Barley

Background for 1990 Farm Legislation

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Introduction

The 1986 barley crop was the largest ever, totaling 611 million bushels and 12 million acres harvested. At $994 million, barley ranked eleventh among principal U.S. agricultural crops in production value for 1986. However, due to high temperatures and drought in the major barley growing States of the Northern Plains, 1988 production dropped 54 percent from 1987 to 291 million bushels, the smallest crop since 1953. Lower yields pushed feed barley prices up 20 percent in 1988, while malting barley prices about doubled. Production in 1989 is expected to rebound to over 400 million bushels.

This report describes major factors and trends in barley production and markets. Economic and structural factors affecting the costs/returns position of barley farmers are discussed. Trends in supply, domestic use, and exports are examined to gain an idea of future economic conditions in the barley industry. The report reviews past barley farm programs, economic conditions motivating the programs, and effects of the programs on farmers, processors, input suppliers, taxpayers, and consumers.

Structure of the Barley Industry

Barley is an internationally grown and consumed commodity. The progression from the farm to purchase in final product markets is quite complex. The structure of the barley industry consists of the resources employed in farm production, transportation, storage, processing, and the consumer demand for food products.

Production Characteristics

Barley is more adaptable to areas with cooler temperatures and lower rainfall. But it is generally less profitable than corn, sorghum, and soybeans in areas where these crops compete for land. As a result, barley production has been concentrated in the Northern Plains and Pacific Northwest where the other grains cannot adapt as well to the climate. Barley production is concentrated in North Dakota, Montana, Idaho, Minnesota, and Washington, which account for nearly three-fourths of the

national total. Soybeans compete for acreage with barley in the Lake States and Northeast. Wheat competes with barley in most production regions where barley is grown. Other competitive crops include sorghum in the Central and Southern Plains regions, sunflowers and oats in the Northern Plains, cotton in the Southeast, and corn in the Lake States, Central Plains, and Southeast.

An important feature of the barley market is the distinction between feed and malting uses. High-quality malt can be produced only from certain barley varieties. North Dakota, Minnesota, and South Dakota are the major malting barley producing States (table 1). Most six-rowed barley varieties (the most desired by American maltsters) are produced in these three States, with over 83 percent of the acreage planted there.

In the West, malting barley varieties are primarily grown in six States: Colorado, Idaho, Montana, Oregon, Washington, and Wyoming. Two-rowed varieties, used mostly for feed, dominate the barley acreage in these Western States. Only about 30 percent of the planted acres are seeded to barley varieties suitable to the major American brewers. However, plantings of six-row malting varieties have been increasing.

Not only must barley be of a suitable variety to be used for malting, the grain must also possess certain quality characteristics. Conditions during the growing season can damage the quality of a malting variety so that it cannot be used for malting. Important barley quality factors are: (1) germinability, (2) protein, (3) plumpness, and (4) physical condition.

Prices for malting barley generally are about 20 cents per bushel higher than for feed barley. However, the 1988 drought ran premiums as high as $2 per bushel as yields dropped sharply. The 1988 average yield was 38.6 bushels per acre, down from 52.7 bushels in 1987. In addition, hot and dry weather will often produce barley with a protein content too high for malting. High protein content in barley is desirable for feed use, but not for malting. Maltsters may be forced to import additional foreign barley in 1989 because supplies of quality U.S. malt barley were low.

Barley yields increased an average of about 2 percent annually over the past 25 years. Among the important producing States, yields are highest in regions that produce barley for feed, primarily because more nitrogen fertilizer is used on feed barley than on malting barley. Yield and protein content may be raised by increasing fertilization, if other growing conditions are favorable.

The number of farms growing barley declined from 121,700 in 1969 to 79,300 in 1982, while the acreage of barley harvested per farm increased from 79 to 109 acres. Barley is produced primarily on larger farms. Nearly half of the farms growing barley in 1982 had total cropland of 500 acres or more (table 2).

Table 1--Acreage of feed and malting barley planted in major producing States, 1970-89

State	1970	1975	1980	1985	1986	1987	1988	1989
				1,000 acres				
North Dakota:								
Total	2,039	2,220	1,850	3,500	3,700	3,000	2,600	2,800
Feed	163	278	209	560	847	609	481	406
Malting	1,876	1,942	1,641	2,940	2,853	2,391	2,119	2,394
Montana:								
Total	1,800	1,360	1,180	2,350	2,400	2,300	1,800	1,700
Feed	1,091	838	615	1,182	1,142	1,081	974	877
Malting	709	522	565	1,168	1,258	1,219	826	823
Idaho:								
Total	673	775	900	1,280	1,140	840	880	870
Feed	323	403	513	870	695	487	488	420
Malting	350	372	387	410	445	353	392	450
Minnesota:								
Total	607	950	900	1,200	1,200	1,200	1,250	925
Feed	55	104	45	60	96	48	50	18
Malting	552	846	855	1,140	1,104	1,152	1,200	907
South Dakota:								
Total	389	560	535	760	930	870	700	700
Feed	184	240	176	245	--	276	238	211
Malting	205	320	359	515	--	594	462	489
Washington:								
Total	436	420	440	1,200	920	660	580	500
Feed	340	375	381	1,125	858	605	532	453
Malting	96	45	59	85	62	55	48	47
Oregon:								
Total	440	200	170	360	375	250	225	210
Feed	361	152	124	328	--	227	212	188
Malting	79	48	46	32	--	23	13	22
Colorado:								
Total	340	245	265	360	390	230	185	190
Feed	--	126	144	293	--	121	110	85
Malting	--	119	121	67	--	109	75	105

-- = Survey not conducted. Note: Malting varieties planted include all those recommended by the American Malting Barley Association for malting and brewing and other nonrecommended varieties utilized for malting and brewing. Not all malting barley varieties harvested meet malting quality specifications.

Source: American Malting Barley Association and U.S. Department of Agriculture, National Agricultural Statistics Service.

Table 2--Number of farms harvesting barley, by area and sales class, 1982 1/

Cropland	Farms	Proportion	Sales class	Farms	Proportion
Acres	Number	Percent		Number	Percent
1-99	6,709	11.5	Less than $2,500	1,274	2
100-249	10,337	17.7	$2,500-$9,999	4,475	8
250-499	12,010	20.6	$10,000-$39,999	14,923	26
500-999	14,250	24.4	$40,000-$99,999	18,773	32
1,000 and over	15,018	25.7	$100,000-$249,999	13,512	23
			$250,000-$499,999	3,585	6
Total	58,324	100.0	$500,000 and over	1,782	3
			Total	58,324	100

1/ Calculated from the 1982 Census of Agriculture special tabulation for 14 important barley-producing States: Oklahoma, Minnesota, California, South Dakota, Montana, North Carolina, Washington, Wisconsin, North Dakota, Idaho, Colorado, Texas, Oregon, and Kansas. A barley farm is defined as any place that grows barley and from which $1,000 or more of agricultural products were sold or normally would have been sold during the census year.

Trends In Domestic Use

Total disappearance of barley--both domestic use and exports--has fluctuated widely during the past two decades. Barley use typically goes up whenever corn prices go up because barley may be substituted for corn in the feed ration. Barley feed use dropped from 333 million bushels in 1985/86 to a 35-year low of 162 million in 1988/89.

Livestock and Poultry Feed

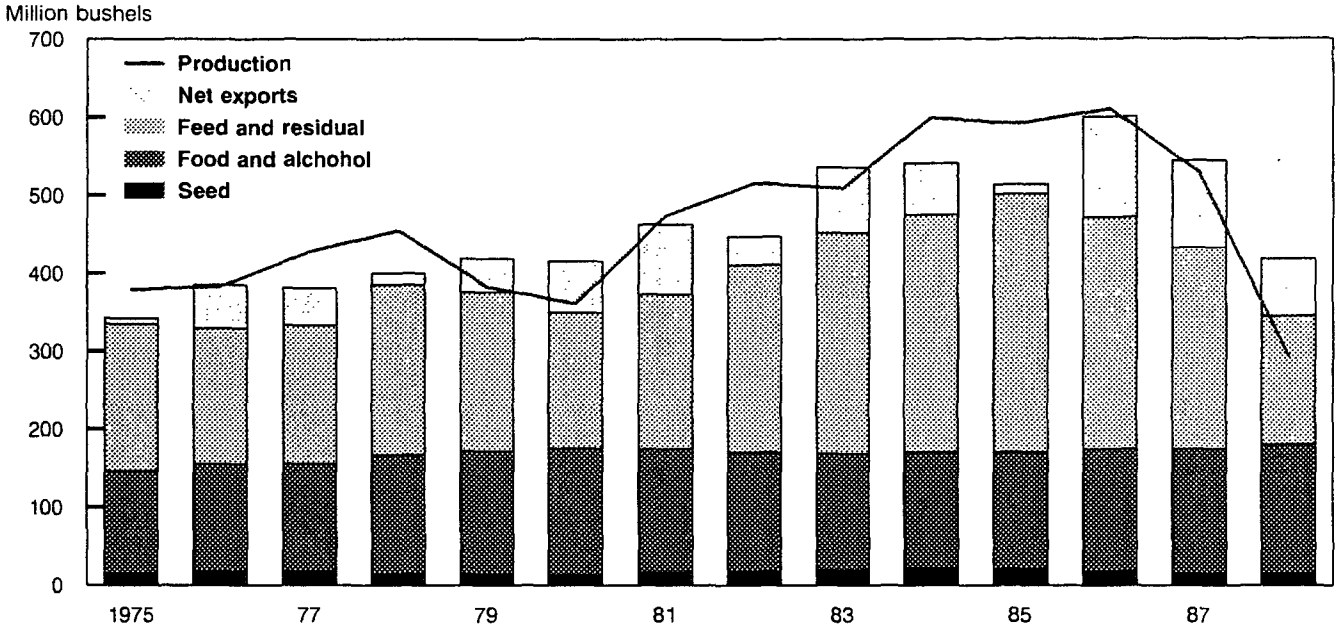
Almost 60 percent of the U.S. barley crop is fed to livestock. Fluctuations in total barley disappearance have largely been caused by large swings in barley feed use (fig. 1). Over three-fourths of barley feed is for ruminants: beef cattle in the Northern Plains and Southwest, and cattle and sheep in the Pacific and Mountain States. The other 40 percent of domestic demand is for beverage and food use. Beverage and food use increased gradually throughout the 1970's, dropped slightly in the first half of the 1980's, and has recently returned to 1970's levels.

Feed consumption for all livestock includes approximately 60 percent roughages and pasture and 40 percent concentrates. Poultry relies primarily on concentrates. Feed concentrates include feed grains, wheat, rye, oilseed meals, animal protein feeds, grain protein, mill byproducts, vitamins, and mineral supplements.

Competition among feed ingredients depends primarily on relative price and relative energy value. The percentage of metabolizable energy in barley is slightly less than corn and sorghum averaged across all livestock classes. Barley is equivalent to corn in terms of feeding value when fed to ruminants like dairy and beef cattle and sheep. Barley's high fiber content makes it less palatable and digestible to young swine and poultry; however,

Figure 1

Barley production and use, 1975-88



breeding programs have begun to develop barley varieties of better value.

Protein and other nutrients are generally more economically supplied by concentrates other than feed grains. For barley to substitute on the basis of protein, the cost on a per-unit basis would have to be less than soybean meal and other protein supplements, not corn. However, barley does provide more crude protein than corn. Barley's added crude protein, associated with the energy portion of the feed ration, would allow less soybean meal to be used. The supplementary feed value of barley depends on the actual protein absorbed by the animal versus other grains and the price of the least-cost sources of protein, which invariably fluctuate.

Although nearly 60 percent of barley's domestic use was for livestock and poultry feeding in recent years, it accounted for only about 5 percent of feed grains or 3 percent of concentrates consumed by livestock. Barley feed use ranged from a low of 3.8 million metric tons in 1980/81 to a high of 7.2 million metric tons in 1985/86. Feed use of barley is positively related to the number of grain consuming animal units (GCAUs) and the feeding rate. For example, feed use of barley dropped in 1988/89 as both animal units and feeding rate declined (table 3).

Variation in feed use also reflects adjustments made over time by livestock and poultry producers in response to relative prices

Table 3--Feed use and animal numbers, October-September years, 1975-88

Item	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988 1/
							Million metric tons							
Feed and residual use:														
Barley	4.1	3.8	3.9	4.7	4.4	3.8	4.3	5.2	6.2	6.6	7.2	6.5	5.6	5.2
Corn	91.2	91.2	94.4	108.3	115.6	105.6	105.9	114.8	97.0	103.6	104.0	119.7	120.3	109.2
Sorghum	12.6	10.4	11.4	13.7	12.6	8.2	10.6	12.6	9.8	13.7	16.9	13.6	14.3	13.1
Oats	8.1	7.0	7.4	7.6	7.1	6.3	6.6	6.4	6.8	6.3	6.7	5.7	5.2	3.1
Total feed grains	116.0	112.1	117.1	134.3	139.7	123.9	127.4	139.0	119.8	130.2	134.8	145.5	145.4	130.6
Wheat and rye	1.7	6.8	4.5	3.3	2.8	4.4	3.9	5.5	10.3	11.4	7.6	11.6	8.3	7.6
Total grains	117.7	118.9	121.6	137.6	142.5	128.3	131.3	144.5	130.1	141.6	142.4	157.1	153.7	138.2
Byproduct feeds 2/	33.8	31.0	33.8	37.8	38.3	36.2	33.7	34.5	33.4	37.6	36.1	36.9	38.7	37.4
Total grains and byproduct feeds	151.5	149.9	155.4	175.4	180.8	164.5	165.0	179.0	163.5	179.2	178.5	194.0	192.4	175.6
							Million units							
Animal numbers														
GCAU 3/	72.6	74.1	75.7	78.3	79.3	77.6	74.3	76.4	75.9	76.5	74.4	74.2	76.6	76.4
							Dollars per bushel							
Prices:														
Feed barley	2.42	2.25	1.78	1.92	2.21	2.77	2.39	2.11	2.46	2.23	1.90	1.52	1.64	2.28
Corn	2.54	2.15	2.02	2.25	2.48	3.12	2.47	2.55	3.21	2.63	2.23	1.50	1.94	2.55
Sorghum	2.37	2.03	1.82	2.01	2.35	2.91	2.24	2.47	2.74	2.32	1.93	1.37	1.70	2.35
Oats	1.46	1.56	1.09	1.20	1.33	1.72	1.88	1.49	1.62	1.67	1.23	1.21	1.56	2.67
Wheat	3.56	2.73	2.33	2.97	3.80	3.99	3.69	3.45	3.51	3.39	3.08	2.42	2.57	3.72
							Metric ton per GCAU							
Feeding rate 4/	2.09	2.02	2.05	2.24	2.28	2.12	2.22	2.34	2.15	2.34	2.40	2.61	2.51	2.30

1/ Estimated. 2/ Byproduct feeds include oilseed meals, animal protein feeds, grain protein feeds, and other byproduct feeds.
3/ A grain consuming animal unit is a weighted average of the number of livestock and poultry fed during the feed year converted to milk cow equivalents and weighted by grains consumed. 4/ Total grains and byproduct feeds per GCAU.

and availability of barley and competing feed grains or nongrain feeds, such as soybean meal. Feed barley prices closely follow the movement of corn prices (fig. 2). Barley feed use declined in 1986 and 1987 to 298 and 258 million bushels (table 4), while corn feed use increased to 4,714 and 4,735 million bushels. The declines of barley feed use in 1987 and 1988 were caused in part by the increase in feed barley price from $1.52 a bushel in 1986/87 to $1.64 in 1987 and $2.28 in 1988.

Malt

Barley's second most important domestic use is for malt which in 1987/88 accounted for 36 percent of domestic barley use (table 4). Malt is produced from barley by germinating moistened barley under controlled conditions for 5-7 days, depending on barley type and intended use. Germination brings about changes in the barley, including development and activation of enzyme systems important in producing the desired color and flavor characteristics. The germination process is ended by kilning (drying with heat). Rootlets that formed during germination are removed and the resulting product is malt. The residual brewer's spent grains are dried and sold as a protein supplement for dairy feeds.

Most malt produced in the United States is used for beer production. In the brewing process, a mixture of ground malt, other grains, and water is heated under controlled conditions,

Figure 2

Feed grain price relationships, Sept. 1982-July 1989

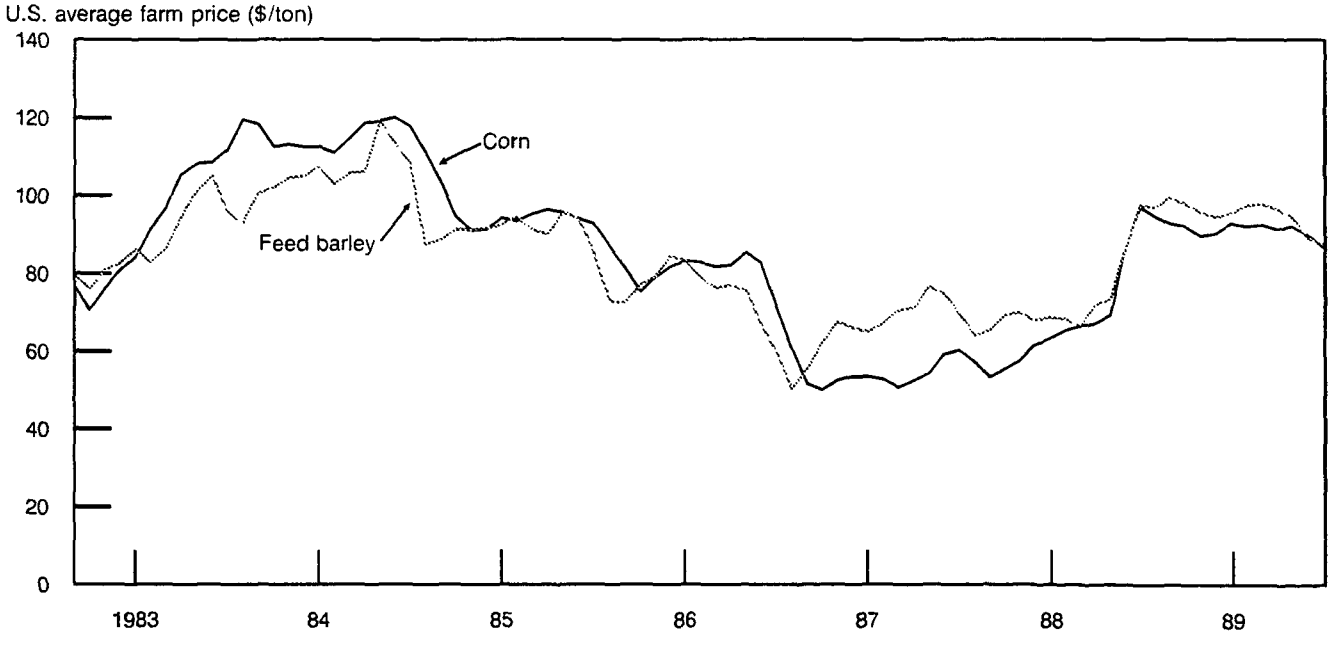


Table 4--Barley: Marketing year supply and disappearance, 1958-88

Year beginning June 1	Supply: Beginning stocks	Supply: Production	Supply: Imports	Disappearance: Total	Disappearance: Domestic use: Food, alcohol, and seed	Disappearance: Domestic use: Feed and residual	Disappearance: Domestic use: Total	Disappearance: Exports	Ending stocks: Total disappearance	Ending stocks: Government owned	Ending stocks: Privately owned 1/	Ending stocks: Total	Stocks-to-use ratio
	Million bushels												Percent
1958	197	477	15	689	112	236	347	114	461	99	129	228	49
1959	228	420	18	666	111	241	352	123	475	71	120	191	40
1960	191	429	15	635	114	254	368	89	457	51	127	178	39
1961	178	392	20	590	110	253	363	78	441	29	120	149	34
1962	149	428	6	583	111	229	340	72	412	38	133	171	42
1963	171	393	13	577	107	240	347	68	415	29	133	162	39
1964	162	386	12	560	109	260	369	59	428	20	113	133	31
1965	133	393	8	534	114	208	322	78	400	11	122	133	33
1966	133	392	7	532	114	222	336	48	384	6	142	148	39
1967	148	374	9	531	122	212	334	36	370	6	155	161	44
1968	161	426	10	597	123	238	360	12	372	8	217	225	60
1969	225	427	13	665	126	260	387	10	397	47	221	269	68
1970	269	416	10	695	136	290	427	84	511	24	160	184	36
1971	184	462	12	658	134	275	409	41	450	37	171	208	46
1972	208	422	17	647	140	245	385	70	455	2	189	192	42
1973	192	417	9	618	138	241	379	93	472	1	146	146	31
1974	146	299	20	465	148	183	331	42	373	0	92	92	25
1975	92	379	16	487	150	184	335	24	359	0	128	128	36
1976	128	383	11	522	159	171	330	66	396	0	126	126	32
1977	126	428	11	565	161	174	335	57	392	0	173	173	44
1978	173	455	11	638	172	214	386	26	412	3	224	226	56
1979	226	383	12	621	176	198	374	55	429	3	189	192	45
1980	192	361	10	564	180	170	350	77	427	3	134	137	32
1981	137	474	10	620	179	193	372	100	472	3	145	148	31
1982	148	516	11	675	170	241	411	47	458	6	211	217	47
1983	217	509	7	733	169	283	452	92	544	12	178	189	35
1984	189	599	10	798	171	304	475	77	551	15	233	247	45
1985	247	591	9	847	168	333	501	22	523	57	267	325	62
1986	325	611	9	945	164	298	472	137	608	76	261	335	55
1987	336	530	14	879	174	258	432	126	558	50	271	321	58
1988	321	291	12	623	180	162	342	85	427	30	166	197	46

1/ Includes quantity of free and farmer-owned reserve ending stocks.
Note: Some totals may not add due to rounding.

which is called mashing. During mashing, enzymes in the malt break down the insoluble grain starch to soluble sugars necessary during fermentation. Some malt is also used for distilled beverages and in certain food products, such as breakfast cereals.

The demand for malting barley depends primarily on per capita disposable income and consumer taste and preference. Per capita consumption of malt beverages has trended upward from 15.4 gallons in fiscal year 1960 to 22.8 in 1986 (table 5). Improvements in malting barley varieties have increased the ability of malt to convert grain to beer, thus somewhat less malt and more adjunct grains are being used. The amount of barley malt used per barrel of beer has declined from 28.5 pounds in fiscal year 1960 to 24.3 pounds in 1986. By comparison, the brewing industry's use of rice as an adjunct increased from 3.7 pounds per barrel in 1960 to 5.2 pounds in 1986.

The demand for malting barley is largely insensitive to price change because there is no alternative grain. Barley malt is the most important grain product used by the brewers, accounting for about two-thirds of the total grain and grain products used by the industry. Additional starch sources, called adjuncts, are also used and include corn, corn syrups, and rice.

Table 5--Production and taxpaid withdrawals of malt beverages and brewing industry use of barley malt, selected years

Year ended June 30	Production of malt beverages	Total barley malt used	Barley malt used per barrel 2/	Taxpaid withdrawals 1/ Total	Taxpaid withdrawals 1/ Per capita
	Million barrels	Million pounds	Pounds	Million barrels	Gallons
1960	94.5	2,697	28.5	88.9	15.4
1965	108.0	3,016	27.9	100.3	16.0
1970	134.7	3,721	27.6	122.6	18.7
1975	157.9	4,225	26.8	146.9	21.1
1976	160.7	4,158	25.9	148.8	21.2
1977	172.2	4,310	25.0	156.9	22.1
1978	171.6	4,392	25.6	157.3	22.0
1979	183.5	4,890	26.6	168.2	23.2
1980	188.4	5,039	26.7	168.8	23.1
1981 3/	194.5	5,160	26.5	176.6	23.9
1982	194.0	4,993	25.7	176.5	23.6
1983	195.7	4,825	24.7	178.0	23.6
1984	193.4	4,749	24.6	176.1	23.1
1985	193.8	4,673	24.1	174.7	22.7
1986	196.5	4,782	24.3	177.3	22.8

1/ IRS taxes paid on sales leaving a brewery. 2/ One barrel equals 31 gallons. 3/ Beginning 1981, fiscal year ends September 30.

The other major factor tempering the domestic demand for malting barley is the increasing popularity of light (low-calorie) beers which use less malt. These factors will result in a static demand for malting barley. Increased demand for U.S. malting barley will most likely result from expanding the export market for malt.

Food and seed uses showed little fluctuation over the last two decades. Food use of barley ranged narrowly between 6 and 8 million bushels a year, but dropped by one-third since 1972 on a per capita basis. Food and seed use over the past 5 years averaged less than 4 percent of total supply (table 4). Seed use declined from 1978-80 as acreage planted in barley declined. An upward trend emerged in the early 1980's due to expanded acreage but has again declined beginning in 1986.

Trends in the World Market

Only corn outranks barley as a leading coarse grain crop consumed and traded in the world. In the United States, barley ranks third in these categories behind corn and sorghum. World barley trade has tripled since 1960, yet still trailed the growth in both corn and sorghum. In 1985-87, barley averaged 30 percent of world coarse grain production and consumption, but was only one-seventh of trade. Europe and the USSR are by far the major producers and consumers of barley. Three nations--Saudi Arabia, the USSR, and Japan--account for half of world imports (table 6). Swings in barley import needs of only a few countries can have a major impact on world trade.

Barley trade is closely linked not only to overall coarse grain supply and demand conditions, but also to the supply of high-protein meals and nongrain substitutes, such as manioc. Approximately two-thirds of world barley use is for livestock feeding, an increasing percentage over the past two decades. Thus, much of the gain in world barley consumption has been in livestock feeding. World demand for beer and malt beverages is also expanding, but is satisfied mostly through trade in malt rather than sales of grain. Slightly over half of the malt exported is supplied by the European Community. Other major malt exporters include Australia, Czechoslovakia, and Canada.

Export competition for barley, however, cannot be assessed in isolation from other feed grains because of the ease of substitution among alternative feed grains and carbohydrate sources in livestock and poultry feeding. Barley faces many substitutes, including other feed grains, feed wheat, grain byproducts, manioc, and citrus pulp. Viewing barley export competition in this context, one can see that the United States faces not only barley competition from the EC, Canada, and Australia (fig. 3), but also from the EC (the major feed wheat exporter), Canada, Argentina, and Australia for wheat and other coarse grains. Exchange rates, transportation costs, debt problems, trade barriers, and domestic policies also affect the total volume and market shares among barley importers.

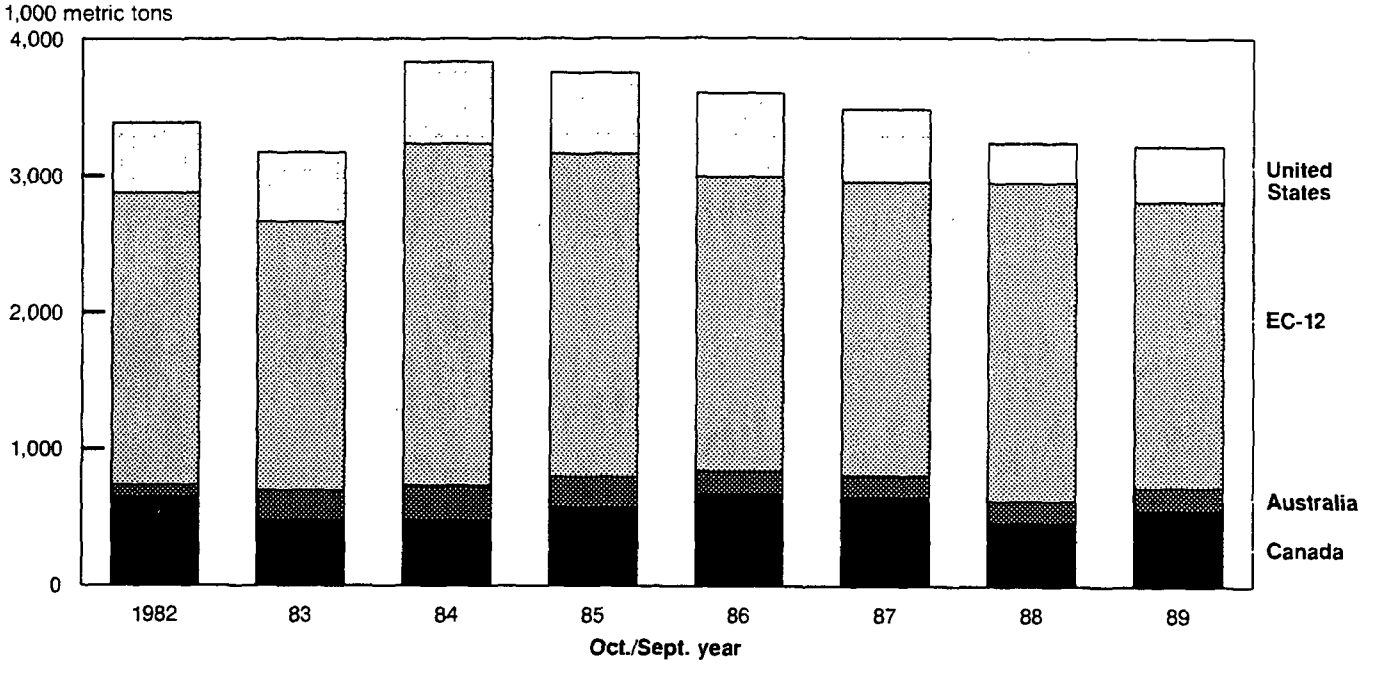
Table 6--World barley supply and use, 1985-88 1/

Item	1985	1986	1987	1988
		Million metric tons		
Exports:				
Canada	4.8	6.0	3.4	3.5
Australia	3.7	2.2	1.6	1.3
EC-12	7.3	6.2	6.9	9.5
Others	1.9	1.2	1.0	1.4
Total non-U.S.	17.6	15.6	13.0	15.7
United States	.8	3.0	2.9	1.3
World total	18.4	18.5	15.9	17.0
Imports:				
EC-12	.1	.1	.5	.4
USSR	2.9	3.0	2.4	3.4
Japan	1.5	1.2	1.3	1.2
East Europe	3.3	1.3	1.9	2.4
Saudi Arabia	6.6	9.0	4.5	4.0
Others	3.9	4.0	5.4	5.6
World total	18.4	18.5	15.9	17.0
Production:				
Canada	12.4	14.6	14.0	10.1
Australia	4.9	3.6	3.5	3.4
EC-12	51.5	46.8	46.8	50.6
USSR	46.5	53.9	58.4	44.5
China	6.2	5.6	6.0	6.3
East Europe	16.4	16.9	16.3	16.2
Others	27.2	27.7	24.2	28.8
Total non-U.S.	165.1	169.1	169.1	160.0
United States	12.9	13.3	11.5	6.3
World total	178.0	182.4	180.7	166.3
Utilization:				
EC-12	41.8	40.5	40.6	42.1
USSR	48.6	56.6	60.9	47.8
East Europe	18.6	18.9	18.1	18.9
Others	52.8	51.8	53.5	53.5
Total non-U.S.	161.8	167.9	173.1	162.3
United States	10.9	10.3	9.4	7.4
World total	172.7	178.1	182.5	169.8
Ending stocks:				
Total foreign	22.6	26.7	25.2	24.4
United States	7.1	7.3	7.0	4.3
World total	29.7	34.0	32.2	28.7

1/ Oct.-Sept. years. Source: World Grain Situation and Outlook, U.S. Department of Agriculture, Foreign Agricultural Service.

Figure 3

Barley production by major exporters



The gap between production and consumption for major exporters has been widening. The proliferation of import quotas and export subsidies to dispose of commodity surpluses has led to trade tension. The proportion of farm receipts for major barley exporters that come from government transfer programs has increased dramatically. Between 1982 and 1986, the level of global subsidies as a percentage of barley cash receipts plus net direct government payments (known as the producer subsidy equivalent) rose from 8 percent to a high of 50 percent.

Multilateral negotiations to reform the rules for international trade are now underway. The United States has proposed to eliminate all subsidies and barriers affecting trade over a 10-year period. The EC, Japan, and other nations have vigorously supported different changes. However, the General Agreement on Tariffs and Trade negotiators reached an accord in April 1989 to make a long-term "substantial progressive reduction" in trade subsidies and import barriers and to freeze agricultural supports at 1987-88 levels. A marketing loan program or expansion of the U.S. export enhancement program for wheat and feed grains would be required by the 1988 Omnibus Trade Act unless material progress is made in the GATT negotiations, although the President may decline to act if it would hamper negotiations.

European Community

The European Community (EC-12) has emerged in the last 6 years as the world's leading barley exporter. Higher yields in Spain (a recent EC member) and short feed grains supplies in other producing countries during 1988/89 sustained foreign demand for EC barley. The EC-12 will sell a record 59 percent of the world's trade in barley in 1988/89, up from 33 percent in 1977/78.

In the European Community, barley production and trade are strongly influenced by the Common Agricultural Policy (CAP) for grains, an intricate system of target prices, intervention (support) prices, and threshold (minimum import) prices. A variable levy is charged on barley imports to protect EC-12 producers from lower priced world supplies. Export refunds are paid to bridge the gap between the normally higher EC prices and world prices.

European consumers incur most of the program cost, but EC taxpayers have been required to carry a larger share. The value of EC price intervention to producers averaged 14 percent of receipts between 1982-86 and rose to a high of 39 percent in 1986. USDA calculations of the producer subsidy equivalent indicated a much lower level of policy transfers for barley than for other EC crops. EC policy transfers to barley producers were lower from 1982-86 (U.S.$4.40/ton) than the comparable U.S. and Canadian data (U.S.$31.96/ton and U.S.$25/ton).

Since EC currencies have been appreciating and world prices have declined precipitously since 1983/84, the EC has increased export subsidies and expanded market share. Swelling agricultural budgets in recent years have forced the EC to defray costs by attempting to discourage production, lowering guaranteed prices to farmers, and imposing a 3-percent producer tax (the co-responsibility levy) when grain production exceeds a ceiling amount. EC farmers exceeded this ceiling in 1988; however, higher world grain prices in 1988/89 reduced the cost of EC restitution payments, including barley. The EC reportedly allocated a 12-percent increase in funds for barley export subsidies in 1988/89 as sharper increases for wheat prices cut wheat subsidy expenses. Smaller crops are expected to reduce exportable supplies for 1989/90.

As a result of guaranteed support prices well above market-clearing levels, EC barley production rose from 16.3 million metric tons in 1967 to 51 million in 1988. The EC has evolved from net importer to net exporter of barley as of 1977. The larger production, lower domestic use (because of higher levels of wheat and nongrain feeding), and massive export subsidies have enabled the EC-12 to expand exports of surplus barley, mainly to Saudi Arabia, the USSR, Eastern Europe, and North Africa.

In more recent years, EC barley area has declined slightly as improved oilseed and wheat yields provided farmers greater

returns. However, EC barley area and exports may expand again in the next few years.

Canada

Barley is the second largest crop produced in Canada, accounting for half of coarse grain production, but it contributes only about 5 percent to farm cash receipts. Canada usually sows about 20 percent more barley than does the United States. Since 1986, Canada has outproduced the United States in barley. About 40 percent of Canadian barley is consumed domestically, almost all of it as feed. The rest is exported. Exports for 1989/90 are expected to rebound from the drought-reduced crop of 1988/89.

Canadian farmers can sell barley privately or they can deliver it to the Canadian Wheat Board (CWB), the sole agency for exporting barley in western Canada. If they choose the latter, farmers receive an initial payment from the board and can receive an additional payment after the conclusion of the marketing year, depending on export sales and world prices. Initial payments for 1988/89 rose 85 percent from a year earlier.

Several factors influence Canadian barley production: farmer preferences, farm location, CWB payments, and quotas. Western Canadian farmers prefer to grow wheat since it brings a greater return per acre, is less risky, and prices are generally more favorable than for barley. Barley area competes more with rapeseed than with wheat. Area has trended up for wheat, while barley and rapeseed area has fluctuated. Barley area will be greatly influenced by export demand, not only for coarse grains, but also for wheat and oilseeds. Farmers can plant as much grain as they want, but can deliver to the CWB only a specified quantity per quota-acre. Quotas are altered by the CWB in response to market demand. Initial CWB prices are set in line with world price expectations. Both quotas and initial prices exert a strong influence on production.

Barley export demand has been strong the past several years (partly due to a depreciating currency) and quotas have been large. The CWB has set ambitious export targets for grains and oilseeds; barley exports are likely to remain high for the next several years. Canada has long-term agreements with Brazil, China, Cuba, Japan, the USSR, West Germany, and Lebanon for wheat and feed grain sales. The CWB regularly provides export credit guarantees of up to 3 years for some nations' barley purchases.

One provision of the bilateral trade agreement between Canada and the United States is that Canada has agreed to eliminate import licenses for barley and other grains, contingent on equalization of support levels in both countries. The United States will likely remain a net importer of barley from Canada.

Australia

Barley is Australia's second largest crop in terms of volume and value. Area sown in barley has fluctuated fairly sharply since

1970, but has been declining since the record high in 1984/85. Australia provides no guaranteed minimum price for barley (unlike wheat), so some barley acreage has shifted to more profitable commodities including livestock and oilseeds. In any given year, price and weather conditions at planting influence the mix in sown area between barley and wheat, and to a lesser degree oats. Australian barley yields are substantially below those of the other exporters.

Domestic and export sales of barley are controlled by state marketing boards, the largest of which is the Australian Barley Board with responsibilities for South Australia and Victoria. Domestic barley use is relatively small, but increases during drought years when grain is used to supplement forage. With highly variable production, barley exports ranged from 600,000 tons in 1982/83 to 3.3 million tons the following year. Japan, Saudi Arabia, and Taiwan are Australia's largest customers. Although exports have been helped in recent years by a weak currency they nevertheless have declined since 1984 because of the drop in production.

Longer term developments in the Australian barley situation will be closely related to trends in wheat, oats, and sorghum production, the domestic and international livestock situation, and the world grain market. Canada and Australia export not only barley, but also other feed grains or feed wheat that compete with barley. While world demand is normally the major determinant of Australian production, domestic feed demand has started to increase because of increased demand by feed lots for the Japanese beef market. However, most cattle are still grazed. Australia exports a significant amount of malting barley to China and Taiwan and malt to South America.

Domestic wheat prices in Australia have been administered at levels that have sometimes been significantly above export prices and on other occasions below export prices. Since the prices are based on a formula that follows world prices they are usually in alignment. While it is possible that these arrangements have encouraged exports, the effect probably was not significant. In the case of coarse grains (primarily barley and sorghum), however, sales are handled by state marketing boards. Barley boards have pools which make payments to farmers based on returns which vary largely with export market conditions. These boards may also increase, to some degree, the variability in world prices by stabilizing internal prices from year to year.

Australia has long-term agreements with Egypt, China, Japan, and the USSR for wheat and feed grain sales. Australia provides the lowest level of producer support among major barley exporters, with average government transfers to receipts level (producer subsidy equivalent) of 3 percent.

Major Importers

Saudi Arabia has become the world's largest importer, surpassing the USSR in 1982/83. In 1986/87, Saudi Arabia accounted for

almost half of world barley trade. However, the Saudis have recently stopped paying generous subsidies to barley importers (occasionally exceeding the value of the commodity) to stop the accumulation of costly, unneeded stocks. This action is intended to promote higher domestic production, indicating that their future imports will be well below record 1986/87 levels. The Middle East accounts for about 40-50 percent of total world imports. Israel, Iran, and Iraq are also large importers.

Production in most of this region is highly variable because of weather. Turkey, normally a small exporter, is importing large amounts because of drought this year. Similarly, Syria and Iraq fluctuate from importers to exporters in many years. Programs to expand local output of meat, milk, and eggs are in place in many of these countries, bolstering the need for barley. Therefore, imports by these countries may continue to fluctuate because of varying domestic production.

Imports by North Africa depend mostly upon domestic production. Barley grown for grazing and as a feed grain is vital to the production of sheep in these countries. Most countries in the region are self-sufficient and import little, except when crops are poor. Harvested area has leveled off but yields have been highly variable, especially in Morocco where annual imports have fluctuated between 0 and 300,000 tons. Algeria is generally the largest importer in the region with 743,000 tons in 1987. Libyan imports are steady because of negligible production. North African imports are supplied occasionally by nontraditional exporters such as Turkey, Syria, and Morocco, which may have surpluses and need the foreign exchange.

The USSR is the world's largest producer but it is also the world's second largest importer of barley. The Soviets have accounted for about 15 percent of world imports in recent years. Although the USSR had a 13-million-metric-ton shortfall in 1988, they imported only an additional million tons of barley as part of their coarse grain/feed wheat needs. Canada has been a primary supplier; however, the EC supplied 91 percent of USSR import demand in 1987. The United States did not sell any barley to the Soviets during the 1980's.

Eastern Europe imports will rise to 2 million metric tons in 1988/89 because of poor weather. East Germany has been the largest importer in the region. Poland's imports are likely to rise somewhat because of the special aid recently received. The EC dominates trade with these countries.

Imports to the EC countries are nearly all intra-EC. A substantial portion of EC barley use is for malting. Although other non-EC nations, such as Cyprus and Switzerland, are major importers, most of their purchases are from EC countries.

Latin American barley production and use is relatively small, about 1-1.5 million tons. Consumption exceeds production, requiring imports of about 400,000 tons, mostly for malting. Little increase in feed barley imports is expected for the next

few years. However, there is significant potential for exports of U.S. malt or malting barley to this market.

Implications for U.S. Exports

Exports, mainly for feed, made up 23 percent of total use in 1987, recovering from 4 percent in 1985. U.S. barley exports have been extremely volatile, often hinging on the size of the U.S. corn crop and barley export subsidies. U.S. exports accounted for 13 percent of world barley trade in crop year 1987, down from nearly 30 percent in 1960 and 16 percent in 1970. Barley imports to the United States are expected to remain small, accounting for less than 3 percent of domestic use in most years. The export market is not as important to U.S. barley producers as to growers of other crops, such as corn, wheat, soybeans, and cotton. The United States exports barley to only about 15 countries each year, about the same as sorghum, compared with about 65 countries for corn and 80 countries for wheat. The United States sells about three-fourths of its total exports to only five customers and these vary from year to year (table 7).

The growth in barley trade during the 1980's has centered in the oil-rich, developing countries in the Middle East and the more developed countries in the rest of Asia. Asian imports of barley as a percentage of world imports have been increasing, nearing 60 percent in 1983/84. Since imports by these countries depend heavily upon income growth, economic conditions in these countries are crucial in determining their imports from the United States and other exporters. Growth in U.S. barley and other coarse grain exports to these and other countries will also depend on the continued use of export bonuses.

The United States has become a residual supplier of Japan's barley purchases. U.S. market share in Japan dropped from 31 percent in 1983 to 0-11 percent from 1984-88. The transport cost advantage of Australia and the relative supply position of Canada have nearly shut out American barley from Japan. Imports by Latin America and Western Europe could remain near current levels. North African imports are expected to increase, but Eastern Europe imports will not increase until their financial conditions improve.

With world trade expected to grow, U.S. export volume will increase slightly, but its market share will likely remain at the present level of 10-16 percent. Opportunities may exist for increased U.S. exports as developing countries attempt to improve diets through increased livestock production. However, imports by these countries are likely to be limited by heavy debt and low economic growth. Export subsidies are employed by exporters to maintain sales among financially stressed importers. Barley sales overseas will be harder to come by as corn prices are expected to drop relative to barley prices. The United States will continue to be the world's largest exporter of all coarse grains (table 8).

Table 7--U.S. barley exports, October-September years, 1984-87

Area	1984/85	1985/86	1986/87	1987/88
		1,000 metric tons 1/		
Western Hemisphere:				
Canada	30	0	1	2
Mexico	2	6	1	2
Colombia	107	50	0	0
Western Europe:				
EC-12	0	0	0	0
Cyprus	21	0	111	12
Eastern Europe:				
Bulgaria	60	0	0	152
Poland	0	0	72	116
Romania	0	0	111	0
Middle East:				
Jordan	18	0	30	22
Turkey	211	0	0	0
Israel	0	5	168	255
Iraq	244	0	0	253
Kuwait	65	0	0	0
Saudi Arabia	42	487	2,341	1,070
Africa:				
Algeria	0	0	36	671
Tunisia	0	0	0	151
Nigeria	33	0	15	4
Asia:				
Japan	130	121	0	68
Taiwan	179	82	51	0
All other	45	5	1	32
Total	1,187	756	2,938	2,810

1/ Includes products.

Source: Foreign Agricultural Trade of the United States, Fiscal Year Supplement, U.S. Department of Agriculture, Economic Research Service.

Table 8--World coarse grain exports, crop years, 1984-88

Country or region	1984	1985	1986	1987	1988 1/
		Million metric tons			
United States	55.4	36.4	47.5	53.5	62.8
Canada	3.3	5.8	6.6	4.2	4.5
Australia	6.4	5.0	3.1	2.5	2.4
Argentina	10.6	9.7	5.0	5.3	3.0
South Africa	.2	1.5	2.6	.8	2.0
Thailand	3.5	4.0	2.8	.8	1.8
EC-12	8.5	8.1	6.7	8.5	11.8
China	5.7	7.1	4.1	4.1	5.0
Other	6.7	5.6	5.7	3.3	3.5
World total	100.4	83.2	84.1	83.1	96.6

1/ Preliminary.

Trends in Prices and Farm Returns

Barley farm prices, adjusted for inflation, in the last half-decade have been about 43 percent of the 1950-59 average, about 50 percent of the 1960-69 average, and about 70 percent of the average for the early 1980's. Prices during the 1950's were supported by relatively high loan rates. Loan rates were lowered in the 1960's to about 80 percent of 1950-59, on average, and farm prices dropped accordingly. A large price increase occurred for all grains in the early 1970's as export demand increased, causing farm prices to be much higher than loan rates. Barley farm prices in the 1970's averaged about 20 percent above those of a decade earlier, but they still fell short of the inflation-adjusted average for the 1950's (table 9).

Barley prices rose sharply in 1980 as a summer drought pushed feed grain prices up. However, during 1981-83, real prices dropped, due to large supplies and weak demand for grains. Nominal prices rose in 1983/84, reflecting higher corn prices.

Barley yields increased steadily from 29 bushels per acre during 1950-59 to an average of about 52 bushels during 1983-87, although yields appear to have plateaued since 1978. Market revenue per harvested acre has fallen both in nominal and constant (1982) dollars since the 1985 farm legislation.

Barley prices are influenced by those for corn and other grains. On a bushel-for-bushel basis, the feed energy value of barley relative to corn across all livestock classes has been reflected in the barley loan rate which is 81 percent of the corn loan rate. While barley is used year round, the first quarter of the

Table 9--Nominal and deflated U.S. barley farm prices, yields, and gross market revenue per acre, 1950-88

Crop year	Farm price		GNP deflator	Yield	Market revenue per harvested acre 1/	
	Nominal	1982$			Nominal	1982$
	Dollars/bu.		1982=100	Bushels	-- Dollars --	
1950-59	1.09	4.02	27.1	28.7	31.3	115.4
1960-69	.95	2.78	34.2	37.9	36.0	105.3
1970-79	1.88	3.26	57.7	44.4	83.5	144.7
1980-84	2.44	2.48	98.3	53.0	129.3	131.6
1985	1.98	1.79	110.9	51.0	101.0	91.1
1986	1.61	1.41	113.8	50.8	81.8	71.9
1987	1.62	1.38	117.4	52.7	85.4	72.7
1988	2.82	2.32	121.3	38.6	108.9	89.7

1/ Nominal or deflated price times yield per harvested acre.

barley crop year (June-August) is the largest quarter for barley feeding. This is a result of low-priced new-crop barley competing with higher priced old-crop corn during this quarter.

Barley competes with wheat and oats for cropland and as a livestock feed. The barley/wheat price ratio has been slightly below the 68-percent barley energy feed value relative to wheat (bushel-for-bushel basis) in recent years. Since 1982, the program acreage bases have been combined into a common oats and barley acreage base. The result has been to reduce oats acres harvested in favor of barley. There is evidence that other nonprogram crops (such as sunflowers) have lost acreage to barley as a result of the higher returns available through participation in the Government feed grain program. During the 1980's, the barley/oats price ratio per bushel was well below the 159-percent barley feeding value relative to oats. Tight oats supplies in 1988 lowered the ratio to 87 percent.

Malting barley usually sells at a substantial premium over feed barley, as indicated in table 10. The ratio jumped sharply in 1988 as a short crop in the Northern Plains made malting quality barley relatively scarce.

Costs and Returns

Cash production costs for barley have been trending downward for several years. Economic (full ownership) costs represent the average longrun costs required to keep land in production (table 11). The national average economic cost fell from $149 per planted acre in 1984 to $121 in 1987. The per unit cost is $2.58 per bushel or slightly below the 1987 target price of $2.60.

The net cashflow position of farmers is determined by subtracting cash expenses from gross receipts. The cash flow is used to pay