Peppermint and Spearmint: An Economic Assessment of the Feasibility of Providing Multiple-Peril Crop Insurance

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Executive Summary

Mint is grown primarily for the oil produced from its leaves. The two major species of mint grown for commercial uses are peppermint and spearmint. Peppermint is grown more widely in the United States because its taste is preferred to that of spearmint. Both types of mint require similar production practices, and many growers produce both types.

Peppermint is the major mint produced in the United States. Between 1972-75 and 1990-94, production of peppermint increased 108 percent. While spearmint is less popular than peppermint, its production also rose during this period, by 87 percent. Very little mint oil is imported, as it is considered inferior to domestic oil. Imported oil is usually blended with domestically-produced oil and re-exported.

Washington and Oregon are the two largest producers of both species of mint. Indiana is the third-largest mint state in terms of acreage. Mint production has only begun in the past several years in Idaho, with acreage devoted to mint showing signs of expanding. Mint is also produced in Wisconsin, Montana, and other states.

Spearmint grown in the Pacific Northwest is subject to a spearmint marketing order. The marketing order is a growers' allotment program and limits the quantity produced. Growers in the Midwest are not subject to the marketing order, and hence, there are no limits on midwestern production. There are no marketing orders for peppermint.

Each spearmint grower in the Pacific Northwest has an allotment base, which is determined by spearmint oil sales plus inventory during a set period before the order was enacted. Each year the marketing order committee (composed of growers) determines spearmint demand for the year and allocates the expected quantity demanded to each grower's base allotment.

Oils produced in certain locations are considered to be of premium quality due to their flavor. For example, peppermint oil from the Willamette Valley in Oregon, and spearmint oil produced in the Midwest, are considered premium oils. These oils receive a higher price than the peppermint or spearmint oils produced in other locations. Also, Scotch spearmint oil has a more desirable flavor than native spearmint oil, and it also receives a higher price.

Peppermint oil has more end uses than does spearmint oil because of consumer preferences. Peppermint is the number-one mint used in chewing gum, the most important use of mint. It is also used extensively in toothpaste, mouthwash, candy, and liqueur. Spearmint is used mostly in toothpaste and mouthwash. Both are used in medicines.

Mint oil is marketed by 6 to 7 dealers (brokers) in the United States. These dealers act as middlemen, purchasing the oil from the growers, mixing it to obtain the correct flavor for the designated end user, and selling to both domestic and international end users. Examples of major end users include Wrigley's, Warner Lambert, and Colgate.

Peppermint and spearmint both require similar production practices, and have similar weather, soil, and light requirements. They are planted and harvested in the same manner, using the same equipment. However, it is necessary that peppermint and spearmint be grown in different fields so that they can be harvested separately. They can be planted in adjacent fields, as long as the plants can be kept apart at harvest. Peppermint and spearmint do not cross-pollinate, so the species remain pure.

Proper temperature and day length are essential to the quality and quantity of oil produced. Mint requires long periods of sunlight to obtain the largest quantity of oil. Nearly all mint is grown in the northern U.S., where 13 or more hours of sunlight are available during the summer months.

Oil quality is highest when mint is grown in locations with hot days and cool nights. Cool night-time temperatures minimize the presence of menthofuran, which imparts a bitter taste to the oil. Most oil that is high in menthofuran is exported to countries that have more of a preference for the bitter flavor than do most Americans.

Mint is a perennial that may be productive for up to 15 years. Generally, the longevity of a commercial mint field is three to seven years. After this period, mint is rotated to another field. Rotating mint out of a field allows replenishment of nutrients and is essential for the control of verticillium wilt, the major peril affecting mint production.

Verticillium wilt affects the mint plant gradually. The fungus first infects the roots and then kills the stem. Plants are stunted because of shortened internodes. The leaves turn yellow and may eventually become red. The mint plant's opposite leaves bend towards each other because of asymmetric growth. Stands become thin as individual plants die. After the first year or two of infection, the verticillium fungus begins to lessen the quantity and quality of production. After the plants have been in a verticillium-infested field for several years, the disease can cause the destruction of the entire stand.

Other production perils include excess moisture (which can promote fungal diseases), days and nights that are too warm (which increases the menthofuran level in the mint oil, reducing its quality), drought (especially in the Midwest and Montana, where irrigation is less common than in the Pacific Northwest), and excessive cold.

The demand for mint insurance would most likely be greatest in the Midwestern mint-producing states. These states have experienced several crop losses in recent years, and appear to be the most interested in crop insurance coverage for mint. Droughts and excessive moisture have been the major perils.

Disaster assistance payments also provide an indicator of Midwestern demand. Midwestern growers accounted for less than a fifth of peppermint production between 1988 and 1993, but received over half the disaster payments made for that crop. Indiana, Michigan, and Wisconsin accounted for about 20 percent of spearmint output, but received 86 percent of total spearmint disaster payments.

While participation in the program may be lower in the Pacific Northwest, there is also a potential need for insurance in that area. Water shortages, hail, and in some instances, cold winters, can reduce production and destroy the mint crop.

Peppermint and Spearmint: An Economic Assessment of the Feasibility of Providing Multiple-Peril Crop Insurance

Introduction

Mint is grown primarily for the oil produced from its leaves. The two major species of mint grown for commercial uses are peppermint and spearmint. Peppermint is grown more widely in the United States because its taste is preferred to that of spearmint. Both types of mint require similar production practices, and many growers produce both types.

This report examines those aspects of the U.S. mint (spearmint and peppermint) industries that relate to the demand for crop insurance and the feasibility of developing a mint crop insurance policy.

The Mint Industry

The mint industry is composed of growers, dealers, and manufacturers. Growers both produce and distill the mint plant to obtain oil. Dealers act as middlemen between growers and the final end users of the oil. Dealers blend the mint oils to obtain the exact flavor for the appropriate end use. End users of mint oil are the manufacturers of chewing gum, toothpaste, mouthwash, candies, and medicines. Each product has a specific flavor associated with it and with the specific manufacturers' brand-name. The final blended-oil flavor must exactly match the requirements for that product.

When a manufacturer needs oil, a dealer is contacted, who either develops a blend from existing stocks or purchases new oil from growers. Dealers also provide storage facilities for growers' oil stocks.

Only a small quantity of the mint grown in the United States is used in tea. Again, dealers act as middlemen between growers and tea manufacturers. Most growers do not grow solely for tea purposes.

The Mint Market

Supply

Peppermint is the major mint produced in the United States. Between 1972-75 and 1990-94, production of peppermint increased 108 percent (Table 1). While spearmint is less popular than peppermint, its production also rose during this period, by 87 percent (Table 2). Very little mint oil is imported, as it is considered inferior to domestic oil. Imported oil is usually blended with domestically-produced oil and re-exported.

Washington and Oregon are the two largest producers of both species of mint. Indiana is the third-largest mint producer in terms of acreage. Mint production has only begun in the past several years in Idaho, with acreage devoted to mint showing signs of expanding (Table 3). Mint is also produced in Wisconsin, Montana, and other states.

Mint oil can be stored indefinitely, and is held by growers, dealers, and manufacturers. During years when oil production is low, or if the quality is poor, existing reserves are used as needed.

Table 1--U.S. peppermint oil, all uses: Supply, use, and price, 1970-95

Year	Supply			Utilization			Season-ave price 3/	
	Production 1/	Imports 2/	Total	Exports 2/	Total	Per capita use	Current dollars 1/	Constant 1987 dollars
	----------1,000 pounds----------					Pounds		$/pound
1970	5,007	5.0	5012.0	1,951.0	3,061	0.0149	3.68	10.48
1971	3,746	16.0	3762.0	2,540.0	1,222	0.0059	4.10	11.08
1972	3,004	8.0	3,012	2,227.0	785	0.0037	5.25	13.49
1973	3,173	4.0	3,177	2,409.0	768	0.0036	7.89	19.10
1974	3,302	7.0	3,309	2,197.0	1,112	0.0052	13.80	30.73
1975	3,753	9.0	3,762	1,603.0	2,159	0.0100	12.60	25.61
1976	3,700	33.0	3,733	2,194.0	1,539	0.0071	14.80	28.30
1977	4,409	18.0	4,427	2,023.0	2,404	0.0109	14.30	25.58
1978	5,557	6.6	5,564	2,506.7	3,057	0.0137	10.60	17.58
1979	4,713	6.6	4,720	2,755.8	1,964	0.0087	9.91	15.11
1980	4,611	11.0	4,622	2,206.8	2,415	0.0106	9.40	13.11
1981	4,191	6.6	4,198	2,085.6	2,112	0.0092	9.39	11.90
1982	3,668	6.6	3,675	2,389.8	1,285	0.0055	9.24	11.03
1983	3,867	15.4	3,882	2,169.3	1,713	0.0073	10.10	11.58
1984	4,334	6.6	4,341	1,880.5	2,460	0.0104	10.80	11.87
1985	4,317	8.8	4,326	1,869.5	2,456	0.0103	10.20	10.81
1986	4,328	101.4	4,429	2,356.7	2,073	0.0086	10.70	11.04
1987	4,495	158.7	4,654	2,658.8	1,995	0.0082	11.70	11.70
1988	5,360	37.5	5,397	2,709.5	2,688	0.0110	15.90	15.30
1989	6,652	15.4	6,667	3,313.5	3,354	0.0136	13.10	12.07
1990	6,953	34.2	6,987	3,495.7	3,492	0.0140	13.90	12.27
1991	6,561	55.8	6,617	3,695.9	2,921	0.0116	13.30	11.31
1992	7,383	89.7	7,473	3,458.4	4,014	0.0157	12.80	10.59
1993	6,027	323.5	6,351	3,649.0	2,701	0.0105	13.30	10.77
1994	7,434	673.3	8,107	4,664.3	3,443	0.0132	14.60	11.56

-- = Not available.f = ERS forecast.

1/ Source: National Agricultural Statistics Service, U.S. Dept. of Agriculture.

2/ Source: Bureau of the Census, U.S. Dept. of Commerce.

Table 2--U.S. spearmint oil, all uses: Supply, use, and price, 1970-95

Year	Supply			Utilization			Season-ave price 3/	
	Production 1/	Imports 2/	Total	Exports 2/	Total	Per capita use	Current dollars 1/	Constant 1987 dollars
	---------- 1,000 pounds ----------					Pounds		$/pound
1970	2,216	--	2,126	632.0	1,494	0.0073		0.00
1971	2.108	--	2,008	838.0	1,170	0.0056		0.00
1972	1.511	--	1,511	842.0	669	0.0032	5.14	13.21
1973	1,348	--	1,348	1,101.0	247	0.0012	8.22	19.90
1974	1,455	--	1,455	982.0	473	0.0022	10.70	23.83
1975	1,778	--	1,778	861.0	917	0.0042	10.40	21.14
1976	1,686	--	1,686	1,167.0	519	0.0024	12.30	23.52
1977	2,329	--	2,329	996.0	1,333	0.0061	12.40	22.18
1978	3,244	0.0	3,244	1,040.6	2,203	0.0099	7.46	12.37
1979	1,921	4.4	1,925	1,353.6	572	0.0025	8.72	13.29
1980	2,139	17.6	2,157	1,183.9	973	0.0043	9.61	13.40
1981	2,177	61.7	2,239	1,029.6	1,209	0.0053	9.42	11.94
1982	1,355	105.8	1,461	901.7	559	0.0024	12.60	15.04
1983	1,596	55.1	1,651	749.6	902	0.0038	12.30	14.11
1984	2,019	163.1	2,182	857.6	1325	0.0056	12.60	13.85
1985	2,317	26.5	2,343	809.1	1,534	0.0064	11.70	12.39
1986	2,658	24.3	2,682	910.5	1,772	0.0074	11.40	11.76
1987	2,060	180.8	2,241	822.3	1,418	0.0058	12.10	12.10
1988	1,745	152.1	1,897	985.5	912	0.0037	12.80	12.32
1989	1,846	134.5	1,980	1,393.3	587	0.0024	13.90	12.81
1990	2,565	327.8	2,893	1,446.6	1446	0.0058	14.90	13.15
1991	3,108	410.4	3,518	1,492.3	2,026	0.0080	13.90	11.82
1992	3,640	529.7	4,170	1,420.3	2,749	0.0108	12.80	10.59
1993	2,722	702.1	3,424	1,544.9	1,879	0.0073	12.30	9.96
1994	2,213	939.5	3,152	1,631.0	1,522	0.0058	12.30	9.74

--=Not available

1/Source: National Agricultural Statistics Service, U.S. Dept. Of Agriculture.

2/Source: Bureau of the Census, U.S. Dept. Of Commerce.

3/Deflated by the GDP implicit price deflator.

Table 3.Mint production by state, 1990-94

State and year	Peppermint			Spearmint		
	Area harvested	Yield	Total production	Area harvested	Yield	Total production
	1,000 acres	Pounds (oil)	1,000 pounds	1,000 acres	Pounds (oil)	1,000 pounds
Idaho:						
1990	13.0	73	949	2.7	86	232
1991	15.1	72	1,087	3.2	90	288
1992	14.9	80	1,192	2.9	103	299
1993	14.2	74	1,051	2.2	84	185
1994	16.0	80	1,280	1.5	84	126
Indiana:						
1990	15.8	39	616	4.8	30	144
1991	24.0	31	744	7.4	30	225
1992	26.0	36	936	8.5	30	255
1993	18.0	36	648	6.0	32	192
1994	20.0	38	760	6.0	34	204
Oregon:						
1990	46.0	73	3,358	1.9	76	144
1991	47.5	64	3,040	2.0	80	160
1992	47.5	71	3,373	2.0	85	170
1993	43.2	60	2,592	1.9	85	162
1994	44.0	73	3,212	1.7	83	141
Washington:						
1990	18.1	93	1,683	14.7	114	1,676
1991	18.1	71	1,285	17.3	108	1,866
1992	17.2	100	1,720	17.4	150	2,611
1993	18.4	88	1,619	13.3	145	1,929
1994	22.7	88	1,998	10.5	139	1.460
Wisconsin:						
1990	8.9	39	347	7.4	41	303
1991	9.0	45	405	9.4	49	461
1992	6.0	27	162	7.4	29	215
1993	4.5	26	117	6.3	26	164
1994	5.1	36	184	6.0	34	204
U.S.:						

1990	101.8	68	6,953	33.7	76	2,565
1991	113.7	58	6,561	42.4	73	3,108
1992	111.6	66	7,383	41.1	89	3,640
1993	98.3	61	6,027	32.5	84	2,722
1994	107.8	69	7,434	28.4	78	2,213

Source: U.S. Department of Agriculture, National Agricultural Statistics Service, Annual Crop Summary, various issues.

Spearmint Marketing Order

Spearmint grown in the Pacific Northwest is subject to a spearmint marketing order (see Appendix I). The marketing order is a growers' allotment program and limits the quantity produced. Growers in the Midwest are not subject to the marketing order, and hence, there are no limits on midwestern production.

Each spearmint grower in the Pacific Northwest has an allotment base, which is determined by spearmint oil sales plus inventory during a set period before the order was enacted. Each year the marketing order committee (composed of growers) determines spearmint demand for the year and allocates the expected quantity demanded to each grower's base allotment.

If a grower produces more than the allotment, the excess oil goes into the reserve maintained by the committee. If demand for the year is higher than estimated, the committee revises the allotment for each grower, and the grower can withdraw his or her own oil out of the reserve to meet the allotted level.

New growers can enter spearmint production in one of two ways. One way is to buy base from an existing grower. The second way is to obtain a new allotment base, as set by the committee each year. When the committee is determining allotment bases, it adds a new base equal to one percent of the existing base. One-half of this new base (one-half a percent) is made available to new growers. New growers must apply to the committee and a lottery system is used to determine who will get the new base. The new base is about 2,000 pounds of oil for each new grower (Boersma).

Demand

In the United States, the taste of peppermint is preferred to spearmint. As a result, peppermint has more end uses than does spearmint. Peppermint is the number-one mint used in chewing gum, which is the most important use of mint. It is also used extensively in toothpaste, mouthwash, candies, and liqueurs. Spearmint is used mostly in toothpaste and mouthwash. Both mints are used in medicines.

The highest-quality oils are used in chewing gum, toothpaste, and mouthwash, where the flavor is an important element in determining product demand. For candy, mint is typically added to other desirable flavors, and therefore, a poorer-quality oil is at times sufficient. For medicines, the oil is added to make the medicine more palatable and taste is not as essential as for certain other products. As a result, poorer quality oils may be used.

The United States produces the world's highest-quality oil, and world demand for U.S. oil is growing. Between 40 and 50 percent of U.S.-produced mint oil is exported. The leading markets are England, Japan, and other European Union countries. Preferences in some of these countries differ slightly from those in the United States, and oils that would be considered poor quality here are desirable elsewhere. For example, while Americans do not generally like the taste of oil with high levels of menthofuran, the British and Japanese like the taste (Lundy). Therefore, much of the oil with high menthofuran levels is exported.

The use of peppermint leaves for tea is a very small market, although it has been growing in recent years. Only about 2,000 to 2,500 acres of peppermint, about two percent of U.S. total acreage, is used for tea. Almost all of the mint that is used for tea leaves is produced in Oregon and Washington.

Prices

Peppermint oil prices are set by brokers, depending on the demand of end users and available supplies. Oil demand was quite strong in 1994, and prices increased even though production was up (Lundy).

By controlling supplies, the spearmint marketing order influences spearmint oil prices, even in the Midwest. However, brokers (or dealers) determine the actual prices charged to end users. In the past, spearmint oil prices were usually lower than peppermint oil prices because the demand for spearmint oil was lower. Since initiation of the marketing order, however, spearmint oil prices are often higher than peppermint oil prices (Boersma).

Quality is often a factor considered by brokers in determining oil prices for individual barrels. Off-flavors in the oil, such as the presence of weed oil or another mint oil, will lower the barrel's price (Lucak).

Oils produced in certain locations are considered to be of premium quality due to their flavor. For example, peppermint oil from the Willamette Valley in Oregon, and spearmint oil produced in the Midwest, are considered premium oils (Lundy). These oils receive a higher price than the peppermint or spearmint oils produced in other locations. Also, Scotch spearmint oil has a more desirable flavor than native spearmint oil, and it also receives a higher price.

Contracts between growers and brokers are a way for growers to establish a degree of price certainty for their mint crop. Contracts also provide brokers with assurance that they will have sufficient supplies to meet demands from end users (Morlan). A grower may put part or all of his or her mint acreage under contract with a broker at an approximate price (Mauer). The contract can be for one or more years. In Oregon, many growers contract about 10 percent of their mint acreage with brokers for 3-year contracts (Mitchell).

Cultivation and Management Practices

Peppermint and spearmint both require similar management practices, and have similar weather, soil, and light requirements. They are planted and harvested in the same manner, using the same equipment. Many growers plant both mints. However, it is necessary that peppermint and spearmint be grown in different fields so that they can be harvested separately. Mixing mints in one field contaminates the oil because the different mint species cannot be separated at harvest. They can be planted in adjacent fields, as long as the plants can be kept apart at harvest. Peppermint and spearmint do not cross-pollinate, so the species remain pure.

Climate

Proper temperature and day length are essential to the quality and quantity of oil produced. Mint requires long periods of sunlight to obtain the largest quantity of oil. Nearly all mint is grown in the northern U.S., where 13 or more hours of sunlight are available during the summer months.

Oil quality is highest when mint is grown in locations with hot days and cool nights. Cool night-time temperatures minimize the presence of menthofuran, which imparts a bitter taste to the oil. Most oil that is high in menthofuran is exported to countries that have more of a preference for the bitter flavor than do most Americans.

Soil Requirements

Mint can grow in a variety of soils, but prefers soils that are well-drained. In the Midwest, mint was at one time mostly grown in muck soils. In the West, and increasingly in Indiana, mint is grown on silt, clay, and sandy soils.

Varieties

Three varieties of peppermint and two varieties of spearmint are produced in the United States. Each variety has a slightly different flavor. Variations in flavor are often undetectable to most people, but affect the flavor of the final blend.

The original peppermint variety (*mentha piperita*) is Black Mitcham, brought to the U.S. from Great Britain. It is the most common variety produced in the United States, although it is also the most susceptible to verticillium wilt.

From Black Mitcham, two newer peppermint varieties were developed: Todd Mitcham and Murray Mitcham. Murray Mitcham is considered to be more vigorous than Todd Mitcham, especially during its first year. It is more resistant to verticillium wilt than either of the other two peppermint varieties.

The two spearmint varieties are native spearmint (*mentha spicata*) and Scotch spearmint (*mentha cardiaca*). Both varieties are grown in the Midwest and the Pacific Northwest. Native spearmint is hardier than Scotch spearmint, and is resistant to verticillium wilt. However, it has a less desirable flavor than Scotch spearmint and, therefore, is grown less widely.

Planting

Mint is a perennial that may be productive for up to 15 years. Generally, the longevity of a commercial mint field is three to seven years. After this period, mint is rotated to another field. Rotating mint out of a field allows replenishment of soil nutrients and is essential for the control of verticillium wilt.

The mint plant is sterile and must be grown by root stock (rhizome or stolon) propagation. About five to ten percent of a planted field is used to provide root stock for growers' new fields. Roots are dug from a field using a chain digger in the spring or fall, immediately prior to planting. They are placed in a large planter that is similar to a manure spreader. The planter has a beater attachment, which cuts the roots into small pieces and spreads them in the new field. The planter first opens furrows in the soil, and then drops the root pieces in the soil and closes the furrow.

Peppermint root stock also can be purchased as certified (verticillium-free) root stock, most of which originates in Oregon. This stock is obtained from tip cuttings, which produce new roots in greenhouse settings. Root stock can be expensive, and is mostly used when planting a field to mint for the first time. On fields that have been previously planted to mint, verticillium wilt will generally already be present, and growers consider the added expense of certified root stock less justified.

Fertilization

Nitrogen is an important element in mint production, and helps enhance leaf growth by delaying maturity. Once a plant matures, it begins to flower and the quality and quantity of oil decreases. Nitrogen is generally applied at the beginning of the growing season. If the plants begin to show signs of flowering and the grower wants to delay the process, nitrogen may be applied again during the growing season.

Lime may be needed in the Midwest on muck soils to raise the pH to between 5.5 and 6.5. Phosphorus and potassium are also added to the soil, when needed, to enhance fertility.

Irrigation

All mint production in the western U.S. is irrigated. In Oregon and the Yakima Valley of Washington, sprinklers are used for irrigation. In other western states, furrow irrigation is the most common method. In the Midwest, the water table can be controlled by raising or lowering gates in drainage ditches. Generally, little irrigation is used in the Midwest.

Pesticides

Weed control is very important in mint production. Not only do weeds compete with the mint plant for nutrients, any weeds in the field will be harvested with the mint and affect the flavor of the oil.

Two herbicides are used in mint production, Sinbar (terbacil) and Basagran (bentazon). Sinbar is the more commonly used. While it is effective in controlling weeds, it has a long residual life and limits the crops that can be rotated onto the acreage.

Harvesting

Mint is harvested when the plants are at less than 10 percent of full bloom. Peppermint is cut once a year, between late July and early August. Native spearmint, and at times, Scotch spearmint, grows more quickly than peppermint. On the West Coast, these species can be harvested twice during the growing season, between late June and early July, and again in mid-August (Lundy). Scotch spearmint, however, does not always have an early harvest. Spearmint grown in the Midwest has only one harvest, at the same time as peppermint.

Mint is harvested in a similar manner to hay. First, the field is cut and left laying in rows (windrows). The cut mint (often referred to as hay) is left in windrows from two to five days to dry, allowing much of the plant's moisture to evaporate. Mint should not be allowed to become too dry or the leaves will shatter and some of the oil will be lost. If it is too green, however, it will be difficult to distill.

When the crop is adequately cured, the grower uses a forage chopper to chop the mint finely and to blow it into a mint tub attached to the chopper. A standard tub will hold the hay from about 3/4 to 1-1/4 acres, depending on the yield (Lacy, Stephens, Green, and York). When full, the tub is disconnected from the chopper and taken directly to a distillery.

Mint harvested for tea is also cut and windrowed. Once the leaves have dried sufficiently, the plant is combined, which separates the plant's leaves from the stems. The fragmented leaves are sold to a dealer, who sells to the tea companies. Almost all of the tea mint produced in the U.S. is grown in the Pacific Northwest. Summers in the Midwest are usually too damp to allow for proper curing of the leaves needed for tea.

Packing and Shipping Mint

Large producers usually own their own distilleries. Because distilleries are expensive, some smaller growers contract with larger growers for distilling. Under certain contract arrangements, large growers will perform all harvesting activities, including cutting, chopping, and distilling. In the Midwest, small growers often do their own harvesting, but take the cut mint to larger growers for distilling.

Mint production needs to be near a distillery to minimize losses in oil quantity and quality. As the chopped mint plant sits in the tub, the outside heat can essentially "cook" the contents. The heat inside the tub can cause the oil to evaporate from the leaves and change the components in the remaining oil, affecting its quality (Simon). Distance from a distillery also increases costs to growers, with 10 miles considered the outside limit for hauling mint tubs (Lucak).

Once in the distillery, the mint tub is attached to a boiler. Steam generated by the boiler is directed into the bottom of the tub and vented out the top into a condenser. As steam passes through the mint leaves, it combines with the oil in the leaves. As it rises and passes through the condenser, the steam is converted into a mixture of water and mint oil. The liquid mixture then passes through a separator, which removes the water from the oil.

The distilling process takes about two hours, depending on the size of the tub. An average tub yields 80 pounds of oil. The refined oil is then stored in 55-gallon galvanized drums. Each drum holds about 400 pounds of oil, the average yield from approximately 5-1/2 acres (Oregon Mint Commission). Oil can be stored indefinitely in these air-tight drums.

Marketing

Mint oil is marketed by 6 to 7 dealers (brokers) in the United States. These dealers act as middlemen, purchasing the oil from the growers, mixing it to obtain the correct flavor for the designated end user, and selling to both domestic and international end users. Examples of major end users include Wrigley's, Warner Lambert, and Colgate.

Dealers purchase the oil or leaves (for tea) directly from growers. Dealers have field managers who inspect fields during the growing season to estimate the size of the crop and to ensure that weeds are kept to a minimum.

Once the crop is distilled into drums, dealers grade the oil by analyzing its water content, smell, and taste. Based on their analysis, they decide whether or not to purchase the oil and at what price. They then transport the drums to their storage facilities. Dealers also provide storage for growers' drums.

The flavor and quality of the oil varies for each drum harvested, and also for each production region. Blending to obtain the very specific taste required for each end product is a very guarded process, both by the dealer and the final-product manufacturer.

Because blending oil to obtain the desired flavor is an exacting science, dealers must first qualify with manufacturers before they can sell them oil. They send samples to the manufacturers, who then inspect the dealers' laboratories, examine their methods and records, and analyze the manuals that explain the step-by-step procedures they use to obtain exact blends. Dealers also have agents around the world to sell their oils.

Once the dealers receive a request for oil from a specific manufacturer, they blend the oils from different drums to obtain the correct flavor for that brand of gum, toothpaste, mouthwash, candy, medicine, or liqueur. About 80 percent of U.S. mint oil production is destined for chewing gum, toothpaste, and mouthwash. The remaining 20 percent is used in candies, medicine, and liqueurs.

Mint leaves for tea are purchased by brokers, who sell to tea companies. Only a few growers produce mint for tea, and very few brokers deal in mint tea leaves.

Costs of Production

For the first year of mint production, the activities required to plant the field represent the major production costs. Harvesting costs during the first year are less than 20 percent of total costs. Because mint is a perennial crop, and does not require planting every year, harvesting costs increase in proportion to total production costs after the first year. Harvesting costs generally range from 25 to 40 percent of total costs for an established stand, depending on the irrigation system used. Appendix II provides production cost tables for Oregon, Washington, and Indiana, detailed by planting year, age of stand, and irrigation system.

Although harvesting costs can be a large portion of total production costs, they are unlikely to be a factor in a producer's decision to harvest a mint field. The storability of the final product allows the producer to hold the product off the market until prices become favorable. Because producers have leeway in when they market their mint, moral hazard due to low market prices is not likely to be an issue for crop insurance for mint.

Production Perils

Commercial mint production faces various perils from weather, diseases, and insects. Verticillium wilt is the major peril confronted by mint growers in all production areas.

Excessive Moisture

Excess moisture can create a peril for mint production at various times during the production cycle. During the growing season, extended periods of excess moisture can increase the presence of the mint anthracnose fungus. If excess moisture occurs during harvest, the oil can develop a musty odor. If excess rain occurs after the crop has been cut, but while it is still in the field, the moisture can wash the oil off the leaves, reducing the yield of oil. A heavy storm can reduce oil yields by up to 10 to 15 percent (Morlan).

Too much moisture on mint plants grown in sandy soil also can decrease yields. Excess moisture can promote root rot, or cause the plants to produce fewer leaves. Since the oil is obtained from glands in the leaves, a low leaf-count would reduce yields (Mitchell).

Heat

High-quality mint production requires cool nights. Days and nights that are warm increase the level of menthofuran in the mint oil, reducing its quality in the U.S. market. While this oil commands a lower price in the U.S. market, it is a desirable flavor in England and Japan, and is exported.

Excessive heat is a particular problem in the Midwest, where fewer growers irrigate mint than in the Pacific Northwest. If hot weather persists for a prolonged period, the plants may wither and dry up.

In the Pacific Northwest, irrigation is used to help alleviate the effects of excessive heat. A problem may arise when reservoirs become depleted because of heavy water demands during prolonged periods of heat. In many parts of the Pacific Northwest, growers have no other source of irrigation water than the irrigation districts, and mint production may suffer if the reservoirs go dry (Lundy).

Excessive Cold

Excessive cold can affect mint because the plant roots are shallow. Excessive cold is mainly a problem for growers in the Midwest and eastern Oregon. Very cold winter temperatures can freeze the roots, killing plants. The remaining plants may be less vigorous the next year (Mauer). The effects of winter freezes are especially harmful if there is little or no snow coverage. Snow cover serves as a protective mulch.

A dry fall, followed by a cold winter, can destroy entire mint stands. A dry fall stresses the plant's roots, making the mint stand more susceptible to winterkill (Morlan). To guard again winter freezes in the Midwest, growers plow their mint under (no deeper than 4 to 5 inches) after the first killing frost to protect the roots.

A late spring frost may also reduce yields. Frost may kill off early growth, reducing plant vigor and resulting in smaller plants that year, having fewer leaves.

Drought

Drought is especially a problem in the Midwest and Montana, where few growers irrigate. Without enough moisture, the plants will wither or growth will be stunted. The stress on the plants causes yields to be reduced. A drought may also affect the root stock, potentially reducing next year's crop (Mauer).

In eastern Oregon, the Yakima Valley of Washington, and Idaho, mint producers are dependent on irrigation district reservoirs to supply their water needs. If the reservoirs are low due to little rain or short snowfall, growers may not be able to obtain enough water for optimum production (Lundy).

Depending on when reservoirs are depleted, both the current year's and next year's crops can be affected. If moisture supplies are depleted early in the production cycle, the current year's crop may be reduced. Low water supplies late in the fall may affect next year's crop.

Hail

Hail can destroy a mature mint crop by stripping the leaves from the plant. A severe hail storm can devastate whole fields. In 1990/91, hail storms leveled mint fields in Oregon, destroying several thousand acres (Morlan). While hail can reduce yields in the year which it occurs, it does not necessarily affect future production of the root stock.

Diseases

The number-one peril facing mint production is verticillium wilt. Once the verticillium fungus is established in the soil, mint can no longer be produced in infected fields. The presence of verticillium in the soil has forced mint production to move from the northeastern United States, where it was first planted, to the Midwest and West. Other diseases include mint rust and mint anthracnose (also called "leopard spot").

Verticillium Wilt

Verticillium wilt is caused by the soil-borne fungus *Verticillium dahliae*, which affects only mint plants. The fungus can survive for 10 or more years once it builds up in the soil, even if the soil is continuously fallowed. It can also survive indefinitely on the roots of many plants for which it does not cause the disease, including many weed species. As a result, once a field becomes heavily infested with verticillium, mint production can no longer take place in that field.

Crop rotation is only effective in preventing the buildup of verticillium wilt if practiced from the beginning of the mint production cycle. Profitable mint production may be maintained almost indefinitely by using rotations of 3 years in mint, followed by 3 years in other crops. Onions are a particularly good rotation crop.

Verticillium wilt affects the mint plant gradually. The fungus first infects the roots and then kills the stem. Plants are stunted because of shortened internodes. The leaves turn yellow and may eventually become red. The mint plant's opposite leaves bend towards each other because of asymmetric growth. Stands become thin as individual plants die. After the first year or two of infection, the verticillium fungus begins to lessen the quantity and quality of production. After the plants have been in a verticillium-infested field for several years, the disease can cause the destruction of the entire stand.

Two peppermint varieties, Todd Mitcham and Murray Mitcham, are tolerant, but not immune to, verticillium wilt. Certified root stock, grown from the tips of the peppermint plant, also helps control verticillium. This root stock is expensive, and most growers continue to use root stock harvested from other fields.

Native spearmint is resistant to verticillium wilt, but Scotch spearmint is not. Native spearmint is not a substitute for Scotch spearmint because they each have a different flavor.

Mint Rust

Mint rust, *Puccinia menthae*, affects mint plants in most growing regions of the country, except for central Oregon. There are two types of mint rust. The rust that infects peppermint does not infect native spearmint, nor will the rust that infects native spearmint infect peppermint. Both types of rust can infect Scotch spearmint. In the Midwest, spearmint is more susceptible to rust than is peppermint.
Rust causes light-yellow, blister-like lesions to appear on young shoots in the spring. Later in the season, brownish-red spots surrounded by a yellow halo appear on the leaves. Affected leaves may eventually drop off, causing the plant to become severely defoliated. When rust infects young plants, the shoots usually become twisted and distorted, and break off easily at the point of infection. In late summer and fall, the spots on the leaves become deep-chocolate brown, as the overwintering spores of the fungus are produced.

Clean fall plowing of mint beds is necessary to control rust. Overwintering spores on the stubble, on regrowth, or on the soil surface will be buried so that they cannot germinate and infect mint shoots or leaves the following year. Fungicides can also help control rust (Lacy, Stephens, Green, and York; Simon).

Mint Anthracnose or Leopard Spot

Mint anthracnose, also known as "leopard spot," is caused by the fungus *Sphaceloma menthae*. The fungus causes small, sunken brown spots to appear on the lower leaves, stems, and roots. These spots enlarge to form oval lesions with light gray centers and reddish-brown borders, and may unite. Mint anthracnose may cause defoliation and cankers, which may lead to splitting of the stem. Heavily-infected plants are weakened and oil yields are reduced. Anthracnose may become severe during wet seasons when the mint foliage is wet for long periods.

Anthracnose overwinters mainly in mint refuse, rather than in the soil. Clean fall plowing usually prevents the disease from reappearing the following year (Lacy, Stephens, Green, and York).

Insects

Insects that create problems for mint production include mint-flea beetles, loopers, cutworms, spider mites, and mint-root borers. These insects can be controlled by pesticides. Often, however, the insects are hard to detect in their early stages of infestation.

Mint-Flea Beetles

The mint-flea beetle is a problem mainly for growers in the Midwest. It first appears in fields in mid-July, and population levels rise until early August. Most of the adult flea beetles' activity is confined to the bottom half of the mint plant and may go unnoticed until they are quite numerous. The adults feed on the leaves, creating holes.

Female mint-flea beetles lay their eggs in late fall. The eggs remain dormant in the soil until late April or early May. After hatching, the larvae feed first on the fine hair roots, and then tunnel into the underground parts of the stem, where they continue to feed. Damage to the underground parts is visible as tracks or tunnel marks.

Larval damage caused by the mint-flea beetle is far more serious than that of the adult beetle. In addition to interfering with water and nutrient uptake, feeding damage provides an entrance for pathogens and promotes plant stress. Stress can cause the plant to be stunted. A reddish-purple discoloration may appear on new growth, although spearmint may not show this color change.

Mint-flea beetle larvae are difficult to control. The best way to control an infestation is to control the adult population through frequent crop rotation and chemicals (Lacy, Stephens, Green, and York).

Loopers

Loopers are caterpillars that have an inchworm or looping habit, and include the mint looper, celery looper, and cabbage looper. Adult loopers are dark moths which fly at night. They lay eggs singly on plant leaves, and the larvae that hatch from these eggs feed on leaf surfaces. As they mature, they begin to eat ragged-edged holes in the leaves, from the top to the bottom of the plant.

Large populations of loopers may seriously affect oil yields by feeding on the mint leaves. While some loopers may be found through the summer, the mint looper, the most common and the most serious type, appears in mid-June and again in mid-August. The second brood can cause serious damage in this pre-harvest period. Loopers can be controlled with pesticides.

Cutworms

Cutworms are caterpillars that attack several crops including mint, potatoes, and tomatoes. Cutworm moths fly at night and lay eggs in bunches throughout a field, causing circular infested areas throughout. The first infestation of larvae appear in mid-spring. A second infestation occurs about mid-July, and a third in mid-to-late August.

The larvae (caterpillars) feed on all portions of the plant, but are usually found under the canopy. They can be controlled with pesticides.

Spider Mites

When spider mite populations are low-to-moderate in size, they are generally found on the undersides of leaves and feed by sucking out cell contents. As the chlorophyll is removed, the plant takes on a mottled appearance, and the leaves eventually turn bronze or brown. During heavy infestations, leaves drop and plant vigor is reduced. Spider mite populations are highest in hot, dry years. Mites can be controlled with pesticides.

Mint-Root Borers

The mint-root borer grows in the stems of the mint plant. If infected, the top three to four inches of the plant's stem will appear wilted. If the stem is split at the joint where the wilting originated, the larva can often be found. If the infestation is severe, the borer can destroy a stand.

Nematodes

The root-lesion nematode is the major nematode affecting spearmint and peppermint. The greatest problem associated with this nematode is that it interacts with verticillium wilt, making the wilt more severe.

Root-lesion nematode

The root-lesion nematode feeds on the roots of the mint plant, inhibiting root and plant growth. In large numbers, root-lesion nematodes not only stunt growth of the mint plant, but also cause more severe symptoms of verticillium wilt to appear than would occur without the nematodes' presence. Using a soil fumigant before planting and using clean, healthy planting stock are the only ways of controlling the root-lesion nematode.

Weeds

Weeds are a significant problem in mint production, and can affect the quantity and quality of oil produced. Quantity is affected because weeds compete with the mint plant for soil and water, reducing the number of mint plants and the quantity of mint leaves. Quality is affected when weeds are harvested with the mint. Once distilled, the weed oil will mix with the mint oil. If the weeds are present in a large quantity, their oil can give the mint oil an off-odor, and may make the oil unmarketable or reduce its value. Dealers, however, are often able to remove part of the weed oil.

Weeds are controlled by herbicides and by manual labor. Weeding fields is the most labor-intensive component of mint production.

State Analyses

Indiana

Indiana is the third-ranked state in mint acreage. Both peppermint and spearmint are grown in the state. Most of Indiana's mint production takes place in the northern part of the state in Starke, St. Joseph, Pulaski, and La Porte counties. In 1994, Indiana accounted for 10 percent of total U.S. peppermint oil output and 9 percent of total spearmint oil output (USDA, NASS).

Indiana had 150 farms producing mint on 34,487 acres in 1992, up from 57 farms and 10,927 acres in 1987 (1992 Census). The average mint grower in Indiana has 800 to 1,000 acres of mint, on farms averaging about 2,000 acres (Lucak). About half of Indiana's mint growers produce both peppermint and spearmint. In Indiana, mint production averages about 35-45 pounds of oil an acre. Both peppermint and spearmint are harvested once in August.

Mint fields in Indiana are generally rotated to a different crop every four years. Mint is rotated most often with corn and soybeans, although a small number of growers rotate their mint with potatoes, onions, and seed corn (Lucak, Simon). Mint is grown mostly on either sandy or muck soils. Very few growers in the state irrigate their fields. Mint fields are plowed under every year after harvesting to protect the root stock from insects and cold winter temperatures.

Most mint growers harvest and distill their own mint (Lucak). Only a few growers contract with other growers.

Production Perils

Because few growers irrigate, the major peril to mint production in Indiana is drought. Drought stunts the mint plants' growth, making the plants too short for harvest. Those plants that grow tall enough to be cut have been stressed, reducing the quantity of oil production. Indiana mint growers received disaster assistance payments in 1988 and 1991 due to droughts. In 1988, payments exceeded $1 million.

Floods also reduce mint production in Indiana. The effects of flooding are severest when it occurs immediately before a harvest. Flooding can cause the mint leaves to drop from the plant, reducing output (Lucak).

Flooding earlier in the production cycle can also destroy the mint harvest. Because much of Indiana's mint production takes place on sandy soil, flooding is less of a problem than when a higher proportion occurred on muck soils. Sandy soils do not hold water to the extent that muck soils do, and plants may have the time to recover and produce new leaves after the flood abates.

Excessive moisture can also cause poor mint quality and reduce the yields and composition of the oil (Simon). Excessive moisture can particularly be a problem if it occurs after the crop has been harvested and is left in the field to dry. Excessive moisture prevents the mint hay from drying and may cause the hay to become moldy. The quality of the oil would be reduced drastically in the event of moldiness.

Indiana's relatively wet summer and fall weather prevents its mint growers from producing mint for tea. Mint leaves for tea must be left in the field longer than those used for oil. In most years, the chance of wet weather near harvest-time does not provide growers enough time to dry the leaves properly for tea use.

Winter cold is not considered a problem as long as growers follow good management practices (Lucak). Plowing the roots under after harvest helps protect them from cold temperatures. Dry weather in the fall after a harvest may cause a poor root stand in spring. Weeds, which compete with mint roots for nutrients and can taint the oil, are also a peril.

Demand for Crop Insurance

The demand for crop insurance is expected to be high in Indiana and among most Midwestern mint producers. The major need for insurance in this area is in response to drought. Mint production has realized low yields several times over the past few years because of drought. Since most growers in Indiana and other Midwestern states do not irrigate to limit the effects of drought, losses have at times been high.

Oregon

Oregon ranks number-one in peppermint production and number-three in spearmint production in the United States. Mint production is concentrated in Linn, Jefferson, Lane, and Crook counties. In 1994, Oregon accounted for 43 percent of total U.S. peppermint oil output and 6 percent of U.S. spearmint oil output (USDA, NASS).

In 1992, Oregon had 314 farms growing mint on 47,160 acres. This is an increase from 264 farms and 32,728 harvested acres in 1987 (1992 Census). The average mint farm in Oregon ranges from 40 to 200 acres in size (Crowe). Black Mitcham is the most popular variety of peppermint grown in the state, although growers are increasingly converting to both Todd Mitcham and Murray Mitcham (Crowe). In Oregon, mint production averages about 65 pounds of oil an acre, but can go as high as 100 pounds an acre (Mitchell).

Most of Oregon's mint is grown on mineral soils, and all of the state's output is irrigated. The most common methods of irrigation are sprinkler and furrow irrigation. Most of the mint is planted in the fall, although spring planting is also common. If the mint is planted in the spring a crop of "baby mint" will be produced the first year (Crowe).

Oregon is the major producer of certified root stock for peppermint, which provides a clean source of wilt-free stock (Morlan).

Peppermint in Oregon in harvested from about July 1 to August 20. Central Oregon growers harvest towards the end of this period (Crowe). The majority of growers do their own cutting, chopping, and distilling. A small number of growers pay other growers, who act as custom harvesters, to do all of their harvesting and distilling (Morlan).

Oregon mint producers rotate their mint crop after 5 to 8 years. In eastern Oregon, mint is rotated with garlic, onions, carrots, and turfgrass. Growers often also produce potatoes. In the Willamette Valley, mint is rotated with turfseed crops (Lundy).

Production Perils

The major perils to production in Oregon are cold weather in eastern Oregon, hail, wet weather at harvest, lack of an adequate supply of irrigation water, spider mites, mint rust in eastern Oregon, mint-flea beetles, cutworms, nematodes, weeds, and verticillium wilt (Lundy).

Eastern Oregon mint is susceptible to cold winters. If there is not enough snow to provide protection for the mint roots, winterkill can be a problem.

Excessive moisture can hinder oil production if it occurs after the mint has been windrowed. The moisture can make the crop moldy, affecting the quality of the oil. Excessive rain at this time can also wash the oil out of the leaves, reducing the quantity of oil produced by the crop (Morlan).

Hail can be a problem throughout Oregon, defoliating the plants. If hail occurs too close to harvest-time, the plants will not have time to recover and the mint crop will be lost. In 1990/91, hail leveled many fields in Oregon, affecting several thousand acres of mint (Crowe).

Mint production in Oregon is dependent on irrigation. However, in many parts of the state, growers are dependent on old irrigation reservoirs. As a result, there have been times when water was unavailable during the growing period, reducing the quantity of mint produced (Lundy).

Insects and nematodes can reduce yields by reducing leaf volume. In addition, weeds can reduce yields and the quality of the oil. Growers use pesticides and herbicides for control of these perils.

Verticillium wilt is a major problem in Oregon, as it is everywhere mint is produced in the United States. While growers can fumigate before planting to reduce the presence of verticillium, few growers actually do so. Most growers manage verticillium by rotating their mint to other fields before the presence of the disease becomes apparent. They then wait about 5 to 8 years before planting mint in that field again (Crowe).

Demand for Crop Insurance

For the most part, Oregon provides the ideal environment for mint production. Temperatures are generally moderate, with warm days and cool nights. Flooding is not a problem and almost all growers irrigate their fields.

The state does, however, experience crop failures under several circumstances. Eastern Oregon has the greatest potential need for crop insurance. This part of the state is dependent on old irrigation reservoirs. A lack of sufficient irrigation water can affect the present year's crop, as well as the following year's crop if the reservoirs become dry during the fall. Eastern Oregon can also suffer from cold winters. Winterkill has occurred in this region when cold winters have been coupled with low snowfall. A final important peril is hail, which has at times destroyed the mint crop.

Washington

Washington is the largest mint producer in the United States, producing the largest quantity of spearmint and ranking second in peppermint production. In 1992, there were 180 farms that harvested 31,731 acres of mint in Washington, up from 149 farms and 19,197 harvested acres in 1987 (1992 Census). Yakima County is the largest producer of mint, accounting for over half the mint oil produced in Washington in 1992. Other major mint-producing counties include Grant, Adams, and Benton (1992 Census).

Mint farms in Washington range from 20 acres to 500 acres, with the average about 60 to 70 acres (Mauer, Lundy). Farms in the Columbia Basin (Grant, Adams, Franklin, and Benton counties) tend to be larger and the growers are newer to the industry than those in the Yakima Valley (Mauer).

In Washington, more acreage is devoted to peppermint than to spearmint. In most years, however, the total quantity of spearmint oil produced is greater than peppermint oil. This is because spearmint grows faster than peppermint. In addition, due to the favorable climate in Washington (warm days and cool nights), native and sometimes Scotch spearmint can be cut twice, increasing the year's output.

Spearmint is first cut in late June and then again in early August, with the first cutting yielding the largest amount of oil. Peppermint is cut in late July or early August (Lundy).

Mint is rotated out of a field after 6 or 7 years of production. Mint is rotated with vegetables in the Yakima Valley. Elsewhere in Washington, the mint crop is rotated with hops, grapes, wheat, and barley. Growers usually produce three, four, or more different crops (Lundy).

Production Perils

Washington mint growers confront the same perils as do Oregon growers. The major perils include verticillium wilt, hail, weather that is too hot or too cold during the growing season, excessive moisture at harvest-time, water shortages from irrigation reservoirs, and weeds.

Demand for Crop Insurance

Washington, like Oregon, provides an ideal climate for mint production. Crop insurance may be most useful during water shortages and because of hail damage.

Ad Hoc Disaster Assistance for Mint

Ad hoc disaster assistance payments were available to growers with crop losses resulting from natural disasters between 1988 and 1993. Payments made to mint producers can be an indicator of their need for crop insurance. Table 4 shows the total payments made to all mint producers, broken down by peppermint and spearmint.

Payments for 1988-93 totalled $7.5 million, with $4.8 million dollars paid to peppermint growers for losses, and $2.6 million paid to growers for spearmint losses. Disaster assistance payments in 1988, at $3.6 million, accounted for nearly half the total payments made over the six-year period. As with many payments made in 1988, drought was the major cause of loss. Mint growers also received large payments in 1991 and 1993 because of crop losses resulting from a lack of irrigation water (1991 in Oregon) and excessive moisture and late spring frost (1993 in the Midwest and Pacific Northwest).

Disaster assistance payments made to certain states were disproportionately large relative to their share of production. Table 5 shows that while Midwestern states accounted for less than a fifth of peppermint production between 1988 and 1993, they received over half the disaster payments made for that crop. The same is true for spearmint payments. Indiana, Michigan, and Wisconsin accounted for about 20 percent of spearmint production, but received 86 percent of total spearmint disaster payments.
The "share of production" measure is not necessarily the best indicator of potential risk because it includes several years where Midwest production was reduced relatively more than in the Pacific Northwest due to poor weather. It does, however, indicate the regions most susceptible to mint crop losses and therefore, areas where the needs and demands for crop insurance will likely be the greatest.

Mint Insurance Implementation Issues

Adverse Selection

The major peril to peppermint and spearmint production is verticillium wilt. The new varieties of peppermint are more tolerant of verticillium wilt than the standard Black Mitcham variety, although they,

Table 4--Total disaster assistance payment for mint by State, 1988-93

State	Total ad hoc disaster assistance payment for 1988-93		
	Peppermint	Spearmint	Total
	--dollars--	--dollars--	--dollars--
Idaho	278,640	102,850	381,490
Indiana	1,324,322	252,854	1,577,176
Michigan	223,050	160,096	383,146
Montana	240,370	--	240,370
Oregon	755,041	22,945	777,986
Washington	497,874	266,285	764,159
Wisconsin	1,471,545	1,841,883	3,323,428
Other states[1]	39,236	--	68,382
United States	4,830,078	2,646,913	7,506,137

[1]Other states include Florida, Hawaii, Kentucky, Massachusetts, New Jersey, Ohio, Texas, Utah, and Viriginia.

Source: USDA, Consolidated Farm Service Agency data, as complied by GAO.

Table 5--Disaster assistance payments for mint, by share of total production and total payments, 1988-93

State	Peppermint		Spearmint	
	Share of total production	Share of total payments	Share of total production	Share of total payments
	---Percemt---			
Idaho	16	6	8	4
Indiana	10	27	7	10
Michigan	--	5	3	6
Oregon	47	16	5	1
Washington	24	10	67	10
Wisconsin	4	30	10	70

--=data not available.

Sources: USDA, NASS (production) and USDA, CFSA, complied by GAO.

too, often succumb to the fungus within a few years. One source of potential adverse selection may occur when a grower is aware that verticillium wilt is likely to soon affect his or her yields, but that risk is not included in the rate charged to the grower.

All the mint varieties react to weather and insects and most other diseases in much the same way. Native spearmint is an exception. It is the hardiest of all mints, and the only variety resistant to certain pests and diseases (such as verticillium wilt). However, native spearmint produces a different flavor than Scotch spearmint and a completely different flavor than peppermint. For most diseases and pests, growers and FCIC will have similar information with which to judge the adequacy of premium rates.

Setting Reference Prices

The reference price for mint should be based on the quantity of oil that the crop is expected to produce. The costs of harvesting and distilling should be deducted from the total value of the oil, since these activities will be foregone if the crop is lost. Marketing is done by the dealers and should not be included in factoring the value of the oil.

Peppermint oil pricing is very secretive and even growers are unclear as to exactly how prices are determined. For peppermint, dealers would be able to quote the prices they are willing to pay for a barrel of oil at a time the lost crop would be ready for harvest, or provide information on historical prices. The price quotes obtained from dealers would probably be the most appropriate method for determining a reference price.

Spearmint oil prices are influenced to a large extent by the decisions of the spearmint marketing order. However, dealers determine the final price charged to end users. Such historical prices, along with marketing order parameters for the given insurance year, could be used as the basis for determining the value of a spearmint loss.

Market Prices and APH Distortions

Yield distortion due to variations in market prices are not likely to be an issue in estimating a grower's average production history for peppermint or spearmint. Mint growers always harvest their crop regardless of market prices because the oil produced from the crop can be stored indefinitely. If the market price at the time of harvest is unfavorable, producers can always store and market their oil when prices are higher.

Market Prices and Moral Hazard

Market price at the time of harvest is not a factor in harvesting mint. Producers harvest their crop regardless of the current market price and store the oil until prices are more favorable. Even low quality oil is kept because during periods of low stocks, dealers will purchase this oil.

If market prices continue low, some growers may reduce the number of new acres planted to reduce stocks. Most growers, however, still plant and harvest all their mint crop.

Availability of Individual Yield Data

Average yields by county are available for mint production. However, no source is readily apparent for individual yield data, other than the growers themselves. Individual yields for spearmint production in Washington, Oregon, and Idaho are known by the spearmint marketing order committee. Such data are not available for Midwestern spearmint growers.

Estimating Appraised Production

Estimating appraised production for mint (harvestable, but unharvested yield in a field) would require taking into account the age of the field (and the potential presence of verticillium wilt), and also the number of cuttings that can be obtained in the season.

Yields vary regionally. Yields are much higher in the Pacific Northwest than in the Midwest. Yields also are higher for spearmint, and especially native spearmint, which can be harvested twice in a season in the Pacific Northwest, than they are for peppermint.

Demand for Insurance

The demand for mint insurance would most likely be greatest in the Midwestern mint-producing states. These states have experienced several crop losses and appear to be the most interested in crop insurance coverage for mint. While participation in the program may be lower in the Pacific Northwest, there is also a potential need for insurance in that area. Water shortages, hail, and in some instances, cold winters, can reduce production and destroy the mint crop.

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Appendix I: The Spearmint Marketing Order

Appendix II: Cost of Production Budgets

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