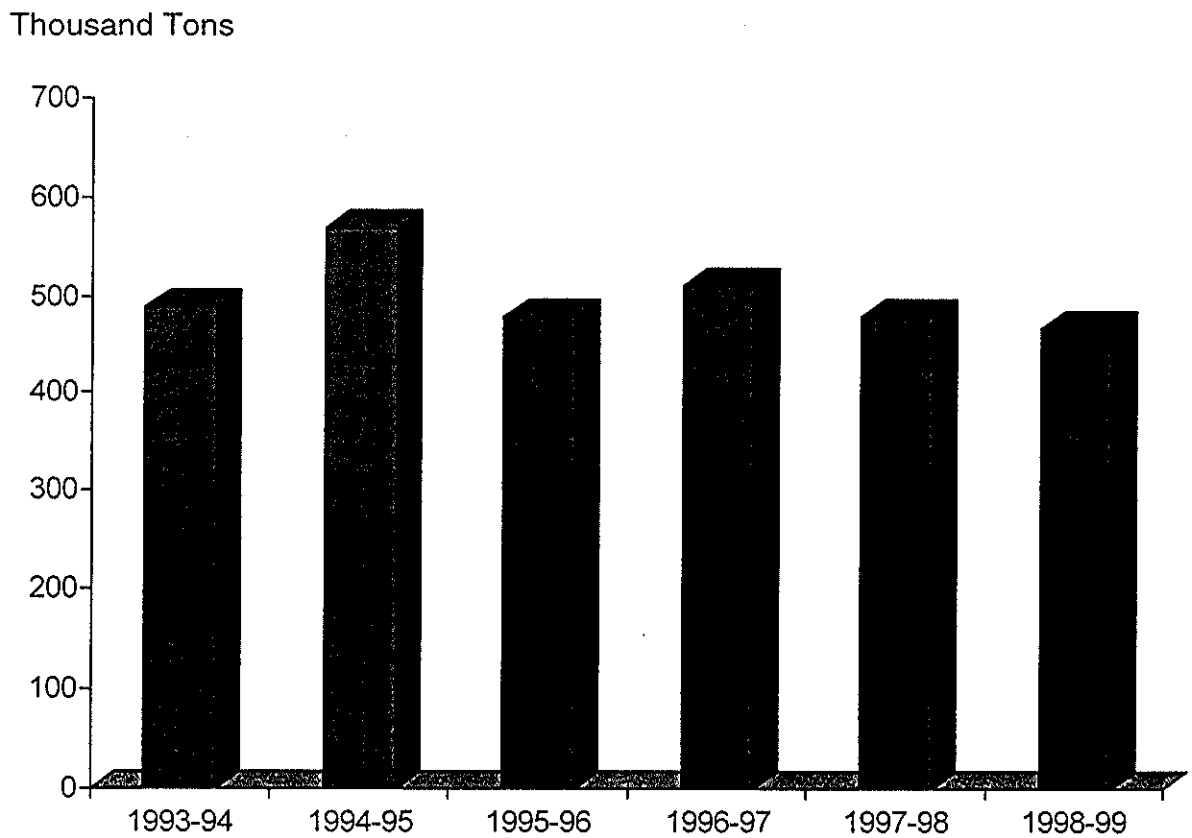
Canada has become the world's largest exporter of alfalfa pellets, and the world's second largest exporter of alfalfa cubes. The Canadian Dehydrators Association represents 30 alfalfa processing plants, mostly located in Alberta and Saskatchewan.

- Canada produced $150 million worth of processed alfalfa products in 1998, of which about $30 million were pellets.
- Canada exports more than 80% of its processed alfalfa products.
- Japan absorbs more than 50% of Canada's annual alfalfa exports.
- Other major markets for Canadian processed alfalfa products include South Korea and Taiwan.

Historic Canadian Pellet Production

Pellets: Competitive Analysis

Canada's production of alfalfa pellets has averaged 500,000 tons per year since 1993. While Canadian production levels are similar to those of the U.S., about 35% of Canada's output is exported to Asia.[3]



[3] Source: SJH interview with CDA

The U.S. Pellet Market Environment

Pellets: Competitive Analysis

- The pelleted alfalfa market has been controlled by the same 2 or 3 families and companies for the past 50 years.
- This market has been characterized by a lack of innovation with respect to methods of processing and potential avenues for cost saving.
- The industry has been characterized by a lack of marketing efforts.
- Little attempt has been made to recapture lost markets, and little attention appears to have been has been paid to the active development of new applications.
- Most of the processors with whom we spoke had a dismal view of the future of the U.S. market for pelleted alfalfa.
- For Example, two of the top four processors of alfalfa pellets offered to sell us plants during the course of our interviews with them.

Innovation

Pellets: Competitive Analysis

Our interviews revealed two striking exceptions to the bleak picture painted by the pellet manufacturers with whom we spoke.

- Ohio Blenders expressed confidence in their market prospects. Their operations appear to be unique in the following ways:
  - Focus exclusively on the premium / dehydrated market. They began to do this years ago, at a time when most producers were focussed on suncured.
  - Sought cheap ways to fuel their dehydrators, in order to avoid the fuel costs incurred by most producers, who used gasoline-powered dehydrators.
  - For the past 20 years, they have been fueling their dehydrators with a mixture of sawdust – scraps from furniture manufacturers – and coal. This combination has enabled them to dehydrate more cheaply than others in the industry.

Pellets: Competitive Analysis

- The Minnesota Valley Alfalfa Producers (MnVAP) have embarked on a unique project which they hope will "revolutionize" the market for alfalfa pellets.
  - MnVAP produces standard 15% and 17% pellets. However, their other value-adding operations with alfalfa have earned them large government grants and enabled them to under-bid most other U.S. pellet producers.
    - MnVAP will separate the stems and leaves of their alfalfa.
    - The stems will be used to produce biomass energy, fueling an electric power plant that will produce 75 megawatts of electricity (this biomass project won MnVAP a $44 million DOE grant).
    - The leaves will be ground into a pure alfalfa leaf meal (ALM) that has higher protein levels and lower fiber levels than standard alfalfa pellets, making it the new premium pelleted alfalfa product.

Assessment of the Future of the U.S. Pellet Market

Pellets: Competitive Analysis

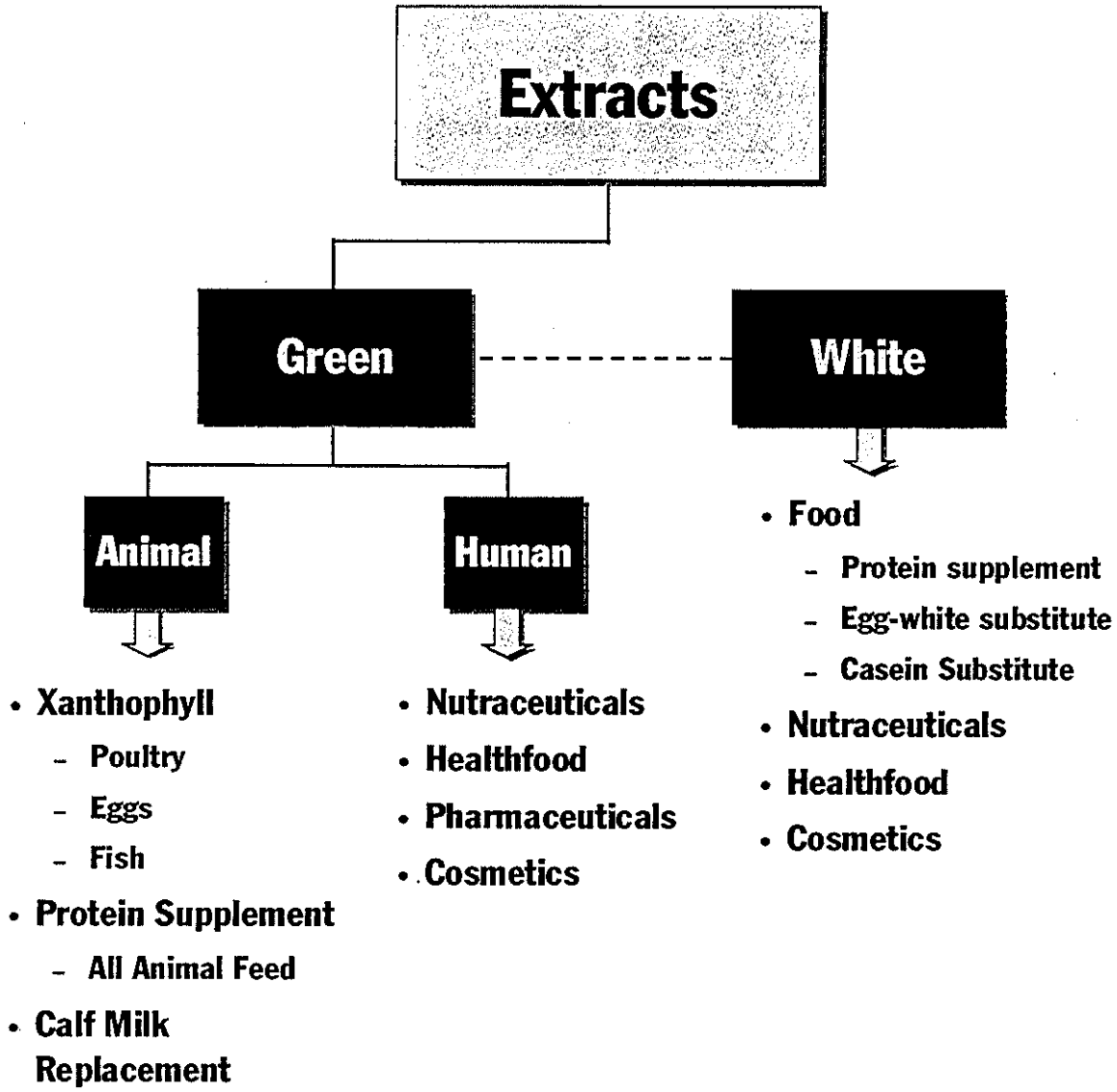
In the course of interviews with leading experts on alfalfa processing, a number of possible directions emerged as the most promising opportunities for revitalizing U.S. market for processed alfalfa products.

- Separation of leaves and stems will become an essential part of the production of premium alfalfa products.
- Stems should be used to produce quality roughage while leaves should be used to produce high nutrient feed supplements.
- Providing feed for simple stomach animals (non-ruminants) will be the future of the pelleted alfalfa business.
- Producers must find more efficient ways to dehydrate, enabling them to produce higher quality alfalfa products without incurring additional costs.

Extracts: An Overview

The Products

Extracts: An Overview



U.S. Market

Extracts: An Overview

Throughout the years
there has been a fascination with pressing alfalfa.
At this point the activities in the United States
have almost all ceased operation.[1]

[1] Source: Vincent Press Corp., literature on alfalfa

Applications

Extracts: An Overview

Extracts made from alfalfa have existed in various forms for centuries. However, in the last 20-30 years, there has been increasing awareness of the health benefits of alfalfa products to humans and animals, and of the potential for such extracts to transform commercial alfalfa from a commodity to a lucrative, value-added specialty product.

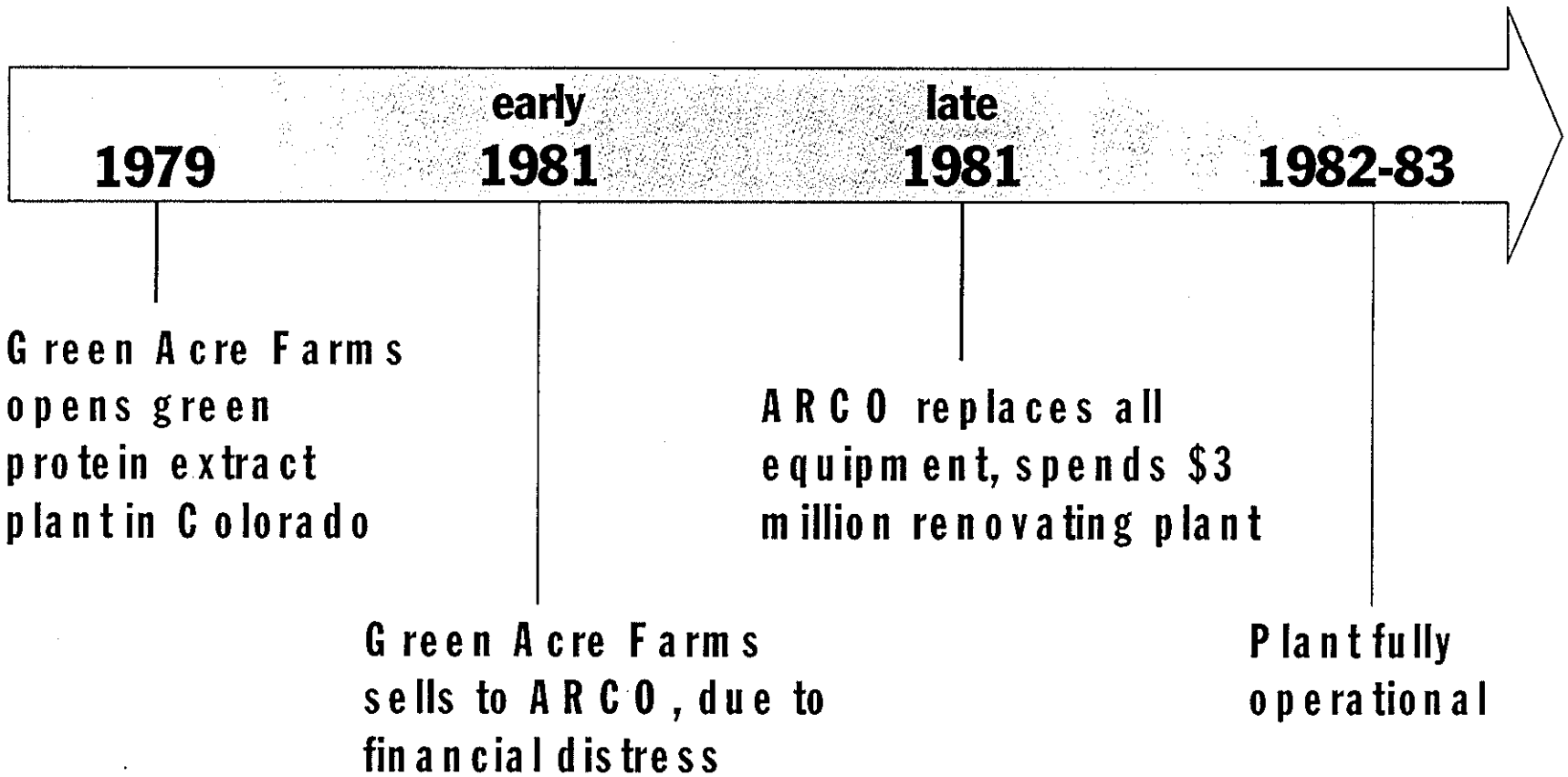
The three primary applications for extracts made from alfalfa are:

- As a feed additive for animals, to provide targeted nutritional benefits
- As a replacement for certain dairy and egg products in human food
- As a health food or curative food supplement for people

U.S. History[2]

Extracts: An Overview

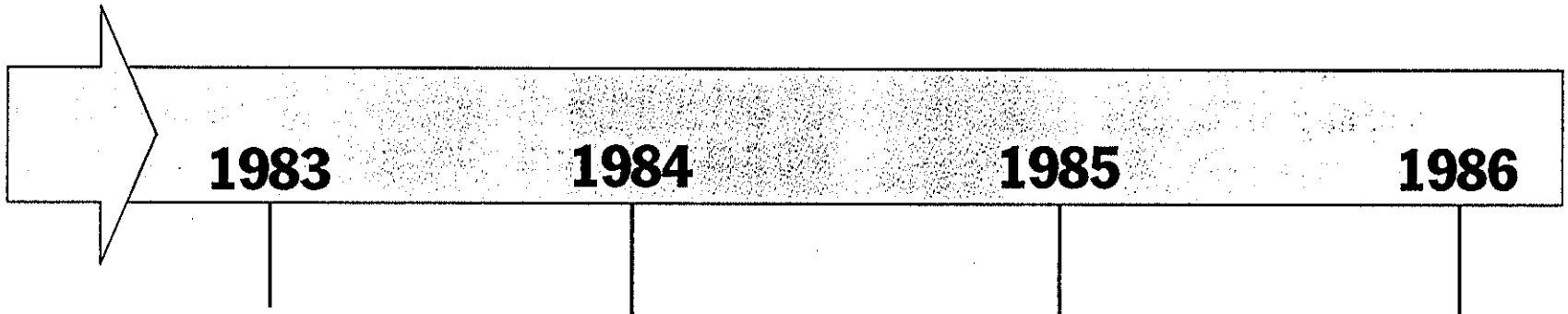
A brief history of commercial efforts at alfalfa protein extraction in the U.S.



[2] Source: SJH interview with former manager of ARCO's alfalfa project

U.S. History (continued)

Extracts: An Overview



ARCO decides to move operation to California due to poor growing season in Colorado

ARCO spends $20 million building California plant, a cost over-run of 400%

Plant operates, but ARCO fails to find sufficient market for products

ARCO abandons project. Factory is left intact, unsold.

Other dehydrators, having watched ARCO's experiment with curiosity about the future potential of extracting, saw ARCO's failure as a sign that extracting juice from alfalfa was not commercially viable in the U.S. market.

"If ARCO failed, how can we hope to succeed?"[3]

[3] Source: SJH interview with former manager of ARCO's alfalfa project

The products which Green Acre Farms / ARCO were producing were high quality, pure "green protein" extracts intended as feed additives for a variety of animals. At the time, managers of the operation thought that they would be able to bring the extracts to market at a price of $700 per ton, or 8 times the going rate for alfalfa pellets.[4]

- There were various other small-scale efforts at producing alfalfa extract. All of them failed to achieve commercial viability.
- By the early 1980s, all attempts to commercially produce alfalfa extracts for feed purposes had ceased.

[4] SJH interview with former owner of Green Acre Farms

New Extraction Methods

Extracts: An Overview

Extracting juices and proteins from alfalfa and other organic matter is usually done with presses. In 1997, the University of Wisconsin developed a new method, based on their work with alfalfa.[5]

- Dynamic Membrane Filtration (DMF)
  - Filters out juice by running alfalfa over a fast-moving membrane
    - The movement of the membrane prevents build up which blocks flow
- Eliminates the need for evaporating excess water
  - This facilitates significant savings on fuel for evaporation
    - Preserves over 97% of the protein in the juice

This new methodology is still in the developmental stage. Experts at the University of Wisconsin believe that DMF has the potential to provide significant cost savings in the extraction of juices and proteins from organic matter.

[5] Source: Agricultural Research Service

Green Protein: Animal Grade

Applications

Green Protein: Animal Grade

The main applications for animal grade green alfalfa proteins are:

- Xanthophyll: supplying the poultry industry with a high-grade pigment
- Fish feed supplement: supplying salmon, trout and shrimp farmers with a high-grade pigment
- Animal feed supplement: providing a nutrient-rich additive to animal feed
- Calf milk replacement: using lactose-type substances extracted from alfalfa as a replacement for milk for growing calves

Competing Products

Green Protein: Animal Grade

The main potential substitutes for these applications of animal-grade alfalfa extracts are as follows:

Application	Substitutes
Xanthophyll	• **Marigold extract** • Apocartenal • Astoxanthin • Corn Gluten • Paprika
Fish food supplement	• **Astoxanthin**[1] • Marigold extract • Apocartenal
Animal feed supplement	• **Soybean meal** • Cottonseed meal
Calf milk replacement	• **Soy protein isolates**

[1] Astoxanthin is a synthetic carotenoid made by Roche. It sells for approximately $212/kg. or $193,000/ton.

Market Opportunities

Green Protein: Animal Grade

There are currently no companies in the U.S. producing animal grade green alfalfa protein. The absence of any players in this market presents a great opportunity. However, the market situation should be evaluated on the basis of the competing products.

- Opportunities in the xanthophyll market depend on:
  - The continued use of xanthophyll by the poultry market
  - The ability of would-be entrants to supply a xanthophyll product at or below the current cost of marigold extract ($375 per ton)
- Opportunities in the fish feed supplement market depend on:
  - The ability to produce a substitute product at or below the current cost of astoxanthin

Market Opportunities (continued)

Green Protein: Animal Grade

- Opportunities in the animal feed supplement market depend on:
  - Marketing green protein as a healthier alternative to soy meal and cottonseed meal
  - Convincing feed manufacturers that the use of green protein can result in cheaper overall feed

- Opportunities in the calf milk replacement market depend on:
  - Convincing dairy farmers of the nutritive benefits of alfalfa proteins
  - Being able to enter a market in which established soy processors, such as ADM, are already well-entrenched

Market Potential

Green Protein: Animal Grade

Following is an estimate of the potential value of these applications for the alfalfa extract market.[2]

Product	U.S. Market	% to Capture	Potential Value
Xanthophyll[3]	$82 million	2 - 10	$1.6 - 8.2 million
Fish Feed Supplement	$12 million	10 - 25	$1.2 - 4 million
Animal Feed Supplement	$550 million	10	$55 million
Calf Milk Replacement	$350 million	10	$35 million
Potential Market			**$93 - 102 million**

[2] Source: SJH estimates

[3] Extracts and pellets can both serve the xanthophyll market. The figures here for xanthophyll duplicate the figures already presented in the segment on the pellet market.

Competitive Assessment

Green Protein: Animal Grade

- Green animal-grade alfalfa proteins are not currently sold foir commercial uses in the U.S. market.
- All of the potential applications for green animal-grade alfalfa proteins are currently served by other products and ingredients.
- Alfalfa proteins can function as superior replacements for most of the products against which they would compete.
- Cost will be a key factor in attracting customers to alfalfa-based products.
- Extensive consumer education will be required to convince customers to switch from their current products to alfalfa.
- Focussing on numerous applications of green alfalfa proteins is a critical element to achieving commercial success in the U.S. market.

Green Protein: Human Grade

Applications

Green Protein: Human Grade

Because green alfalfa protein has a pungent grass-like taste, it is not very palatable for most humans. It also has a strong green hue that colors most substances to which it is added. The main human applications for green protein are as an ingredient in:

- Health Food
- Nutraceuticals
- Pharmaceuticals
- Cosmetics

Benefits

Green Protein: Human Grade

The main benefits which green alfalfa protein brings to these applications are:

- Health Food / Nutraceuticals / Pharmaceuticals
  - Tonic: soothes and refreshes
  - Cholesterol: has been shown to lower cholesterol in monkeys
  - Arthritis: is reputed to heal joint pains
  - Macular Degeneration: is reputed to slow ocular degeneration in the elderly
  - Anti-oxidant: boosts immune system functions
- Cosmetics
  - emulsifies, meaning it enables the addition of oily ingredients to water-based products

Components

Green Protein: Human Grade

For the health food, nutraceutical and pharmaceutical markets, alfalfa contains a number of substances which make it an appealing ingredient:

- Beta Carotene: aids in the proper healing of wounds; promotes healthy growth of skin and bones; inhibits growth of cancer cells
- Lutein: prevents macular degeneration in the elderly
- Chlorophyll: cleans the blood; cleans the liver; helps control breath and perspiration odor

Potential Substitute Sources

Green Protein: Human Grade

The beneficial elements in alfalfa can all be found in other sources. Below are some of the more common sources for these substances.

Element	Source
Beta Carotene	• Orange fruits (apricots, papayas) • Orange vegetables (carrots, sweet potatoes) • Broccoli
Lutein	• Spinach • Kale • Marigolds
Chlorophyll	• Green vegetables • Green plants and grasses

U.S. Producers

Green Protein: Human Grade

SJH is aware of three companies in the U.S. that are currently making green alfalfa protein in very small quantities, for use in the health food market and in cosmetics:

- Ashland Chemical (Irvine, CA)
  - Lutein Powdered Extract 0.5%: a mixture of dried proteins from alfalfa and marigolds
  - Alfalfa juice concentrate
  - Alfalfa powder
- PhytoLife Sciences (Columbus, OH)
  - Previously made alfalfa juice
  - Currently developing cosmetics applications for alfalfa and red clover extracts
- Standard Process (Palmyra, WI)
  - Alfalfa and kelp powder capsules

Lutein

Green Protein: Human Grade

- Industry experts believe that the presence of lutein – which retards macular degeneration – in green alfalfa protein may yield a large pharmaceutical market for green proteins.

- Due to the numerous medical, regulatory and other uncertainties of such an application, SJH has not made an estimate of the potential value of such an application.

Estimated Machinery Costs and Capacities

White Protein

Below are the costs and capacities of the machines needed for production of white alfalfa protein.[6]

Machinery	Estimated Capacity	Estimated Cost
Forage Harvester	N/A	N/A
Hammer Mill	7,000 lbs./hour(7)	$3,000
Screw Press	70 gallons/minute(8)	$50,000
Heat Exchanger	50 gallons/minute	$35,000
Decanter Centrifuge	50 gallons/minute	$180,000
Ultra Filter	35 gallons/minute	$290,000
Estimated Total Capacity	**35 gallons/minute**	
Estimated Total Machinery Costs		**$558,000**

[6] The costs listed here are accurate only for the capacity levels in this chart. Any increase in capacity would result in a significant increase in cost.
[7] Input quantity
[8] This, and all subsequent capacities, refer to output quantities

Caveat Concerning Market Potential

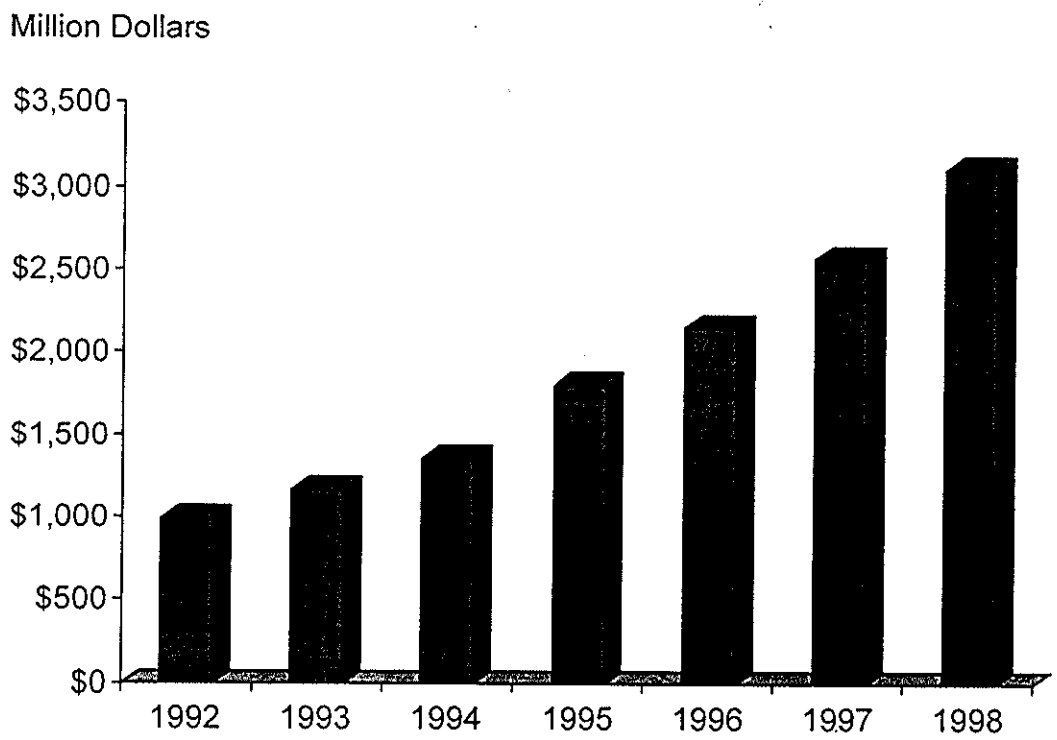
Green Protein: Human Grade

- The applications for human grade green alfalfa protein are mostly products which do not yet exist.
- This makes it difficult to assess the market potential of these application.
- However, the explosive growth of the vitamin supplement and nutraceutical markets may give some indication of the potential markets.

Historic U.S. Vitamin Supplement Market Growth

Green Protein: Human Grade

Sales of vitamin supplements have increased at a CAGR of 17.9% since 1992.[1]

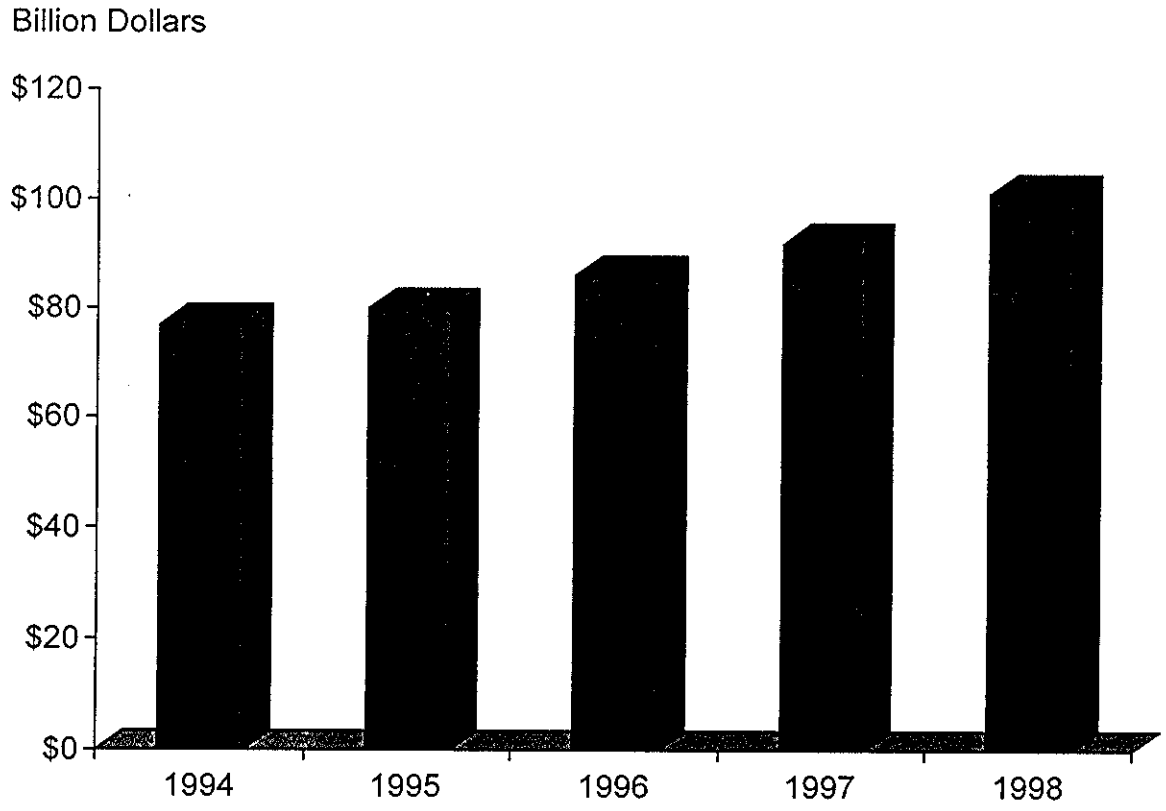


[1] Source: Natural Foods Merchandiser

Historic U.S. Nutraceutical Market Growth

Green Protein: Human Grade

Sales of nutraceuticals have increased at a CAGR of 5.6% over the past five years.[2]



[2] Source: Nutrition Business Journal, June 1999

Competitive Assessment

Green Protein: Human Grade

- Health supplements, nutraceuticals and pharmaceuticals represent the most significant potential applications for green human-grade protein.
- Applications for these proteins will require the development of new products.
- The market for nutritive supplements in the U.S. is growing rapidly.
- While U.S. consumers are receptive to nutritive supplements, marketing green proteins successfully will require extensive consumer education concerning the benefits of alfalfa products.
- FDA approval is required in order to make any claims concerning the health benefits of alfalfa.
- The successful introduction of green human-grade alfalfa proteins into the U.S. market will require extensive market building.

White Protein

Applications

White Protein

- By further processing the extracted proteins from alfalfa, it is possible to remove the green particulates.
- The resulting white protein lacks some of the amino acids and nutrients of green protein, but it has a protein content of up to 85%, and lacks the unpleasant taste of the green protein.
- The main uses for white protein are:
  - Food
    - Egg white substitute
    - Casein substitute
    - Protein supplement
  - Nutraceuticals
  - Health food
  - Cosmetics

Characteristics

White Protein

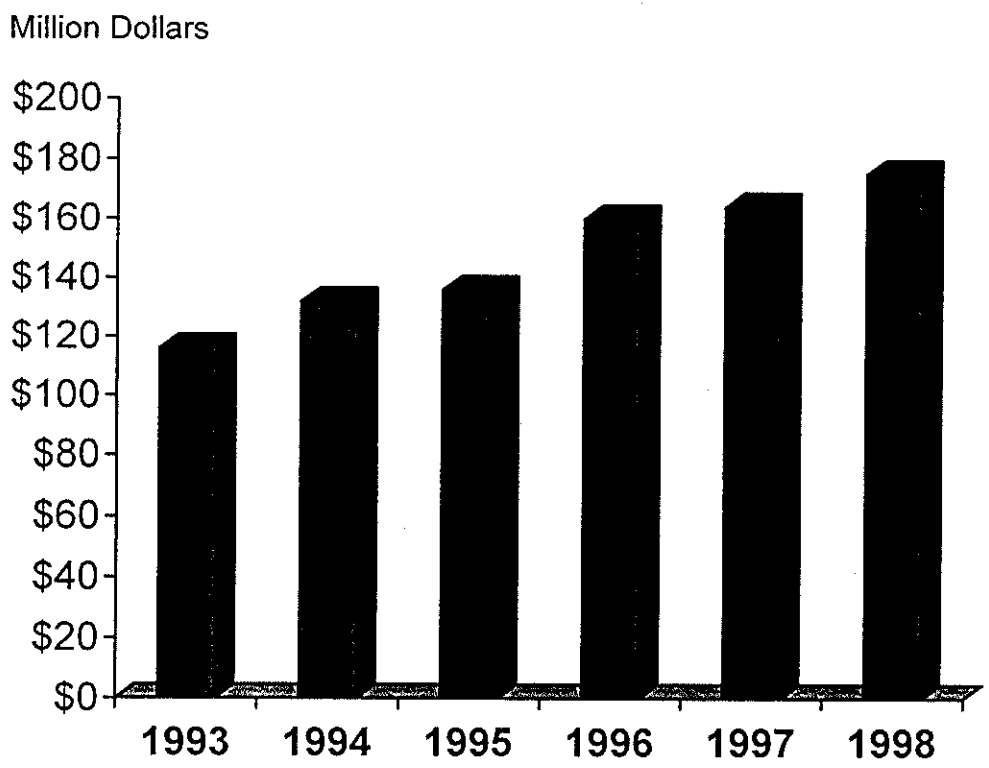
The main functional properties of white alfalfa protein which make it attractive as a food additive are its ability to:

- Foam
- Dissolve
- Emulsify

Historic U.S. Egg White Sales

White Protein

White protein can be whipped into a stable foam that serves as an excellent substitute for egg whites. The US market for egg whites is healthy and has grown at a CAGR of 7.1% since 1993.[1]

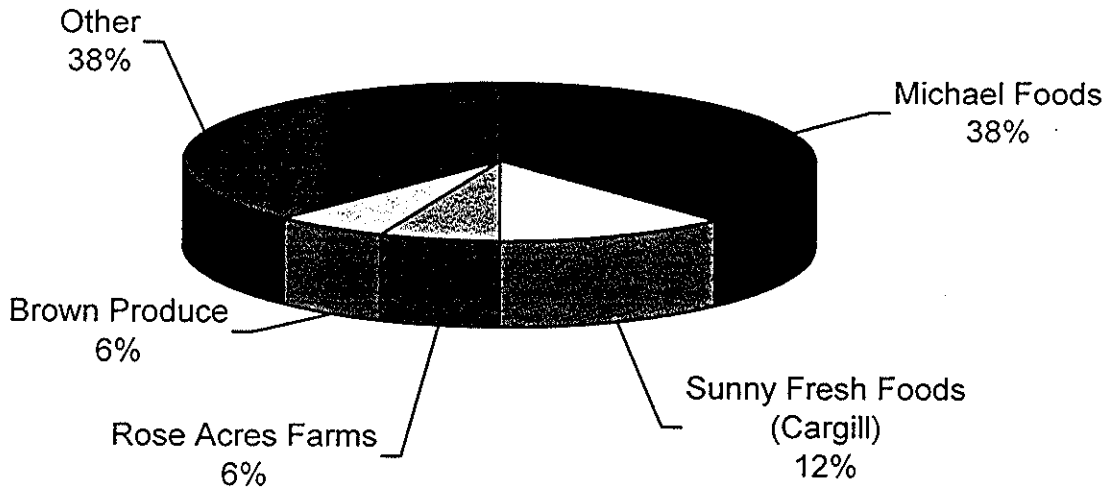


[1] Source: SJH Estimate

Primary U.S. Egg White Producers

White Protein

The U.S. market for egg whites is dominated by Michael Foods Inc., through its Waldbaum division and the newly acquired Papetti's. Michael Foods and its top three competitors combined control 62% of the U.S. market for egg whites.[2]



[2] Source: SJH Estimates

U.S. Egg White Market

White Protein

Although the U.S. market for egg whites and egg white products is fairly concentrated, it presents numerous opportunities for white alfalfa protein.

- White alfalfa protein is a comparable source of protein.
- White alfalfa protein can fulfill the functional roles of egg whites, such as foaming and binding.
- White alfalfa proteins have a more complete nutrient profile than egg whites.

SJH estimates that the potential market for white alfalfa protein to serve as an egg white substitute is at least $20 million or 10% of the total U.S. egg white market.

Casein

White Protein

The high protein content of white alfalfa protein makes it a suitable replacement for casein.

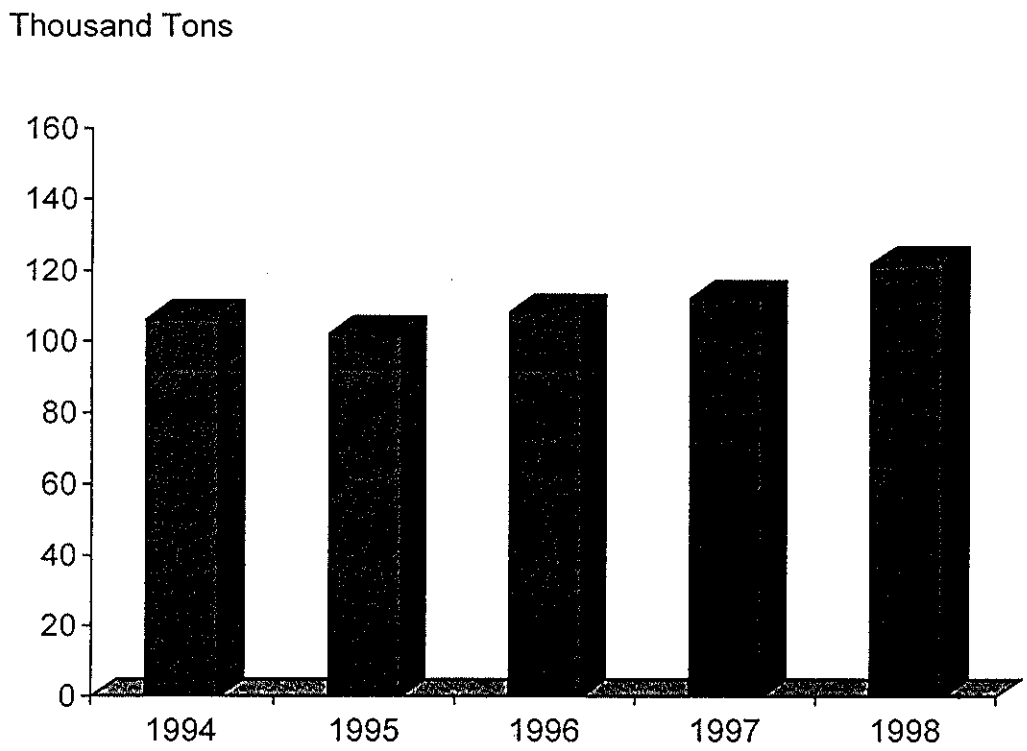
- Casein is a globulin protein made from milk
- Most casein is made from skim milk powder
- Casein is used in dry feeds and pet foods
- Casein can also serve as a replacement for fluid or powder dairy in cheese and ice cream

- The U.S. government currently buys all excess skim milk powder from U.S. dairy farmers and processors. As a result, dairymen have no incentive to produce casein.
- At present there is no casein produced in the U.S.
- All casein in the U.S, is imported.
- Casein imports are allowed only for industrial, chemical uses, such as glue manufacturing.
- It is suspected that the next year will bring a liberalization of the laws controlling casein imports into the U.S.

Historic U.S. Casein Imports

White Protein

Imports of casein have been increasing at a CAGR of 2.85% since 1994.[3]

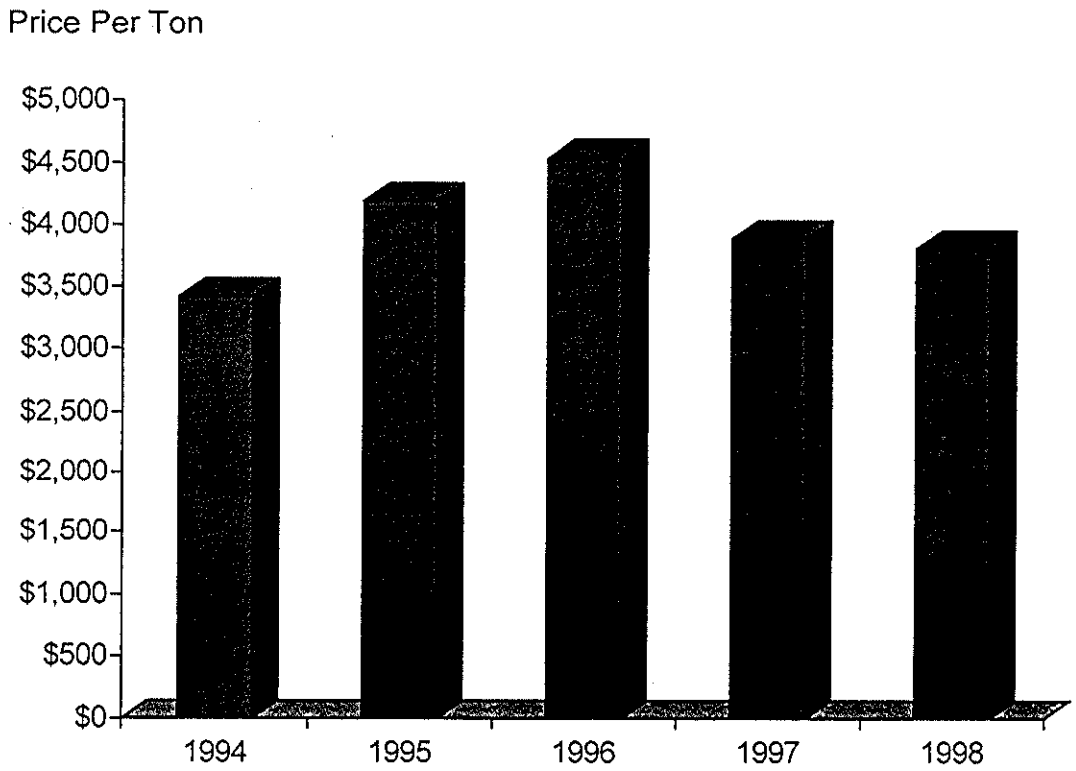


[3] Source: USDA

Historic Casein Prices

White Protein

Casein is a high value-added product. Currently, casein sells for $3,800 per ton. Its price has fluctuated significantly over the past 5 years, rising as high as $4,527 per ton.[4]



The total U.S. import market for casein was worth $465 million in 1998.

[4] Source: USDA

Opportunities and Considerations for Casein Substitutes

White Protein

The market for casein in the U.S. presents many opportunities for substitute products. The following are some of the relevant considerations:

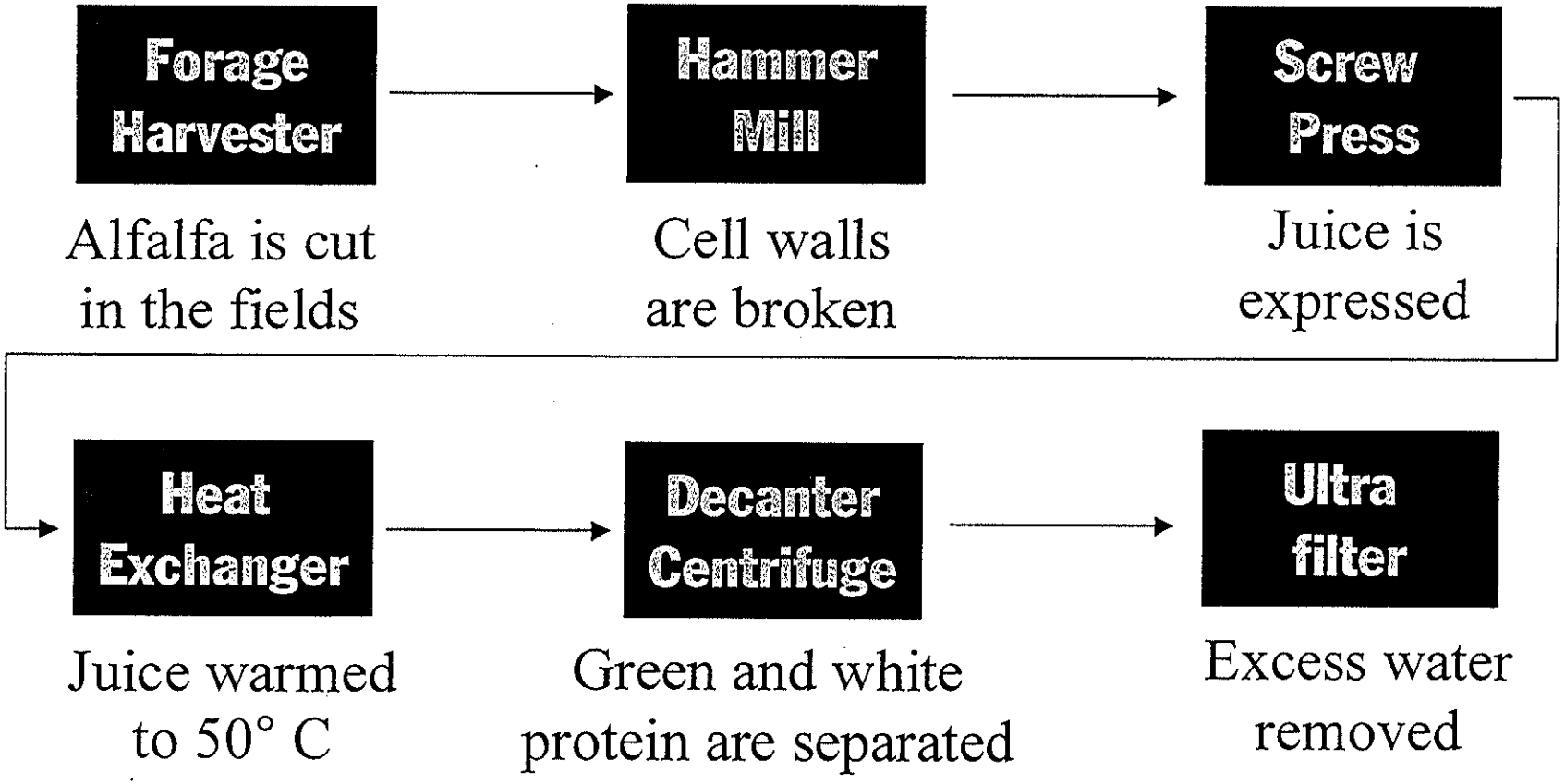
- U.S. dairymen currently have an incentive to try to restrict any domestic production and sale of casein.
- Any high-quality substitute for casein has the potential to capture a significant portion of the current U.S. market.
- The high price of casein makes it particularly vulnerable to replacement by lower cost substitute products.

SJH estimates that the potential market for white alfalfa protein to serve as a replacement for casein is at least $50 million or 10% of all current U.S. casein imports.

Process Flow and Required Machinery

White Protein

The diagram below demonstrates the machinery required to produce white protein, and explains the basic task associated with each machine.[5]



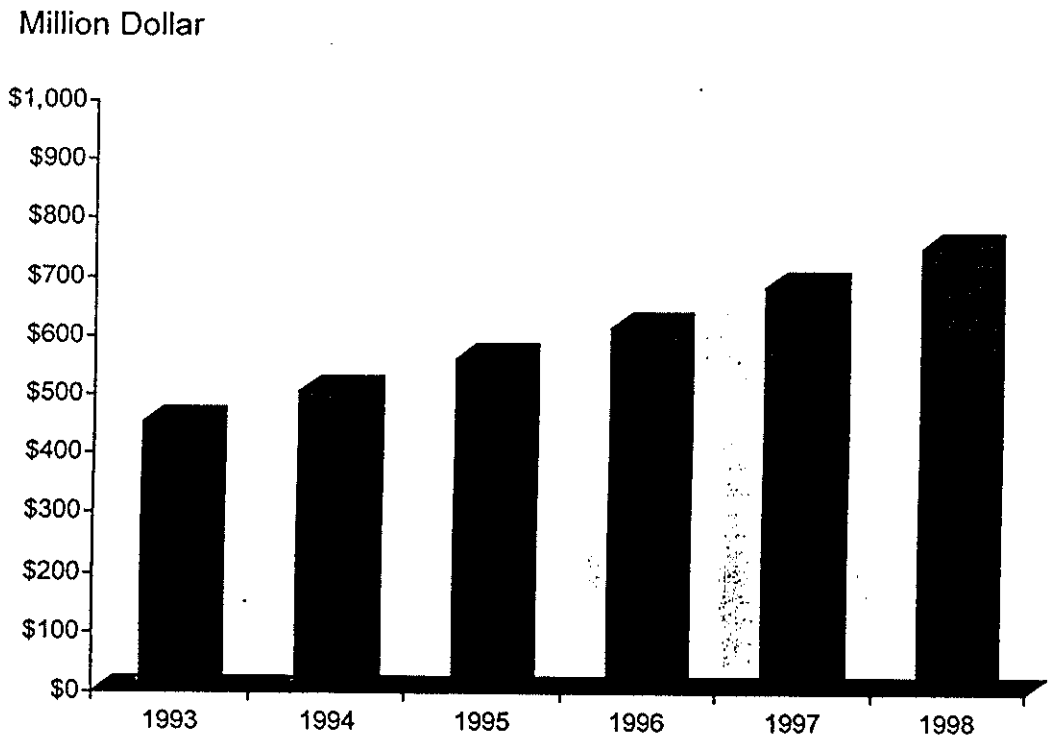
[5] Source: Industry Experts

Competition From Soy

Sales

Competition From Soy

The biggest competitor products facing white and green alfalfa proteins are soy protein isolates and soy protein concentrates. Soy proteins are well established in the U.S. market, and have been growing at a CAGR of 8.8% since 1993.[1]



[1].Source: SJH & Company Inc.

Prices

Competition From Soy

Due to the high value-added nature of soy proteins, changes in commodity prices have very little effect on them. Prices for both products have been relatively stable for the past five years.

- Soy Protein Isolates: $3,200/ton
- Soy Protein Concentrates: $1,900/ton[2]

[2] Source: ADM Sales Representative

Characteristics and Uses of Soy Proteins[3]

Competition From Soy

Soy proteins:

- Help with the emulsification of fats and other ingredients, and are used in coffee whiteners and liquid whipped toppings
- Are used with whey as ingredients for commercial baking
- Are used to produce numerous "dairy analog" products including: imitation cheese, imitation milk, non-dairy frozen desserts and yogurt In this application, they function like casein)
- Are used to make non-dairy baby formula
- Are used to replace the milk protein used in feeding young animals

[3] Source: Soy Protein Council

Isolates

Competition From Soy

Following are some of the characteristics and uses of soy protein isolates.[4]

- Protein content is 90%
- Single most important application is as a replacement for casein
- Used extensively as a nutritive additive to beverages, nutraceuticals, and weight-gain mixes
- Most appealing characteristic is their ability to deliver lots of protein without any bulk

[4] Source: Soy Protein Council

Concentrates

Competition From Soy

Following are some of the characteristics and uses of soy protein concentrates:

- Protein content is 65-75%
- Most important application is as a meat extender (a filler in meat products)
- Are also used in soy-based milk replacements
- Valued for their low fat content, low fiber content, and high digestibility

Archer Daniels Midland

Competition From Soy

Archer Daniels Midland (ADM) is the premier soy processor in the U.S. General facts about their soy operations.:[5]

- ADM began processing soy proteins in 1966.
- They process soy proteins, meals, and isolates at over 20 facilities throughout the U.S.
- Sales of soy and soy products account for approximately $6 billion of ADM's $16 billion in annual sales.
- In January 1998, ADM began marketing Novasoy, a soy-based isoflavone concentrate.
- Sales of Novasoy have been very strong, and in September 1998, ADM brought a new plant on line, exclusively for Novasoy production.

[5] Source: ADM Web Site

Central Soya and Henkel

Competition From Soy

Central Soya and Henkel recently formed an alliance (HCS Nutritional Resources L.L.C.) to manufacture soy-based isoflavones for use in health-promoting dietary supplements and functional foods.

- Henkel is a $12 billion per year (sales) company that specializes in antioxidants, marigold extracts, cartenoids, and specialty chemicals.
- Central Soya is owned by Eridania Beghin-Say, a $12 billion per year (sales) company, which specializes in grain processing, soy proteins, soy meal and other grain and seed based food ingredients.
- The extensive networks which these two companies enjoy should enable them to market their soy proteins and isoflavones widely.

Competitive Assessment

Competition From Soy

- Alfalfa crops produce more protein per acre than any other crop.
- On the basis of price, alfalfa proteins should be able to compete with soy proteins.
- Soy products and soy proteins have been produced in the U.S. for three decades and have gained wide-spread acceptance.
- Competing with soy will require two courses of action:
  - Developing an alternative product that is cheaper than soy but offers the same benefits.
  - Actively educating customers about alfalfa-based products and the benefits they offer.
- Convincing food manufacturers to adopt alfalfa-based products in place of soy-based products will require aggressive marketing.