Milkweed: The Worth of a Weed

Historically, milkweed has been a weed that farmers tried to kill. Yet now, serious efforts are under way to cultivate it—and even to develop a milkweed industry.

In truth, the use of milkweed is nothing new. American Indians knew the value of floss; they used it as a soft, warm lining for their children’s cradles. In 1635, the French produced silklike fabrics from milkweed fibers. Milkweed “went to war” when World War II interrupted the supply of imported kapok from Asia, and Americans picked milkweed pods so its floss could be used in U.S. Navy life jackets. Each of these uses of milkweed relied on harvesting by hand from the wild. This chapter is a case study of a current venture which seeks to grow milkweed as a cultivated crop, thereby providing a stable source of floss for commercialization.

Background
In the late 1970’s, Nobel Laureate...
Melvin Calvin and others were promoting the idea that billions of barrels of synthetic crude oil could be recovered from plant biomass. Standard Oil of Ohio began a milkweed research program, working with Native Plants, Inc., to produce a synthetic crude oil from milkweed biomass. Milkweed was grown, cut, dried, and baled much like hay. Analysis of that research concluded that the cost of producing the synthetic crude oil was too high and the yield of oil too low to be economically feasible.

During the course of that research project, Herbert D. Knudsen, Manager of Corporate Ventures for Standard Oil, was looking at alternative uses of milkweed. He made contact with William G. Wilson of Kimberly-Clark in Neenah, WI. Kimberly-Clark was interested in the potential of milkweed floss for use in its disposable absorbency products. With Standard Oil’s 5 years of experience growing milkweed in research plots for the synthetic crude oil project, the fit of interests seemed good. Arrangements were made for Kimberly-Clark to proceed with product development research and Standard Oil to grow milkweed.

When British Petroleum acquired Standard Oil of Ohio, they eliminated diversification efforts, so Knudsen decided to acquire the milkweed venture himself. In 1987, Natural Fibers Corp. was founded with the dream of creating a new agricultural industry, comparable in size to the cotton industry, based on milkweed.

**Analyzing the Opportunity**

Product development for milkweed floss has been a cooperative effort between Natural Fibers Corp., the University of Nebraska, the Southern Regional Research Center of USDA’s Agricultural Research Service, and various private corporations. Based on their experience, 10 pounds of dried milkweed pods can be used to produce 2 pounds of floss, 3 pounds of seed, and 5 pounds of pod biomass. Prototype development using these components has shown that it is possible to make a number of products with milkweed floss, which can be:

- Combined with down and used as loose-fill in comforters, pillows, and clothing,
- Used to form a batt or filling for quilts, jackets, and disposable absorbency items, and

**Milkweed**

Milkweed is changing, from a worthless weed to a comfortable crop.
• Blended with cotton and woven to make a linenlike cloth.

In addition to the products developed from floss, milkweed biomass and the oil from the seeds have been evaluated for potential uses. Paper has been made from the bast fiber; pet litter and fireplace logs have been made from the pod biomass. The seed oil has been analyzed to determine its lubricating properties and its potential for use in cosmetics. There are undoubtedly other possible uses for milkweed. The challenge is to determine which ones are economically viable at given levels of milkweed production and cost.

To move ahead, market opportunities for milkweed were assessed in terms of volumes, prices and resources. The resources of Standard Oil were substantially greater than those of an entrepreneur, even with the cooperation and special grants funding of the University of Nebraska and USDA’s Cooperative State Research Service (CSRS). While the nonwovens market was a realistic target, considering the resources of Standard Oil, it was not realistic as a startup venture for an entrepreneur. The $2 billion nonwovens market requires a minimum of 500,000 pounds of floss at less than $9 per pound. Financial projections determined that penetrating the nonwovens market would require at least $6 million of investment by Natural Fibers Corp., so it was not viewed as a viable short-term target. Instead, the goal was to find a high-value, low-volume market for the initial entry.

Market Niche
Milkweed floss has properties similar to those of goose down. In the United States, the size of the waterfowl down market is about 10 million pounds with a price range of $10 to $30 per pound. A number of loose-filled products can be made: comforters, pillows, sleeping bags, and jackets.

Knudsen’s approach to product development and testing is to “put the product in the customers’ hands and tell them the price. Then keep lowering the price until you cannot get the product back.” With an idea of the potential retail value, one can then look at the economics of costs and revenue for the grower, the processor, the manufacturer, and the distribution system. Next, ask if you can make a profit at the price the customer is willing to pay. If the answer is “yes,” you proceed to make the process as efficient as possible, from grower to consumer. For blended, loose-fill milkweed floss, the products that held the greatest potential were comforters and pillows. Thus, Natural Fibers Corp. chose these to launch their line of Ogallala Down products.

Growing Milkweed
After years of trying to kill milkweed, it now seemed that growing it was nearly as difficult. First, farmers willing to grow milkweed had to be found. Richard D. Zeller, an agribusiness professional, was hired to coordinate production activities. Robert L. Raun, former director of agriculture in Nebraska, is growing milkweed in Minden, NE. Ralph Holzfaster and Edward Perlinger, farmers from the
Ogallala, NE, area, also have fields of milkweed. In addition, a number of researchers from the University of Nebraska and one from Kansas State University have been actively involved in addressing the obstacles to growing milkweed.

Milkweed grows in the same basic regions as corn and is planted and cared for with traditional row crop equipment. A deep-rooted perennial, milkweed produces beautiful flowers that provide habitat for Monarch butterflies in mid- to late summer as they migrate south for the winter. Pods containing floss and seed are formed in the second year after planting.

The major production problems faced by milkweed farmers have been diseases, weeds, and hail. The diseases causing the most damage are a black spot fungus and a bacterial blight. University of Nebraska plant pathologist Anne Vidaver leads the efforts to control the bacterial blight, and Michael Boosalis, also a plant pathologist at the University of Nebraska, is attempting to find ways to minimize black spot. Chemical controls have not been successful; thus, variety selection may be the best recourse.

As a step in this direction, Zeller and Paul D. Nordquist have established a germplasm nursery in Ogallala. Seed from vibrant wild plants is being evaluated for yield, resistance to disease, and cultural needs such as water and fertility requirements. Test plots have been established at an experiment station in Garden City, KS. Other test plots exist at Nebraska sites near Beatrice and Scottsbluff. Average test-plot yields for the past 5 years from all varieties and hybrids have been about 252 pounds of floss per acre.

In spite of disease and hail, Natural Fibers Corp. was able to produce 1,000 pounds of floss in 1990 and 1,500 pounds in 1991 from production fields and supplemental wild collections. While this is far short of the 500,000 pounds of floss needed to penetrate the nonwovens market, it is enough to encourage those involved to continue the effort.

Harvesting and Processing
Green milkweed pods are harvested with a modified New Idea Uni-System ear corn picker, at about 70 percent moisture, before they open to release the floss and seeds. The pods are cracked open in a roller mill and dried to about 30 percent moisture in portable tanks on the farm. The partially dried pods are transported to the Ogallala processing plant and dried to 10 percent moisture. At this moisture level, they can be safely stored and processed. The harvester was designed by Kenneth Von Bargen and the drying system was designed by David D. Jones, both of the Biological Systems Engineering Department at the University of Nebraska.

Once the pods are dried, they are pneumatically conveyed from the drying bins to the floss processing line. The processing line consists of a modified 1940 model combine, a cleaning apparatus, and a hopper. Floss is vacuum-bagged from the hopper. Milkweed floss and goose down are air-blended to produce Ogallala Down, which is manufactured into
comforters or pillows using standard loose-fill processing equipment.

**Commercialization**

Penetrating a well-established market with a new product is not an easy task. Understanding the properties of your product, as well as the perceived needs of the end user and of the distributors with whom you will work, is essential. As milkweed floss was assessed, the following features were found to be important factors for the down market:

- A nonallergenic cellulose fiber,
- Fill-power comparable to high-quality goose down,
- White color,
- More durable than down, and
- 20 percent warmer per unit of weight than down.

In addition, as milkweed floss absorbs moisture, it continues to allow more air to move through the fibers compared to down, making it more “breathable.”

End-user acceptance and promotional support were important to distributors. Promotion is a paramount concern for most startup ventures because the image created is important not only in selling the product but also in attracting investors and farmers. Natural Fibers Corp. based its 1989 promotions both on the Ogallala Sioux legend of an Indian maiden named Flame and on the Monarch butterflies. The result was sales of $20,000.

Touting comforters with milkweed floss did not create sufficient consumer demand. An attractive product name was needed. Hence, “Ogallala Down” was adopted to describe a blend of 60 percent milkweed floss and 40 percent goose down, and the slogan “Nothing Warms You Up Like Ogallala Down” was coined. Attractive, high-quality brochures, labels, and product inserts were developed. Many customers have a special interest in environmental issues. To address such issues it was pointed out that milkweed floss is a vegetable fiber produced in low-input agriculture and that use of the comforters allows the user to turn down the thermostat in the winter to save energy. (University of Nebraska and Kansas State University researchers determined that milkweed floss possesses 25 percent more insulating power than goose down.)

Selecting and recruiting wholesale distributors was also a key issue. Early sales were the result of word-of-mouth and direct marketing campaigns. To penetrate the wholesale distribution channel, it was important to convince wholesale customers to risk carrying this “new” product. Therefore, a strategy of demonstrated acceptance of Ogallala Down products by retail customers was needed. It was also important to find a wholesaler whose volume requirements fell within available floss resources. Using both direct marketing and wholesale distribution, Natural Fibers Corp. achieved a fivefold increase in sales in 1990, with nearly two-thirds of the sales in the wholesale trade.
Conclusion
In spite of the myriad obstacles, tangible, useful results have been achieved with milkweed. Many challenges remain to be conquered, but our current successes lay a strong foundation for future development of this new crop. The cooperative effort including USDA-CSRS funding resources, university research capabilities, and the entrepreneurial spirit is a model for new crop development.

How many other weeds are potentially valuable crops for use as industrial raw materials? Fewer than 300 of the estimated 300,000 plant species are used in organized agriculture; the possibilities for new discoveries, knowledge, and uses seem extraordinary.

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Peter Knudsen, director of plant operations for Natural Fibers Corp., is wearing a jacket lined with milkweed floss. Items currently on the market include pillows and comforters. Prototype products include the jacket, thread, and cloth.

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