

Market Opportunities and Strategic Directions for Specialty Herbs and Essential Oil Crops in Montana

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EXECUTIVE SUMMARY

The growth and rising interest in herbal, botanical, and essential oil products in the United States over the last several years has caught the attention of the agricultural community. Reports of high prices for specialty crops, coupled with a decrease in prices for traditional grain crops, has caused many agricultural producers in Montana and other states to consider whether specialty herb crops offer opportunities for diversification and increased profits. This report, prepared for the Montana Department of Agriculture, explores the economic feasibility of specialty herb and essential oil crops (specialty crops) for Montana farmers.

This report explores production, uses, markets, and prices for several specific specialty herb crops. It presents findings from agronomic production trials including test plot yields. Strategic considerations for prospective growers and Montana producers in particular are explored. Available market data is presented; and, market depth, price volatility, and potential trends are analyzed. Risk management considerations are highlighted, and methods of risk management for individual producers are explored.

The research recommends several potential strategies and considerations for prospective Montana growers considering specialty crop opportunities. Notably, it is recommended that the benefits of cooperative arrangements and alliances be explored.

Significant opportunity may exist for some producers in the production and marketing of high-quality, specialty herbs and essential oils. Taking advantage of such opportunities will require significant expertise and participation of the grower beyond crop production. Progress has been made toward the development of production knowledge and research for western Montana climates. The markets for such products are expected to expand. Furthermore, the production of such products, following organic practices in the pristine environments of Montana, may provide an opportunity for some Montana agricultural producers with a desire to further their own active involvement in product research and marketing of their products.

I. INTRODUCTION

The growth and rising interest in herbal, botanical, and essential oil products in the United States over the last several years has caught the attention of the agricultural community. Reports of high prices for specialty crops, coupled with a decrease in prices for traditional grain crops, has caused many agricultural producers in Montana and other states to wonder whether specialty herb crops offer opportunities for diversification and increased profits. This report, prepared for the Montana Department of Agriculture, explores the economic feasibility of specialty herb and essential oil crops (specialty crops) for Montana farmers. Following this introductory section, Section II examines the overall market for specialty crops, types of crops that are grown, ways in which they are used, and the organization and structure of the industry. Section III looks into specific crops that have been grown and evaluated by Dr. Nancy Callan at the Western Montana State University Agricultural Experiment Station and provides more detailed information about their uses and markets. Section IV investigates strategic management considerations for an individual producer considering specialty crops as an agricultural enterprise. Section V describes critical elements of a marketing plan from a producer perspective. Section VI considers the limited production risk management products currently available. Section VII discusses price risk management strategies, and Section VIII presents conclusions and recommendations for producers considering producing specialty crops.

II. THE MARKET FOR SPECIALTY HERB AND ESSENTIAL OIL CROPS

The market for specialty herb, botanical, and essential oil crops has been growing rapidly within the United States for the last several years. Definitions of goods and products that comprise this market vary due to the wide diversity of plants, forms, and uses. This section will describe this broadly defined industry and will identify market segments, marketing channels, and marketing forms that are important when considering a new farming enterprise.

II.A. Market Decomposition and Classification

The market for specialty crops, as defined for this report, is actually a diverse collection of markets for crops that are sold under the broad categories of herbs, botanicals, and essential oils. A comprehensive list of specific crops included under this definition is beyond the scope of this report. However, the market can be classified into several important segments including: foods, medicinal botanicals, essential oils, and florals.

II.A.1. Foods – Teas, Fresh-cut and Dried Culinary Herbs

Specialty crop products are used extensively in many foods including teas, spices and seasonings, flavorings, additives, and condiments. These crops may be consumed in a natural state as teas, fresh herbs, dried herbs, and spices; or, food and spice manufacturers may use them as inputs. Various forms of these crops and their derivatives are sold to consumers by local restaurants, health food stores, multilevel marketing companies (e.g., Amway, Shaklee), mass marketing companies (ex., Wal-Mart, etc), and, in some cases, directly by growers. This market segment overlaps with medicinal botanicals, as medicinal products are often “delivered” to consumers in the form of teas and natural health foods.

Fresh-cut culinary herbs and spices are grown primarily in California and Florida and are marketed through wholesale channels (ATTRA 2000). Buyers demand reliable year-round supplies, limiting the ability of northern regions to compete in this market. Much of the production of these products occurs in greenhouses. Limited local markets exist for supplying upscale restaurants with fresh culinary herbs. Dried culinary herbs can be grown in many northern climates. However, this market is also served by product gathered from the wild (wildcrafted). Organically produced dried herbs are frequently sold through direct marketing channels such as farmers’ markets and Internet sales.

Many herb crops including chamomile, mint, and Echinacea are used in herbal tea formulas. Teas created from medicinal herbs represent a “crossover” market segment – medicinal products contained in foods – sometimes called “nutriceutical.” Herbal teas are also direct marketed by small specialty herb growers. Montana producers have pursued private labeling and brand development of herbal teas with some success. Larger tea companies such as Celestial Seasonings also purchase herbs as inputs, but such companies usually require consistently large quantities at very competitive prices. It appears unlikely that individual Montana producers will be competitive suppliers to herbal tea companies where price competition from the world market is strong and product differentiation may not be important.

II.A.2. Essential Oils

Essential oils, distilled from many plants, are used in the flavor and fragrance industry. They are distilled from many parts of the plant including flowers, bark, seed, leaves, roots, and the whole herb. The cosmetics industry uses many herbs and spices in the manufacture of skin cream, lip balms, shampoos, soaps, and perfumes. Essential oils are also used by soft drink companies and by food companies. The United States is the largest user of essential oils and flavor and fragrance industry continued growth is expected (Alberta Essential Oils 1996).

Distillation of essential oils can be performed in a variety of ways including water distillation, which involves boiling plants with water, and steam distillation, which is preferred for commercial production. An experimental-scale steam distillation facility is located at the Montana Northwestern Agricultural Research Center (NWARC) in Kalispell. Many mint producers in Northwest Montana have commercial-scale steam distillation facilities.

Mint has historically been the most important of the essential oil crops. However, many other herbs and botanicals are distilled into essential oils including anise, clary sage, coriander, caraway, calendula, "Omega" flax, parsley, sage, sweet basil, sweet fennel, lavender, chamomile, and dill to name a few. Markets are served by individuals, who grow, process, and independently market them through cottage industries. Aromatherapy products are commonly sold in this fashion.

II.A.3. Medicinal Botanicals

Many varieties of herbs and botanicals are used for medicinal purposes. In fact, herbal alternatives exist for many traditional medical and pharmaceutical products. The main players in the medicinal herb market are pharmaceutical, medicinal supplement, and nutraceutical companies. The use of herbs as alternatives or complements to traditional medicine has been increasing. A recent study by Harvard researchers estimated that total consumer demand for these products was \$5.1 billion in 1997 (Blumenthal 1999).

Medicinal botanical herbs are often purchased from growers by wholesalers and brokers or, in some cases, directly by manufacturers. These "phytomedicinal" herbs are often classified according to standardized extracts, for which quality is based on measurable chemical compounds, and non-standardized extracts, for which quality is not based on a specific compound but rather on the overall herb (stems vs. flowers, time of harvest, etc.). For standardized extracts, higher compound content lowers processing costs and increases value of the herb product. Manufacturers evaluate quality before purchase by analyzing product samples. Much of the input product used by manufacturers is purchased from wholesale distributors.

Medicinal herbs are sold to the end user in the form of dried powdered products, tablets, and capsules. They are also marketed as teas, tinctures, liquid extracts, and creams. A relatively new "delivery" method for medicinal herbs involves "nutraceuticals," or as healthy ingredients in conventional foods such as ginseng teas or ginkgo additives to blended fruit drinks.

Some of the most important and widely marketed medicinal herbs are Echinacea, goldenseal, ginseng, and St. Johns Wort. Select market opportunities exist for growers of these crops, but they must be carefully evaluated. Growing and marketing medicinal botanicals requires skill and expertise and demands a high level of knowledge and participation from the farmer. Prospective farmers should expect marketing efforts that are likely to surpass time spent farming. An example of marketing plan considerations for a specific crop (Echinacea) is presented in Section V.

II.A.4. Floral, Decorative, and Ornamental Plants

Many varieties of herbs and flowers can be raised and sold for decorations or ornamental arrangements. This market segment includes the growing of plants such as sage, yucca, and potentillas for use in landscaping. Many floral shops also purchase baby's breath, dried flowers, and other ornamental plants. This market segment may provide opportunities for some specialty herb crops during certain times of the year and certain market conditions. However, it likely will not be the primary market for most Montana growers.

II.B. Marketing Channels and Methods

Within market segments, further market distinctions must be made between bulk commodities (wholesale) and direct niche (retail) marketing. Bulk marketing refers to the production of large volumes of product for sale to large buyers or intermediary market participants such as brokers and wholesalers. Direct marketing refers to selling directly to individual end-users or small buyers.

Bulk herb products are marketed largely to wholesale distributors who warehouse and resell them to manufacturers and other further processing companies, although many such companies also purchase directly from growers. Sales are conducted both on cash basis and through contracts. Discussions with industry buyers suggest that contracts may have become less common in the wholesale herb market for at least two reasons. First, buyers are reluctant to commit to contracts, which limit their flexibility to respond to seasonal and structural fluctuations in demand for certain types of herbs. Second, although quality is very important for this market, it appears that buyers can easily measure quality in product offerings and, therefore, have less need to rely on contractual arrangements to obtain requisite quality.

A large number of specialty herb growers pursue direct marketing of their crops through farmers' markets, direct sales of dried herbs to health food stores, Internet marketing and cottage industries. The term "cottage" relates to small farms that grow, manufacture, and sell end products in a retail environment. Products sold through direct channels and the cottage industry include an assortment of herbal salves and lip balms produced by home distillation, ornamental flowers, dried culinary herbs, herbal teas, tinctures, and potpourris.

II.C. Marketing Forms and Uses

Specialty crops are delivered to various market segments in a multitude of forms that require a variety of harvesting techniques and on-farm processing. Harvested forms of specialty herbs include whole herbs, flowers, roots, bark, seeds, leaves, and buds.

Many require special harvesting and handling techniques because the process can affect quality. Even bulk markets frequently require further processing of the product after harvest. For example, herbs are often sold in dried or in powdered form. Essential oil crops such as anise often must be distilled before sale.

Milled forms of dried herbs include whole, chipped or cut, shredded, chopped, cut and sifted, and tea bag cut. Growers of all types of specialty herb crops, bulk or retail, are often responsible for packaging their product. In many cases the crops will also need to be packaged in burlap or polypropylene bags of a specific weight, in cartons, and in drums, or in the case of retail sales, in tea bags and containers. Such packaging usually requires nutritional labeling and, because of consumer preferences, tamper-resistant closures.

Medicinal botanicals take a number of intermediate forms as they are processed into increasingly valuable products. Fresh herbs are dried and can be made into various extracted forms including tinctures, extracts, and standardized extracts (those with guaranteed levels of chemical compounds).

Organic Certification

Organic certification is an important quality attribute of most types of specialty herb production. Many market channels require organic certification. In the health food industry organic production has become a consumer standard that signals nutritional properties. Growers must, therefore, heed these market signals and must provide the quality of goods demanded by consumers. They should recognize that the market may not differentiate between real and perceived quality. Organic production and certification will therefore be an essential part of quality niche marketing.

II.D. World Production and U.S. Import / Export Data (Size of Market)

North America supplies only a small portion of the world market for herbs and botanicals. Information about the size of the world market for specialty herb crops is scarce. Much of the world's medicinal herb supply is generated by India, Korea, and European countries. Discussions with key industry players suggest that China and Egypt are also participating important foreign competitors. Both countries are able to produce large volumes at low costs. This is the likely result of large-scale "wildcrafting" (non-cultivated production). Wildcrafting is highly labor-intensive and may result in lower product quality. However, for many products quality does not seem to be the most important feature. In addition, although wildcrafting may be an extremely inefficient method for producing such crops, very low labor costs in some countries more than offset this disadvantage.

Despite the growth in the herb industry and the increase in sales in herbal products, it is important to remember that the scale of agricultural production for these crops is small. Table 1 summarizes the estimated number of acres cultivated for some specific crops in North America and worldwide.

Table 1. Estimated Number of Acres Cultivated for Select Specialty Herb Crops in North America and Worldwide

Crop	North America (Ac.)	World (Ac.)
Anise	22,000	240,000
Basil	2,500	25,000
Calendula	500	2,200
Caraway	6,200	47,000
Chicory	NA	NA
Clary Sage	NA	NA
Coriander	12,000	1,500,000
Dill	10,000	91,500
Echinacea	10,000 (20,000 wildcrafted)	40,000
Fennel	17,000	175,000
Feverfew	400	3,200
German Chamomile	6,000	50,000
Ginseng	18,000	175,000
Goldenseal	17,000	42,000
Lavender	2,500	22,000
Lemon balm	200	2,500
Omega Flax	30,000	NA
Parsley	62,000	620,000
Mint	40,000	600,000
Psyllium Plantain	NA	NA
Sage	6,000	400,000
Savory	800	2,000
Skullcap	1,000	12,500
Thyme	6,000	82,000
Valerian	4,000	12,000
Yarrow	10,000	NA

Sources: *Richters 2000 Catalogue in Ward, Jeff. The Market for Herbs and Essential Oils. Alberta Agriculture, Food & Rural Development.

** Miller, Richard Alan. *Alternative Crop Overviews*. Northwest Botanicals, Incorporated.

As illustrated in Table 1, total world cultivated acres for many specialty herb crops are less than the number of acres of wheat planted on a typical Montana wheat farm. This reflects the small market for these crops as well as their labor-intensive nature which generally prohibits large scale production. Wildcrafting also supplies a significant portion of the industry for many of these crops and competes with cultivated production. It should be noted that opportunities in the specialty herb crop market may be found in crops that are not on the list and, in some cases, are yet to be discovered.

The U.S. Foreign Agricultural Services (FAS) collects and publishes import and export information for some herb crops. Table 2 summarizes this information for some related crop products and calculates implicit per pound prices.

Table 2. Summary of U.S. Imports and Exports of Herb, Spice, and Essential Oil Crops: 1996-2000

IMPORTS CROP NAME	1996			1997			1998			1999			2000		
	Quantity	Value (\$)	\$/lb												
Anise	1,347.7	2,560,552	0.86	1,211.4	2,709,216	1.01	1,448.6	3,588,515	1.12	1,373.7	3,034,597	1.00	1,503.5	3,017,120	0.91
Anise Oil	61.8	615,091	4.51	98.4	850,906	3.92	106.5	1,000,399	4.26	152.9	1,208,731	3.59	85.9	682,112	3.60
Basil Fresh or Dried	4,195.3	5,589,786	0.60	2,766.0	3,580,329	0.59	3,431.5	4,810,263	0.64	3,241.3	5,106,062	0.71	3,313.4	5,675,028	0.78
Caraway	4,205.6	4,909,411	0.53	3,139.4	2,812,025	0.41	3,238.0	2,535,391	0.36	3,405.1	2,509,688	0.33	3,325.0	2,825,281	0.39
Caraway Oil	6.4	244,946	17.36	7.0	275,413	17.85	6.9	285,103	18.74	4.7	186,142	17.96	5.5	203,795	16.81
Coriander	2,855.0	2,021,889	0.32	3,100.8	2,702,865	0.40	3,268.6	2,723,133	0.38	3,589.9	2,168,507	0.27	4,081.2	2,165,728	0.24
Dill	884.5	908,057	0.47	598.3	768,940	0.58	715.1	900,797	0.57	732.0	945,892	0.59	699.5	1,007,306	0.65
Fennel	2,851.0	3,546,613	0.56	3,418.3	4,069,820	0.54	3,752.2	3,834,845	0.46	3,472.7	3,860,851	0.50	3,262.7	3,761,696	0.52
Ginseng Root, Cultv	456.4	10,749,168	10.68	514.6	10,137,875	8.94	637.2	11,699,521	8.33	495.8	9,468,141	8.66	424.9	12,309,518	13.14
Ginseng Root, Wild	130.9	809,553	2.81	199.3	2,030,104	4.62	452.4	1,054,657	1.06	155.0	1,307,195	3.83	106.7	381,502	1.62
Lavender Oil	510.4	7,775,176	6.91	525.1	8,454,437	7.30	406.8	7,706,789	8.59	474.7	8,998,672	8.60	527.1	8,150,639	7.01
Mint Leaves CR,NMF	250.2	421,606	0.76	279.1	469,239	0.76	196.3	303,931	0.70	182.5	302,404	0.75	217.5	381,359	0.80
Mint Leaves, F,D,C	66.1	298,536	2.05	40.1	191,616	2.17	79.5	289,902	1.65	102.7	417,701	1.84	92.5	285,717	1.40
Mint Leaves, F/D	279.9	827,049	1.34	138.3	854,815	2.80	107.5	531,674	2.24	106.0	531,709	2.28	83.3	507,556	2.76
Thyme, Nesoi	167.7	228,281	0.62	151.4	281,877	0.84	147.8	205,655	0.63	92.4	207,533	1.02	172.8	570,705	1.50
Thyme; Bay Leaves, CR	2,204.5	6,015,126	1.24	1,962.8	5,191,901	1.20	1,708.5	4,185,932	1.11	2,142.0	5,313,977	1.13	1,980.6	5,151,583	1.18
Peppermint Oil	456.4	7,494,678	7.45	253.7	3,997,337	7.15	356.5	5,691,318	7.24	316.5	4,214,997	6.04	394.7	6,255,748	7.19
Psyllium Seed Husk	8,434.2	21,722,947	1.17	17,013.2	38,564,812	1.03	16,862.8	30,323,494	0.82	10,495.0	16,582,239	0.72	12,744.2	24,634,318	0.88
Sage	2,065.0	3,859,752	0.85	2,007.8	3,384,644	0.76	2,396.6	4,922,034	0.93	2,493.6	4,389,441	0.80	2,473.0	4,523,320	0.83
EXPORTS CROP NAME	1996			1997			1998			1999			2000		
	Quantity	Value (\$)	\$/lb												
Anise/Badian Seeds	119.7	145,524	0.55	127.2	178,149	0.64	149.3	187,664	0.57	63.4	85,401	0.61	103.4	287,444	1.26
Caraway Seeds	99.9	193,113	0.88	70.6	27,079	0.17	25.8	59,218	1.04	64.8	64,415	0.45	57.7	175,007	1.38
Coriander Seeds	151.8	132,020	0.39	154.9	289,660	0.85	140	425,568	1.38	175	547,227	1.42	201.3	403,220	0.91
Fennel/Juniper Seeds	79.4	328,488	1.88	106.7	295,540	1.26	100.2	216,201	0.98	77.7	153,906	0.90	43.2	80,348	0.84
Ginseng Root, Citv	669.4	33,270,392	22.54	699.7	31,620,115	20.50	702.2	20,916,992	13.51	447.8	16,377,390	16.59	405.5	16,921,790	18.93
Ginseng Root, Wild	191.5	32,454,473	76.87	143.5	25,340,271	80.10	108.7	13,846,663	57.78	117.1	20,597,315	79.79	144.2	24,496,814	77.06
Lavender Oil	56.5	1,076,070	8.64	62.7	1,226,164	8.87	94.0	1,631,948	7.87	95.1	1,727,334	8.24	121.4	2,118,791	7.92
Peppermint Oil	1,958.9	67,223,834	15.57	2,356.8	73,332,268	14.11	2,511.8	81,657,674	14.75	2,355.7	74,319,607	14.31	2,188.9	63,752,384	13.21
Thyme; Bay Leaves	89.5	293,850	1.49	126.7	391,563	1.40	152.5	410,503	1.22	129.1	305,916	1.07	145.4	346,021	1.08

SOURCE: *Department of Commerce, U.S. Census Bureau, Foreign Trade Statistics

**Note: Wide implicit (calculated) price fluctuations were found for some crops, which may be due to inconsistent unit reporting. Units are reported in metric tons

The types of products for which trade data are collected are limited and may not be exactly comparable to farm specialty herb products. For most crops and products shown in the table it is apparent that more product is imported into the U.S. than is exported with two notable exceptions. The first is mint, which has been an established crop in the Pacific Northwest for several years, and peppermint oil exports far surpass imports. The second is ginseng for which the American variety is very popular and is in demand in Asian markets including China, where Ginseng use is high. Aggregate import and export figures are sensitive to variations in quantity units, but the table suggests that average prices of world imports are lower than prices for similar types of domestic production.

III. POTENTIAL SPECIALTY HERB AND ESSENTIAL OIL CROPS

Twenty-four agronomically promising crops have been grown in test plots at the Western (Corvallis) and Northwestern (Kalispell) Montana Agricultural Experiment Stations over the past several years. Two additional crops have been identified through research and interviews with industry experts as having market potential. The following section contains form, use, pricing, and production information for these crops.

III.A. Forms and Uses

Specialty herb crops are used in a variety of ways as described in Section II. Table 3 summarizes forms, uses, and other important characteristics of selected specialty herb crops. It also summarizes expected yields reported in collected studies as compared to yields from Montana test plots for these crops.

Table 3. Forms, Uses, Markets, and Other Important Characteristics of Selected Crops

Source / Crop	Latin name	Portion Used	Use (type)	Medicinal	Flavoring	Cosmetic	Culinary or Tea	Expected Yield Per Acre from Other Reports	Yield Per Acre (WARC/NWARC)	Components
Western Ag Experiment Station (WARC)										
Anise	<i>Pimpinella anisum</i>	seed	oil, tincture	X	X	X	X	446-1,338 lbs seed	1,100-1,150 lbs. seed; 10 lb.s -oil	Anethole, isomer methyl chavicol, fixed oil, choline, sugar, mucilage
Calendula	<i>Calendula officinalis</i>	flowers - entire head or petals, leaves, seed	dried, absolute oil, fresh, orange flowers fed to laying chickens to deepen yolk color	X	X	X	X	400-600 lbs. (up to 1,500 lbs.) -dried flowers	1,100 lbs. - dried herb	calendic acid
Caraway	<i>Carum carvi</i>	seed, leaves	bruised seeds, tender leaves, essential oil	X	X	X	X	"few hundred pounds" (annual) to 1000 lbs.(biennial) -seed	1,160 (annual) to 2,400 lbs. (biennial) -seed; 3lbs. (annual) to 42.1 lbs. (biennial) -oil	hydrocarbon termed Carvone, oxygenated oil Carvol, protein, fat
Clary Sage	<i>Salvia sclarea</i>	whole herb	fresh, dried, tincture, oil	X	X	X		not available	4,700 lbs. -dry herb; 27 lbs. -oil	linalil acetate, sclareol, linalol, nerol, beta-pinene, alpha- and beta-thujone, borneol, mircene, camphor

Table 3. Continued

Source / Crop	Latin name	Portion Used	Use (type)	Medicinal	Flavoring	Cosmetic	Culinary or Tea	Expected Yield Per Acre from Other Reports	Yield Per Acre (WARC/NWARC)	Components
Western Ag Experiment Station (WARC)										
Coriander	<i>Coriandrum sativum</i>	seed and fresh leaves	fresh leaves, fruit (seed), powdered fruit, fluid extract, oil	X	X		X	700-900 lbs.-seed	2,360-2,640 lbs. seed; 13 lbs. -oil	volatile oil, malic acid, tannin, fat
Omega' flax	<i>Linum usitatissimum</i>	seed	seed, oil, capsules, meal	X			X	535-1,600 lbs. seed	1,200-2,000 lbs.-seed	omega-3 oil (alpha linoleic acid ALA), lignans, soluble and insoluble fiber
Parsley	<i>Petroselinum crispum</i>	root, leaves, seeds	fresh, dried, oil	X	X		X	<i>not available</i>	9,355 lbs. -dry herb; 70 lbs. oil	starch, mucilage, sugar, volatile oil, terpenes, Apiin, Apiol
Sage	<i>Salvia officinalis</i>	whole herb	fresh, dried, tea, oil,	X	X	X	X	1,000-2,000 lbs. dry herb	4,000 lbs. -dry herb; 2,500 lbs. -leaves, and 37 lbs. oil	salvene, pinene, cineol, borneol, esters, ketone thujone, dextro-camphor, salviol
Summer Savory	<i>Satureja hortensis</i>	seeds, leaves	fresh, dried, essential oil, syrup	X	X	X	X	<i>not available</i>	2,700-3,000 lbs. -dry herb, 1,650 -leaves,; 37-44 lbs. -oil	essential oil, carvacrol, p-cymene, gamma-terpinene, alpha-pinene, dipentene, borneol, 1-linalool, terpineol, 1-carvone
Sweet Basil	<i>Ocimum basilicum</i>	whole herb	leaf products, essential oil, oleoresin	X	X	X	X	<i>not available</i>	2,250-3,250 lbs. -dry herb; 8-11 lbs. -oil	{many different varieties}

Table 3. Continued

Source / Crop	Latin name	Portion Used	Use (type)	Medicinal	Flavoring	Cosmetic	Culinary or Tea	Expected Yield Per Acre from Other Reports	Yield Per Acre (WARC/NWARC)	Components
Western Ag Experiment Station (WARC)										
Fennel	<i>Foeniculum vulgare</i>	seeds, leaves, roots	oil, water, bruised seeds, tender leaves, tender stems	X	X	X	X	not available	3,300-4,100 lbs. - dry herb; 22-40 lbs. -oil	volatile oil (Anethol, Fenchone), d-pinene, phellandrine, anisic acid, anisic aldehyde, limonene
Thyme	<i>Thymus vulgaris</i>	whole herb	fresh, dried, oil	X	X		X	1,000-1,500 lbs. -dry herb	1,180-4,400 lbs. - dry herb, 2,500 lbs. -leaves; 9-38 lbs. -oil	Thymol, carvacrol, cymene, pinene, menthone, borneol, linalol
Chicory	<i>Cichorium intybus</i>	root, leaves (fresh)	dried, roasted, ground	X	X		X	not available	not available	NA
Lavender	<i>Lavandula vera</i> <i>Lavandula angustifolia</i> <i>Lavandula officinalis</i>	leaves, flowers	dried flowers, ointments, salts, oil	X	X	X	X	150-250 lbs. dry flower for <i>L. angustifolia</i>	not available	ursolic acid, linalyl acetate, linalool, 1.8-cineole, camphor, α -pinene, geraniol, lavandulol, nerol cineole, caryophyllene, limonene, furfural, ethyl amyl ketone, thujone, pinocamphone
Lemon Balm	<i>Melissa officinalis</i>	leaves	fresh leaves, dried leaves, essential oil	X	X	X	X	1,500-2,500 lbs. dry herb	not available	citronellal, geraniol, citral, citronellol, eugenol, geraniol, polyphenols, flavonoids, triterpenoids; caryophyllene, caryophyllene oxide, linalol, limonene
Peppermint	<i>Mentha piperita</i>	whole herb	fresh, dried, oil	X	X	X	X	not available	not available	Menthol, menthyl acetate, menthyl isovalerate, menthone, cineol, inactive pinene, limonene

Table 3. Continued

Source / Crop	Latin name	Portion Used	Use (type)	Medicinal	Flavoring	Cosmetic	Culinary or Tea	Expected Yield Per Acre from Other Reports	Yield Per Acre (WARC/NWARC)	Components
Western Ag Experiment Station (WARC)										
Plantain	<i>Plantago</i>	seeds,	dried	X				2,000 lbs. -dry herb	<i>not available</i>	NA
Psyllium	<i>psyllium</i> <i>Plantago lanceolata</i> (leaves) <i>Plantago ovata</i> (seeds)	leaves								
Skullcap	<i>Scutellaria galericulata</i>	whole herb	dried, powdered, dried and fluid extract	X				2,000 lbs. -dry herb	<i>not available</i>	volatile oil, scutellarin, bitter glucoside, tannin, fat, sugar, cellulose
Yarrow	<i>Achillea millefolium</i>	whole herb	fresh, dried, tea	X			X	<i>not available</i>	<i>not available</i>	volatile oil, peculiar principle, achillein, achilleic acid, resin, tannin, gum and earthy ash
Northwestern Agricultural Research Center at Kalispell, MT Research (NWARC)										
Echinacea	<i>Echinacea angustifolia</i>	root, leaf, flower, seed	fresh tincture, dried	X	X		X	<i>not available</i>	<i>not available</i>	alkamides, caffeic acid esters, polysaccharides, volatile oil, echinolone, betaine
	<i>Echinacea purpurea</i>	root, leaf, flower, seed	fresh tincture, dried	X	X		X	8,000 -10,000 lbs. -fresh root; 2,500-3,000 lbs. - dried root	<i>not available</i>	humulene, caryophyllene, sesquiterpenes, polyacetylenes, isobutylalkamines, glycoside, polysaccharide, betaine, inulin, caffeic acid esters, echinolone
NWARC and WARC										
German Chamomile (NW)	<i>Matricaria chamomilla</i>	flowers	dried, tea, tincture, oil, topical oitment	X	X	X	X	300-500 lbs. - dried flowers	1,250-3,000 lbs. - dried herb	volatile oils, angelic and tiglic esters, amyl and isobutyl alcohol, anthemol, hydrocarbon anthemene, tannic acid

Table 3. Continued

Source / Crop	Latin name	Portion Used	Use (type)	Medicinal	Flavoring	Cosmetic	Culinary or Tea	Expected Yield Per Acre from Other Reports	Yield Per Acre (WARC/NWARC)	Components
NWARC and WARC										
Dill (NW)	<i>Peucedanum graveolens</i>	seeds, leaves	dried leaves, seed, oil	X	X	X	X	not available	not available	paraffin hydrocarbon, d-carvone, d-limonene
Feverfew (NW)	<i>Tanacetum parthenium</i>	herb	dried, tablets, tinctures	X				1,000-4,000 lbs. -dry herb	not available	parthenolide
Valerian (NW)	<i>Valeriana officinalis</i>	root	tincture, juice, tea	X			X	1,500-2,500 lbs. -dry root	not available	volatile oil, valerianic, formic and acetic acids, borneol, pinene, chatarine, valerianine, glucosid, alkaloid, resin
Other Potentially Promising Montana Specialty Herb Crops										
Goldenseal	<i>Hydrastic Canadensis</i>	rootstock, leaves	bulk, capsules, tincture, volatile oil, tea	X			X	1,500-2,500 lbs. dried root	not available	isoquinoline alkaloids: hydrastine, bereberine, tetrahydroberberine
Ginseng	<i>Panax quinquefolius</i>	root	dried, powder, capsules, tincture	X	X		X	not available	not available	starch, gum, resin, panacon, volatile oil

Note that many of the crops outlined in Table 3 have multiple forms and uses. Growers should consider alternative market channels and expected net returns to each. It is important for growers to remember that crops and forms of crops yielding the highest price or total revenue may not be those that yield the highest net income. Increases in sale price accruing to further processing at the farm level can be more than offset by increased costs in some cases. Individual operations, therefore, will need to evaluate processing options and costs when choosing which form to market. For example, several of the crops considered here are essential oil crops, which may require distillation. Growers should locate possible distillation facilities and estimated costs prior to planting these crops. Distillation facilities may represent an important potential shared resource for farmers in a cooperative arrangement. Many of these crops also have alternative uses, such as fresh or dried herbs.

Expected or reported yields per acre as reported in Table 3 are gathered from various sources in an attempt to estimate industry standards for production of these crops. Given the small scale of production for most crops, the reliability of these results may be limited. Yields per acre obtained on test plots at the WARC and/or NWARC have also been included for comparison. These production trials provide useful information for evaluating the production potential of these crops in Western Montana. However,

growing conditions, soils, and even disease prevalence may vary widely throughout the state; and, results from individual operations in commercial production could produce a very different result.

Table 3 also lists important chemical components of each crop that are often measured when evaluating quality. These components are often of particular importance to buyers of medicinal botanicals for extracts. Presence of these compounds can be affected by many factors including growing conditions, age of plants, and harvesting.

III.B. Price Information

Table 4 presents a summary of price information collected for various crops from a host of sources including references, private retail listings, and Internet postings. The table presents a range of high and low prices observed in the market from several time periods, marketing channels (retail and bulk), and product forms. The wide range and disparity of prices reflect market diversity and lack of depth. Prices for similar products in a single time period frequently vary by 50 to 100 percent based upon quality, quantity, and other sale specific differences.

Prices reported in Table 4 are in dollars per pound and represent and vary over the reported range according to quality, quantity, and use. Forms and types are listed in the table. Prices for herbs in the table assume that the plants have been milled or otherwise processed for sale but have not been distilled into an essential oil.

Table 4. Matrix of Price Data for Selected Crops

Summary Price Survey Crop		Price Ranges for Selected Crops in Dollars per Pound			
		High	Form/type	Low	Form/type
Western Ag Experiment Station (WARC)					
Anise	<i>Pimpinella anisum</i>	\$ 9.60	retail	\$ 0.72	dried seed
Calendula	<i>Calendula officinalis</i>	\$ 20.00	dried flowers	\$ 1.10	dried herb
Caraway	<i>Carum carvi</i>	\$ 12.80	retail (one lb.)	\$ 0.95	large quantity
Clary Sage	<i>Salvia sclarea</i>	\$ 45-\$50	essential oil		
Coriander	<i>Coriandrum sativum</i>	\$ 12.00	retail	\$ 0.65	large quantity
Omega' flax	<i>Linum usitatissimum</i>	\$ 12.41	premium seed	\$.10-\$.20	seed for consumption
Parsley	<i>Petroselinum crispum</i>	\$ 13.60	retail	\$ 2.00	large quantity
Sage	<i>Salvia officinalis</i>	\$ 12.80	retail	\$ 0.95	large quantity
Summer Savory	<i>Satureja hortensis</i>	\$ 9.80	retail	\$ 1.20	large quantity
Sweet Basil	<i>Ocimum basilicum</i>	\$ 8.00	retail	\$ 1.60	large quantity
Sweet Fennel	<i>Foeniculum vulgare</i>	\$ 12.80	retail	\$ 0.72	dried seed
Thyme	<i>Thymus vulgaris</i>	\$ 16.00	retail	\$ 1.60	large quantity
Chicory	<i>Cichorium intybus</i>	\$ 10.40	retail	\$ 0.90	large quantity
Lavender	<i>Lavandula vera</i> <i>Lavandula angustifolia</i> <i>Lavandula officinalis</i>	\$ 24.00	retail	\$ 3.50	large quantity
Lemon Balm	<i>Melissa officinalis</i>	\$ 13.60	retail	\$ 1.80	large quantity
Peppermint	<i>Mentha piperita</i>	\$ 16.00	retail	\$ 1.20	large quantity
Plantain Psyllium	<i>Plantago psyllium</i> , <i>Plantago lanceolata</i> (leaves), <i>Plantago ovata</i> (seeds)	\$ 11.00	wildcrafted	\$ 3.11	husks
Skullcap	<i>Scutellaria galericulata</i>	\$ 17.60	retail	\$ 3.50	large quantity
Yarrow	<i>Achillea millefolium</i>	\$ 16.00	retail	\$ 0.65	large quantity
Northwestern Agricultural Research Center at Kalispell, MT Research (NWARC)					
Echinacea	<i>Echinacea angustifolia</i>	\$ 56.00	retail (root)	\$ 7.00	root
	<i>Echinacea purpurea</i>	\$ 27.00	small quantity	\$ 4.25	root
NWARC and WARC					
German Chamomile (NW)	<i>Matricaria chamomilla</i>	\$ 12.00	cert. organic	\$ 3.00-4.00	bulk non-organic
Dill (NW)	<i>Peucedanum graveolens</i>	\$ 12.80	retail	\$ 1.00	large quantity
Feverfew (NW)	<i>Tanacetum parthenium</i>	\$ 12.00	dried flowers	\$ 1.80	dry herb
Valerian (NW)	<i>Valeriana officinalis</i>	\$ 14.40	retail	\$ 0.85	large quantity
Other Potentially Promising Montana Specialty Herb Crops					
Goldenseal	<i>Hydrastic Canadensis</i>	\$ 50.00	cert. Organic	\$ 24.00	large quantity
Ginseng	<i>Panax quinquefolius</i>	\$ 500.00	woods grown	\$ 20.00	commercial organic

*Note: Prices vary widely by volume, quality grade, processed form, market type (retail, bulk), and current market conditions and demand.

**Many crop buyers require contracts or grower experience as prerequisite to buying.

It is important to caution prospective growers about prices in the market for specialty herb and essential oil crops. While much anecdotal evidence and many undocumented price listings are readily available, accurate and reliable information is scarce. Internet prices often represent seller offers and not transaction prices. Such price information therefore should not be interpreted as the market price for commodities. High prices offered by sellers and low prices offered by buyers often do not accurately represent eventual sale price after negotiation. Transaction quantities are particularly important. In many cases small quantities (perhaps only a few ounces) sell for amounts that would translate into very high per pound prices. However, larger volume sales generally yield much lower aggregate per pound prices. Producers should not be under any illusions that premiums paid for small quantities of product determine the market price for whole farm production. Such misconceptions can lead to the inaccurate expectations of significantly above market returns to specialty crop enterprises. All price information should be thoroughly investigated by the prospective grower to determine the form of the product, terms of sale, quality, and quantity characteristics.

No reliable and consistent data has been found that could be used to analyze intertemporal price series trends for herbal crops. Limited price data is available for fresh culinary herbs at various terminals in Chicago, San Francisco, Seattle, and others through the U.S. Department of Agriculture's Agricultural Marketing Service. However, it is extremely unlikely that Montana's location will allow producers to compete in this market, and these prices are not generally applicable to the types of crops likely to be considered.

III.C. Production, Uses, and Pricing by Crop

This section contains information about a number of crops that have been identified as having agronomic or market potential. The Montana Western Agricultural Research Center (WARC) and Northwestern Agricultural Research Center (NWARC) have grown several of these crops in test plots. A summary of the trial results is presented below.

III.C.1. Anise

Anise is a dainty, white-flowered plant about 18 inches high. It has secondary feather-like leaflets of bright green. The fruit or seeds are grayish brown, ovate, hairy and one-fifth of an inch long.

Uses for Anise

Anise is used for medicinal purposes when dried. Seeds are crushed and are used in cough lozenges and pectoral affections. It is also used as an ingredient in cathartic and aperient pills to relieve flatulence and colic. Anise tea is used to control coughs. The volatile oil, when mixed with spirits of wine, forms the liqueur Anisette, which is claimed to reduce symptoms related to bronchitis and spasmodic asthma. Oil of anise is also used to control insects when mixed with oil of sassafras and carbolic oil.

Production of Anise

Anise is an umbelliferous annual. Cultivation of anise seed begins in early April. The seeds are sown in dry, light soil in sunny areas. Harvest occurs when the seeds are fully ripe.

Anise is challenging to grow. A long, warm growing season of at least 120 frost-free days is required to ripen the seed. Seedlings are tolerant of frost, so seeds may be planted early. The plant requires good soil and sufficient water and does poorly on dry, sandy soils or heavy, cool soils. Stand establishment may be difficult, as the seed germinates slowly and the seedlings are not competitive with weeds. Seeds should be harvested when they begin to turn gray. If the plant is cut and windrowed when the seeds are green, the seeds will continue to mature without shattering. Seed left on the plants too long becomes an undesirable black color. Reported yield of anise seed ranges from 446-1338 lbs. per acre (Hornock 1992)

Montana WARC Test Plots for Anise

Anise was grown at the Montana WARC under irrigation. Anise was sown in early May at 8.2 lbs. per acre in 8-row plots 15 ft. long with rows 1 ft. apart. Seedling stand was 7.4 plants per foot in 1999. Seed was harvested in late September. The air-dry seed was distilled in 1999 but not in 2000.

Yield of anise seed at WARC was about 1,100 lbs. per acre in 1999 and 1,150 lbs. per acre in 2000. Oil content was relatively low at 10 lbs. per acre, but levels of the anethole compound were high at about 91 percent. This crop may have potential for a grower with rich soil, adequate water, and labor for weed control, as no herbicides are currently registered in the U.S.. Pre-emergence propane flaming may be a practical method of early weed control because anise seedlings emerge slower than many weeds. Additional information regarding anise test plots is available at http://www.ag.montana.edu/warc/Specialty_crops.htm.

Prices for Anise

Retail offering prices for anise seed in whole or powered form ranged from \$1.50 to \$3.50 per pound in the 1998 to 2000 time frame. Bulk dried seed prices may range under \$1.00 per pound. Anise essential oil from seed appears to retail in the range from \$20 to \$25 per pound.

III.C.2. Calendula

Calendula or marigold (*Calendula officinalis*) is a garden plant with pale green leaves and golden orange flowers.

Uses for Calendula

Calendula yields a yellow dye and is used in numerous cosmetic preparations and potpourri. The deep orange-flowered variety is of medicinal value. Calendula blossoms are used in the treatment of wounds, sores, and other skin problems. The leaves, eaten as a salad, have been considered useful in the control of scrofula in children; and, the acrid qualities of the plant have caused it to be recommended as an extirpator of warts. The Tagetes species is primarily cultivated for oil. It is used as a fragrance in cosmetics and a flavoring additive in foods. Tagetes meal and extract are added to poultry feed to encourage additional yellow coloring in chicken skin and egg yolks.

Production of Calendula

In general, calendula is an annual plant. However, the *Tagetes lucida* species is a perennial. Calendula grows in most soils and in full or partial sunlight. Calendula is sown in mid-spring, blooms in 80-90 days, and self-sows the following year. Harvest is time-consuming and labor intensive because the flowers form over a long period of time, and individual flowers mature quickly. Frequent hand harvesting is necessary to avoid over maturity and to obtain the highest quality product. Some harvest mechanization may be possible for lower-quality products or industrial seed use. Yields are reported to be 400-600 lbs. per acre, and reports of up to 1,500 lbs. per acre have occurred (Sturdivant and Blakley 1999, Ward 2000, Miller 1998).

Montana WARC Test Plots for Calendula

Two different varieties of calendula, "Resina" and "Erfurter Orangefarbige," were grown at the Montana WARC in 1998 and 1999. Seeding was done in early May at 5 lbs. per acre in six-row plots 8 ft. long with rows 18" apart. Final stand of Resina was 3.3 (1998) and 4.6 (1999) plants/ft. and of Erfurter Orangefarbige was 5.5 and 3.9 plants/ft. Flower heads were plucked from the plants by hand and air-dried out of direct sunlight. In 1998 flowers were harvested biweekly from late July through late August then weekly until late September (13 total harvests).

The two varieties did not differ significantly in total yield, averaging about 1,100 lbs. dry weight per acre. The calendic acid content of oil from the Montana test plots appeared within the range reported by other studies. While the plant is generally easy to grow, aster yellows limits its productivity in many locations, especially for the organic market. Additional information regarding calendula test plots is available at http://www.ag.montana.edu/warc/Specialty_crops.htm.

Prices for Calendula

In 1999 the price range for dried calendula flowers appeared to be \$10 to \$20 per pound (Sturdivant and Blakley 2000). No price quotes were found for essential oil from calendula.

III.C.3. Caraway

Caraway (*Carum carvi* L.) is a member of the carrot family. It has smooth, furrowed, 1.5 to 2 foot high stems. Stems have finely cut leaves and white flowers that blossom in June.

Uses for Caraway

Caraway has a pleasant aromatic odor and is grown for seed and oil. It has culinary, cosmetic, and medicinal uses. It is a spice used in baked goods and meat dishes. Caraway oil is used in alcoholic and nonalcoholic beverages, frozen dairy desserts, candy, condiments, and relishes. Caraway has a distinctive licorice flavor. Cosmetic products that use caraway include toothpaste, mouthwash, soaps, creams, lotions, and perfumes. Medicinally, caraway is used in some carminative, stomachic, and laxative preparations. The oil has been used as a flavoring in pharmaceutical products. Distilled caraway water is used to treat flatulent colic of infants.

Production of Caraway

Annual and biennial caraway varieties exist. Caraway needs full sun and fairly heavy soil. It should be harvested as soon as the seeds darken and ripen in the fall. Mechanical methods are often used to harvest caraway fields in commercial production. The fruit or seeds are then dried. Expected yields for caraway seed range from a few hundred pounds in the first year to an average of 1,000 lbs. per acre in subsequent years (Alberta agri-fax 1998).

Montana WARC Test Plots for Caraway

Both annual and biennial caraways were grown under irrigation at the Montana WARC. Annual caraway was sown at 12-16 lbs. per acre in early May of 1998 and 1999. Plant stand in 1998 was 10 plants per foot, and in 1999 it was 9 plants per foot. Eight-row plots were 15 ft. long with 1 ft. between rows. In 1998, which was a longer than usual growing season, mature seed was harvested in early October and yielded about 1,160 lbs. per acre. In 1999, which was a normal growing season, plants would not have matured before frost. They were cut in late September when seeds were still immature and distilled without drying to yield somewhat less than 3 lbs. of oil per acre. Annual caraway seed was late maturing in western Montana and yields were lower than those obtained in production trials from other regions.

Biennial caraway was sown at 3.5 lbs. per acre in early May of 1998. Six-row plots were 8 ft. long with 1.5 ft. between rows. Seeds were harvested in late June of 1999 in an immature condition and were distilled for a yield of 42.1 lbs. of oil per acre. Seeds were also harvested in mid-July for a total yield of about 2,430 lbs. of seed per acre. Biennial caraway grew well with no overwintering mortality and produced a good seed crop. It was much more productive at WARC than was annual caraway and appears to grow well in western Montana. Additional information regarding caraway test plots is available at http://www.ag.montana.edu/warc/Specialty_crops.htm.

Prices of Caraway

Retail prices for caraway seed appeared to be in the range of \$1.50 to \$2.50 per pound for the 1998 to 2000 time frame. Retail price offerings for caraway seed oil were observed for around \$50 per pound in 2001.

III.C.4. Clary Sage

Clary sage grows 2 to 3 feet tall. It has brownish, hairy, square stems with few branches. The leaves are arranged in pairs and are almost as large as a hand. A rosette of leaves is formed the first year, and white to pink flowers are produced the second year.

Uses for Clary Sage

Clary sage oil has a strong odor and is used in perfumes, soaps, cosmetics, aromatherapy, and as a flavoring, especially for muscatel wines. Fresh or dried herbs have medicinal uses for treating symptoms related to digestion, kidney diseases, hysteria, and wind colic.

Production of Clary Sage

Clary sage is a biennial or short-lived perennial member of the mint family. The plant is adapted to a dry climate and produces more oil under low fertility and moisture. The plant is harvested during late bloom when the seeds are at the milky stage. Most of the oil is in the flowering stalk, so the plant should be cut to include the inflorescence and only the top few pairs of leaves. The plant material is distilled fresh and should be distilled immediately to avoid volatilization of the oil. Oil content is lowest from noon to 3:00 p.m., so clary sage should be harvested in the evening or morning hours.

Montana WARC Test Plots for Clary Sage

Clary sage was sown in a greenhouse in early April of 1998. Plants were transplanted to the field in early May. Six-row plots were 8 ft. long with rows 18" apart. Plant spacing was initially 1 ft. in the row, but in the early spring of 1999 plants were thinned to stand 2 ft. apart.

Plant growth was vigorous; and, flowering tops were harvested at late bloom in mid- to late-July, 1999, as the flowers were fading and the seeds were in the milk stage. Flower stalks and the top pair of leaves were harvested and immediately distilled. The plants continued to bloom and yielded another harvest in mid-August, 1999.

The first harvest produced about 3,400 lbs. per acre of dry flower stalks and leaves that distilled to approximately 20 lbs. per acre of oil. The second harvest yielded 1,300 lbs. per acre of dry production and 7 lbs. per acre of oil. Thus, total production was about 4,700 lbs. per acre of dry production and over 27 lbs. per acre of oil. The oil from the two harvests did not differ greatly in quality; oil from the first cutting averaged 64 percent linalyl acetate and the second averaged 59 percent.

Overall, it appeared that clary sage was well adapted to the climate of western Montana. Yield and quality of plants grown at the WARC were relatively high, and the plants were free of pests and diseases. Additional information regarding clary sage test plots is available at http://www.ag.montana.edu/warc/Specialty_crops.htm.

Prices for Clary Sage

Price listings for essential oil from Clary Sage were in the range of \$45 to \$55 per pound. No listings were available for the dried herb.

III.C.5. Coriander

Coriander is a slender, branched plant that grows 1 to 3 feet high. It has pale mauve flowers with bright green, round leaves.

Uses for Coriander

Dried coriander seeds are fragrant and are used for culinary (spices) and medicinal (aromatic stimulant) purposes. Coriander is used as an aromatic stimulant and spice. The seeds and leaves are used in salads and soups. Powdered seeds, fluid extract, and oil are used medicinally as flavoring for active purgatives. Coriander water is used as a carminative for wind colic.

Production of Coriander

Coriander is an annual. It is grown in warm, dry, light soil in full sun. Seeds sown in April and ripen in August. Coriander plants are mechanically harvested and are dried before seeds are collected. Yields of coriander seed in western Canada have been reported to be 700-900 lbs. per acre (Alberta agri-fax 1998).

Montana WARC Test Plots for Coriander

Coriander was direct-seeded in early May of 1998 and 1999 at the rate of 14.4 lbs. per acre. Eight-row plots were 15 ft. long with rows 1 ft. apart. Stand was 15 plants/ft. in 1998 and 14 plants/ft. in 1999. Plants were swathed in mid-September and were combined three days later. Seeds were ground and then distilled in 1998, yielding just under 13 lbs. per acre of oil. Seed yields totaled about 2,650 lbs. per acre in 1998 and 2,350 lbs. per acre in 1999. Additional information regarding coriander test plots is available at http://www.ag.montana.edu/warc/Specialty_crops.htm.

Prices for Coriander

Farmgate coriander seed prices appear to have been in the range of 17 to 47 cents per pound in the 1980s and early 1990s. More recent information has put the range from 65 to 90 cents for bulk product. Retail prices for seed may range as high as \$1.50 per pound. Essential oil from coriander has recently been listed in retail offerings from \$20 to \$25 per pound.

III.C.6. 'Omega' Flax

Omega flax is a new variety of flaxseed developed by researchers at North Dakota State University and South Dakota State University. It was created for the food industry. Omega flaxseed can be stored indefinitely. Once seeds have been ground, the resulting flax meal should be stored in airtight containers. Shelf life is only a few days under refrigeration. However, it lasts for several months if frozen.

Uses for 'Omega' Flax

Omega flax produces oil high in linolenic acid. It has light colored seeds. Freshly ground Omega flaxseed provides health benefits associated with both Omega-3 essential fatty acids and lignans. The fiber is readily absorbed and processed by humans.

Production of 'Omega' Flax

Omega flax is mostly produced without irrigation. Experimental oilseed flax yields varied from 535 lbs. per acre in North Dakota, to 700-1,600 lbs. per acre in northern Idaho, to 1,000–1,100 lbs. per acre in Minnesota and Wisconsin (Kephart and Auld 1990, Oplinger, et. al. 1989).

Montana WARC Test Plots for 'Omega' Flax

'Omega' flax was sown in mid-May of 1999 and early-May of 2000 at 30 lbs. per acre. Plots in 1999 were 8 ft. long with 11 rows 9" apart and in 2000 were 15 ft. long with eight rows 12" apart. Plots were harvested in mid-August of 1999 and 2000. Yield was 1,937 lbs. per acre in 1999 and 1226 lbs. per acre in 2000. Flax was also grown in 1998, but yield was low (432 lb per acre) due to poor stand establishment. The yields at

WARC under irrigation were relatively high, but dryland production is expected to be lower. Additional information regarding 'omega' flax test plots is available at http://www.ag.montana.edu/warc/Specialty_crops.htm.

Prices for 'Omega' Flax

The prices for 'Omega' Flax may vary depending on whether organic or grown for feed and could range between 10 and 20 cents per pound (Miller 1999). Premium seed may sell for as high as \$12.00 (Miller 1998).

III.C.7. Parsley

Parsley is a small, bushy green plant with tiny, greenish-yellow flowers.

Uses for Parsley

Parsley has both culinary and medicinal uses. The leaves and stems of parsley are consumed raw, cooked or dehydrated and are used as a garnish or seasoning. The roots, dried leaves, and oil obtained from seeds have medicinal uses. Parsley oil, Apiol, is used for malarial disorders and influences the nerve centers in the brain and spine. Dried parsley leaves (parsley tea) are considered a diuretic and decrease kidney complications caused by dysentery. A fluid extract, prepared from the roots and seeds, also reduces symptoms related to kidney functions.

Production of Parsley

Parsley is a biennial plant but is usually produced as an annual crop. Parsley can be grown from seed or divisions in fertile soil in full or partial sunlight. It matures in 70 to 90 days; and, harvest begins in October and continues through March, depending upon weather and location. Parsley leaves can be hand-harvested three to four times per season. Parsley yields are approximately 20-60 cwt. per acre. Fresh parsley can be stored for up to 2 ½ months at 32° Fahrenheit.

Montana WARC Test Plots for Parsley

"Moss Curled" parsley was hand sown in mid-May of 1998 at 1.5 lbs. per acre. Six-row plots were 8 ft. long with 1.5 ft. between rows. No harvest was taken the first year. In 1999 the top of each seed-bearing plant was cut in late August and was immediately distilled.

Parsley plants formed a healthy rosette the first year, and winter mortality was low. Plant growth and seed production were excellent the second year. Oil production was high with about 70 lbs. per acre of oil from about 9,350 lbs. of dry matter per acre. Yields of parsley herb oil from the WARC are comparable to those reported elsewhere. Oil yield on a fresh weight basis was 0.26 percent. However, small plot yields may be higher than those from commercial production. Note that a low seeding rate was used because of the hand sowing method; the conventional seeding rate is 5.5 lbs. per acre. Additional information regarding parsley test plots is available at http://www.ag.montana.edu/warc/Specialty_crops.htm.

Prices for Parsley

Dried or powdered parsley prices in recent years range from \$2.00 for large bulk quantities to \$4.80 for one-pound quantities. Parsley flakes were priced at \$5.85 (1-4 lbs.) and \$5.27 (5-24 lbs.), while powdered parsley herb was priced \$3.25 (1-4 lbs.) and \$2.93 (5-24 lbs.). Retail prices can range from \$6.00 to \$13.00 per pound. No prices for parsley seed essential oils were obtained.

III.C.8. Sage

Sage is a small, rounded evergreen shrub that grows up to 3 feet high and 3 feet wide. The flowers are violet-blue, pink, or white and are up to 1 3/8 inches long. The small, tube-like flowers are clustered in whorls along the stem tops. They bloom in May and June. The leaves are woolly white, textured, elongated ovals that are 1-2 1/2 inches long. The leaves are grayer in dryer climates.

Uses for Sage

Although well known as a culinary herb, sage also has medicinal uses. It is a drying agent, and sage oil is used to reduce perspiration. Sage herbs and tinctures are used as sore throat gargles and as a poultice for sores and stings. Infusions intended for internal use is called sage tea and is used as a lotion for ulcers and to heal raw abrasions of the skin. It has also been used to darken hair. Sage is a common ingredient in tooth powders.

Production of Sage

An average of 1,000 to 2,000 pounds of dry herb per acre can be expected when properly irrigated (Sturdivant and Blakley 2000). Plants are normally harvested for oil at full bloom and for leaf before bloom. Sage is a perennial plant that prefers fertile, drained soils. It can, however, grow in poor soils.

Montana WARC Test Plots for Sage

Sage "Extrakta" was sown in a greenhouse in mid-April of 1998 and was planted in plots in mid-May. Six-row plots were 8 ft. long with rows 18" apart and 12" between plants. No harvest was done the first year. The top 2/3 of the plant was harvested when in full flower in mid- to late-June of 1999. Yields totaled 1,950 lbs. per acre of dry matter and 1,049 lbs. per acre of leaf. The plants were harvested again in mid-August of 1999 and yielded an additional 2,101 lbs. per acre of dry matter and 1,494 lbs. per acre of leaf. Plants were air-dried, and the entire top was distilled to produce a combined total of just under 37 lbs. per acre of oil from both harvests. Additional information regarding sage test plots is available at http://www.ag.montana.edu/warc/Specialty_crops.htm.

Prices for Sage

Dried certified organic sage may sell for \$6.00 to \$8.00 per pound (Sturdivant and Blakley 2000). However, bulk prices have also been reported for sage at \$0.95 to \$4.00 per pound (Miller 1998).

III.C.9. Summer Savory

Summer savory is a hardy plant with slender erect stems that grow up to 18 inches high. The leaves are about ½ inch long, narrow, dark green and spice-scented. Summer savory produces small, pale, lilac labiate flowers in the summer.

Uses for Summer Savory

Summer savory is a popular flavoring ingredient for foods. The leaves can be used as a spice, or the entire plant may be distilled for an essential oil. Fresh and dried herbs and the essential oil are used to season tomato sauces, stuffings, sausages, and meat dishes. It is sometimes added to medicines for its aromatic and warming qualities.

Production of Summer Savory

Summer savory is an annual plant that can be grown by direct seeding in the field or from transplants. It grows well in a moderately rich, well-drained soil but is tolerant of poor soils and relatively dry conditions. The plant is harvested at the beginning of its bloom.

Montana WARC Test Plots for Summer Savory

Summer savory “Aromata” was sown in a greenhouse in mid-May of 1998 and was planted in plots in mid-June. Six-row plots were 8 ft. long with rows 18" apart and 8.7" between plants. The plants were poorly anchored and were easily uprooted by cultivation equipment or wind. By the end of the 1998 season, only about 60 percent of the plants remained. In 1999, summer savory was direct sown in mid-June at 1.25 lbs. per acre. Plant stand was 6.3 plants/ft. Plant stand and anchorage were good, and growth was vigorous.

Two harvests were obtained at WARC in 1998 and 1999. The top 2/3 of the plant was cut in early August of 1998 as plants were beginning to flower, yielding about 1,100 lbs. per acre of dry weight and 16 lbs. per acre of oil. A second harvest of the top 2/3 of the plant was done in late September when the plants were in full bloom, which yielded about 1,900 lbs. per acre of dry weight and about 21 lbs. per acre of oil. Total production for 1998 was about 3,000 lbs. per acre of dry weight, which yielded 37 lbs. of oil per acre. In 1999 the entire top of the plant was harvested during bloom in early September and yielded 2,700 lbs. per acre of dry weight. The plants were air-dried and about 44 lbs. per acre of oil was distilled from the entire plant top. Plants grown from transplants bloomed earlier and could be harvested twice. However, a higher oil and dry matter yield was obtained from direct-seeded plants harvested only once. Direct-seeded plants were more vigorous and strongly rooted than those grown from transplants. Additional information regarding summary savory test plots is available at http://www.ag.montana.edu/warc/Specialty_crops.htm.

Prices for Summer Savory

In 1998, prices for dried and milled summer savory were reported to vary from \$1.20 to \$3.10 by volume. High retail prices were reported to be \$9.60 (Miller 1998).

III.C.10. Sweet Basil

Sweet basil is a hairy, labiate plant that grows about 3 feet high. The labiate flowers are white, and the leaves are grayish-green and are dotted with dark oil cells.

Uses for Sweet Basil

Sweet basil is used for cosmetic, culinary, and medicinal purposes. Sweet basil emits a scent of cloves and is sold as crude leaf products, essential oils, and oleoresin. In the cosmetic industry sweet basil is used as a fragrance ingredient in perfumes, soaps, hairdressings, dental creams, and mouthwashes. Sweet basil is used as a spice in foods and chartreuse liqueur. The oil and oleoresin are used as a flavor ingredient in many common food products. Medicinally, sweet basil is used to reduce symptoms from head colds and as a cure for warts and worms.

Production of Sweet Basil

Sweet basil is an annual plant. Germination ranges from 4 to 7 days, and harvests should occur prior to flowering. Sweet basil can be harvested twice (approximately 2 to 3 weeks apart). Harvesting continues until the first frost, after which the plants die.

Montana WARC Test Plots for Sweet Basil

“Italian Large Leaf” basil was sown in a greenhouse in early-May of 1998 and was transplanted to plots in mid-June. Six-row plots were 8 ft. long with rows 18" apart and 8.7" between plants. Plants were harvested three times during the season. In late-July stalks were clipped above the first branch. In early August the top 2/3 of the plants were clipped during the early bloom stage. The final harvest occurred in mid-September. The three harvests yielded 581, 855, and 1,850 lbs. per acre of dry weight, respectively, for a total of about 3,250 lbs. per acre of dry weight. Plant material was air-dried and was distilled in early October. A total oil yield of just over 9 lbs. per acre was obtained.

Three varieties of basil were grown in 1999: Sweet Dani, Cinnamon, and Italian Large Leaf. Seeds were sown in a greenhouse in early-April and were transplanted to plots in mid-June. Sweet Dani and Cinnamon basil were harvested in late-July and mid-August. Plants were cut 6" above the ground. Entire plants were harvested in mid-September. Sweet Dani yielded a total of 1,750 lbs. per acre of leaf and 2,600 lbs. per acre of dry weight and yielded about 10 lbs. per acre of oil. Cinnamon yielded around 1,500 lbs. per acre of leaf and 2,250 lbs. per acre of dry weight and about 11 lbs. per acre of oil. Italian Large Leaf was harvested only twice. It produced a total of about 1,750 lbs. per acre of leaf and 2,400 lbs. per acre of dry weight and yielded roughly 8 lbs. of oil per acre. Plant material was air-dried and was distilled in mid-September. Additional information regarding sweet basil test plots is available at http://www.ag.montana.edu/warc/Specialty_crops.htm.

Prices for Sweet Basil

In 1999 sweet basil retail prices were reported to be \$8.00 per pound and \$1.60 per pound for larger wholesale quantities (Miller 1998). Sweet basil retail prices were observed from \$7.95 (1-4 lbs.) to \$7.16 (5-24 lbs.), while powdered sweet basil prices

ranged from \$3.60 (1-4 lbs.) to \$3.24 (5-24 lbs.). Essential oil prices ranged from a low of \$12 to a high of \$60 per pound.

III.C.11. Fennel

Fennel (*Foeniculum vulgare*) has yellow flowers and feathery leaves, and it grows 4 to 5 feet high. Its bright golden flowers bloom in July and August.

Uses for Fennel

Fennel seeds, leaves, and oil have culinary, cosmetic, and medicinal purposes. Fresh leaves are served with fish and used in sauces. Fennel seeds are used for flavoring and to produce carminative oil, which has a sweet aromatic odor and flavor. Seeds are also used to make cordials and liqueurs, perfume, and soaps. Fennel seeds and tea are used medicinally to control flatulence in infants and chronic coughs. Powdered fennel is used to rid kennels and stables of fleas.

Production of Fennel

Fennel is a hardy, perennial herb that is native to the Mediterranean and southern Europe. Although it is cultivated as a perennial in warmer climates, it must be grown as an annual in Montana. Seeds are sown in early April in sunny areas in dry soil. Mechanical harvesting methods may be utilized.

Montana WARC Test Plots for Fennel

Fennel was direct-seeded in May of 1998 at 6 lbs. per acre. Six-row plots were 8 ft. long with rows 18" apart with four replications. Plant stands were 15 plants per foot. The top 6-8" of the plants were harvested in October and yielded 3,260 lbs. per acre of dry weight. Plant material was air-dried and was distilled in two ways: (1) the plant tops were distilled intact, which yielded 22 lbs. of oil per acre and (2) the seeds were threshed and crushed before distillation which yielded over 39 lbs. of oil per acre.

Fennel was direct-seeded in early-May of 1999 at 3 lbs. per acre. Eight-row plots were 15 ft. long with rows 1 ft. apart. Plant stand was 8 plants per foot. The top 6-8" of the plants was harvested in mid- to late-September and yielded 4,100 lbs. of dry weight per acre. Harvested plant material was distilled without drying and yielded 37 lbs. of oil per acre.

The test plot results suggested that fennel could be grown in the Bitterroot Valley's short growing season if the plants are harvested while seeds are still immature and are distilled without drying. The composition of the fennel oil was in the acceptable range for both years. Additional information regarding fennel test plots is available at http://www.ag.montana.edu/warc/Specialty_crops.htm.

Prices for Fennel

In 1998, prices for dried and milled sweet fennel were reported to vary from \$0.85 to \$2.55 by volume (Miller 1998). Whole and powdered fennel seed retail prices ranged from \$2.55 (1-4 lbs.) to \$2.03 (5-24 lbs.). Essential oil retail prices from \$12 to \$40 per pound were observed.

III.C.12. Thyme

Thyme is a member of the mint family. It grows to 12 inches high and has small, glossy green leaves clustered along slender woody stems. It spreads one to two feet. The flowers are white to lilac and bloom in summer.

Uses for Thyme

Thyme can be used as a whole herb or can be distilled to produce an essential oil. It is used for flavoring foods and in medicinal products and cosmetics.

Production of Thyme

Thyme has very small seeds and is generally produced from transplants grown in a greenhouse. The herb is harvested once the first year when it starts to flower and then twice a season thereafter to prevent the accumulation of unproductive woody tissues. The first harvest is when it is in full flower, and the second is in the fall. Thyme is a perennial plant that grows best in well-drained, sandy soil and full sun. If cultivated in heavy soils, it becomes less aromatic. Yields of 1,000 to 1,500 pounds of dry herb per acre are possible (Sturdivant and Blakley 2000).

Montana WARC Test Plots for Thyme

“German Winter” thyme was sown in a greenhouse in late-March of 1998 and transplanted to plots in mid-May. Six-row plots were 8 ft. long with rows 18" apart and 10" between plants. In 1998 the top 2/3 of the plants were harvested in late-July when 50 percent of the plants were in bloom. This yielded about 1,200 lbs. per acre of dry weight. Plants were harvested twice in 1999 in late June and late August. Two-thirds of the foliage was removed which yielded about 2,200 lbs. per acre at each harvest (a total of 4,400 lbs. per acre). Plant material was air-dried and was distilled. In 1998 about 9.5 lbs. of oil per acre was produced. In 1999 the two harvests yielded a total yield of 38 lbs. of oil per acre. Additional information regarding thyme test plots is available at http://www.ag.montana.edu/warc/Specialty_crops.htm.

Prices for Thyme

Reported prices range from \$2.50 to \$4.00 for commercial thyme to \$9.00 to \$12.00 for certified organic (Sturdivant and Blakley 2000). Thyme leaf prices ranged from \$2.80 (1-4 lbs.) to \$2.52 (5-24 lbs.), while powdered thyme has prices of \$3.15 (1-4 lbs.) to \$2.84 (5-24 lbs.). Essential oil prices vary by variety of plant from \$40 to \$120 per pound.

III.C.13. Chicory

Chicory has a tap root that resembles the root of a dandelion. The stems are 2 to 3 feet high with light blue flowers.

Uses for Chicory

Chicory has culinary and medicinal uses. The leaves of chicory are used in salads. The thick-cultivated root can be sliced, dried, roasted, and ground. Ground chicory is primarily used as a substitute or additive to coffee. It gives coffee a bitter taste and a dark color. Chicory root is used medicinally as a laxative or diuretic. It is used to reduce symptoms related to jaundice, liver enlargements, gout, and rheumatism.

Production of Chicory

Chicory is a perennial plant that will grow in any soil type. Seeds may be sown in the fall because the tops will withstand frost. It may be grown in full sun to produce green leaves or in partial sun to produce white leaves. Leaves are harvested as needed. The roots are dug when fully mature.

Prices for Chicory

Small quantities of chicory appear to sell in the range of \$2.00 to \$3.00 per pound. Roasted and granulated chicory retail prices of \$2.70 (1-4 lbs.) or \$2.43 (5-24 lbs.) were observed in 2001.

III.C.14. Lavender

Lavender has narrow gray-green leaves and long spikes with purple, pink, or white flowers.

Uses for Lavender

The fragrant leaves and flowers can be dried or crushed for oil. Both forms are used for culinary, cosmetic, and medicinal purposes. Leaves and flowers are used fresh in salads and fruit dishes and in sauces, candies, baked goods, and jellies. Lavender oil is used to flavor beverages and baked goods. Oil is also used as a fragrance in perfumes and cosmetic products.

Medicinal uses include reducing symptoms related to acne, colic, faintness, flatulence, giddiness, migraine, nausea, neuralgia, headache, palpitations, poor appetite, pimples, rheumatism, sores, spasms, sprains, toothache, vomiting, and worms. Lavender oil vapor is inhaled to prevent vertigo and fainting. Ointments are rubbed into burns, bruises, varicose veins, and other skin injuries. Pure lavender oil is used to stop itching from insect bites.

Production of Lavender

Lavender is a perennial plant. It grows in light, dry soil in full-sun. Lavender can be started from seeds or cuttings. Seeds germinate in 15 to 25 days. Flowers are harvested during the second year. If flowers are to be dried, harvest occurs as the flowers are about to open. For the production of oil flowers are harvested at 50 percent bloom. Yields range from 150 to 250 pounds of dry flowers per acre (Sturdivant and Blakley 2000).

Prices for Lavender

Reported prices range from \$10.00 to \$15.00 per pound for top quality lavender (Sturdivant and Blakley 2000). Essential oil retail prices were observed from \$10 to \$30 depending upon quality and type.

III.C.15. Lemon Balm

Lemon balm grows to 3 feet in height. It has small, white, tube-shaped flowers with oval leaves. Lemon balm has a strong lemon scent.

Uses for Lemon Balm

The leaves of lemon balm are used for culinary, cosmetic, and medicinal purposes. Its subtle lemon flavor and fresh lemon fragrance make lemon balm popular in fruit dishes, custards, and tea. Other culinary uses include seasoning fish, stuffing, sauces, vegetables, light grains, roast chicken, rice, yogurt, and fresh berries. Lemon balm oil is used as an aromatherapy ingredient in baths for basic skin care.

Lemon balm's main medicinal use is as a tranquilizer. It is also used to reduce symptoms related to stomach problems and colic. The leaves are used to lower blood pressure. Lemon balm tea relieves cold, flu, and fever symptoms and combats mumps and cold sores.

Production of Lemon Balm

Lemon balm is a hardy perennial plant. It can be produced from seed, cuttings, or divisions. Lemon balm grows best in good soil and partial shade. Seed germination occurs in 7 to 14 days. Lemon balm can be harvested at least twice a year and should be cut before it flowers. Harvested stems can be baled and allowed to dry. Dry herb yields of 1,500 to 2,500 lbs. per acre have been reported (Sturdivant and Blakley 2000).

Prices for Lemon Balm

Reported prices range from \$7.00 to \$10.00 per pound for certified organic lemon balm (Sturdivant and Blakley 2000). Lemon balm observed retail prices ranged from \$4.30 (1-4 lbs.) to \$3.87 (5-24 lbs.).

III.C.16. Peppermint

Peppermint (*Mentha piperita*) is extensively cultivated as a source of peppermint oil. The entire plant has a characteristic odor because of the presence of volatile oil. It has an initial hot, aromatic taste that later produces a sensation of cold because of its menthol content.

Most peppermint produced in the United States is grown in the Pacific Northwest and the Great Lakes Regions. Peppermint is a single-harvest, perennial crop. Total U.S. annual peppermint oil production was 6.9 million pounds (89,500 acres) in 1999.

Uses for Peppermint

Peppermint is the primary mint oil used for flavoring chewing gum. It is also used in toothpaste, mouthwash, candy, and medicines.

Production of Peppermint

Peppermint thrives best in warm, moist climates and prefers deep soils rich in humus, open in texture, and well drained. Peppermint is established by planting peppermint roots, grown and dug in separate fields. Production in the first two years is lower than in subsequent years as peppermint stands thicken over time. The highest quality oil is produced in areas with hot days and cool nights. The primary production risk associated with growing peppermint is the risk of producing bitter, low quality oil. Such oil is discounted heavily and sometimes is not marketable.

Peppermint is harvested once annually from stands that are usually kept in production for five years. However, peppermint stands may remain productive for as many as 15 years. At harvest, peppermint is swathed then chopped and hauled to a still where oil is extracted. Farmers then sell peppermint oil to dealers, who eventually sell oil to end-users.

Prices for Peppermint

The average national price for peppermint oil from 1999 to 2001 was \$10.75 per pound. New York Spot price for crushed leaves was \$2.3 per pound (in 1999, 2000 and 2001). Value of production for peppermint in 2000 was \$72.7 million. Same year U.S. export of peppermint oil was 2,208,705 kilograms in the value of \$64.4 million, while import was 370,744 kilograms in the value of \$6.04 million (USDA NASS).

III.C.17. Plantain Psyllium

Plantain psyllium grows to 16 inches high with spreads up to 16 inches. Flowers are produced on thin stalks and are tiny, yellow-green blooms.

Uses for Plantain Psyllium

Plantain has medicinal uses. Plantain psyllium leaves and seed are utilized in laxative products but can also relieve chronic diarrhea, bladder and kidney problems, urethritis, and hemorrhoids. Psyllium seeds are crushed or boiled to treat rheumatism and gouty swellings, reduce fever, lower blood cholesterol, and treat eye inflammation. Plantain is mainly used to facilitate the healing of wounds and to repel fleas.

Production of Plantain Psyllium

Plantain psyllium is a perennial plant. Seeds or divisions are used to plant crops in any type of soil. It will grow in full- or partial- sun. Plantain leaves are harvested before flowering. Beginning in the second year, two to four harvests are possible with total yields of up to 2,000 pounds of dry herb per acre.

Prices for Plantain Psyllium

Plantain sells for \$8.00 to \$11.00 per pound dry, most wildcrafted (Sturdivant and Blakley 2000). Observed prices for plantain psyllium ranged from \$3.45 (1-4 lbs.) to \$3.11 per pound (5-24 lbs.) for whole plantain husks, while powdered plantain husks had prices of \$4.50 (1-4 lbs.) to \$4.05 (5-24 lbs.). Whole seed had prices of \$2.40 (1-4 lbs.) and \$2.16 (5-24 lbs.), while powdered whole seed was \$4.50 (1-4 lbs.) and \$4.05 (5-24 lbs.).

III.C.18. Skullcap

Skullcap grows up to 3 feet in height and spreads broadly. Its blue flowers bloom on just one side of the stalk in summer.

Uses for Skullcap

The whole herb, dried or powdered, has medicinal uses. Skullcap is used to improve the health of the nervous system. It is also used in nervine or sedative formulas to treat headaches, neuralgia, hysteria, convulsions, and hydrophobia.

Production of Skullcap

Skullcap is a perennial crop. It is grown from seeds, cuttings, or divisions in fertile soil in full or partial sunlight. Skullcap is harvested by hand at the start of flowering. Yields of over 2,000 pounds of dry material per acre are possible.

Prices for Skullcap

Prices range from \$17.60 retail to \$3.50 for large quantities (Miller 1998). Another source listed dried skullcap at \$12 to \$15 per pound and fresh skullcap at \$6 to \$9 per pound (Sturdivant and Blakley 2000). Retail prices for the whole herb ranged from \$10.35 (1-4 lbs.) and \$9.32 (5-24 lbs.).

III.C.19. Yarrow

Yarrow grows to 3 feet high and spreads to 1-2 feet. It has aromatic, finely cut, almost evergreen leaves that range from bright green to grayish. The white, red, or pink flowers are clustered in umbels and bloom in summer. The whole plant is more or less hairy with white, silky hairs.

Uses for Yarrow

Yarrow is used medicinally for easing diarrhea, reducing bleeding internally and externally, and functioning as a diaphoretic. It is also grown for its flowers, which are excellent for fresh or dried arrangements.

Production of Yarrow

Yarrow is a perennial plant. Although it grows everywhere- in the grass, in meadows, in pastures, and by the roadside, it grows best on a well-drained soil and needs good air circulation. The whole plant- stems, leaves, and flowers- are collected when in flower.

Prices of Yarrow

Prices for yarrow ranged from \$0.65 per pound for large quantities to \$16.00 per pound retail price (Miller 1998). Another source quotes prices of \$6 to \$10 per dry pound (Sturdivant and Blakley 2000). Retail prices for yarrow flowers for potpourri of \$3.35 (1-4 lbs.) or \$3.02 (5-24 lbs.) have been observed.

III.C.20. German Chamomile

German chamomile (*Matricaria recutita* L., sometimes referred to as Wild Chamomile) is an annual plant native to Europe.

Uses for German Chamomile

German chamomile has been cultivated in North America as an herb or an essential oil. The flowers are edible and are used in salads or beverages. German chamomile is produced in a variety of forms including dried flower heads, tea, liquid extract, essential oil, and topical ointments. An infusion of the flowers is used in shampoos. An essential oil, distilled from its flowers, is used as perfume in cosmetics and as a flavoring for confections and beverages. This oil is called "blue chamomile" because of the compound chamazulene, which is formed during the distillation process.

Production of German Chamomile

German chamomile is relatively easy to grow but prefers cooler climates. Chamomile may be produced from seed or transplants. Irrigation is usually necessary especially during stand establishment. Chamomile is seeded in early spring, and seedlings will tolerate a light frost. The seed is small and must be planted very shallow. The plant grows to about 20 inches tall. The leaves are finely divided, light green and feathery. The flowers are daisy-like and about 1 inch across. The plant blooms from May to October.

Successive plantings spread out harvest times. Hand harvesting is used to produce the highest quality (tea grade) product. Harvesting involves raking the flower heads from the plants at various intervals. The flowers must be dried carefully to avoid discoloration caused by overheating. Clipped flower heads can be used to produce oil, but lower quality oil results if too much foliage is included. German chamomile will reseed itself, but weeds often create production problems. A yield of 300-500 pounds of dried flowers per acre is often obtained.

Montana WARC Test Plots for German Chamomile

Two varieties of chamomile were sown in a greenhouse in 1998 in early April and transplanted to plots in mid-May. In 1999 chamomile was sown in mid-April and transplanted in mid-May. Plant spacing was 8.4" between plants and 18" between rows. Plots were split to compare harvesting method, raking versus clipping. Rake harvest began in mid-July and was repeated every 10 days until late-July for Bona or early August for Bodegold. Clipped harvesting began in late July and was repeated in late August for Bodegold in 1998. In 1999 clipped harvesting followed the same 10-day intervals as raking. Bona yields from raking ranged from 1,375 to 1,500 lbs. per acre for the two years, and Bodegold yields from raking ranged from 1,250 to 1,900 lbs. per acre. Bona yields from clipping ranged from 2,200 to 3,000 lbs. per acre for the two years. Similar results were obtained from trials conducted at NWARC.

Oil production of at least 3 pounds per acre was obtained at both WARC and NWARC, using either harvest method in 1999. Distillation of German chamomile is difficult because of the viscosity of the oil.

Prices for German Chamomile

Prices range between \$8 and \$12 per pound for fresh Chamomile flowers (Sturdivant and Blakley 2000).

III.C.21. Dill

Dill grows 2 to 2.5 feet high with feathery leaves and yellow flowers. Seeds are produced in great quantities and are very pungent and bitter. The entire plant is aromatic.

Uses for Dill

Dill has culinary, cosmetic, and medicinal uses. Culinary dill weed and oil are used in baked goods, meat and meat products, condiments and relishes, fats and oils, and

numerous snack foods. The leaves are added to fish or pickled cucumbers to produce a spicy taste. Dill vinegar is used as a condiment.

Dill weed oil is used as fragrance in cosmetics such as soaps, detergents, creams, lotions, and perfumes. The oil and seeds are used as an aromatic carminative and to reduce flatulence of infants.

Production of Dill

Dill is an annual crop. It is best grown in rich, loose soil with full sun and good drainage. Planting begins in May, and harvest can occur in 8 weeks. For high oil and fragrance qualities the seed is harvested mechanically when light brown. The seed is dried and yields oil when added to hot water or alcohol.

Prices for Dill

Observed retail prices for whole dill seed range from \$2.45 (1-4 lbs.) to \$2.21 (5-24 lbs.) or for dill weed \$3.35 (1-4 lbs.) to \$7.16 (5-24 lbs.). Dill seed oil retailed from \$25 to \$60 per pound.

III.C.22. Feverfew

Feverfew grows between 9 inches and 2 feet high. The deeply cut leaves are brightly colored and have a sharp, unpleasantly bitter taste. Feverfew flowers are thick and daisy-like with yellow centers. The whole plant has a strong and bitter smell.

Uses for Feverfew

Feverfew is crushed and is used to reduce coughs and wheezing and to improve breathing. Feverfew tinctures relieve pain and swelling caused by insect bites. It is used for migraine relief, for the prevention of blood clots, as an anti-inflammatory for arthritis and menstrual relief, and as a digestive aid.

Production of Feverfew

Feverfew is a perennial. Planting occurs in well-drained soils in full-sun. Feverfew may be grown from seed, divisions, or cuttings. Seeds should be sown in February or March, while root divisions should be planted in March. Cuttings can be planted in the fall or spring. Leaves and flowers should be cut from the plants when harvested. The flowers may be dried in 4 to 6 days and may be used for potpourri. Feverfew yields range from 1,000 to 4,000 lbs. per acre.

Prices for Feverfew

Prices for dried feverfew are reported in the range from \$7 to \$12 per pound (Sturdivant and Blakley).

III.C.23. Valerian

Valerian grows 4 to 8 feet high with a spread of 1 to 2 feet. The leaves are deeply divided into 7-10 segments. The stems are hollow and flowers are umbel-like clusters of white to pink. The root consists of spindle-like, fibrous components that are dark on the outside and white on the inside. There are 150-250 species of valerian, but *Valeriana officinalis* dominates the American market.

Uses for Valerian

Valerian is used as a powerful nervine, stimulant, carminative, and antispasmodic. It is also used as a sedative.

Production of Valerian

Valerian is a perennial plant. It does well in all soils but prefers rich, moist soil. Seeds or divisions are planted. If flowering tops are removed as they appear, rhizome development is improved. Valerian roots are harvested in the fall of the second year by hand or mechanically. The roots can be sold fresh or dried. Yields of 1,500 to 2,500 pounds of dry root per acre are possible.

Prices for Valerian

Prices have been reported to be \$10 to \$12 per pound for certified organic dried root while commercial root goes for less than a half of that (Sturdivant and Blakley). Fresh root sells \$6 to \$8 per pound. Another source lists a range of prices from \$0.85 per pound for a large quantity to \$14.40 per pound retail price (Miller 1998). Retail prices observed for valerian root were \$4.70 (1-4 lbs.) to \$4.23 (5-24 lbs.), while powdered valerian root prices of \$5.60 (1-4 lbs.) to \$5.04 (5-24 lbs.) were observed.

III.C.24. Echinacea

Echinacea is a perennial plant. It requires dry soil and full or partial sun in hot climates. The plant grows 3 feet high and 2.5 feet wide. Flowers are bright pink/purple, 3-inch long petals around a raised center, orange disk. The plant produces brown, papery seeds. The root is long and spindly. In older plants the roots are grouped together with a fleshy white inside covered by a dark skin.

Uses for Echinacea

Echinacea is a medicinal herb used for flavoring tea and for medicinal purposes. Echinacea root is said to enhance immune systems, reduce symptoms of arthritis, and treat allergies such as asthma or upper respiratory infections. Echinacea is also used as a blood purifier.

When the tops are harvested, they must be dried out of the sun and must be processed before being shipped to a buyer. Most buyers require that the roots and tops be milled to their specifications, pass tests to assure freedom from microbial contamination, and meet standards for medicinal constituents.

Production of Echinacea

Echinacea blooms from July to August during which the plant's petals and leaves can be harvested. Echinacea is a three- or four-year crop with the tops harvested in the second or third years. It takes 3-4 years to develop roots large enough for it to produce a substantial harvest. All plant parts including flowers, leaves, seeds, and roots can be dried and powdered.

There are two main species of Echinacea: *Echinacea Purpurea* and *Echinacea Angustifolia* with different constituents. These include humulene, caryophyllene, sesquiterpenes, polyacetylenes, isobutylalkamines with olefinic and acetylenic bonds,

glycoside, polysaccharide, betaine, inulin, caffeic acid esters, echinolone, and alkamides.

Montana NWARC Test Plots for Echinacea

Three species of Echinacea- *E. angustifolia*, *E. purpurea* and *E. pallida*- were direct seeded at 9-seeds/linear ft. in early May of 1999 at the NWARC. Tops and roots of *E. purpurea* were harvested in 2000, and tops and roots of the other species will be harvested later.

Two manners of plant harvest were compared for *E. purpurea*. In mid-August the top halves of the plants were removed from fifty percent of *E. purpurea* plots, and the flower heads only were removed from the other fifty percent. Four plots in an adjacent demonstration nursery were left intact but were affected by plant disease. There was no difference in either top growth or root yields between the flower and top harvest techniques. Top half removal yielded approximately 6,950 lbs. per acre, and roots from these plants yielded about 2,000 lbs. per acre. Flower heads from the other half of plants yielded approximately 6,700 lbs. per acre and roots from these plants yielded about 2,000 lbs. per acre. Cichoric acid, an important compound in Echinacea plants, was analyzed at Nutritional Laboratories International, Lolo, MT. Flowers were higher in cichoric acid (3 to 3½ percent) than leaves (2 to 2½ percent) for *E. purpurea* plants harvested in August.

Prices for Echinacea

Prices of Echinacea *angustifolia* root were \$30-\$40 per pound in 1998-1999 and \$18 to \$27 per pound for Echinacea *purpurea* root (Sturdivant and Blakley). However, more recent prices (2001) for Echinacea *angustifolia* are in the range of \$14 to \$18 per pound (Richters Q&A 2001). Some have been reported as low as \$7 for *E. angustifolia* and \$4.25 for *E. purpurea* (Ward 2000).

III.C.25. Goldenseal

Goldenseal is made from the roots of a small forest plant. The plant grows up to 16 inches in height with a spread of 6-12 inches. Leaves are light green, palmate, and deeply toothed. Small flowers with greenish-white stamens bloom in late spring. They live only a week or so and are followed by a soft red berry containing 10-30 black seeds. The yellow rhizome is about one-half to three-quarters of an inch thick and about 2 inches long, covered with skinny fibrous rootlets.

Uses for Goldenseal

Purported medicinal benefits of goldenseal include strengthening immune systems, using it as an antibiotic, and having a variety of anti-inflammatory and antibacterial properties. The herb is also used as a treatment for skin disease, as a wash for sore eyes, and as a mouthwash in treating canker sores. It also has been used to relieve indigestion, stimulate secretion of saliva, and increase appetite.

Production of Goldenseal

Goldenseal is a perennial plant. It grows best in humid regions with rich humus soil in shady areas. Harvest begins after 3-4 years of stand establishment. Rhizomes are

harvested either by hand or with a root digger in the fall after the seed is ripe. Leaves are harvested in late spring/early summer. Goldenseal crops yield 1,500 to 2,500 pounds of dry root per acre.

Prices for Goldenseal

Grower prices in 2000 ranged from \$35 per pound for a dry wildcrafted to \$50 per pound for organic goldenseal (Sturdivant and Blakley 2000). Observed retail prices for goldenseal powder range from \$59.22 to \$65.80 per pound.

III.C.26. Ginseng

The most commonly used type of ginseng is Asian ginseng (*Panax ginseng* C.A., Meyer), often sold as Panax, Chinese, or Korean ginseng. Closely related to Asian ginseng is American ginseng (*Panax quinquefolius* L.), which is sometimes preferred for its milder effects. Siberian ginseng, also called eleuthero (*Eleutherococcus senticosus* Rupr ex Maxim), is not as closely related to the other two, is often considered somewhat weaker in action, and is a less expensive ingredient.

Uses for Ginseng

Ginseng is widely used in the U.S. as a dietary supplement and is believed to improve general energy and vitality particularly during times of fatigue or stress. Ginseng-containing dietary supplements are typically made from a powder or extract of ginseng root. Other reported uses of ginseng include normalizing blood sugars, such as in diabetes; stimulating immune functions; and treating impotence. Biologically, ginseng has been shown to allow cells to more readily use stored sugar, enabling red blood cells to carry more oxygen. However, the clinical evidence for ginseng's effectiveness has been mixed.

Production of Ginseng

Ginseng is a fleshy rooted herb and is native to well-drained, cool, shaded hardwood forests. It does not grow in full sunlight. Most ginseng in the U.S. is cultivated under artificial shade. It is a perennial plant, but unlike other perennials, lies dormant some years and does not grow new tops every year. The root does not die but lies dormant until the following year. The time of harvesting depends on the method of propagation used. Ginseng is harvested in the fall in four to nine years, when it is planted from seed, and in two to four years, when transplants are used. Average ginseng roots are about four inches long, one inch thick below the crown, forked, and about one ounce each when fresh. Older roots are larger and receive higher per pound prices. Seeds are harvested in the fall when the berries are ripe. There are usually two seeds per berry. Freshly harvested ginseng must be thoroughly pressure-washed before it is dried. Ginseng is dried for a period of 21 days after being harvested in a moisture-controlled room at a temperature of 100 degrees Fahrenheit. If properly dried, it can be stored in a cool, dry environment for many months.

Yields of dried roots from a well-managed planting should average about one ton per acre, although greater yields are often reported. Crops derived from forest plantings are reported to yield about one-half of those obtained in lath sheds; however, production costs from forest plantings are lower.

Prices for Ginseng

Prices for Ginseng have been reported in 2000 to be \$20 to \$60 per pound, with organic production going for over \$100 per pound. Some wildcrafted Ginseng harvested from the woods may go for as high as \$500 per pound (Sturdivant and Blakley 2000).

IV. GENERAL STRATEGIC MANAGEMENT PLANNING FOR SPECIALTY HERB AND ESSENTIAL OIL CROPS

The production and marketing efforts of individual producers or groups of producers related to specialty herbs and essential oil crops must address strategic marketing issues. This section provides a detailed discussion of the critical components of such plans.

IV.A. Industry and Competitive Analysis

The first step in developing a strategic plan is to evaluate the competitive elements of an industry. The process considers 5 elements of an industry, which contribute to the potential success of any single firm within the industry. The 5 elements are (1) a situation analysis, (2) the industry environment, (3) the five competitive forces, (4) driving forces, and (5) key success factors.

IV.A.1. Situation Analysis

An industry situation analysis evaluates the external and internal factors, which define the current and future elements of an industry. In the case of specialty herbs and essential oils, there is ample evidence that the overall market for such products is growing. In 1994 the estimated market for herbal supplements and botanical medicines was approximately \$1.6 billion in annual retail sales. In 2000 the size of this market was estimated to be \$4.13 billion dollars. As shown in Table 5, the market has leveled off somewhat in recent years but continues to grow.

Table 5. Sales of Herbal Supplements in All Channels of Trade: 1998-2000

Sales by Channel (\$ millions)	1998*	1999**	2000**
Natural Food/Health Food stores and Specialty Shops	1,207	1,360	1,400
Mass Market (Food, Drug, Mass Merchandise Retail)	663	760	690
Mail Order	320	340	350
Multi-level Marketing	1,050	1,260	1,290
Practitioner	270	330	350
Tea (All channels)	266	n/a	n/a
Specialty Shops	90	n/a	n/a
Internet	n/a	40	50
Total	3,866	4,090	4,130

Sources: *Nutritional Business Journal as reported in Brevoort 1998, & Blumenthal 2001

The source of this growth can probably be traced to increased wealth in developed countries, the high-cost of traditional health care, and a desire by consumers to have more control over their personal health care. As mentioned earlier in this report, sales of other herbal crop derivatives such as essential oils also continue to increase.

The overall industry environment for herbal products at the retail level appears to be favorable. However, the challenge for individual growers will be to capitalize on this success given price competition, the high level of labor input, and fractured market structure.

IV.A.2. Industry Environment

The business environment for any industry is defined by both its external and internal traits. An industry's external environment is defined by its dominant economic traits and its relative attractiveness. Dominant economic traits for an industry include

- market size and growth rates,
- entry/exit barriers,
- pace of technological change,
- product and customer characteristics,
- scale economies,
- learning curves,
- capacity utilization and capital requirements, and
- industry profitability.

Given the growth of the specialty herb and essential oil market and increasing per capita wealth in developed countries, it appears that this industry is poised for additional growth.

The specialty herb and essential oil industry's internal environment is complex. That is, the industry is fragmented because of product diversity and usage as described in Section II. The market for any individual herb or oil is relatively thin and is subject to wide fluctuations in prices.

Storage is an option for most herb products. Many buyers will only purchase product after it has been processed into a storable intermediate form. Storage will affect industry price response to changes in demand and supply. Supply increases stimulated by new crop opportunities and demand fluctuations will often cause increases in stored inventories. Eventually, these inventories are delivered to the market so that low prices may persist.

Another important characteristic of the industry environment is local regulatory conditions. With the recent emergence of natural medicinal products as an important part of the overall health care industry have come new regulations governing the use of these products. A newly evolving and changing regulatory environment has generated considerable market uncertainty for these crops. Botanical medicinals and dietary supplements are regulated according to the Dietary Supplement and Health and Education Act of 1994 (DSHEA) and defined as "a vitamin, a mineral, an herb or other botanical (or) an amino acid." (Brevoort 1998) A focus of the current regulatory structure is the substantiation of claims regarding the effects of dietary supplements. Ongoing research findings lead to changes in demand for certain crops.

The herb St. Johns Wort provides a specific example of the impact of research and regulation on the medicinal herb market. In the mid-1990's research findings suggested that a primary active ingredient in the herb, hypericin, may have many of the same effects as the popular anti-depressant Prozac. This report led to an increase in the popularity and market presence of St. Johns Wort. According to one source, "After an episode on the 20/20 television show which portrayed it in a positive light St. Johns Wort sales shot up several hundred percent virtually overnight." (Sturdivant and Blakley 1999) According to one study, the demand for St. Johns Wort increased by 2,801 percent in 1998 (IRI data presented in Brevoort 1998). Recently, the National Institute of Health announced that extensive trials would be conducted to test these claims. Results of such trials obviously are of tremendous importance to the future market demand for the herb and should be carefully monitored by potential growers. However, St. Johns Wort provides another example of the importance of government regulation in the market for specialty herbs. For example, St. Johns Wort is listed by the state of Montana as a noxious weed, prohibiting its commercial cultivation in the state unless variances are obtained.

IV.A.3. Five Competitive Forces

The third element in developing a strategic plan is to evaluate the five competitive forces in an industry. The five competitive forces include

- (1) rivalry among competitors,
- (2) availability of substitute products,
- (3) potential entry of new competitors,
- (4) bargaining power of input suppliers, and
- (5) bargaining power of buyers (customers).

The relative importance of each of these factors varies, depending upon product. This is especially the case for specialty herbs and essential oils because of the fragmented nature of the industry. Thus, for any single crop, each of the five competitive forces must be evaluated in terms of potential strength. The goal is to identify those production/marketing alternatives, which have the *weakest* competitive forces.

IV.A.3.a. Rivalry Among Competitors

Rivalry among competitors is the most powerful factor of the five competitive forces. Rivals use a variety of factors to influence customers and, thereby, affect the success of other firms in an industry. In addition to price and quality attributes, rivals influence customers by offering a variety of performance features, warranties, customer service, and product innovations. In addition, successful rivals often use advertising and special promotions to gain market share.

An important feature of the competitive environment for suppliers of specialty herb crops is that many growers derive utility from farming and producing these crops. Thus, returns to labor are often quite low. Many specialty herb growers simply enjoy the endeavor and do not require large returns. Interviews with industry participants suggest that for some, growing herbs is an end and not a means to financial success.

Many existing growers have also developed long-term relationships with buyers based upon years of experience. New growers would be expected to have difficulty in establishing equal footing in the short-term. Given the relatively small total market for many of these crops, such relationships are expected to present formidable challenges to new producers.

Low cost competitors also pose a challenge. In most market segments growers must compete in some fashion with foreign growers, wildcrafters, and/or large mainstream suppliers and mass retailers. Montana growers must combat these competitive forces through niche marketing and product differentiation.

IV.A.3.b. Substitute Products

Substitute products, offered by firms in other industries, represent another competitive force. For example, herbal medicine uses of specialty herbs likely compete with traditional pharmaceutical products. The variability of ingredients is likely less in pharmaceuticals that are created in laboratories which suggests that quality is important in specialty herbs.

IV.A.3.c. Entry of New Competitors

The potential for new entrants into a market provides a strong competitive pressure. New entrants increase production and capacity, which divide market share and reduce output prices. The seriousness of this threat depends in large part on the entry barriers. Entry barriers exist when it is difficult for new entrants to enter a market. Barriers to entry include technological or knowledge-based information, comparative production advantages because of location, high-capital requirements, and market dominance by current producers.

In the case of specialty herbs and essential oils, production, processing, and marketing knowledge probably provide the only barrier to entry. Of course, this is a relatively weak barrier and one that must be penetrated by new prospective Montana growers as well. Information on production practices is often lacking for many of these herbs.

Agricultural producers of specialty crops also must face potential entry from wildcraft harvesting of many similar plants. An increase in demand leads to higher prices which likely triggers an increase in both wildcraft and cultivated production. In many cases regulations are being developed and enforced to limit wildcraft production. Nonetheless, wildcrafting poses a competitive threat for many specialty crops.

IV.A.3.d. Bargaining Power of Suppliers

If input suppliers have significant bargaining power, then the industry becomes less attractive to an individual firm. The bargaining power of input suppliers into the production of specialty herb and essential oil crops is relatively low. The exceptions to this would be in three areas: (1) seed and/or transplant suppliers, (2) contract processing facilities (such as commercial distillation), and (3) manual laborers. In general, it is difficult to find agricultural laborers willing to pull weeds and hand pick flowers at prevailing agricultural wage rates.

IV.A.3.e. Bargaining Power of Buyers

The bargaining power of buyers increases when there are few purchasers of a product, when many substitutes exist, and when the buyers maintain a large market share of the industry. It appears that large purchasers of raw input such as herbs used in tea manufacturing and essential oils used in cosmetics and medicinal products have relatively strong bargaining power. These purchasers often argue that they are focused on buying the highest quality of inputs, providing that such inputs are cost competitive with foreign sources. Thus, it appears that quality may be less important than prices in some markets (tea and lotions). It also appears that relatively abundant supplies of many mainstream herbs in the current market environment give buyers additional bargaining power. Purchasers have less need to rely upon contractual relationships to guarantee supplies and are able to “pick and choose” sources for many crops. However, industry purchasers have indicated they are more likely to buy from established producers with experience in the industry who are likely to remain in the marketplace for years to come. This suggests the importance of long-term marketing relationships in the industry.

Bargaining power of buyers may be somewhat less important in the cottage industry, although marketing efforts will be important. In other direct retail channels, such as sales to health food stores and restaurants, sellers will need to consider other options that may be available to these buyers for the herb products supplied. In most cases similar products may also be available from mainstream distribution sources, but growers must attempt to differentiate themselves through quality, freshness, supply consistency, and other important attributes.

IV.A.4. Driving Forces

The driving forces in any industry are those factors, which are generating both change and opportunities. A driving force in the specialty herb and essential oils industry is increasing per capita incomes in developed countries. Increased incomes have allowed for more discretionary spending by populations who already have enough wealth for shelter and food. An aging U.S. population also provides the impetus for additional health and nutrition needs. In addition, rising costs of traditional medical care and a desire by consumers for "natural" solutions to a variety of medical problems has increased the demand for specialty herbs and essential oils.

Increasing involvement of pharmaceutical companies in the herb market has also driven change. The entry of three large pharmaceutical firms into the herbal market in 1998- Bayer, Warner Lambert, and Whithall-Robbins - appears to have changed the dynamics of retail sales channels (Blumenthal 1999). Overall growth in the sector seems to have leveled off at the same time that mainstream channels are becoming more important and price competition is increasing.

IV.A.5. Key Success Factors

Key success factors refer to those issues, which must be addressed for a producer to have an opportunity for sustained profitability in this market. Meeting these factors does not ensure success, but ignoring them will likely guarantee failure. The following key

success factors are expected to be important in the market for specialty herb and essential oil crops:

- Industry research of herbs and their potential health benefits will continue to dictate the market environment and determine the popularity and sales volume of individual crops.
- Grower development of marketing and research must be pursued diligently in order to identify changing environments and emerging opportunities.
- Growers must be able to store and produce multiple products, preferably from a variety of crops in order to reduce dependence on market fluctuations of any single crop.
- Developing a sales network of multiple buyers will reduce dependence on any single purchaser and increase the producer's relative bargaining power.
- Due to the labor intensive weeding and harvesting practices required by many of these crops, growers must be able to secure a consistent labor supply at relatively low cost.

IV.B. Strategy and Competitive Advantage

The production agriculture and food and fiber processing sectors operate in relatively competitive environments. A competitive business environment is one in which the prices of goods and services are driven towards their marginal costs of production by the entry and exit of firms. Entry occurs when firms in an industry are (or anticipate) receiving *above-average returns*, and exit occurs when firms are receiving *below-average returns* over the long term. That is, if a firm's resources are earning *below-average returns*, those resources will be redirected to sectors in which returns are commensurate with opportunity costs.

Competition is not defined in terms of numbers of firms competing in an industry. Rather, it is entry (or threat of entry) and exit of firms which, given consumer demands, alters market supply and prices. Hence, supply, demand, and entry/exit are the mechanisms which drive market prices towards the marginal costs of producing a good or service. In such environments, the average firm will only receive a *normal* rate-of-return over the long term. A normal rate-of-return implies that resources used in the production of goods and services receive compensation equal to their opportunity costs (i.e., the value of their next best alternative) and that returns are sufficient to neither entice additional entry into the industry nor cause additional exit.

Although firms in competitive industries will, on average, receive only a normal rate-of-return on their investment, technological change, management abilities, location advantages, and many other factors will cause some firms to receive higher-than-average returns (and by extension, some firms to earn lower-than-average returns). The concept that, even in a competitive environment, individual firms may have advantages over others is not new. For example, Alderson noted in 1957 that:

"Every business firm occupies a position which is in some respects unique. Its location, the product it sells, its operating method, or the customers it serves tend to

set it off in some degree from every other firm. Each firm competes by making the most of its individuality and its special character." (p. 101)

Formal aspects of strategic business management were introduced in 1980 by Michael Porter in his seminal book Competitive Strategy. Porter devised a taxonomy for explaining the wide variety of behavior exhibited by business firms as they compete within an industry. Economists have long noted that a variety of positioning activity occurs in markets which are less-than perfectly competitive. For example, Alderson notes that "competition is a war of movement in which each of the participants is searching for strategies which will improve his relative position" (p. 108). Strategic management concepts are widely used by business firms for market positioning and planning.

The purpose of strategic business management is to build a strategic (or competitive) advantage over rival firms which can lead to long-term above-average returns for a firm in an industry. In addition, it is essential that firms consider strategies to defend their competitive position lest it be compromised to other firms who adopt similar market strategies. Porter argues that successful companies employ one of two strategies: (1) a low-cost strategy, or (2) a differentiation strategy. Within each of these strategies producers may choose to focus on a niche. Each of these strategies provides direction for firm-level decision-making and implicitly develops entry barriers to protect the developed competitive position.

A low-cost strategy occurs when a company in an industry makes decisions to gain a competitive advantage by producing output at the lowest cost per unit among rivals. Although all firms try to reduce production and marketing costs, adopting a low-cost strategy requires managerial decision-making which, at all times, seeks to control and reduce average costs of production throughout the value chain. This often requires a complete change in traditional ways of performing tasks and/or by-passing some of these tasks in an effort to reduce costs. The use of private label brands by retailers is an attempt to provide products at the lowest possible cost. Therefore, the provision of private label (or generic) herbal teas is an example of a retail/processing low-cost strategy.

Low-cost strategies can be employed through attaining scale economies, developing new technologies, outsourcing tasks, integrating market segments, or developing strategic alliances. A low-cost strategy provides a competitive advantage and above-average returns because of resulting larger-than-average margins or through increased bargaining power with purchasers. A low-cost strategy provides barriers-to-entry because low-cost firms can price their products or services below those of competitors.

Although low-cost producers may initially generate a competitive advantage, several strategic risks exist. For example, firms which pursue low-cost strategies must ensure that they are the absolute low-cost producer in an industry. That is, little is gained by being the *almost* low-cost producer. In addition, a low-cost strategy will not be successful if technological change alters industry cost structures, or if rivals find it relatively easy or inexpensive to imitate the low-cost strategy. Finally, firms can be so

focused on lowering costs that they overlook important changes in consumer desires for added quality or service, new developments in related products, and declining buyer sensitivity to price.

In a situation where the price elasticity of demand may be high such as the case of a commodity, producers use their low marginal cost structure to enable them to increase market share. For a consumer-type product with a lower price elasticity of demand, producers use their low marginal cost structure and maintain price parity with the competition which results in a higher profit margin.

A differentiation (also called benefit strategy) strategy is one in which a producer incorporates features into goods or services which cause buyers to prefer that firm's product/service over those of others. That is, differentiation seeks to increase the demand for a good or service and/or capture consumers who have relatively inelastic price elasticities of demand. Branded products which are geographically widely distributed (such as Stash or Celestial Seasonings herbal teas) represent examples of differentiation strategies. Because differentiation adds costs to products and services, it is essential that a differentiation strategy produces output for which premiums can be charged in excess of added costs. In addition, successful differentiation strategies must create value for buyers that is not easily copied by rivals. Failure to do so results in a firm developing a market only to find that others can easily enter the market and gain an advantage while not incurring market development costs. Successful differentiation allows firms to command premium prices, increase unit sales, and/or build brand loyalty. Such a strategy can generate larger profit margins and provide bargaining power over purchasers and input suppliers.

Differentiation strategies are often attained by generating product attributes which are valued by purchasers for tangible or intangible reasons. Differentiation strategies fail when focus is erroneously placed on features that buyers do not perceive as providing added value, features for which price premiums in excess of perceived value are charged, or features that exceed buyers' needs. In addition, such strategies sometimes fail because signals of value are inadequately communicated to buyers. Thus, differentiation strategies must not only provide appropriately priced features desired by consumers, but must also signal the value contained in added features.

In a situation where the price elasticity of demand may be high such as the case of a commodity, producers maintain price parity with their competitors and use their superior benefits to increase market share. For a consumer-type product with a lower price elasticity of demand, producers charge a higher price premium which enables them to have a greater profit margin. This latter situation is likely to be the case for herbal flowers.

A focus (or niche) strategy may contain elements of either a low-cost or a differentiation strategy, but is tailored to a narrow market in which buyers have unique characteristics or requirements. Such markets might be defined geographically or by purchaser incomes, ages, demographics, exacting specifications, etc. For example, a western Montana farmer is producing, packaging, and marketing a "Made in Montana" branded

tea product. The tea uses local, organically grown herbs and is sold through specific health food markets. The marketing efforts for such products are often based on direct communication with customers and specialty stores. A focus strategy is centered on providing a differentiated product to a target market niche.

A focus strategy entails doing a better job of serving buyers in a target niche market than rivals. This could be accomplished either through providing products or service at lowest-cost or by providing superior value for a narrowly defined market segment. Such strategies tend to work best in markets which are being "ignored" by other firms because of a lack of knowledge or because established firms find it too costly to tailor products for small volume niche markets.

Knowledge of niche markets and ability to provide exacting products or services provide barriers-to-entry. However, risks of such strategies do exist. For example, larger competitors may find effective ways to match the value being offered by a focused firm in serving a target market. Niche buyers' tastes and preferences may eventually gravitate towards product attributes desired by a broader market. Finally, a niche market may become so appealing that it becomes crowded with aggressive rivals, causing profits to be split among many firms.

The best strategy is ultimately a function of consumer demand and the product/service attributes, core competencies, and managerial skills of each company. However, the worst strategy is being "stuck-in-the-middle". That is, being unable to compete with others on the basis of cost, value, or market specificity. In each case, rivals are able to undercut prices, maintain market share, or be the supplier of choice whenever change in an industry occurs. In addition, strategies must be refined as market conditions change.

IV.B.1. Strategies for Montana Specialty Herb Producers

It is unlikely that Montana producers will be able to compete with foreign providers of specialty herbs and essential oils on a cost basis. Production costs in the U.S. are higher than in developing countries because of higher land values, wage rates, and regulations, which govern environmental and labor standards. However, it may be possible for productivity, knowledge, and infrastructure advantages to offset some of these higher costs.

The fragmentation and diversity of the specialty herb and essential oil industry inhibits the adoption of a differentiation strategy. It seems unreasonable to expect to be able to market such products to a broad spectrum of consumers, especially when these types of products are not generally considered to be "mainstream" other than for use in personal hygiene products.

Specialty herbs and essential oils are used in other products which are used in consumer-type products. However, they are ingredients and cost is clearly going to be important to pharmaceutical firms. Thus, these ingredients are likely to be sold in a high price elasticity of demand situation. But it is apparent that Montana producers will not be able to compete with foreign suppliers on a cost basis. Thus, it will be necessary to

develop and market products for which quality does matter – specifically, as inputs into diet and medicinal supplements. This is a low price elasticity of demand situation.

Of the two generic strategies, a benefits-driven differentiation strategy has the best chance for success. That is, starting as a small, clearly defined producer of specialty herbs and essential oils will be important. This market will require a price premium. In this type of a situation, competition is going to be difficult because a great deal of marketing and promotion is needed to convince the user that the price premium is justified by the benefits of the product.

Montana producers may pursue such a strategy for marketing specialty herb products by adding value in a number of ways:

Entrepreneurial skills

One way in which producers may compete in specialty crop markets is by applying entrepreneurial skills to identify promising emerging markets that can be differentiated by quality. Markets for many herbs have become “commoditized,” meaning that the herbs are mass-produced at relatively low cost, often using less expensive overseas labor. Montana producers generally face higher land and labor costs than these overseas competitors and must carefully choose markets that will reward high quality at higher cost with higher prices. Specialty herb production and marketing will require additional skills beyond those required to simply grow and harvest the crop. Specialty herb marketing will require ability to connect with people (customers), entrepreneurial ability, and business acumen. The continuing process of developing new markets and identifying changing market conditions will require ongoing market research. Growers must initiate contact and maintain relationships with prospective buyers. Given the significant commitment, growers should also ask themselves whether they are willing to invest the requisite time needed to build and to maintain a customer base.

Ability to offer consistent supply and volume

Products can be differentiated by providing services or by guaranteeing supplies to customers. Bulk sellers can differentiate their product to customers by offering a consistent supply volume. Industry research and conversations with key players as part of this study indicate that consistent supplies of quality product are valued by customers but that it may take years to develop this reputation.

Vertical Integration/Alliance Strategies

Another strategy will be either to vertically integrate into further processing or to form alliances with marketers or users of these raw inputs. Such alliances have several potential benefits to growers. First, a collection of producers can increase production diversity while at the same time increase production volume. Second, marketing and processing efforts and costs can be spread over a larger enterprise. Third, geographic dispersal of production among farms can decrease production risks. Fourth, larger and more consistent production volumes may give allied farmers increased bargaining power with purchasers.

Defensive Strategies

If successful, producers must plan to defend their advantages. Possible defensive strategies include (1) patenting products or processes and (2) developing brand loyalty through the marketing of climatic or cultural practices used in producing these crops. Montana's reputation for a high quality, pristine environment should be a part of any market strategy.

Strengths and Weaknesses

The strengths and weakness of Montana producers for establishing these new crops will vary by producer. Nonetheless, Montana producers can market a clean environment, high elevations, family labor, and Native American cultures as strengths in producing specialty herbs and essential oils.

Montana producers also face several weaknesses. These are new crops, and field production trials are only now being done. In addition, producers must be concerned about meeting contractual obligations should region-wide drought or hail events destroy crops. Also, current users of these crops appear to already have solid suppliers of these crops; therefore, the market may be difficult to penetrate. Montana producers will find it difficult to compete on a cost basis. Perhaps the biggest weakness is that many Montana producers do not have sufficient capital to accept the risks of developing and marketing these crops. Such crops do not have production insurance mechanisms, and price risk alternatives are limited to, at best, contractual agreements. Furthermore, many producers do not have the entrepreneurial marketing skills (or the desire to develop such skills) to make such activities successful.

Opportunities and Threats

A significant opportunity exists for the production and marketing of high-quality, specialty herbs and essential oils. Initial production research regarding specialty crops has been completed in western Montana. The markets for such products are expected to expand. Furthermore, the production of such products, following organic practices in the pristine environments of Montana, provides a significant opportunity.

Nonetheless, significant threats exist. Substantial labor requirements are needed to produce such crops. In addition, markets appear to be very thin and exhibit much price variability. Thus, significant risks exist for the production of these crops. Marketing is important and most producers are not as knowledgeable about marketing as they are about production. Marketing is much easier for a large entrant that can supply enough volume at a given quality than it is for a small producer.

V. STRATEGIC MANAGEMENT CONSIDERATIONS AND MARKETING PLAN FOR ECHINACEA

An important part of evaluating and ultimately pursuing any business opportunity is creating a marketing plan. The following section outlines the basic elements of such a plan for an example crop- Echinacea. Echinacea has attracted much attention from traditional farmers in recent years due to reports of high revenues. The herb is relatively well known and is used in this example to highlight examples of opportunities and obstacles inherent in this industry.

Industry and Competitive Analysis

Echinacea is grown mainly as a medicinal herb, although it is used as a nutraceutical in teas. The following marketing plan considers important aspects of producing and marketing Echinacea commercially.

V.A.1. Situation Analysis

As the herb industry grows, markets for some crops are maturing; and, others are just being commercialized. One herb with an established market is Echinacea, commonly known as purple coneflowers and native to the central United States. There are nine known species with three having commercial importance: *E. purpurea*, *E. angustifolia* and *E. pallida*. The dried root is the major product, but the leaves are sometimes also harvested.

Echinacea is highly regarded as a non-specific stimulant of the immune system, as an anti-inflammatory, as a treatment for cold and flu symptoms, and as an aid in wound healing. Traditionally, it has been used as a remedy against infections and for treating poisonous snakebites. North American Indians have used Echinacea for medicinal purposes throughout history.

In recent years Europeans have adopted Echinacea in mainstream medicine. Over 300 different preparations are sold including ointments, lotions, creams, tinctures, liquid and dry extracts, and toothpastes. In the United States the demand for herbs such as Echinacea has been increasing.

In the U.S. the production of Echinacea has occurred both by cultivation of mostly *E. purpurea* and by the digging of native plants (in Montana usually *E. angustifolia*). In recent years the cultivation of Echinacea has become an important topic for producers seeking to grow alternative crops.

V.A.2. Industry Environment and Production Practices

Production practices are an important crop characteristic that must be explored in order to understand the nature of business opportunities associated with Echinacea production. As with many high-value crops, there are no comprehensive sources of information.

A survey of Great Plains producers was done at Kansas State University to learn more about production practices. Echinacea growers have many different ideas on

production practices and do not readily share the information that they have learned through experience. Most agree that Echinacea grows best on fertile, free-draining soils with a pH range from 6 to 8. However, even these basic requirements are not universally agreed upon. In New Zealand a pH of 5.5 to 6 has produced *E. purpurea* with good results. *E. angustifolia* seems to prefer a more alkaline soil. All agree that a soil texture easily washed off the roots is very important.

Planting and establishing Echinacea is where each grower seems to have their own individual methods for success. Planting can occur in either the spring or fall. For a crop with seed costs ranging from \$50 to \$500 per pound, most growers believe transplanting is best to ensure uniform, consistent plants. Others feel they can get an adequate stand through direct seeding with a precision planter, which also allows for higher plant densities than transplanting. All are in agreement that learning how to establish a good stand of plants takes a great deal of experimentation and practice. One grower commented that when he first grew Echinacea, only 12 of 8000 transplants survived. Echinacea seed has to be stratified and handled with care to improve germination. Even then the germination may be as low as 20-30 percent. Some form of irrigation is usually needed to establish transplants. Since *Echinacea angustifolia* is a native Montana species, it is very drought tolerant after establishment. However, drip irrigation can be used to ensure that a high value crop of Echinacea is produced. Even brief periods of drought could reduce yield and quality, especially during the maturation process.

The spacing of plants in rows and in-between rows varies among producers starting from 10,000 plants per acre to over 50,000 per acre. Growers tend to start with wide row spacings but tend to decrease them over time.

As with any perennial crop, initial costs are significant. Costs in later years are limited to weed management and to harvesting. Echinacea is a three-year crop. Roots are harvested the third year. If growing conditions have not been ideal, harvest is sometimes delayed until the fourth year.

During the first year controlling weeds is an important consideration. There are no herbicides labeled for Echinacea. Most Echinacea growers are organic growers that do not use herbicides. Much time and effort is therefore spent controlling weeds with mulching, hand pulling, and hoeing. One grower commented that he hoes weeds in his Echinacea 12 hours a day, six days a week and estimates 80 percent of people who plan to grow Echinacea never harvest a crop because of the labor intensive weeding. One large commercial grower did mention he uses grass killers and Roundup wick equipment. Cultivation destroys weeds and increases soil aeration, but the wider plant spacing that allows for mechanical tillage seems to hurt the Echinacea plants because it allows them to lodge. Therefore, this is one reason many growers have decreased plant spacings and have increased plant densities.

Another reason for denser plantings is that in the second and third years the Echinacea plants have developed thick canopies that discourage weed growth. Mulches have been used to control weeds with varying degrees of success. Black plastic mulch

controls weeds but seems to encourage roots to rot. Organic mulches (straw) have been somewhat successful in controlling weeds. Landscape fabric seems to have some potential to control weeds. One grower thought green mulch such as crabgrass in the summer and winter perennials like henbit and chickweed did not hurt his Echinacea. All growers agree that weed control is very important.

Fertilizer requirements are not agreed upon, and growers use a range of fertilizers from nitrogen, phosphorous, potassium combinations to composts to none at all with suitable ph levels are close to 8.

Pests and diseases do not seem to be much of a problem. Intensive production practices can create insect and disease problems that did not exist in plants growing naturally.

There are three distinct parts of the Echinacea plant that are harvested: seeds, leaves and stems, and roots. Seeds may be harvested during the second and third years. Many people are interested in growing Echinacea, and there is great demand for seed especially *E. angustifolia*, which is native to Montana. However, this market will surely decrease since there is a lot of controversy about seed purity (hybridization among species is common), and Echinacea seed already has documented germination problems.

The leaves and stems of Echinacea can be harvested during the second and third years. This process is similar to haying. The plant is cut and allowed to dry; and, the dried plant material can then be used for processing. However, the active medicinal portion of Echinacea does not seem to be as desirable in this part of the plant. The roots are harvested in the fall of the third (and sometimes fourth) year after planting. Harvesting of roots is often done by hand digging. There are reports of using sub soil knives to undercut the rows and beds and raising the soil several inches and loosening the soil around the root. A large commercial grower has reported using a modified potato digger to harvest the roots. Small growers could use a moldboard plow or some type of modified vegetable root harvester. The roots are then washed and dried at 120 degrees to less than 10 percent moisture.

V.A.3. Five Competitive Forces

The five competitive forces analysis of Echinacea suggests that principal competitive pressure comes from rival competitors and bargaining power of buyers.

V.A.3.a. Rivalry Among Competitors

Echinacea producers face competition from wildcrafting. As recently as 1999 when according to estimates, over 18 percent of production of *Echinacea angustifolia* root was wildcrafted. Competition from foreign producers is also a very real threat. According to some industry experts the market for echinacea purpurea has become largely “commoditized.”

V.A.3.b. Substitute Products

Substitute products for Echinacea in other industries include traditional pharmaceutical products.

V.A.3.c. Entry of New Competitors

Recent events in the Echinacea market suggest that new competitors stand ready to enter the market quickly if prices increase. Increases in new end market products and consumer confidence in Echinacea products in 1998 led to an increase in the number of acres planted to the crop (AHPA 1999 Tonnage Survey). Whether these new plantings were a result of new growers or increases in existing acreages is unclear. However, the resulting increase in supply reduced prices from over \$20 per pound to under \$10 per pound.

V.A.3.d. Bargaining Power of Suppliers

Bargaining power of suppliers is not particularly important in the growing of Echinacea except in the case of certified seed.

V.A.3.e. Bargaining Power of Buyers

The bargaining power of buyers of Echinacea may be considerable in certain cases due largely to current oversupply conditions. Industry research suggests that buyers may be moving away from contract arrangements for medicinal botanical herbs. Since Echinacea is harvested between three and four years after planting, the effects of demand fluctuations between planting and harvesting can leave producers with crops in the ground long after market conditions have changed.

V.A.4. Driving Forces

In addition to consumers, a driving force in the industry is related to market structure as it appears that relatively few large companies control manufacturing, distribution, and marketing of herbal products like Echinacea. The marketing of Echinacea involves many channels. Some growers do their own processing and market their own brands in health food stores. Some growers have a satisfactory outlet through an individual herb distributor. Many growers sell to small dealers or brokers who sell to larger dealers or pharmaceutical manufacturers, which form capsules, extracts, or tincture, that are marketed in grocery and drugstore chains. Native Echinacea that is harvested is currently marketed in this manner as well as many small growers' production.

Neither local dealers nor large dealers will enter into a contract with an inexperienced grower until they know what the grower can deliver. A grower must raise a trial plot to supply the dealer with a product sample and must build a reputation for quality and reliability. Thus a long-term commitment is required to grow Echinacea. Large dealers and manufacturers often have minimum amounts that they will buy and will offer contracts to selected established growers.

V.A.5. Key Success Factors

A grower in Canada suggests these items be addressed before marketing Echinacea:

- Botanical Identity Certification – Growers should know what type of *Echinacea* is being grown. It might be one of the three recognized species or maybe even a hybrid of some sort.
- Organic Certification – In general, small growers will end up marketing their product directly to consumers who want organic production. There is a market for non-organic product, but these processors want large quantities.
- Laboratory Tests -- It is helpful to have the crop tested for levels of active ingredients. At least one eastern Montana producer has developed an industry reputation for above average quality product. *Echinacea* trials have been conducted at the Montana NWARC in Kalispell, but additional research may be needed to determine whether certain regions of the state enjoy a comparative advantage in production of important chemical compounds.

V.B. Strategy and Competitive Advantage

It is clear that *Echinacea* producers (as well as those producing other specialty herbs) need to pursue a benefits-driven differentiation strategy. Current prices for all types of *Echinacea* are much lower than those reported during the peak in 1998. However, it appears that niche marketing quality product to manufacturers may hold some promise. Further testing should be done to evaluate whether any Montana regions enjoy comparative quality advantages in production that could increase competitiveness.

A coordinated effort to raise *Echinacea* and other herbal botanicals, such as a producer cooperative, may provide valuable resource sharing opportunities and increased ability to market a reputation for quality product. Numerous growers could use the specialized equipment that is needed for production. A cooperative would also allow for vertical integration by processing herbs and drawing closer to the end-users.

Individual prospective *Echinacea* growers will need to assess their individual operations, growing conditions, and goals. Current market conditions should be carefully studied prior to committing resources to any specialty crop enterprise.

VI. PRODUCTION RISK MANAGEMENT STRATEGIES

The much smaller and clearly defined market size and the lack of production standardization would indicate that prospective growers of specialty herb crops and essential oils must consider significant production and market risk. Risk management tools are less readily available for specialty crops than for traditional crops. However, producers may wish to consider some less well-known tools. The following section outlines some possible production risk management strategies available to producers.

VI.A. Noninsured Crop Disaster Assistance Program

The Noninsured Crop Disaster Program (NAP) provides financial assistance to eligible producers affected by natural disasters. This program covers noninsurable crop losses and prevented plantings, resulting from natural disasters.

Eligible crops include commercial crops and other agricultural commodities produced for food (including livestock feed) or fiber for which the catastrophic level of crop insurance is unavailable.

VI.A.1. Eligible Natural Disasters

An eligible natural disaster is any of the following:

- **damaging weather** such as drought, excessive moisture, or hurricane,
- **adverse natural occurrence** such as an earthquake or flood, or
- **related condition** such as excessive heat or insect infestation associated with damaging weather or an adverse natural occurrence.

VI.A.2. Applying for NAP Coverage

To apply for NAP coverage, eligible producers must file their *Applications for Coverage* and must pay the applicable service fees at their local Farm Service Agency offices.

Applications and service fees must be filed by the application closing date as established by the state-level Farm Service Agency committee.

The service fee schedule is as follows: \$100 per crop per county or \$300 per producer per administrative county with the total fees not to exceed \$900 per producer in all counties. Limited resource farmers may request a waiver of fees.

VI.A.3. Coverage Periods

The coverage period for NAP depends on whether an annual or perennial crop is under consideration.

The coverage period for annual crops begins the latter of (1) 30 days after the producer applies for coverage and pays the applicable fees or (2) the date the crop was planted, not to exceed the final planting date. (Final planting dates will vary by crop. Farm managers will need to confer with Farm Service Agency personnel to identify final planting dates for subject crops). The coverage period for an annual crop ends the earlier of (1) the date the producer completes the crop harvest, (2) the normal harvest date for the crop, (3) the date the crop is abandoned, or (4) the date the producer destroys the entire crop acreage.

The coverage period for perennial crops always begins 30 calendar days after the application closing date and ends the earlier of (1) 10 months from the application closing date, (2) the date the producer completes harvest, (3) the normal harvest date for the crop, (4) the date the crop is abandoned, or (5) the date when the producer will destroy the entire crop acreage.

VI.A.4. Reporting Crop Acreage and Production Information

To remain eligible for NAP assistance, farm managers must annually report both acreage and production information. Local FSA offices can advise producers of reporting dates.

In addition, farm managers must annually provide the following production information:

- the quantity of all harvested production of the crop in which they have an interest during the crop year;
- the disposition of the harvested crop, such as whether it was marketable, unmarketable, salvaged, or used differently than intended;
- verifiable or reliable production records, when required.

The Farm Service Agency (FSA) uses the acreage information to verify that crops exist and to record the number of acres of the subject crop. Acreage information is combined with the production data to calculate an *approved yield*—expected production for the crop year. An approved yield for a crop for an individual producer is usually the average of the producer's actual production history (APH) for a minimum of 4 to a maximum of 10 years.

VI.A.5. NAP Assistance After a Disaster

When an eligible producer's crop or planting is affected by a natural disaster, the farm manager must notify the local FSA office and complete the *Notice of Loss* section of the *Application for Payment* form, within 15 days of the following:

- natural disaster occurrence;
- final planting date, if the farm manager's planting was prevented by a natural disaster;
- date damage to the crop or loss of production becomes obvious to the producer;
- the normal harvest date.

To receive NAP benefits, the farm manager must fully complete the *Application for Payment* form prior to the application closing date for the next crop production year.

In order for a farm manager to receive any NAP payment, the natural disaster must have either

- reduced the expected unit production of the crop by more than 50 percent or
- prevented the producer from planting more than 35 percent of the intended crop acreage.

FSA compares expected production (producer's approved yield), the production expected in the absence of a natural disaster, to the actual production to determine the percentage of crop loss.

VI.A.6. FSA Calculation of NAP Payments

NAP covers the amount of a production loss greater than 50 percent of the producer's expected production, based on the producer's approved yield and reported acreage.

The per unit of production payment rate that FSA specifies is 55 percent of the average market price for the specific commodity, as established by the state FSA committee.

The calculated NAP payment may be reduced by a payment factor, reflecting the decrease in production costs, incurred in the crop production cycle for the crop that is harvested, unharvested, or prevented from being planted. Payment factors will vary by crop.

VI.B. A Request for Actuarial Change

Requests for actuarial change are risk management product offered by the Risk Management Agency (RMA). The following section describes the process of making a request for actuarial change and the type of coverage available.

VI.B.1. The Process of Filing a Request for Actuarial Change

A successful Request for Actuarial Change results in a *Written Agreement*. This agreement, if accepted by the farm manager, is an individualized crop insurance contract on the subject crop in the specified county for that crop year.

The Request for Actuarial Change process is usually initiated with the farm manager conferring with the local crop insurance agent. The farm manager and the crop insurance agent then complete the appropriate form, FCI-5, *Request for Actuarial Change*.

There are details relative to the information that need to be fully understood by the farm manager and the cooperating crop insurance agent. The location of the proposed production requires a *legal description* supported by *Farm Service Agency aerial photography* of the proposed production location.

Crop production history for the subject or *similar* crop needs to be specified. For these purposes the term *similar crop* takes on a relatively generic definition. If the farm manager's subject crop were a particular broadleaf crop, other broadleaf crops would be considered the *similar crop*. The crop production history should include acres, yields,

and production for a minimum of three years. Evidence of the adaptability of the subject crop needs to be provided. Production of the subject crop in the area or like areas should be cited.

Once the *Request for Actuarial Change* form is completed, it is forwarded to the private sector insurance company that the farm manager's crop insurance agent represents for research and review. Subject to the insurance company's review for completeness and accuracy of the information submitted, the request is forwarded to the regional office of the Risk Management Agency, USDA.

VI.B.2. RMA Evaluation of a Request for Actuarial Change

Regional Risk Management Agency specialists will first determine the adaptability of the subject crop. If there is a determination of adaptability, then processing of the request will proceed.

A positive adaptability determination is not assured. The Risk Management Agency determines whether or not general policies are being written for the subject crop somewhere in the United States. If it is determined that no general policies exist for the subject crop, it is unlikely that insurance coverage can be made available to the requesting producer. In other words, there usually has to be a regular multiple peril crop insurance policy available somewhere in the United States for a Request for Actuarial Change to be successful.

With the adaptability of the subject crop affirmed and the reference county designated, the Risk Management Agency then thoroughly reviews the farm manager's production history for the subject or similar crop. The Risk Management Agency prepares a *Written Agreement* with a premium method specified.

VI.B.3. The Written Agreement

The farm manager is provided the Written Agreement with an insurable price for the subject crop, as specified by the Risk Management Agency. The farm manager may denote a price election for the subject crop from 55 to 100 percent of the insurable price.

The farm manager is also notified of the actual production history (APH) yield for the subject crop, as specified by the Risk Management Agency based on the relevant production history. The farm manager may select 50, 55, 60, 65, 70, or 75 percent yield coverage for all insurable crops in the county, as well as 80 and 85 percent for select crops.

Once the desired coverage is fully determined and the farm manager has specified the price and yield elections, the per acre premium rate is determined according to the RMA premium method. The farm manager signs the Written Agreement to signify acceptance of the coverage at the premium rate determined.

VII. PRICE RISK MANAGEMENT STRATEGIES

Price risk in markets for specialty herb and essential oil crops is considerable as a result of the lack of market depth for most crops and of volatile market and price conditions. Farmers have few tools at their disposal for mitigating price volatility. However, this section discusses some management strategies that may be used to reduce exposure.

New specialty crop enterprises should start small to limit the amount of net farm income risk associated with the new enterprise. If the existing enterprise is a traditional farming operation, only small plots should be converted to growing specialty herb crops initially. In fact, the first year of production should be considered entirely experimental as new skills are acquired and production is tested on the operation. But subsequent growth should also proceed slowly so that a large portion of net farm income is not affected by price swings.

Diversification will be an important means of dealing with changing market conditions for various crops. The practice of growing several different crops (at least six) is sometimes called “polyculture.” Diversifying specialty herb enterprises also helps guard against drastic fluctuations in market conditions for specific crops that may be caused by changes in regulatory policy or in supply and demand.

In certain situations growers may be able to contract production with buyers. Usually this involves trading some amount of expected revenue and upside price potential for a guaranteed market and price. Contract arrangements can be very beneficial to producers desiring to limit price risk exposure. However, producers should be cautioned that contracts are only as good as the company involved; and, there is always the risk that the company will default on the contract. Reputation is an important consideration when entering into such agreements. At the minimum, producers should be certain that a company for which they are considering contracting is bonded by the state.

Storage capability represents another avenue for controlling price risk at the farm level. If crops can be stored at relatively low cost on the farm, growers have more flexibility in waiting for poor market conditions to improve. In some cases storage allows producers to capitalize on unexpected price increases in times of shortage. Since many specialty herb crops are sold in storable form, this appears to be a useful strategy for producers.

VIII. CONCLUSION AND RECOMMENDATIONS

In conclusion, this research has produced several recommendations and further considerations. The following is a list of some topics that should be addressed and some suggestions for possible strategies for Montana producers of specialty herb products.

Price volatility

Price volatility results from the small overall size of markets for these products and from many external factors, such as scientific research and regulation that can have tremendous impact. Planning for and reducing exposure to price volatility will be an important part of the business plan for new producers. It is expected that some of this uncertainty and risk can be offset by diversification strategies and through gradual development of market expertise. Producers will not generally want to rely too heavily upon only one crop, market, or buyer.

Price volatility, on the other hand, has also been one of the factors that have drawn so much attention to this industry. In some cases growers have been able to capture very high prices and realize significant returns in the short run as a result of supplying markets during shortages. An important part of any grower's market strategy must also involve exploring new and emerging opportunities in markets for various crops. This type of strategy will allow producers to capitalize on opportunities for profit at the same time that they pursue strategies to minimize exposure to loss.

Price Competition versus Niche Marketing

Tremendous price competition appears to prevail in the market for specialty crops. This research suggests that a low-cost strategy is unlikely to be effective for Montana producers for reasons described throughout the report. It will be important for Montana producers to identify crops for which they are able to gain some sort of advantage, whether it is production or market driven. At the same time it will be important to pursue a marketing strategy that allows them to compete for high value, quality-based markets and avoid direct competition with lower cost producers in other countries. Medicinal botanicals appear to be one promising market in this regard because of the apparent quality premium that may be possible. The pursuit of such a strategy is time consuming and demanding. It may be the case that very few individual producers will find that this type of activity matches their goals and skills. Cooperative arrangements and/or alliances may provide one means to spread marketing efforts between operations.

Lack of Production Risk Management Opportunities

As discussed in Section VI, producers of specialty herb crops will find very few production risk management tools at their disposal. Production risk exposure represents another significant consideration in this industry, particularly considering the large investment per acre in some of these crops. Echinacea, for example, takes three years to harvest and may require up to \$10,000 per acre investment, which could be wiped out as a result of fire or natural disaster. Growers should explore all possible means of mitigating and planning for such risks.

Information Availability

Information plays a vital role in agricultural commodities markets. However, many key market indicators, such as inventory levels, prices, yields, and production, are not generally publicly available for specialty herb and essential oil crops. This lack of information limits effective allocation of resources and planning by industry participants. Lack of information also limits meaningful quantitative analysis that would allow producers to better understand risks and opportunities and to make better decisions.

The Montana Department of Agriculture could assist farmers in this endeavor by facilitating better information tracking for specialty herb crops, perhaps by working with the USDA Census of Agriculture to collect information through the existing survey questionnaire. Such information is already collected on greenhouse, floral, and some horticultural products. The addition of specialty herb and essential oil crop production to agricultural census data may be a relatively low cost means of improving availability of information in these markets.

Additional information is also needed with respect to on-farm research for these crops. Since very little information is available for specialty herb growers with respect to cultural practices and production costs for specific crops, additional efforts in this area would also be valuable.

Intensive Marketing Efforts

A state level agricultural campaign may be an extremely valuable asset not only to specialty herb and essential oil crop producers but to other Montana businesses as well. In many states such programs have been vigorously pursued with much success. For example, Jersey Pride, which certifies all products made in New Jersey, has received much recent press coverage. A state agriculture official from Vermont discussed a similarly successful effort in his state at a Governor's conference last year. Other programs are in place in Indiana, North Dakota, and Delaware. These types of programs enable increased product differentiation for farmers engaged in niche marketing. By increasing Montana's agricultural "brand recognition," many such producers would benefit.

Product Grading Standards

Public grades for product quality of most specialty herb and essential oil crops do not currently exist. Standardized grading facilitates price tracking and comparison across time periods and regions. It also allows buyers to recognize and reward quality more easily. Development of national grading standards will require further crop-specific research. Perhaps a state sponsored labeling program, if implemented, could include a grade or standard that may come to be recognized by the industry.

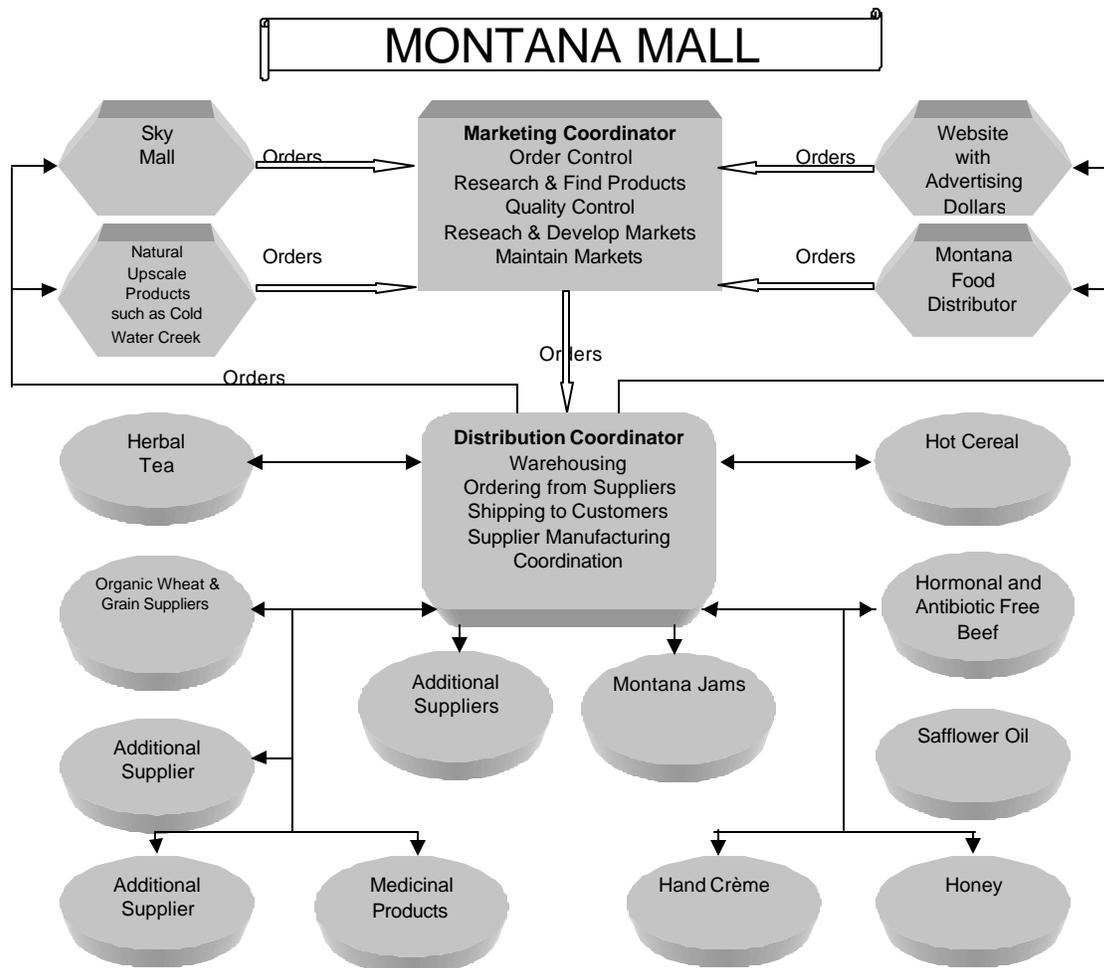
Trade Shows and Fairs

Trade shows and fairs are an important part of marketing many specialty herb products. In particular, producers selling retail products and operating cottage industries rely on fairs and trade shows as a means of reaching consumers. State support for such activities could provide another important benefit to Montana producers.

Potential Market Alliance

With the advent and rapid growth of e-commerce on the Internet, the emergence of upscale product alliances has occurred to create an economy of scale in costs associated with creating a national market presence for a product. An individual producer, incurring the costs to create a national presence, most times is not economically feasible. A joint e-commerce marketing and distribution system that is shared across many producers and possibly is also featured in upscale catalogs such as *Sky Mall* and *Coldwater Creek* is a possibility for products with joint appeal. There are many firms in Montana currently which have a national presence which would benefit from a joint marketing/distribution effort such as the one illustrated in Table 6. In many instances marketing alliances not only spread fixed costs but also create a symbiosis that increases sales for all products involved.

Table 6. Montana Mall



MISSION STATEMENT: To provide a vehicle for Montana producers of healthy, upscale products to market and distribute their products at an economical cost and to create a national market presence.

Conclusion

Significant opportunity may exist for some producers in the production and marketing of high-quality, specialty herbs and essential oils. Taking advantage of such opportunities will require significant expertise and participation of the grower beyond crop production. Progress has been made toward the development of production knowledge and research for western Montana climates. The markets for such products are expected to expand. Furthermore, the production of such products, following organic practices in the pristine environments of Montana, may provide an opportunity for some Montana agricultural producers with a desire to further their own active involvement in product research and marketing of their products.

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