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Weather Facility

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Major World Crop Areas and Climatic Profiles



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Abstract

This reference provides a framework for assessing the weather's impact on world crop production by providing benchmark climate and crop data for key producing regions and countries. For each area, maps define the zones of concentration for major crops, and temperature and precipitation by month at representative locations. Tables report historical averages of crop area, yield, and production. Coverage includes major agricultural regions and crops of coarse grains, winter and spring wheat, rice, major oilseeds, sugar, and cotton. World maps show the normal developmental stage of regional crops by month.

Keywords: barley, climate, corn, cotton, crop area, crop production, crop yield, El Niño, freeze dates, harvest, monsoon, oilseeds, planting, precipitation, rice, soybeans, Soviet Union, sugarcane, sugarbeets, temperature, wheat.

Acknowledgments

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Major World Crop Areas and Climatic Profiles

Joint Agricultural Weather Facility

Introduction

Weather is one of the most important factors affecting the variability of agricultural production. This handbook presents climatological data, agricultural statistics, and crop calendar information in widely ranging crop areas. It serves as a reference for evaluating the effect of weather on world crop production. For each of the world's major crop growing areas, the report describes average (normal) weather patterns and historical crop area, yield, and production trends. It also highlights unique landforms and climatic features important to the region.

The present handbook is the second revision of the original, which was published in 1981. The first revision was issued in 1987. Country and crop coverage are greatly expanded from the 1987 edition and information is organized by country rather than by crop. New articles provide insight into the El Niño phenomenon, the Indian monsoon, and the climate and agriculture of the former Soviet Union.

The handbook was produced by the Joint Agricultural Weather Facility (JAWF), which is jointly operated by the World Agricultural Outlook Board of the U.S. Department of Agriculture (USDA) and the National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce. The Production Estimates and Crop Assessment Division of USDA's Foreign Agricultural Service cooperated extensively with JAWF, providing crop statistics and sharing expert knowledge of growing areas. A major effort was undertaken by JAWF to present a complete profile of each country's

climate and agricultural production regime. The final product depended upon data availability and resource constraints.

Using the Handbook

The first section of this bulletin includes a world crop calendar--12 world maps that depict the normal monthly phase of crop development for selected regional crops.

The main section concentrates on important crop-producing regions. Some of these regions are introduced with special maps noting landforms, river systems, and specific climatic features which often dictate the crop domain.

A crop area map identifies the major production zones within the country. Where possible, percentages of crop production by state, county, or other political divisions within the country are presented. Several meteorological stations are identified in each crop area. These stations typify the climate within the area, and were chosen on the basis of long-term historical records and reliability of current daily observations most readily available to the JAWF.

Monthly climatological information for the stations are graphically portrayed to illustrate normal precipitation and temperature conditions during the crop cycle. These data are based on long-term averages. Bar charts represent average monthly precipitation in millimeters and line graphs indicate mean monthly temperatures in Celsius plotted at mid-month. An example is shown in the box on page 16. The reader may compare current conditions to these climatic

norms. Likely impacts of any weather anomalies on crop growth and vigor can be assessed based on known crop-weather relationships. Monthly precipitation and temperature data for all stations are presented in tabular format in appendix I. These statistics are meant to provide a historical benchmark for comparison.

The source of JAWF's climate data is the World Meteorological Organization's (WMO's) global data base, accessed daily from the NOAA's National Weather Service (NWS).

Historical crop statistics are given for the country as a whole, and generally include at least 10 years of data on area, yield, and production, if available. This information can be used to evaluate trends in the data series and to analyze the impact of weather on crop yields during the reporting period. These country-level statistics were extracted from the official USDA data base maintained by the Foreign Agricultural Service. Regional breakouts (provincial, state, etc.) were compiled from unofficial data and may not add up to the official USDA national totals. Production units are expressed in metric tons unless otherwise stated. A table on page 16 provides factors for converting metric unit into U.S. measures.

A crop calendar indicates the normal growth cycle. Usual planting and harvesting periods are shown, and in some cases, other important growth periods are identified. Crop calendar data were assembled from many sources and often cover broad regions. Hence, they are general in nature and require careful interpretation.

Three articles are presented in the appendices. The first provides insight into the El Niño phenomenon, which has gained substantial notoriety for affecting global weather. The second covers the Indian monsoon, which governs the success or failure of agricultural productivity on the Indian subcontinent. The third reviews the climate and agriculture of the former Soviet

Union, presenting the crop diversity and weather variability of the region.

USDA Weather Monitoring Activities

The JAWF, located in Washington, D.C., monitors daily global world weather events and assesses the likely impact of weather on crop conditions and development. This requires knowledge of the cumulative departures from normal in the weather during the current growing season and long-term patterns of historical crop production, like those published in this handbook. Relationships among weather parameters, stages of crop development, technology developments, and yield trends are also essential for analytical interpretation.

Assessments of world crop conditions are published in the *Weekly Weather and Crop Bulletin*, jointly issued by USDA and by NOAA. The JAWF also supports preparation of the monthly *World Agricultural Supply and Demand Estimates* published by the World Agricultural Outlook Board in cooperation with several USDA agencies. For more information about JAWF activities call (202) 720-9807.

Obtaining Crop-Weather Publications and Production Data

Additional copies of this handbook can be purchased from the ERS-NASS order desk. Call 1-800-999-6779 toll free in the United States and Canada. The cost at time of publication was \$20.00 per copy, and should be verified. Add 25 percent for non-U.S. addresses. Purchases can be charged or paid with a check or purchase order in U.S. funds, payable to ERS-NASS. Send your order to ERS-NASS, 341 Victory Drive, Herndon, VA 22070. The *World Agricultural Supply and Demand Estimates* report also is available from this source.

The *Weekly Weather and Crop Bulletin* is available by subscription from the NOAA/USDA

Joint Agricultural Weather Facility, Room 5844 South Building, USDA, Washington, D.C. 20250. Phone (202) 720-7917 for subscription information.

Historical commodity supply and use data are available in easy-to-use electronic formats from the ERS-NASS order desk noted above. For example, national and state-level production, acreage, and yield data back to 1975 for major U.S. field crops are available on disk in spreadsheet format (order "Crops By State," stock no. 92111).

Foreign production, supply, acreage, and use are available for 190 countries and regions as part of "PS&D View," a user-friendly software and database package (order stock no. 93002). "World Agriculture Trends and Indicators" provides annual data for 160 countries for 1961-69, grouped by region. Many other data titles for U.S. and international agricultural subjects are available. Contact ERS-NASS for ordering information and the Economic Research Service Information Services Division, (202) 219-0012, for technical questions.

Additional Sources

In addition to sources cited above, the following publications were used to prepare this handbook.

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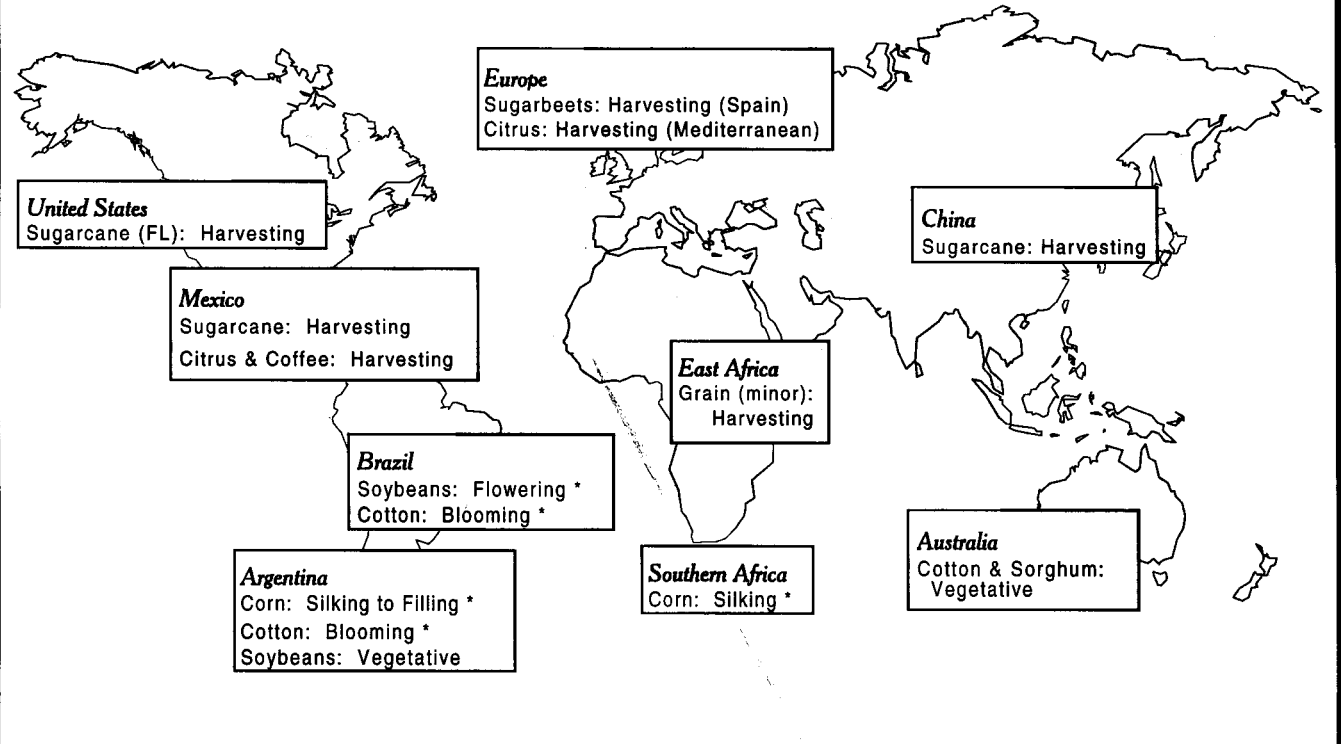
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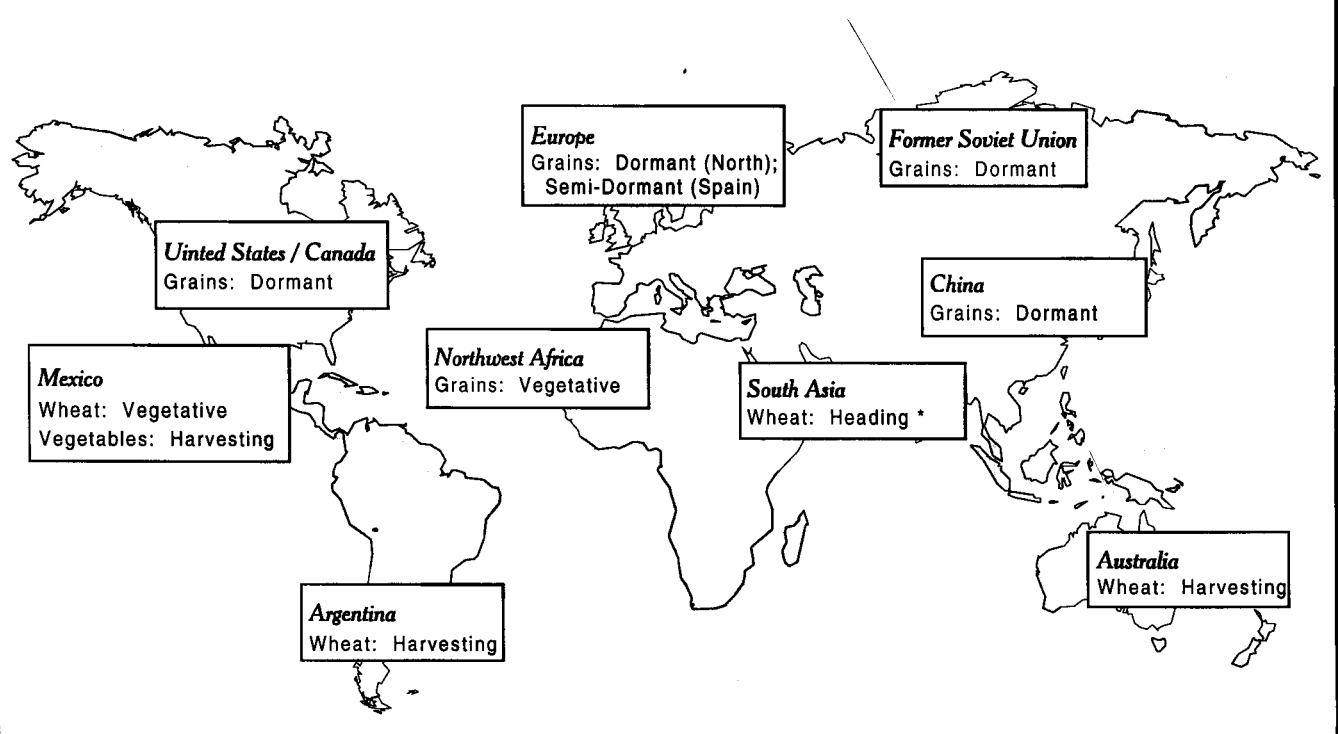
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January normal crop calendar

Summer crops



Winter crops

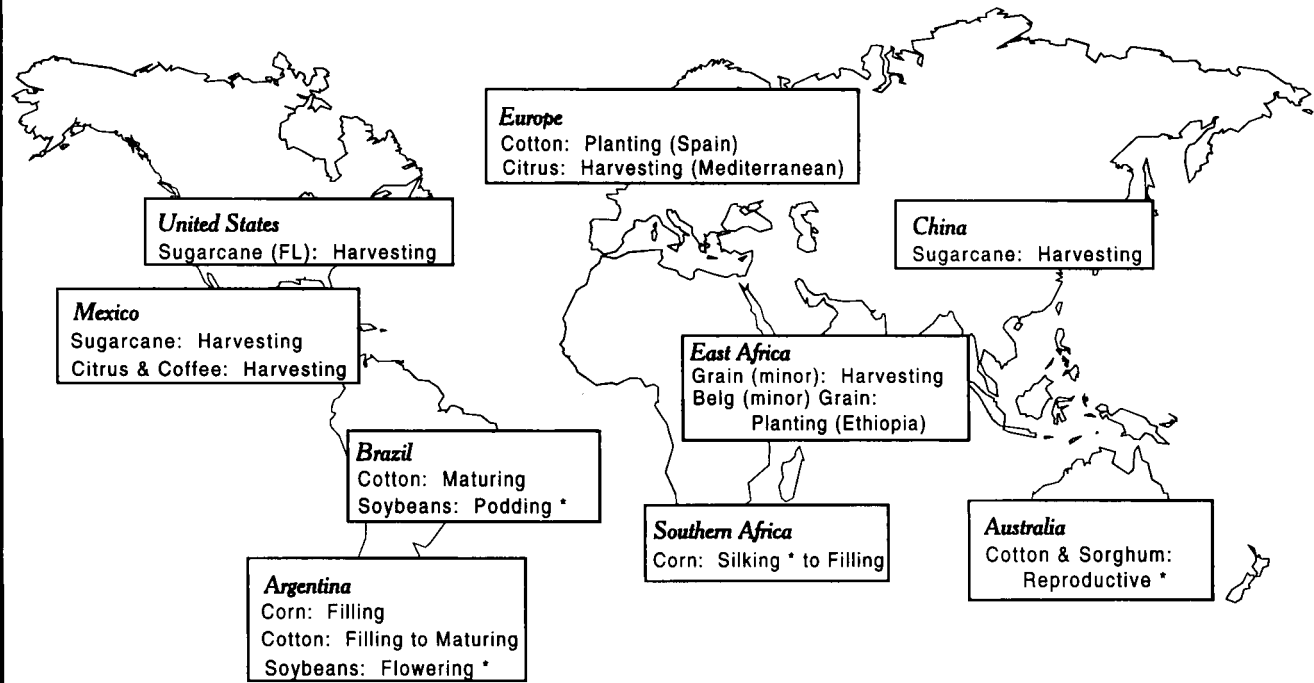


* Moisture / Temperature Sensitive Stage of Development

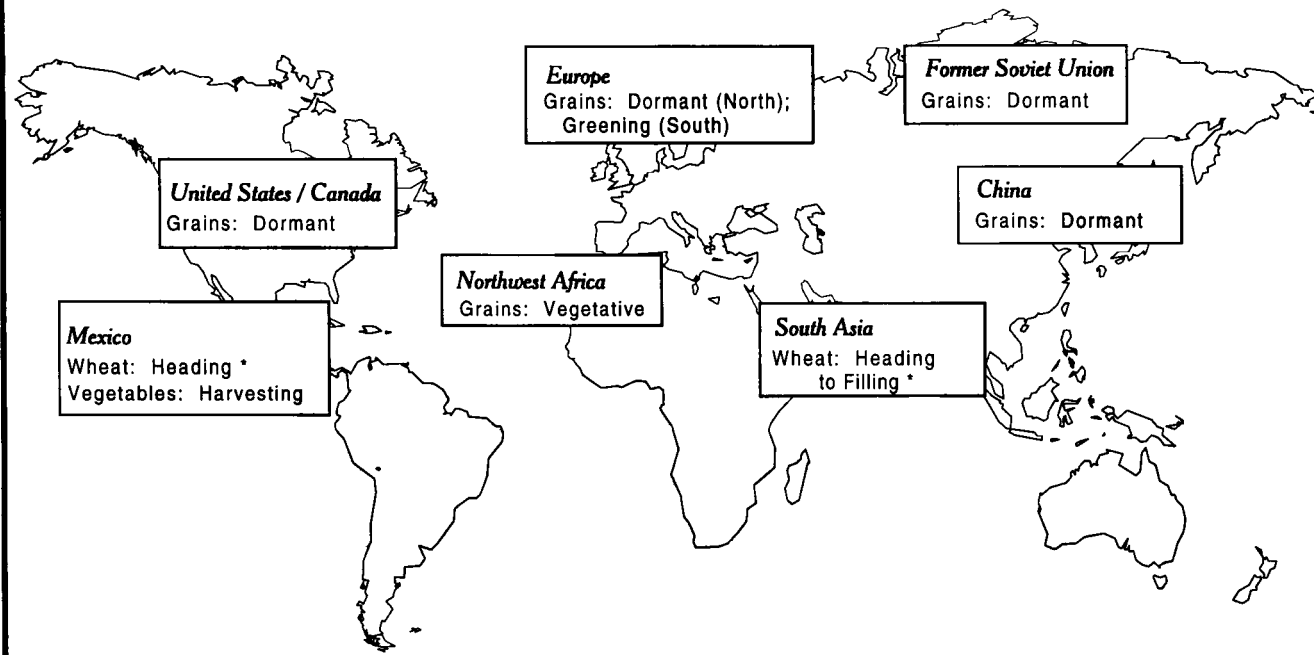
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February normal crop calendar

Summer crops



Winter crops

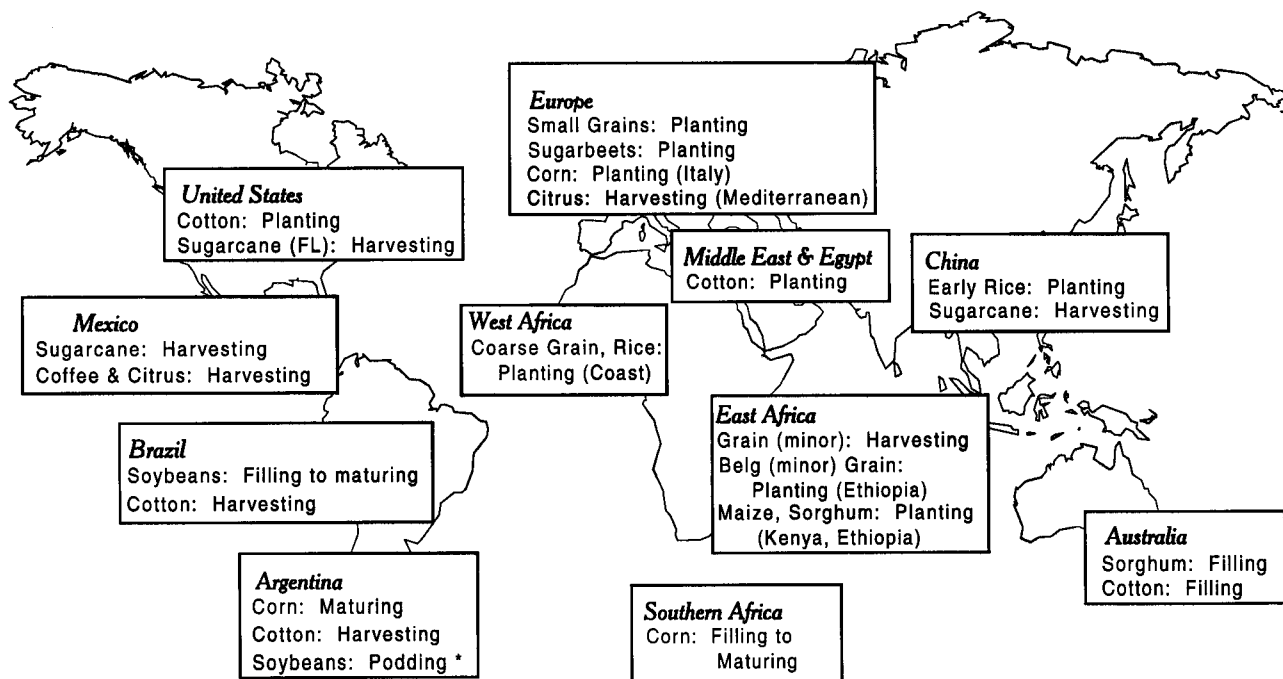


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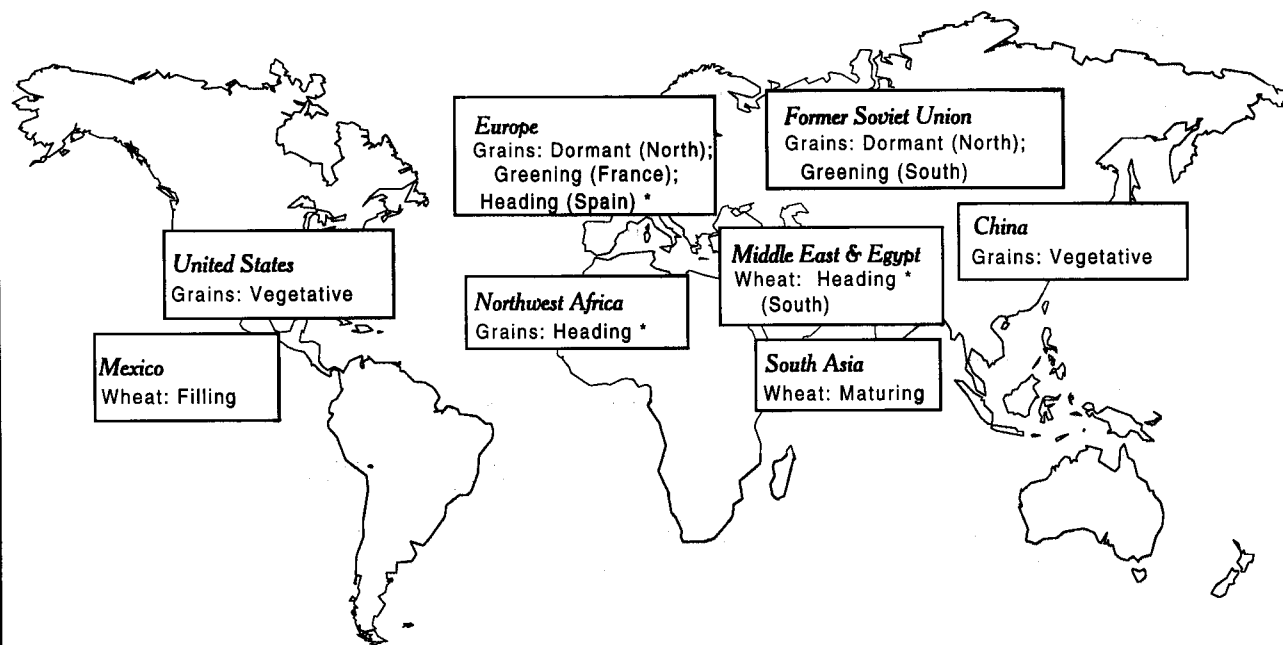
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March normal crop calendar

Summer crops



Winter crops

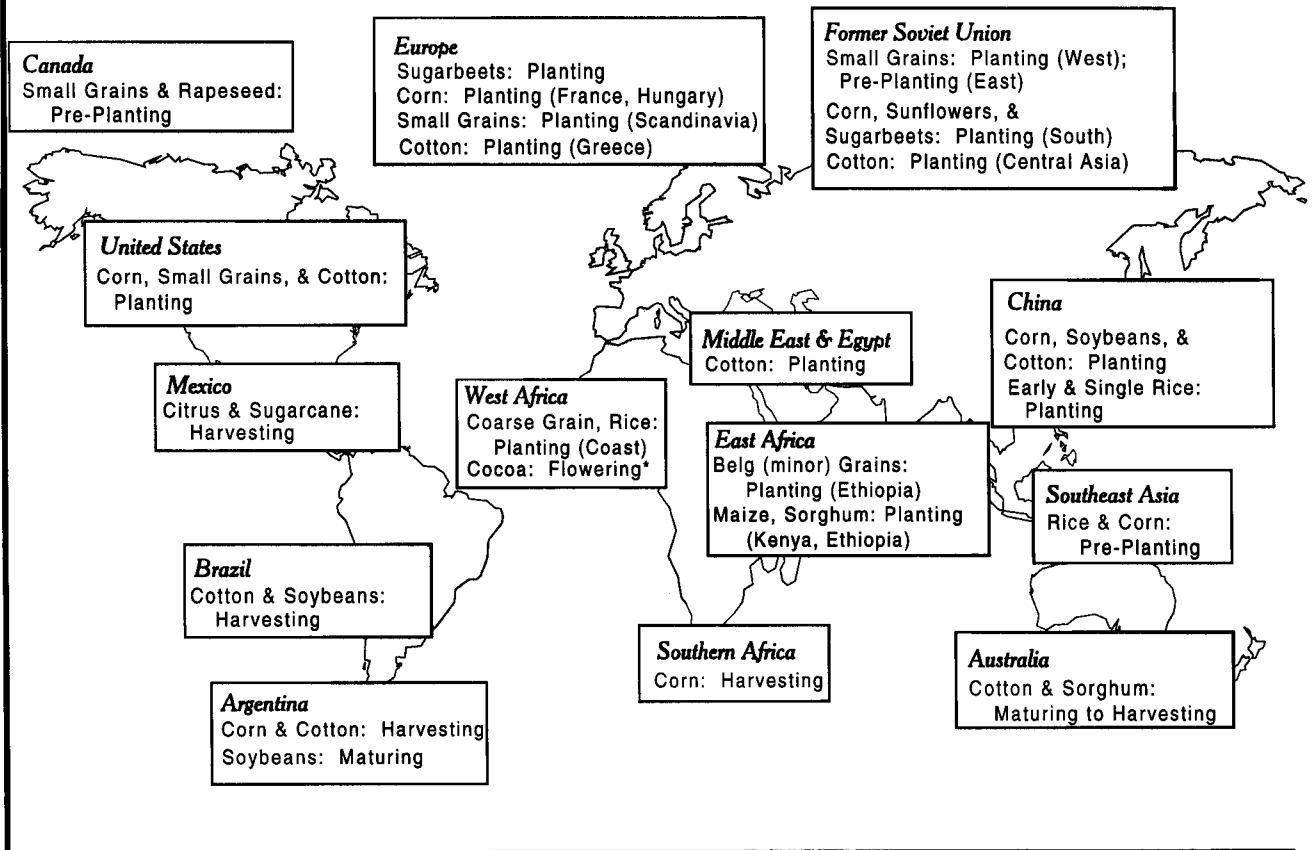


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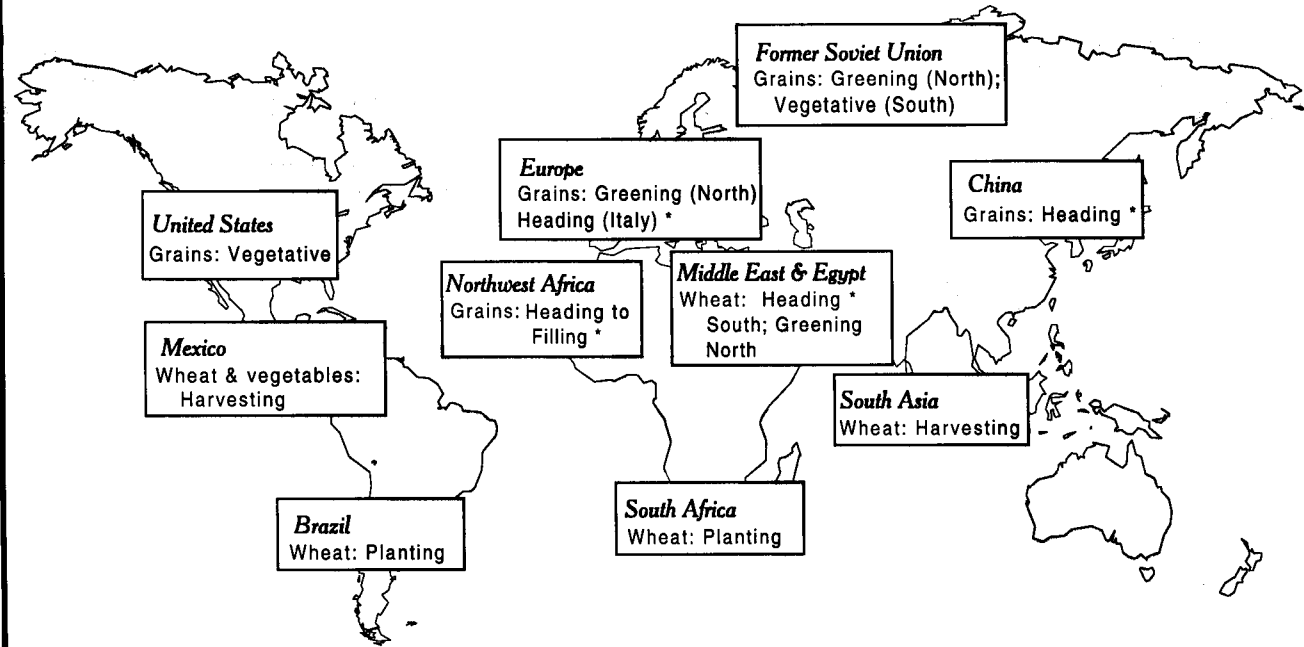
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April normal crop calendar

Summer crops



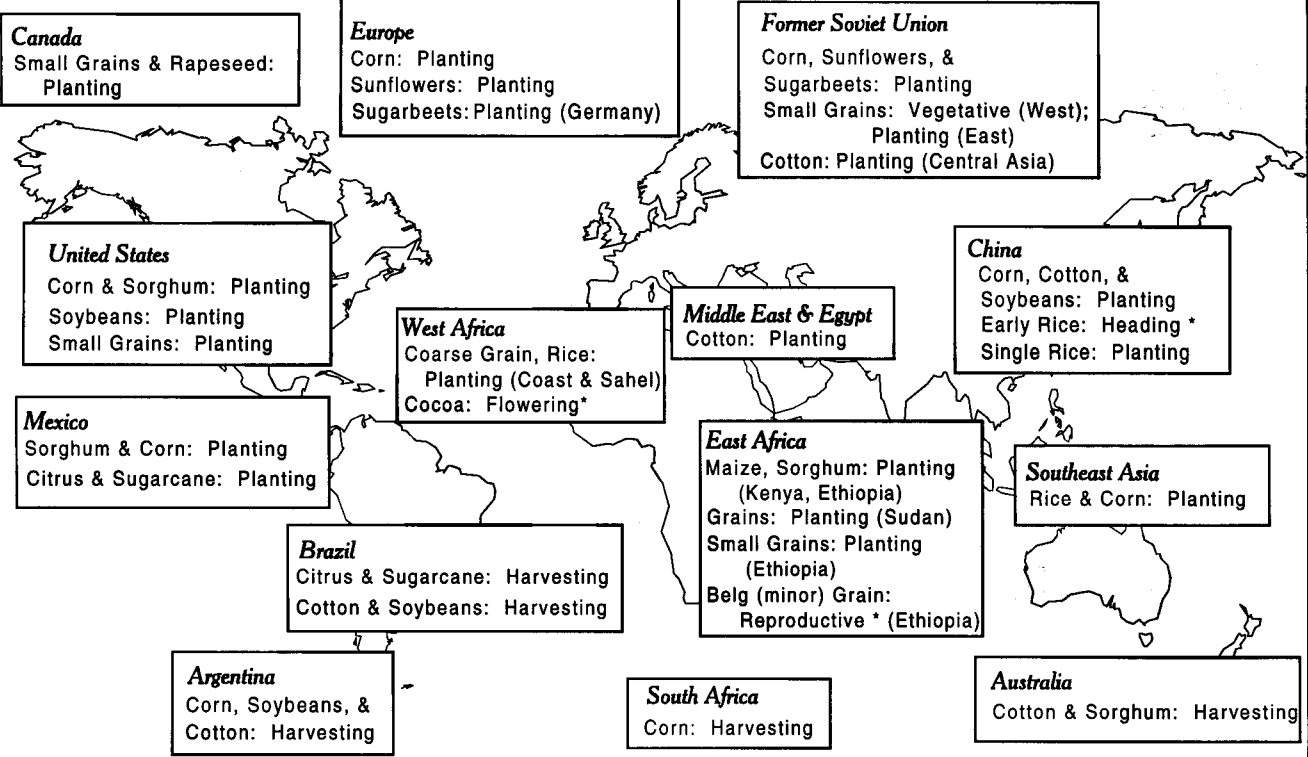
Winter crops



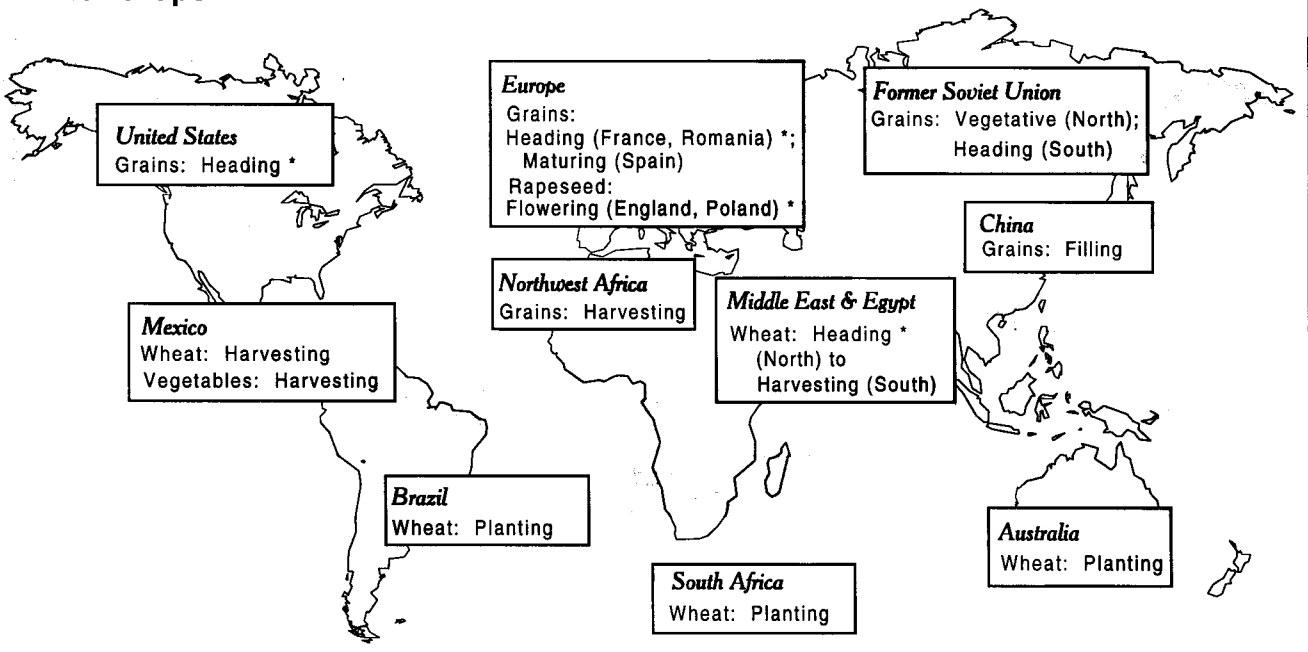
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May normal crop calendar

Summer crops



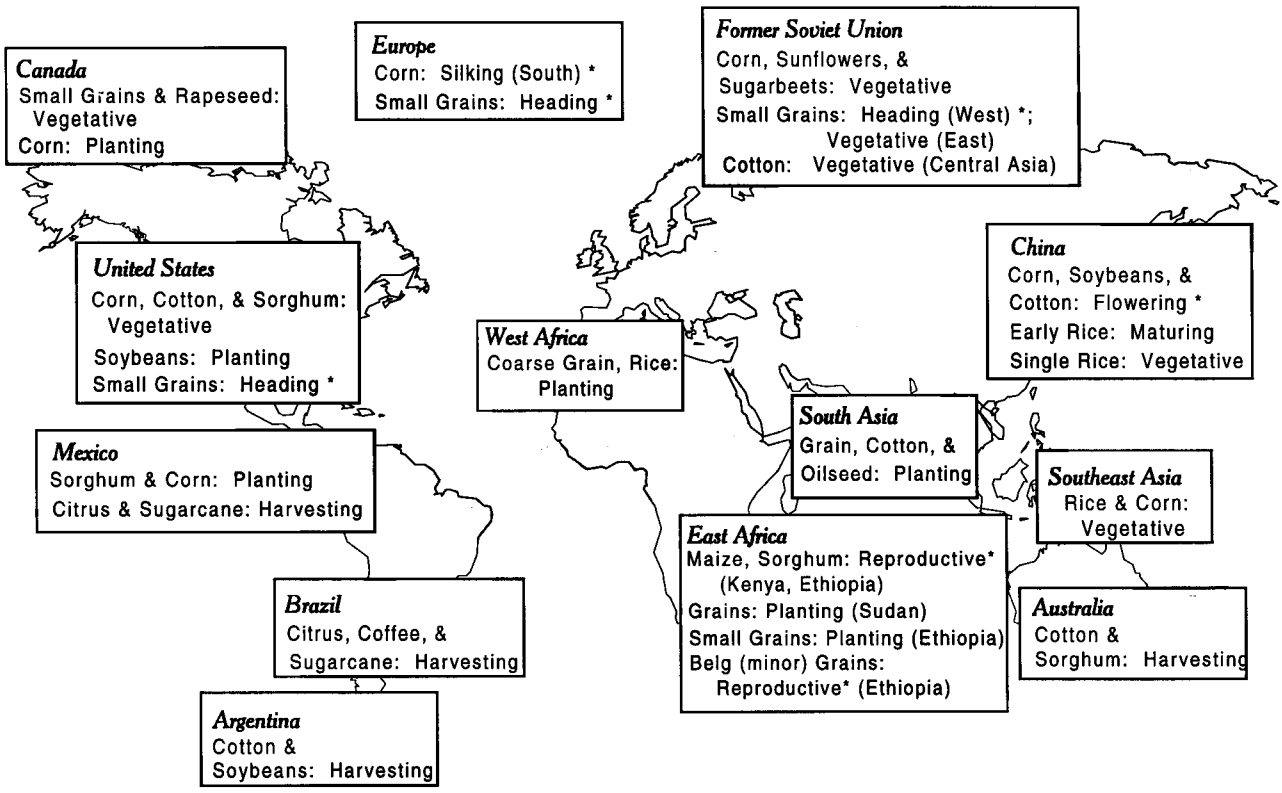
Winter crops



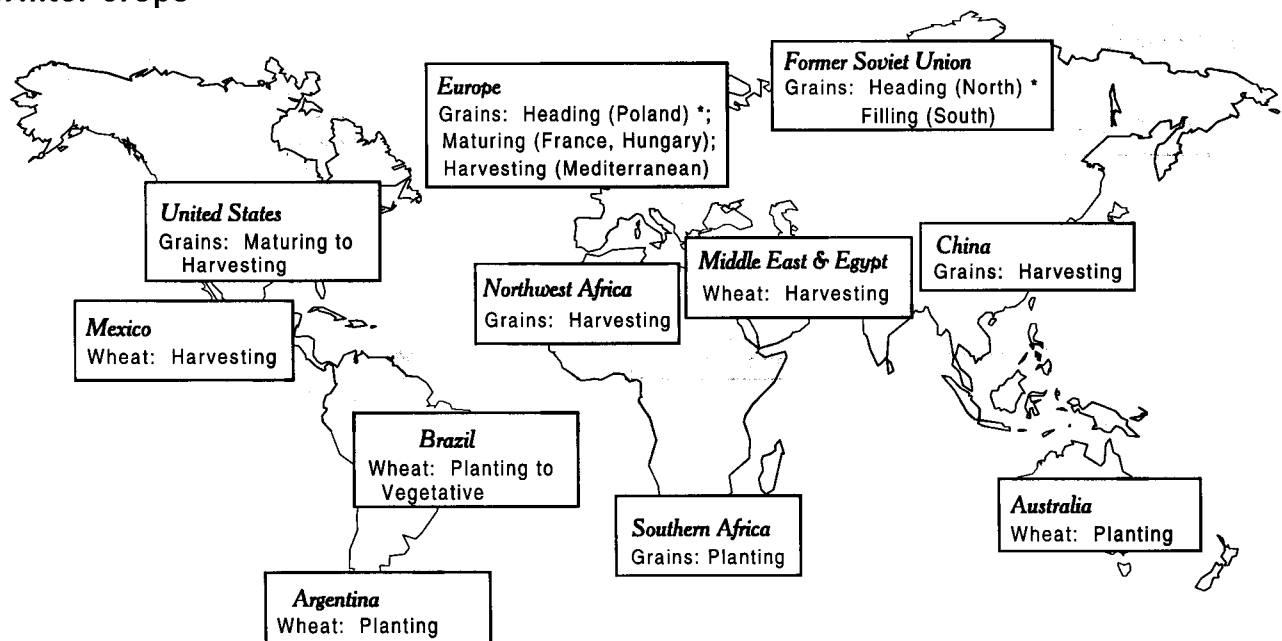
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June normal crop calendar

Summer crops



Winter crops

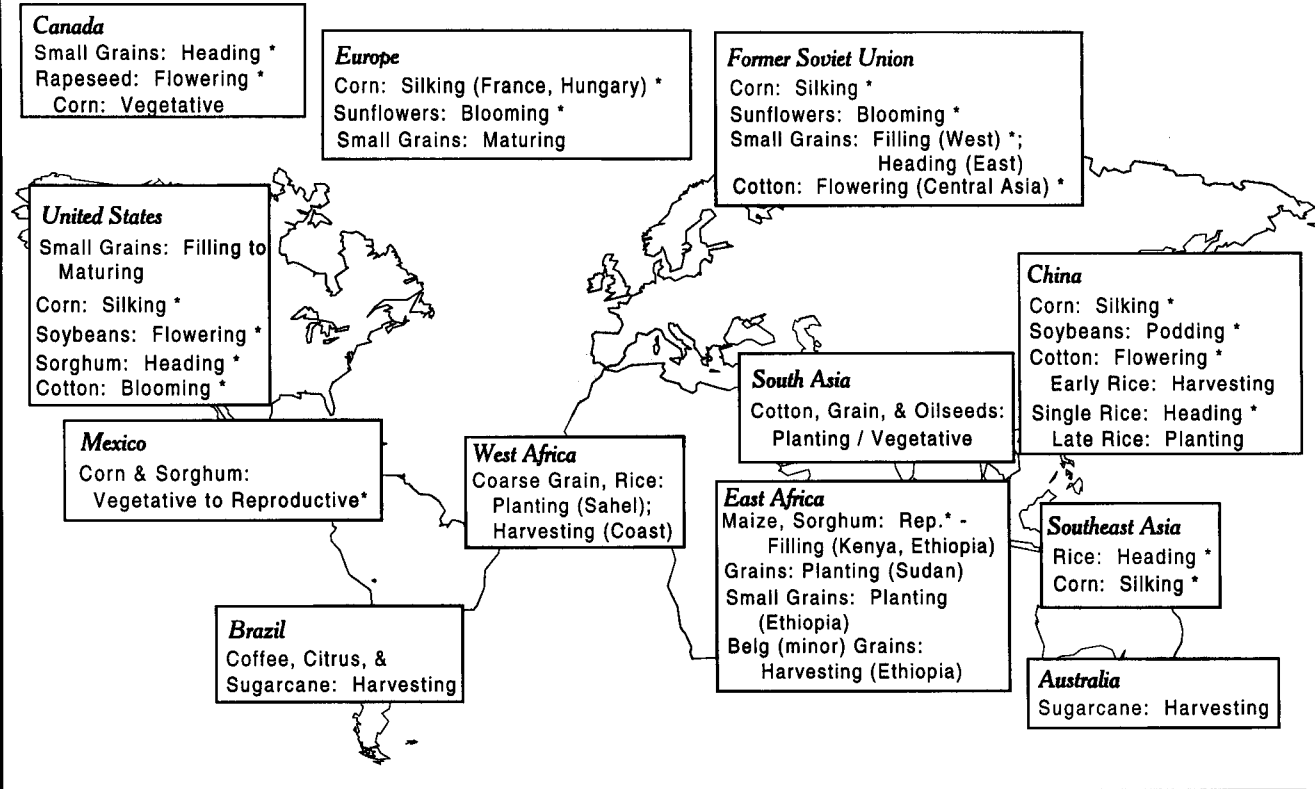


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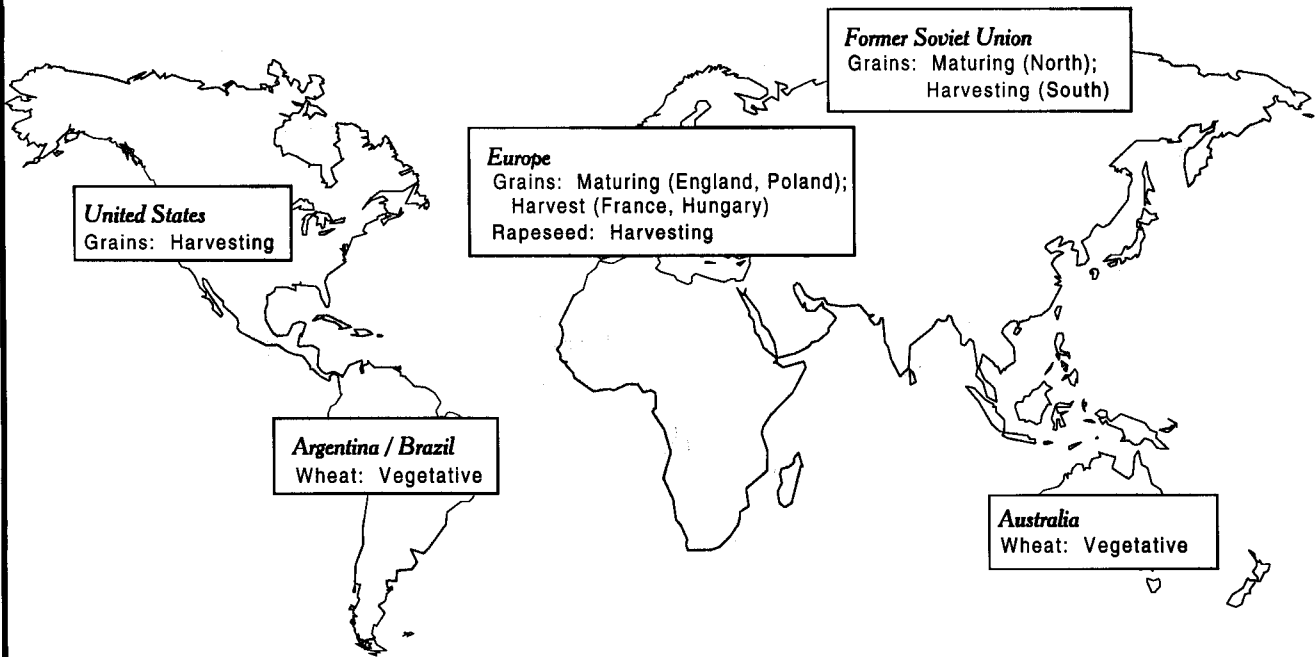
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July normal crop calendar

Summer crops



Winter crops

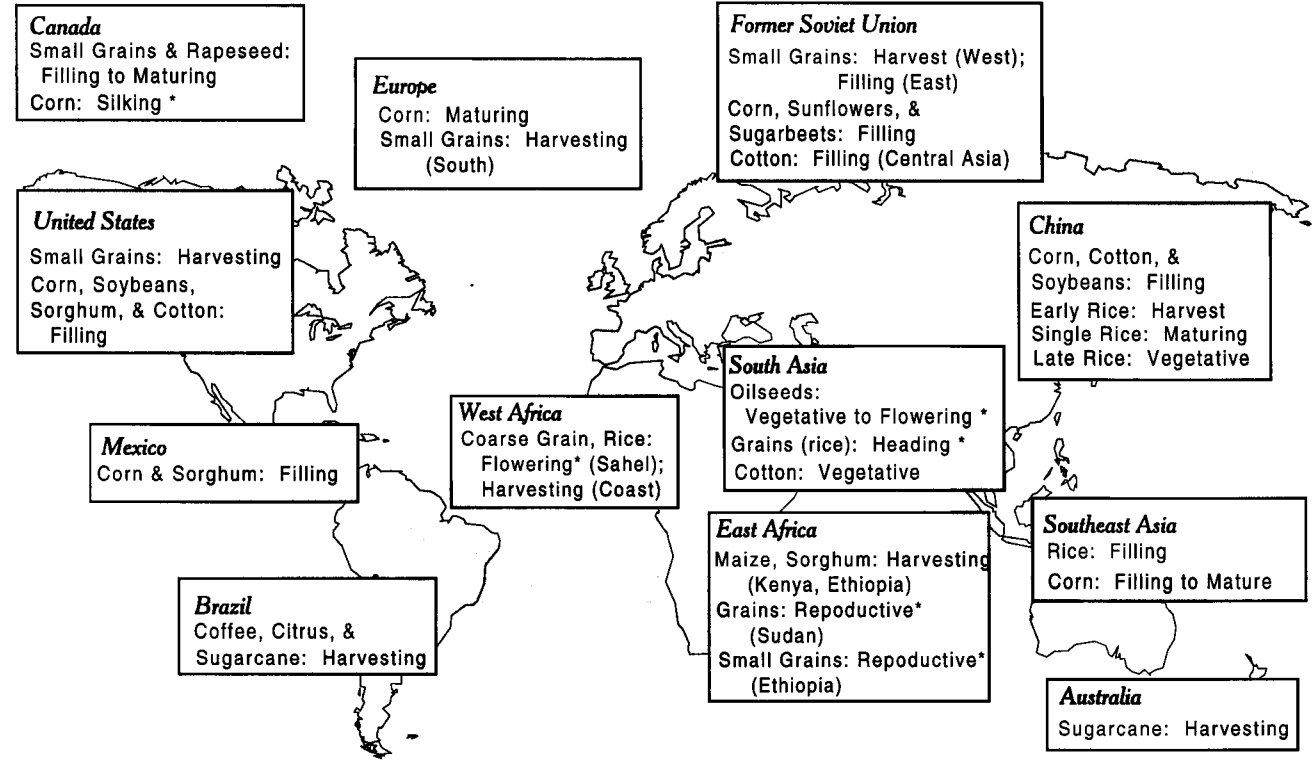


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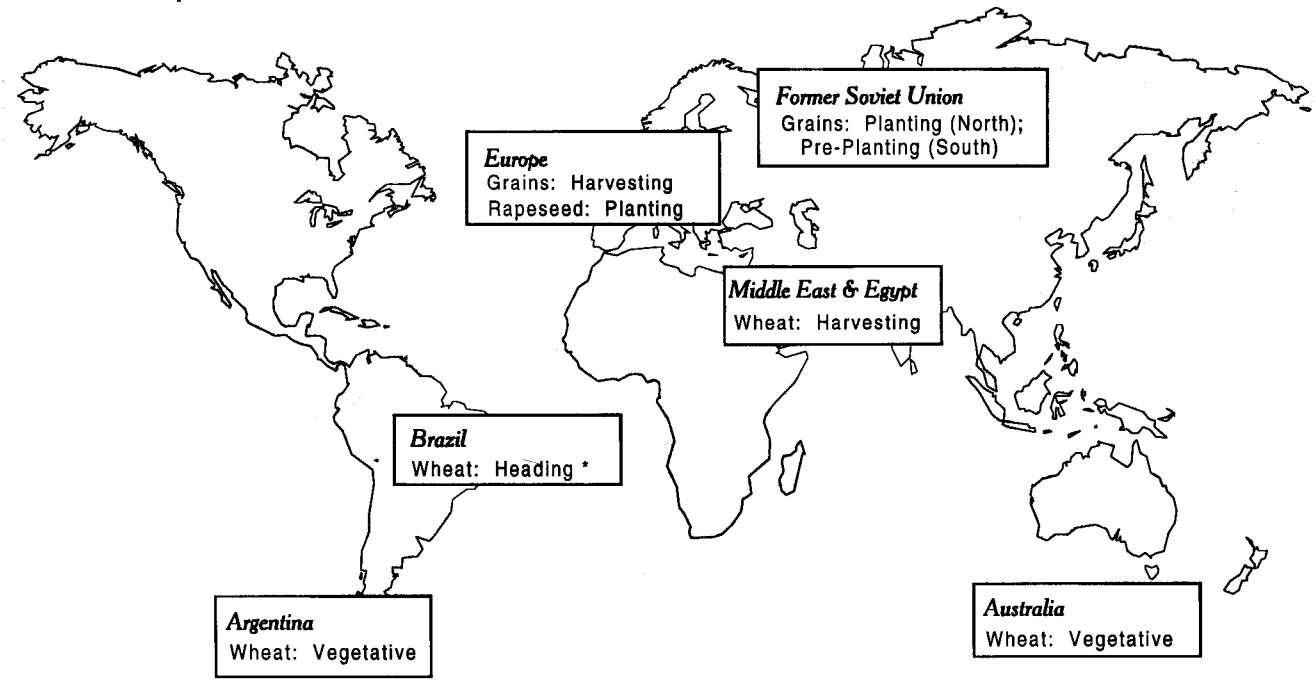
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August normal crop calendar

Summer crops



Winter crops

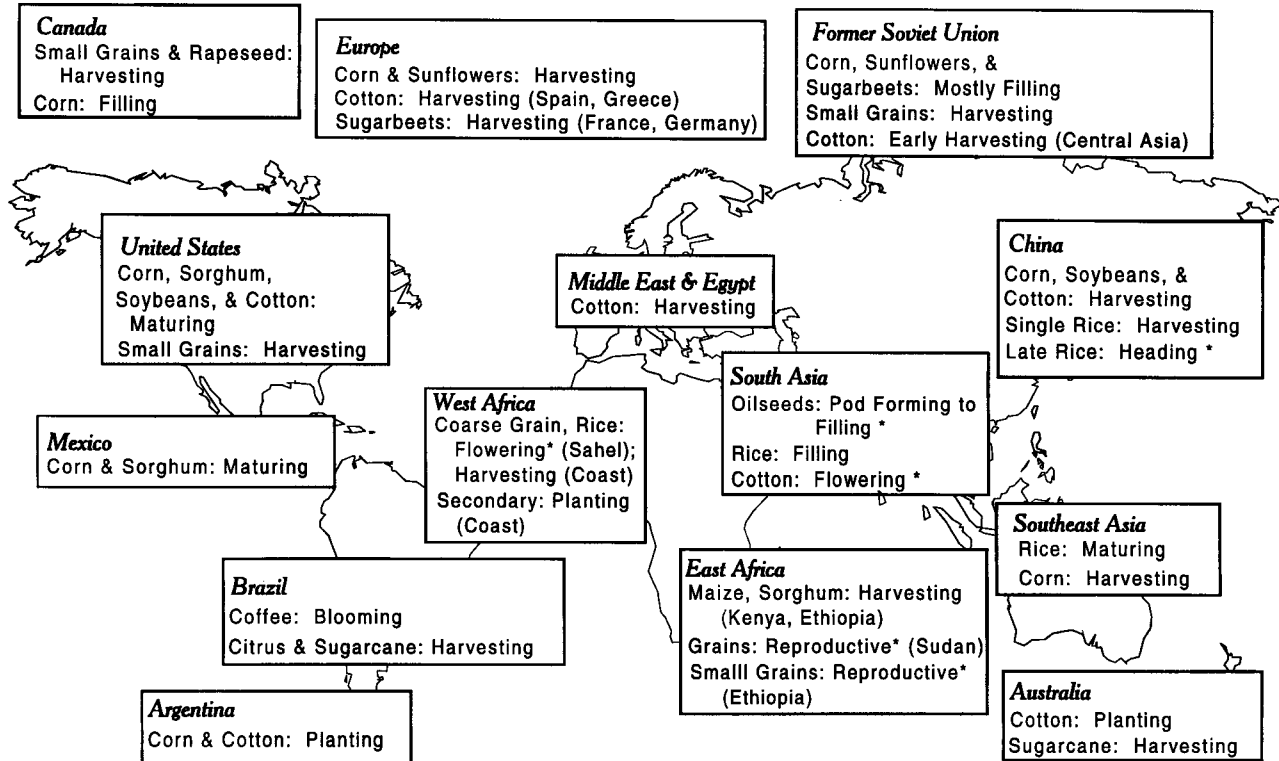


* Moisture / Temperature Sensitive Stage of Development

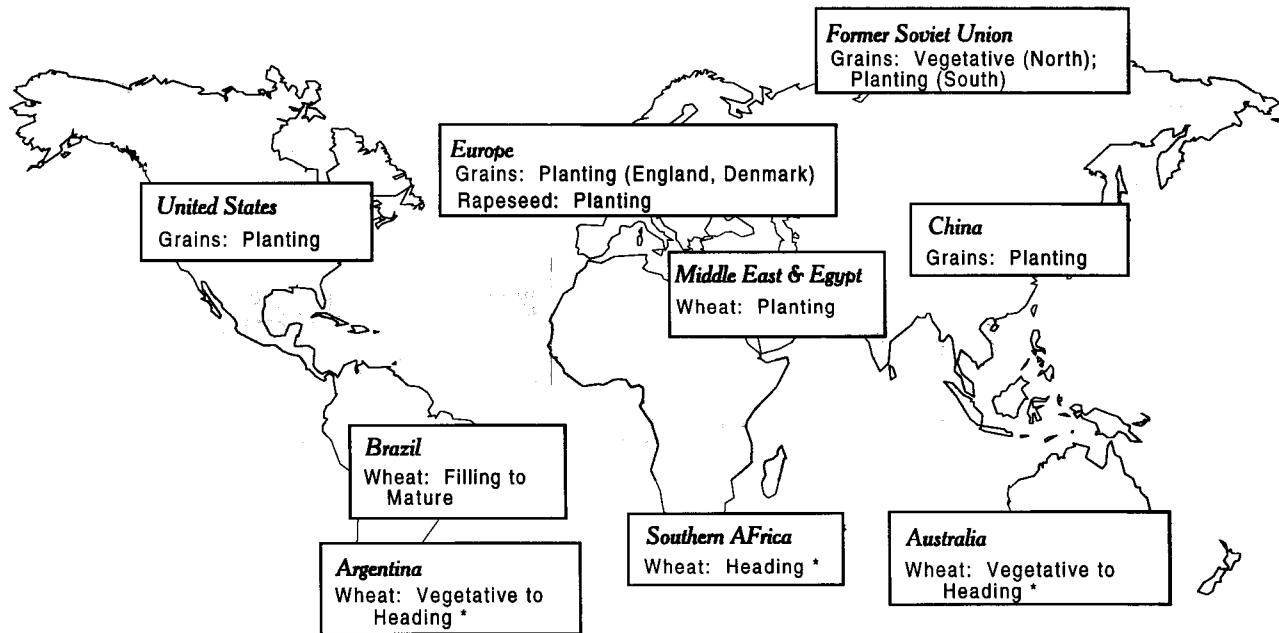
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September normal crop calendar

Summer crops



Winter crops

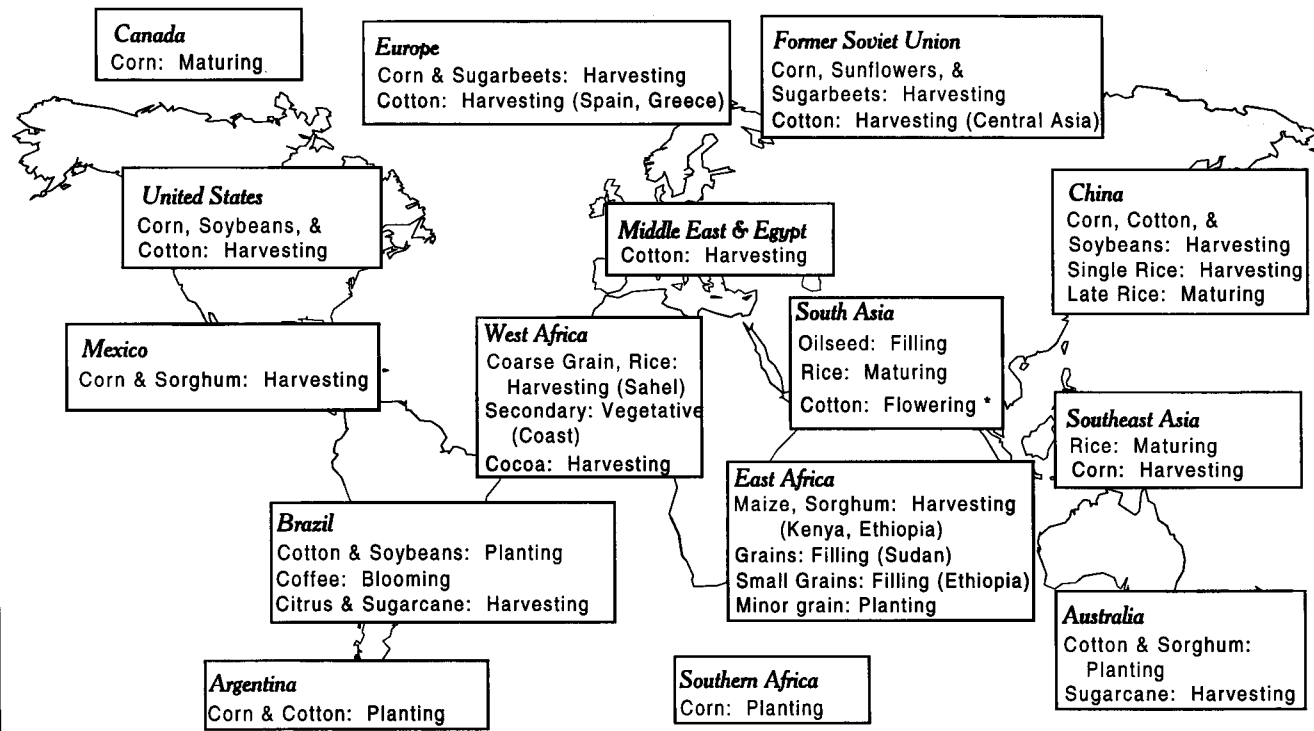


* Moisture / Temperature Sensitive Stage of Development

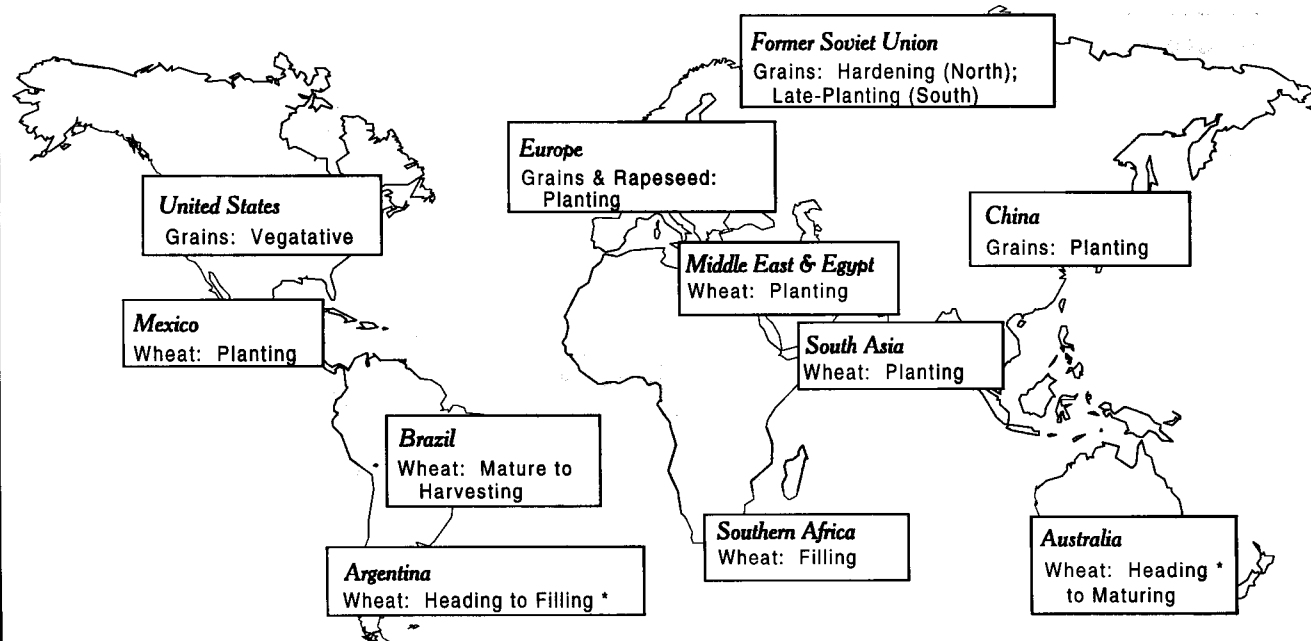
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October normal crop calendar

Summer crops



Winter crops

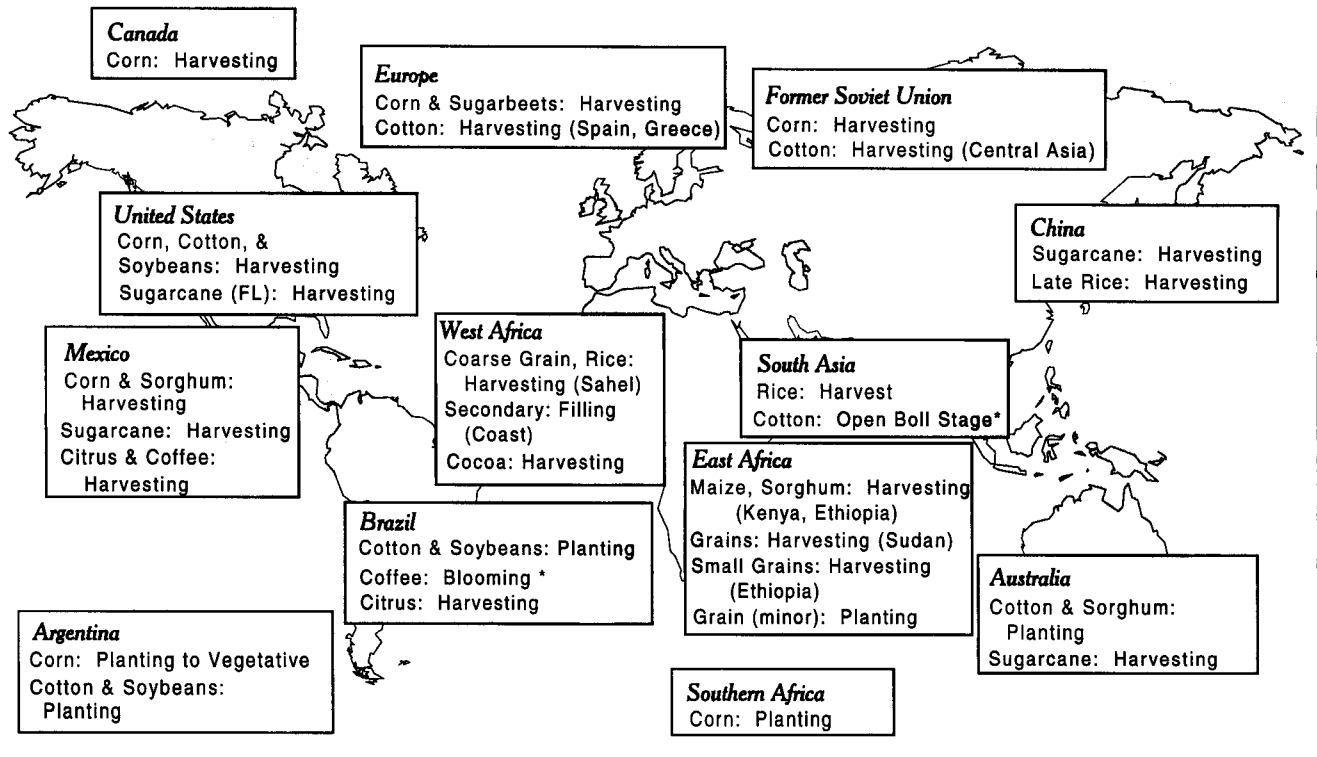


* Moisture / Temperature Sensitive Stage of Development

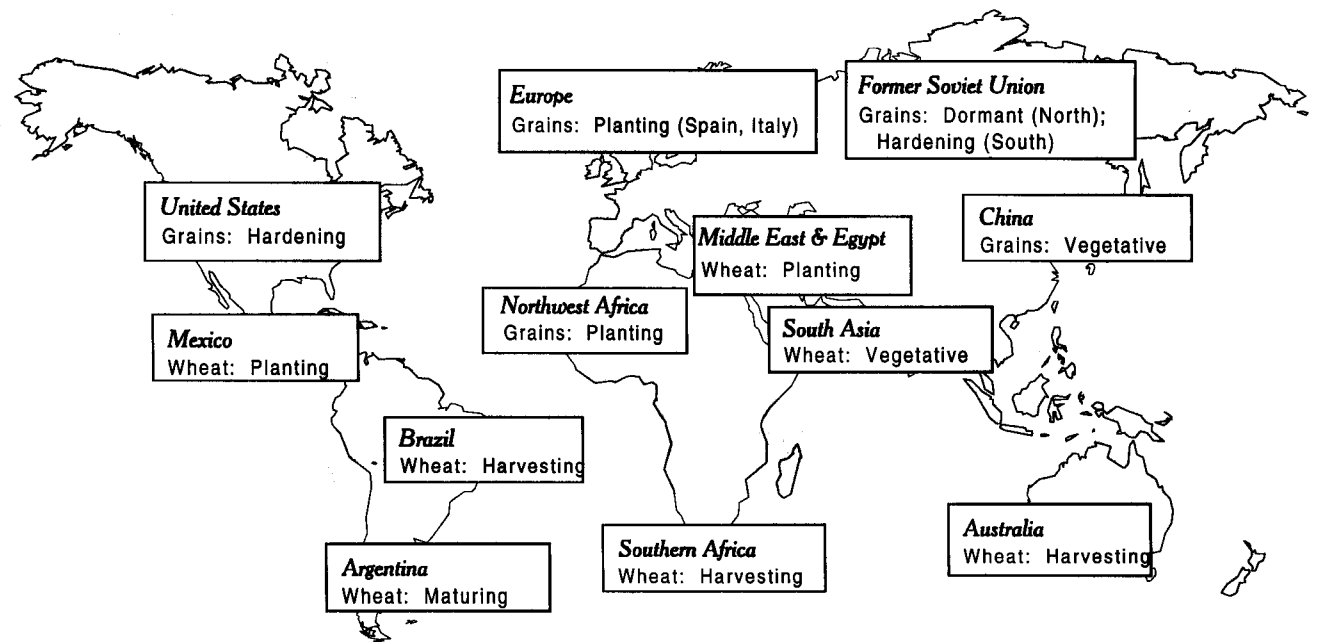
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November normal crop calendar

Summer crops



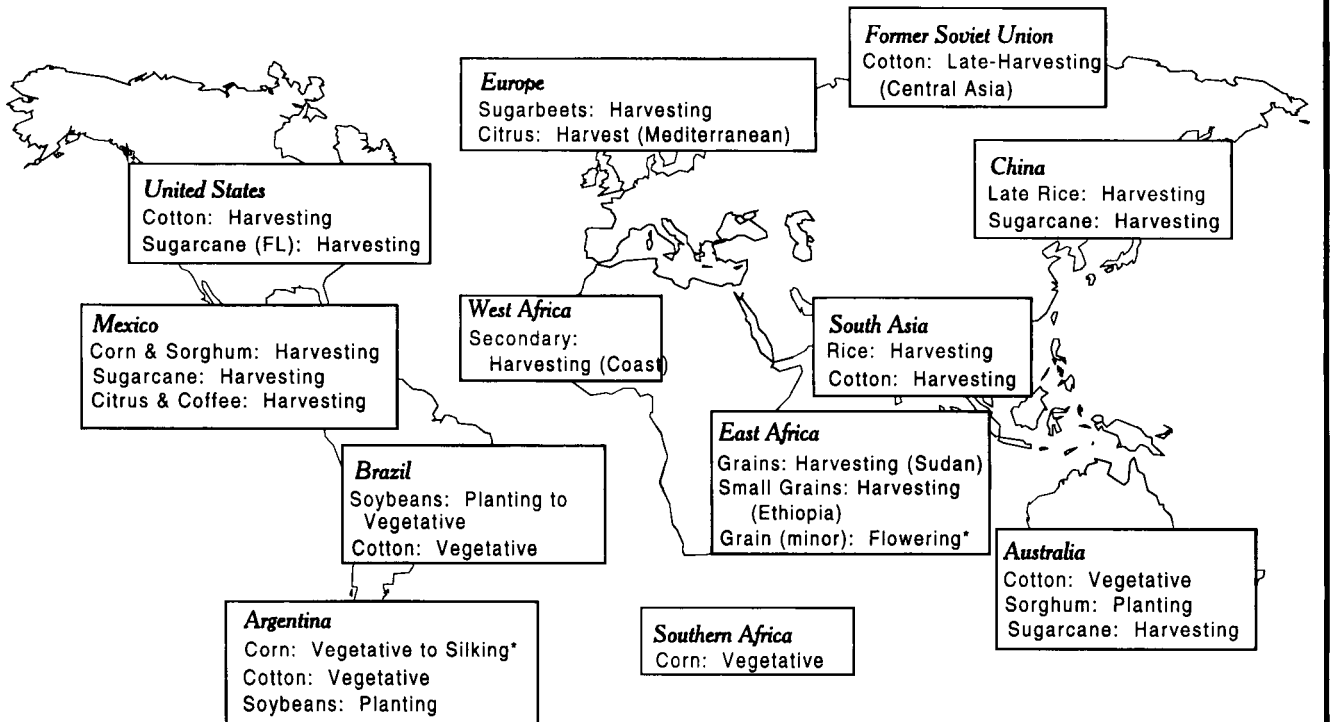
Winter crops



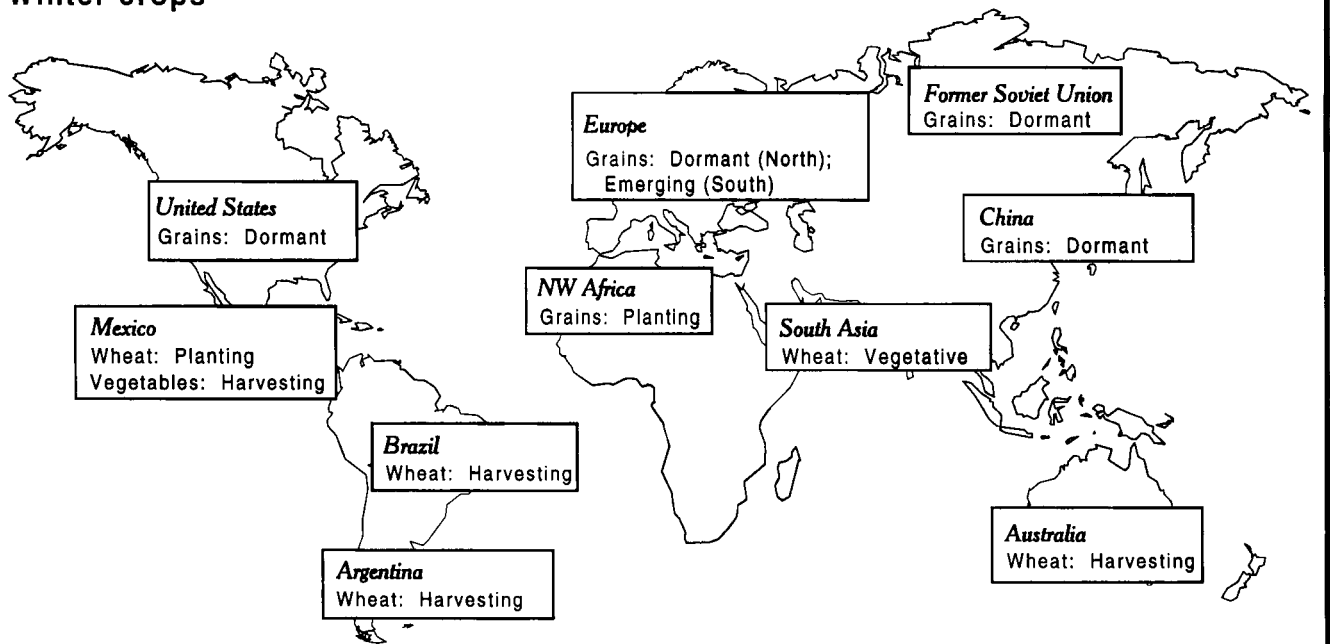
* Moisture / Temperature Sensitive Stage of Development

December normal crop calendar

Summer crops



Winter crops



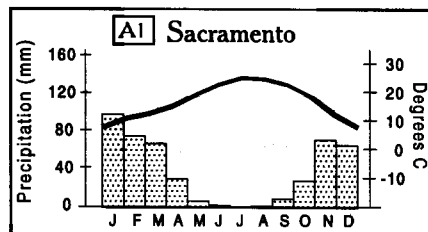
* Moisture / Temperature Sensitive Stage of Development

JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Metric conversion units

Metric unit	÷	Factor	=	U.S. unit
1 hectare	÷	.4047	=	2.471 acres
1 kilogram	÷	.4536	=	2.205 pounds
1 metric ton	÷	.9072	=	1.102 short tons
Metric tons of:				
wheat, soybeans	÷	.027216	=	bushels
rice, rapeseed, sunflowerseed	÷	.045359	=	cwt
corn, sorghum, rye	÷	.025401	=	bushels
barley	÷	.021772	=	bushels
oats	÷	.014515	=	bushels
sugar	÷	.907185	=	short tons
cotton	÷	.217720	=	480-lb. bales

Climate Station Key

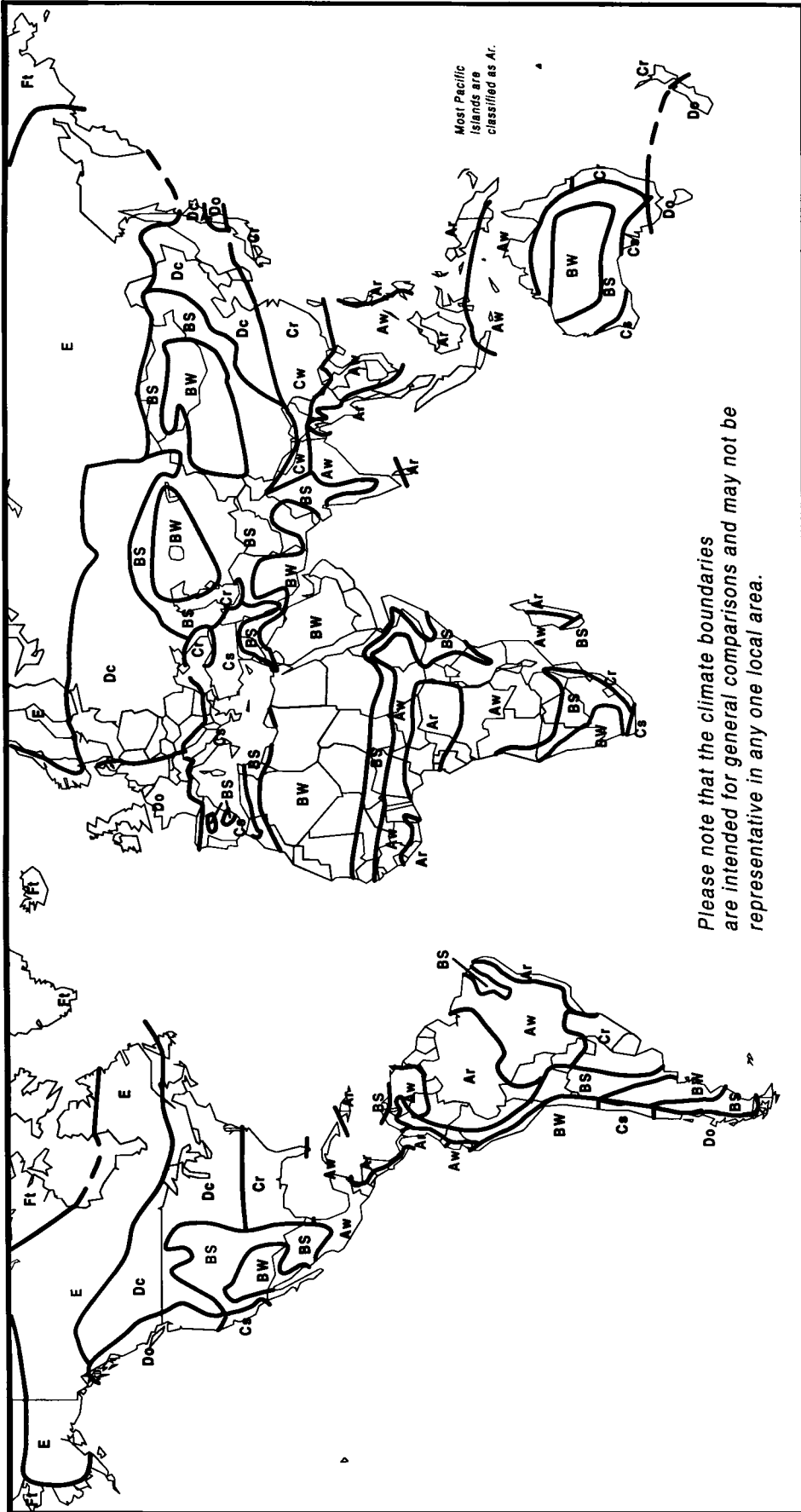


 Precipitation, millimeters

 Temperature, degrees Celsius

Bars show average monthly precipitation. Lines plot mean monthly temperatures. Data for both are reported in appendix I. The boxed number (A1 above) is referenced in the country map and the appendix.

World climates



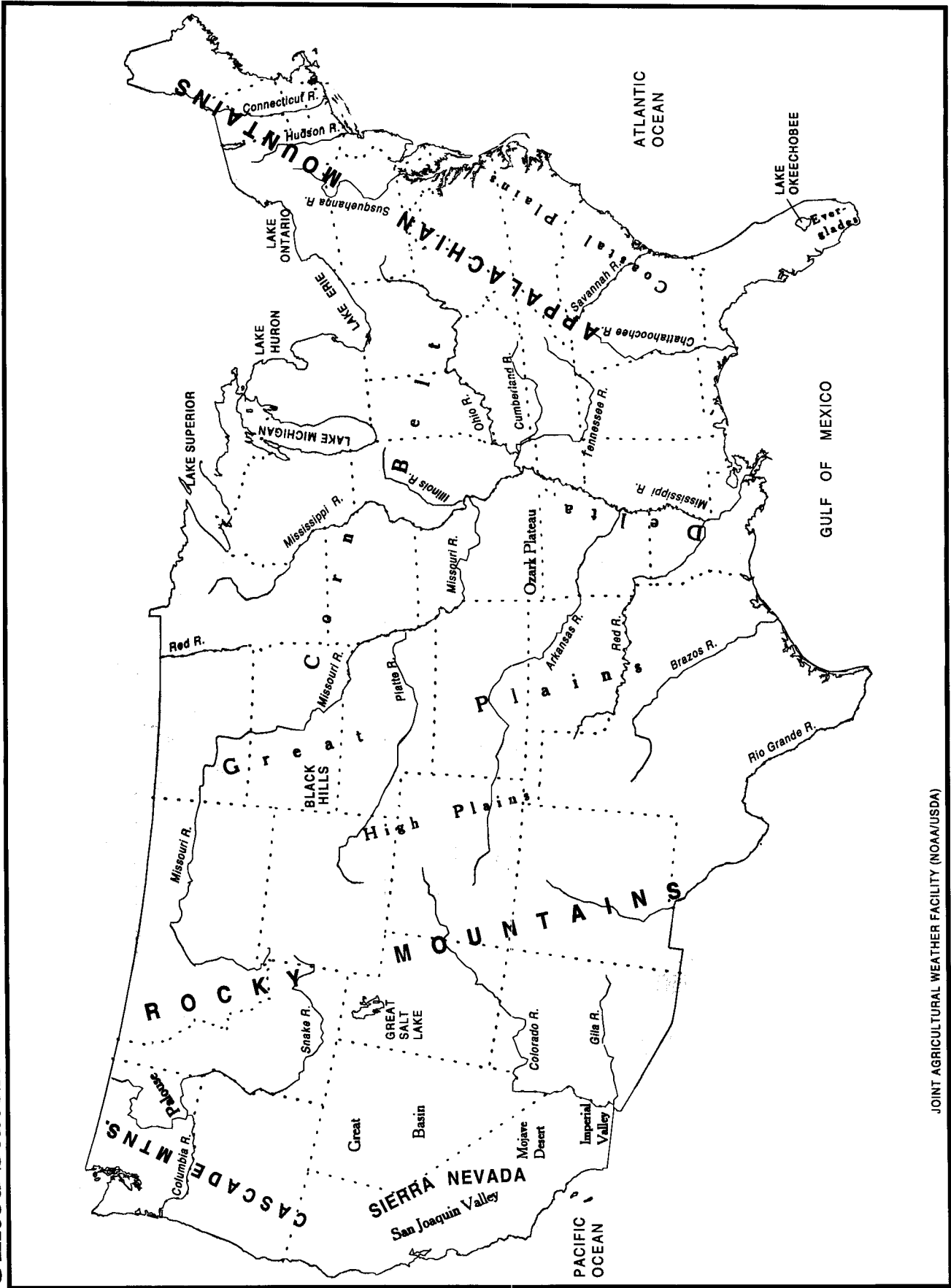
Please note that the climate boundaries are intended for general comparisons and may not be representative in any one local area.

- Ar - Tropical rain
- Aw - Tropical summer rain
- BS - Steppe (arid)
- BW - Desert
- Cr - Subtropical rain
- Cs - Subtropical winter rain
- Cw - Subtropical summer rain
- Dc - Temperate continental
- Do - Temperate oceanic
- E - Subarctic (boreal)
- Ft - Tundra

EXPLANATIONS: A = tropical, little or no killing frost; Ar = rain year round; Aw = greater than 2 months dry. BS = annual moisture loss exceeds annual precipitation; BW = one-half of annual moisture loss exceeds annual precipitation. C = warm middle latitude climate, occasional frost, snow rare; Cr = no distinct dry season; Cs = warm season noticeably dry; Cw = cool season noticeably dry. D = growing season 4-7 months long; Dc = winter and summer temperatures can be extreme; Do = temperature extremes lessened by oceanic influence. E = large annual range of temperatures, very short growing season, severe winters. Ft = monthly temperatures usually below 10 C, little or no growing season.

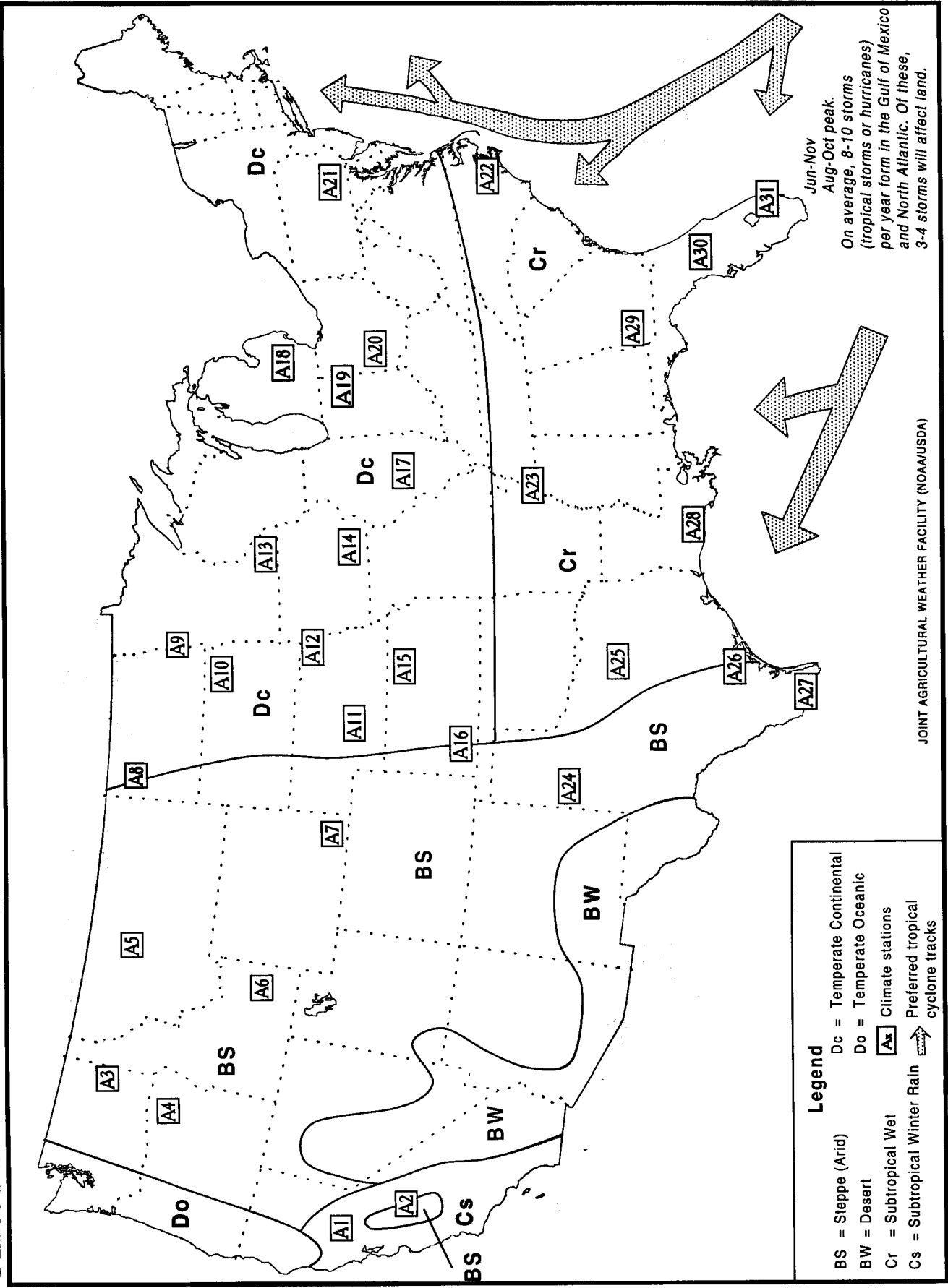
Adapted from *World Climates* by Rudloff (1981)

United States: Landforms

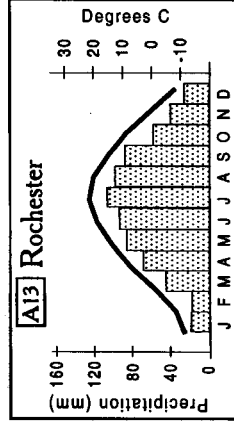
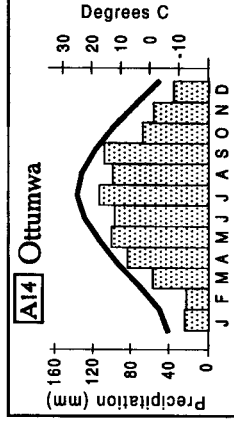
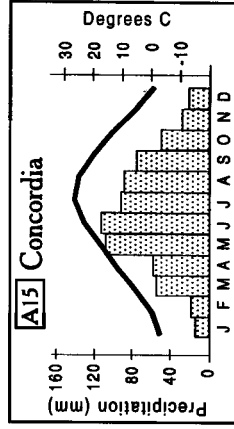
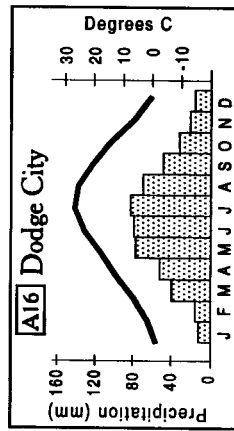
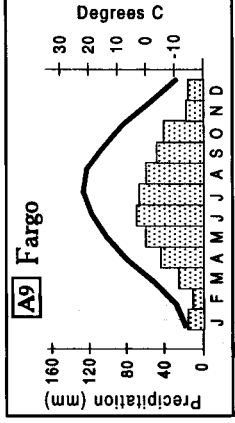
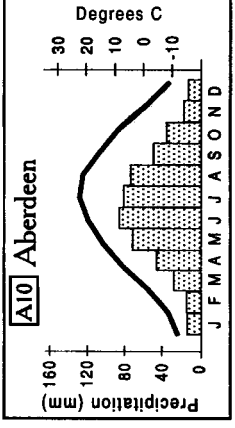
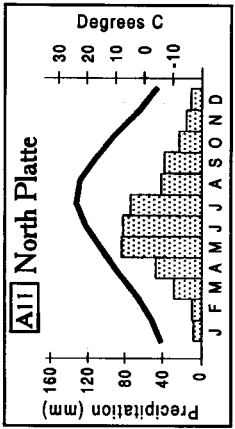
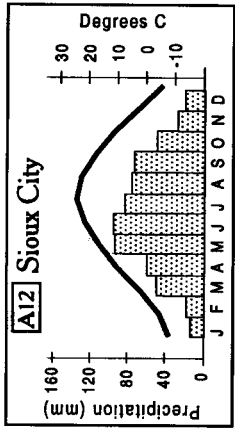
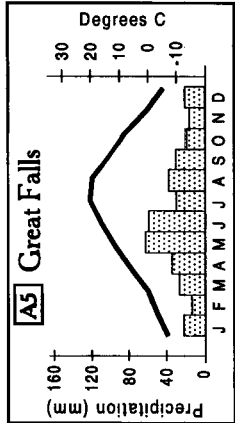
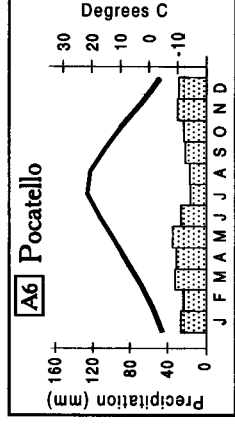
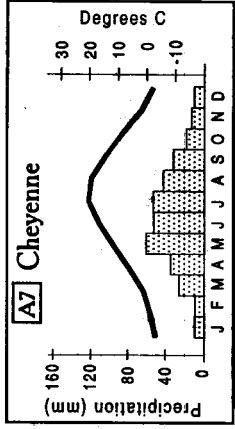
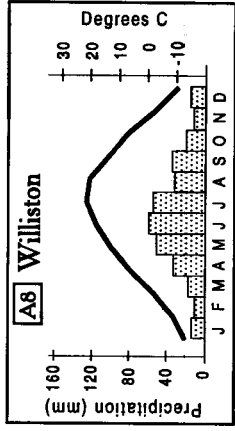
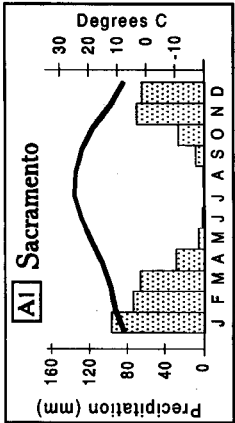
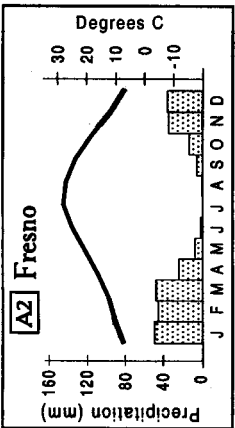
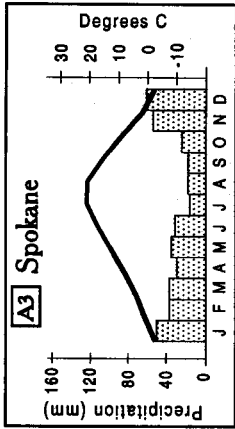
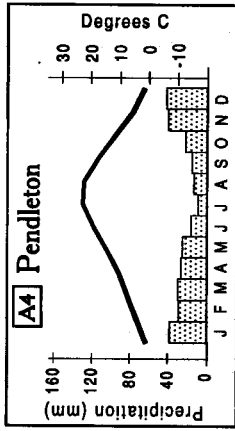


JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

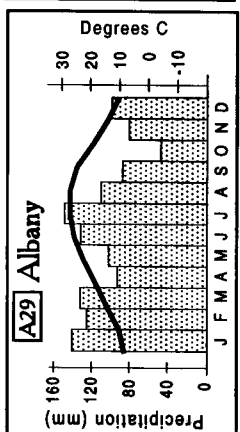
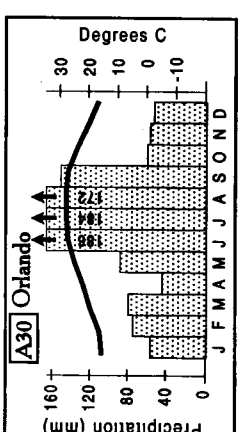
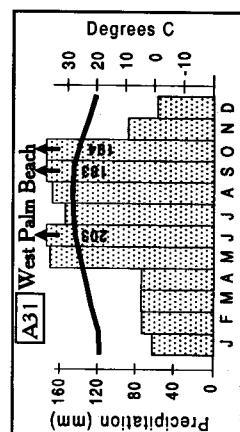
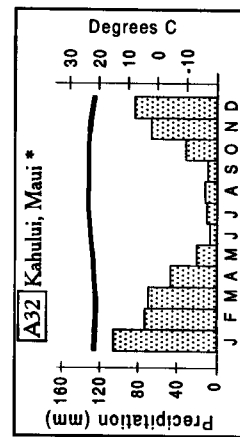
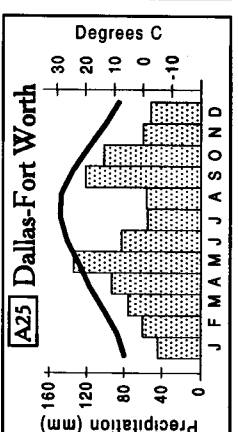
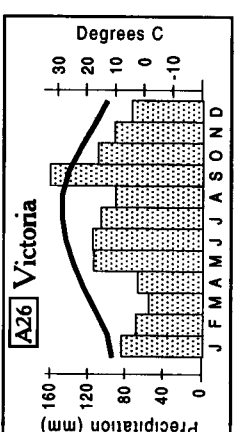
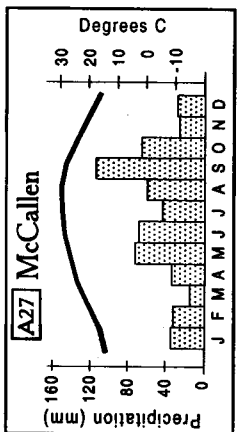
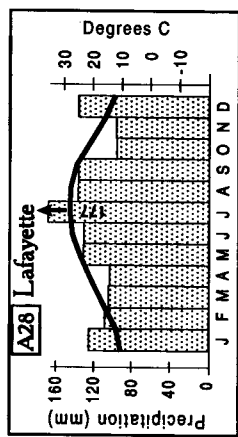
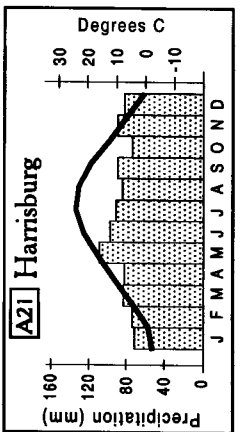
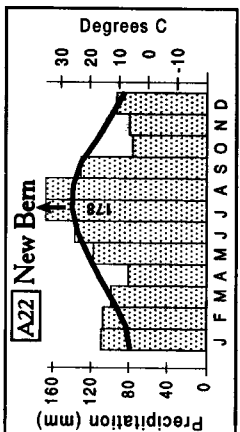
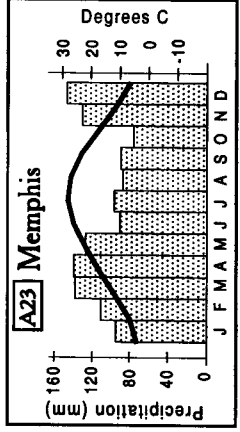
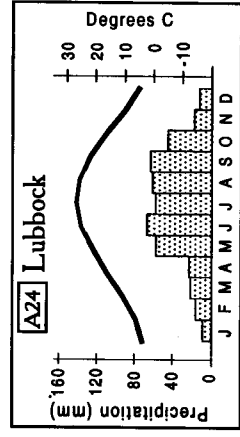
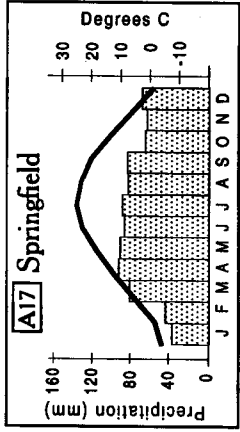
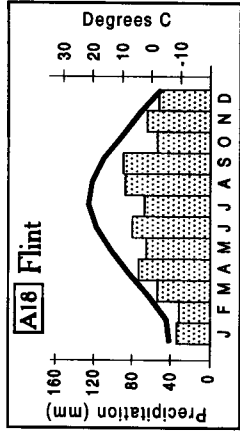
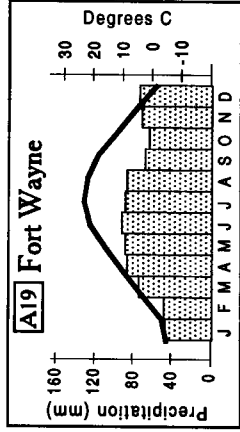
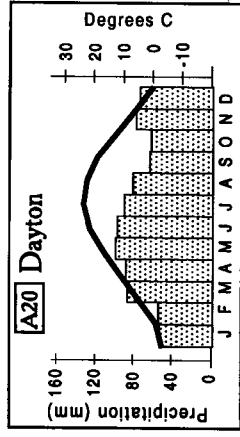
United States: Climate



United States: Climate stations

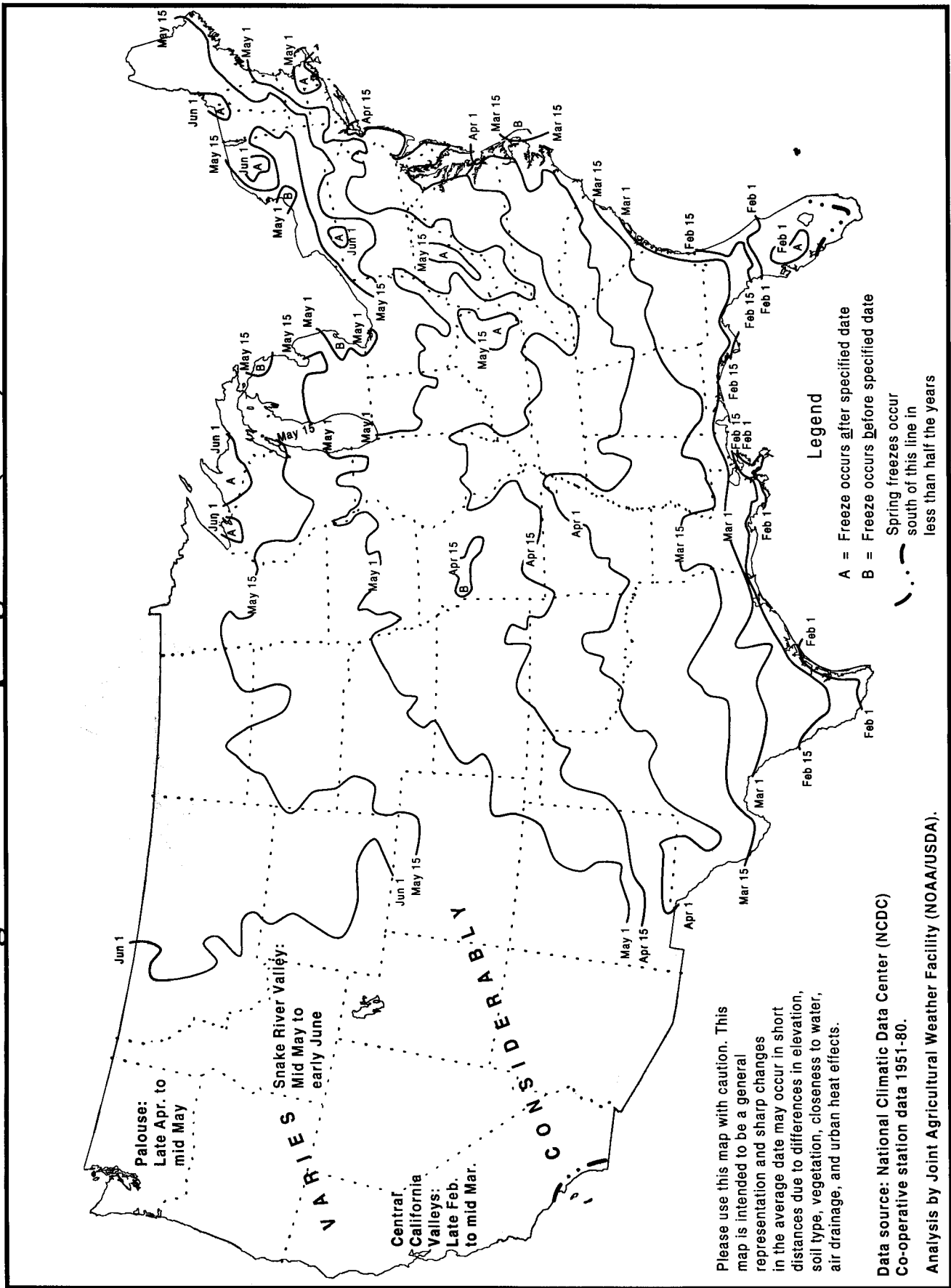


United States: Climate stations (cont'd.)



* NOTE: Hawaiian rainfall is highly variable due to terrain features, and no one station is entirely representative.

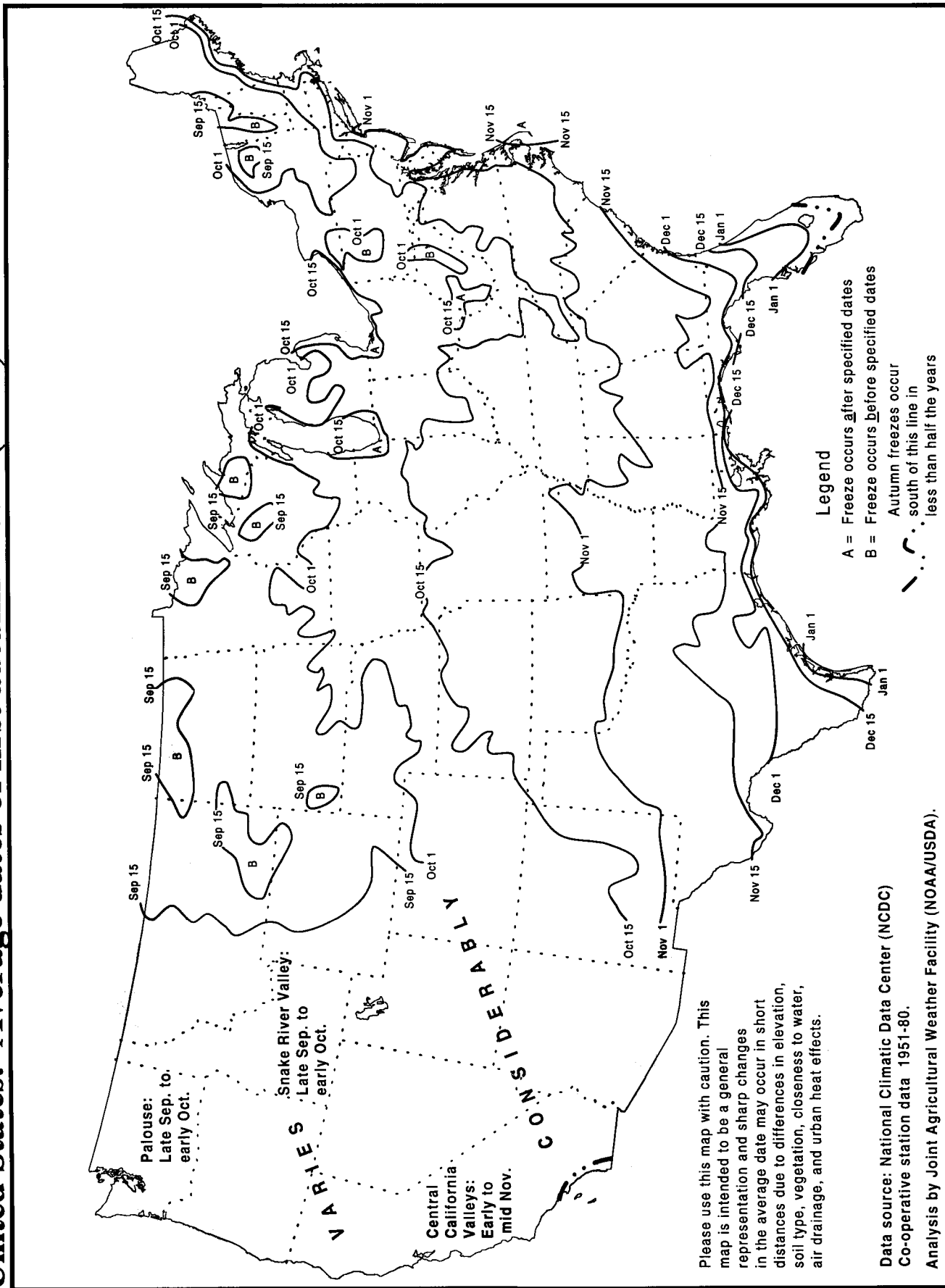
United States: Average dates of last spring freeze (32° F)



Please use this map with caution. This map is intended to be a general representation and sharp changes in the average date may occur in short distances due to differences in elevation, soil type, vegetation, closeness to water, air drainage, and urban heat effects.

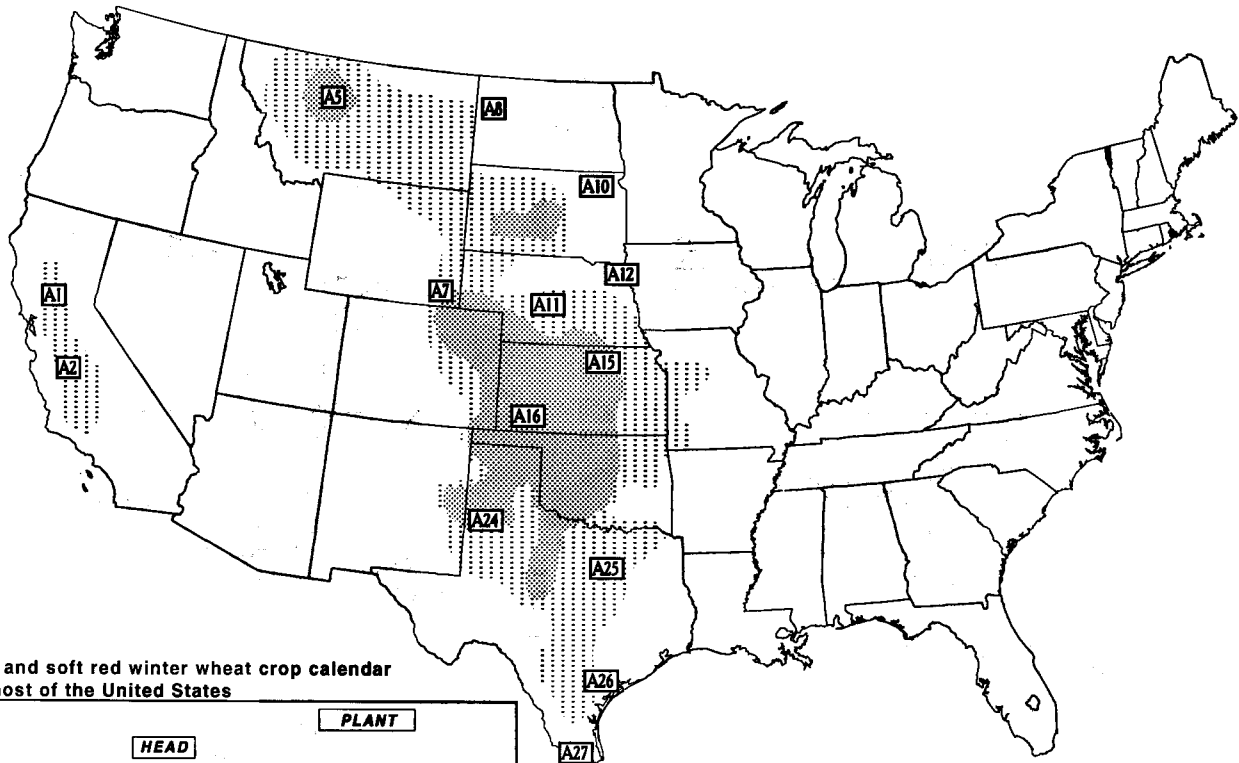
Data source: National Climatic Data Center (NCDC)
 Co-operative station data 1951-80.
 Analysis by Joint Agricultural Weather Facility (NOAA/USDA).

United States: Average dates of first autumn freeze (32° F)

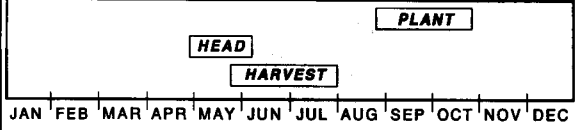


United States: Hard and soft red winter wheat

Hard red winter wheat

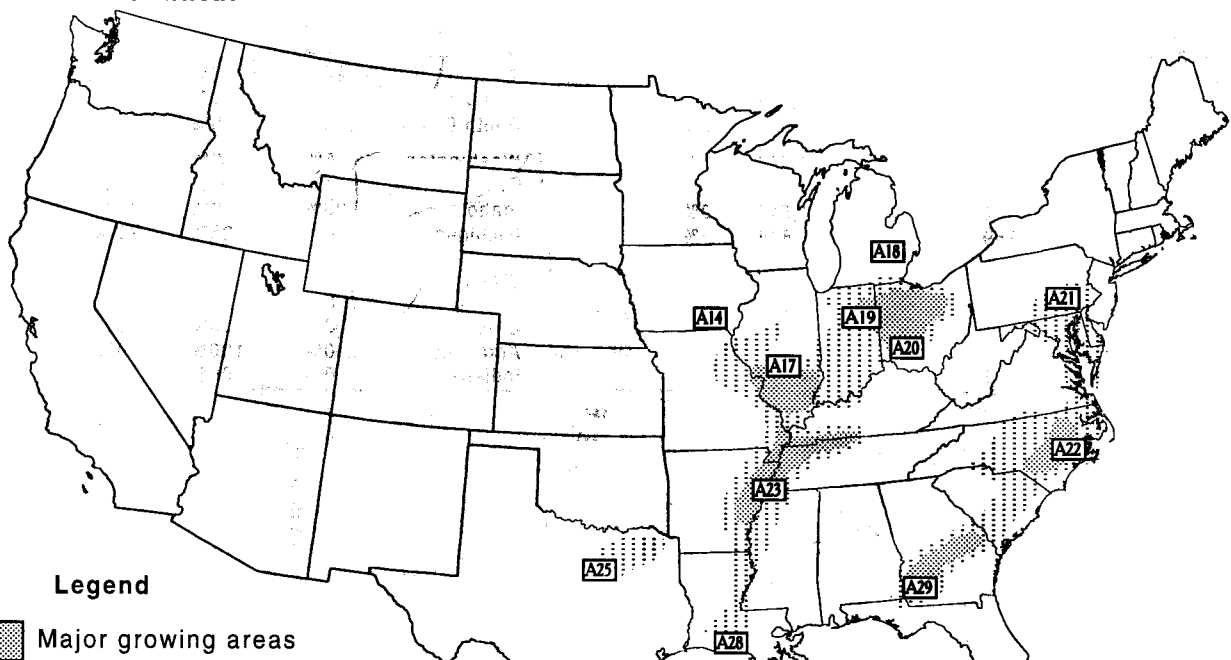


Hard and soft red winter wheat crop calendar for most of the United States






Hard red winter wheat accounts for 42% of total wheat production from 1988/89-1992/93.

Soft red winter wheat

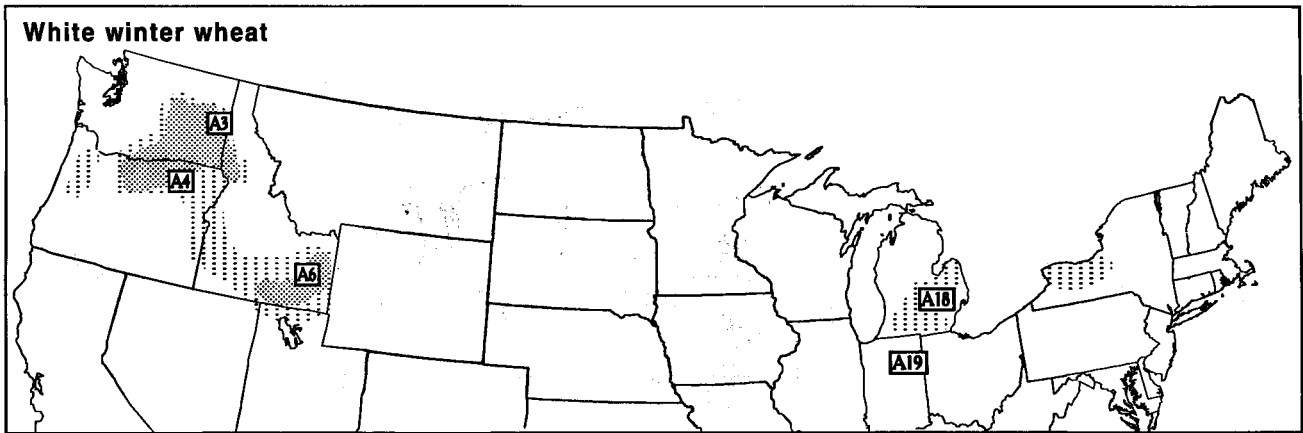





Legend

-  Major growing areas
-  Minor growing areas
-  Climate stations

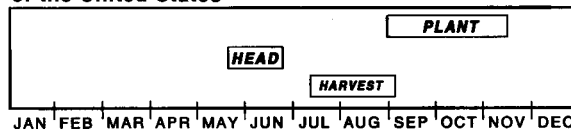
Soft red winter wheat accounts for 21% of total wheat production from 1988/89-1992/93.

United States: White winter wheat and winter wheat statistics



- Legend**
-  Major growing areas
 -  Minor growing areas
 -  Climate stations

White winter wheat crop calendar for most of the United States



White winter wheat accounts for 9% of total wheat production from 1988/89-1992/93.

Winter wheat statistics

United States: Winter wheat statistics by state (1988/89-1992/93 average)

State	Area 1,000 ha	Yield t/ha	Prod. 1,000 t	Pct.
Kansas	4,201	2.25	9,446	22%
Oklahoma	2,242	2.04	4,569	10%
Texas	1,376	1.95	2,683	6%
Colorado	943	2.06	1,946	4%
Nebraska	830	2.20	1,826	4%
Montana	809	2.11	1,711	4%
California	209	5.24	1,095	3%
South Dakota	544	1.94	1,053	2%
Washington	643	3.88	2,496	6%
Oregon	325	3.94	1,278	3%
Idaho	324	4.67	1,511	3%
Michigan	259	3.37	874	2%
Illinois	601	3.33	2,004	5%
Missouri	668	2.87	1,914	4%
Ohio	461	3.55	1,635	4%
Arkansas	441	2.69	1,187	3%
Indiana	301	3.41	1,027	2%

These states account for 87% of total winter wheat production.

Winter wheat classes: Percent acreage breakdown by state (1992)

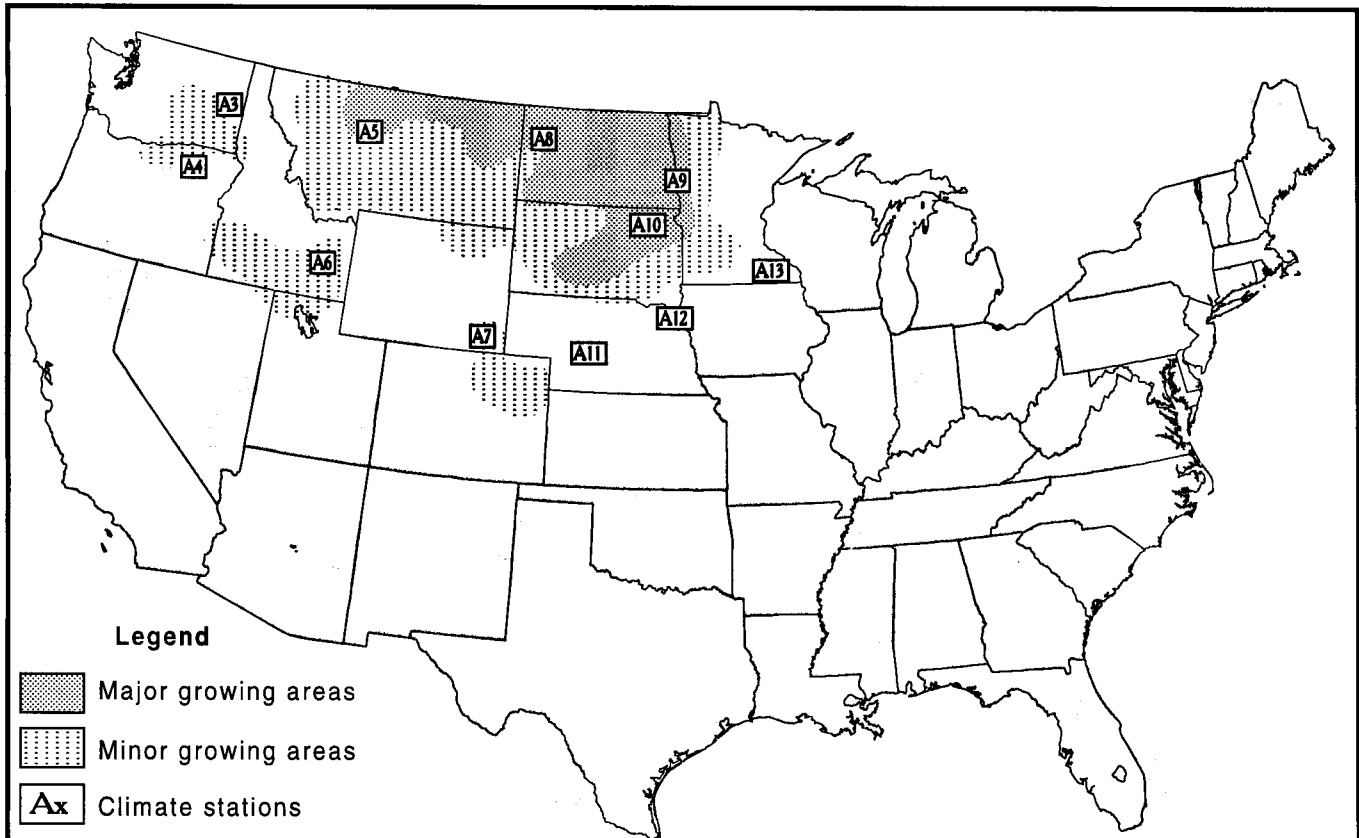
State	Hard red	Soft red	White
Kansas	99%	1%	0%
Oklahoma	99%	1%	0%
Texas	94%	6%	0%
Colorado	100%	0%	0%
Nebraska	100%	0%	0%
Montana	99%	0%	1%
California	90%	0%	10%
South Dakota	100%	0%	0%
Washington	5%	0%	95%
Oregon	1%	0%	99%
Idaho	29%	0%	71%
Michigan	0%	28%	72%
Illinois	2%	98%	0%
Missouri	3%	97%	0%
Ohio	0%	100%	0%
Arkansas	0%	100%	0%
Indiana	0%	100%	0%

United States: Historical winter wheat statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1988/89	16,107	2.64	42,509
1989/90	16,798	2.36	39,590
1990/91	20,195	2.74	55,272
1991/92	15,947	2.34	37,357
1992/93	16,954	2.58	43,723
1988/89-1992/93 average	17,200	2.53	43,690

JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

United States: Other spring wheat (excluding durum)



Hard red spring wheat accounts for 21% of total wheat production from 1988/89-1992/93.

White spring wheat accounts for 2% of total wheat production from 1988/89-1992/93.

United States: Other spring wheat statistics by state (1988/89-1992/93 average)

State	Area	Yield	Prod.	Pct.
	1,000 ha	t/ha	1,000 t	
North Dakota	2,881	2.11	6,076	44%
Minnesota	993	2.65	2,628	19%
Montana	987	1.72	1,698	12%
South Dakota	785	1.82	1,426	10%
Idaho	202	4.61	929	7%
Washington	278	2.84	789	6%
Oregon	33	3.34	109	1%
Colorado	20	4.85	96	1%

These states account for 100% of total production.

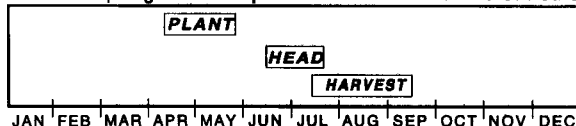
Spring wheat classes: Percent acreage breakdown by state (1992)

State	Hard red	White
	North Dakota	100%
Minnesota	100%	0%
Montana	100%	0%
South Dakota	100%	0%
Idaho	30%	70%
Washington	20%	80%
Oregon	15%	85%
Colorado	84%	16%

United States: Historical other spring wheat statistics

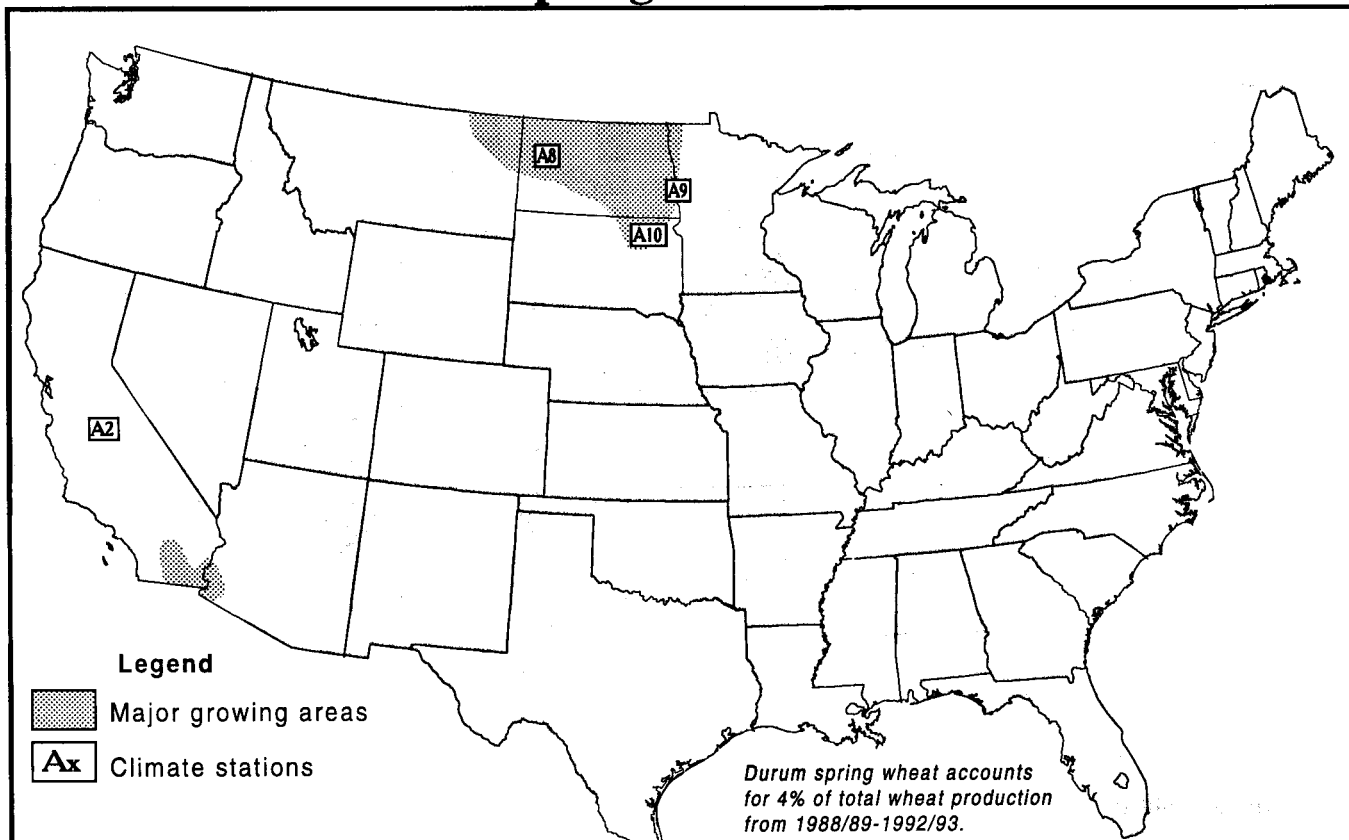
	Area	Yield	Prod.
	1,000 ha	t/ha	1,000 t
1988/89	4,266	1.31	5,592
1989/90	6,883	1.94	13,329
1990/91	6,425	2.47	15,870
1991/92	6,111	2.25	13,732
1992/93	7,312	2.81	20,554
1988/89-1992/93 average	6,199	2.16	13,815

Hard red spring wheat crop calendar for most of the United States

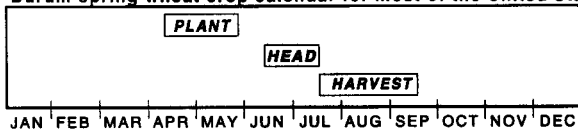


JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

United States: Durum spring wheat and total wheat statistics



Durum spring wheat crop calendar for most of the United States



United States: Durum spring wheat statistics by state (1988/89-1992/93)

State	Area	Yield	Prod.	Pct.
	1,000 ha	t/ha	1,000 t	
North Dakota	1,089	1.85	2,019	81%
California	25	6.16	155	6%
Montana	92	1.40	129	5%
Arizona	21	6.04	128	5%
South Dakota	31	1.71	52	2%
Minnesota	11	2.24	25	1%

These states account for 100% of total production.

United States: Historical durum spring wheat statistics

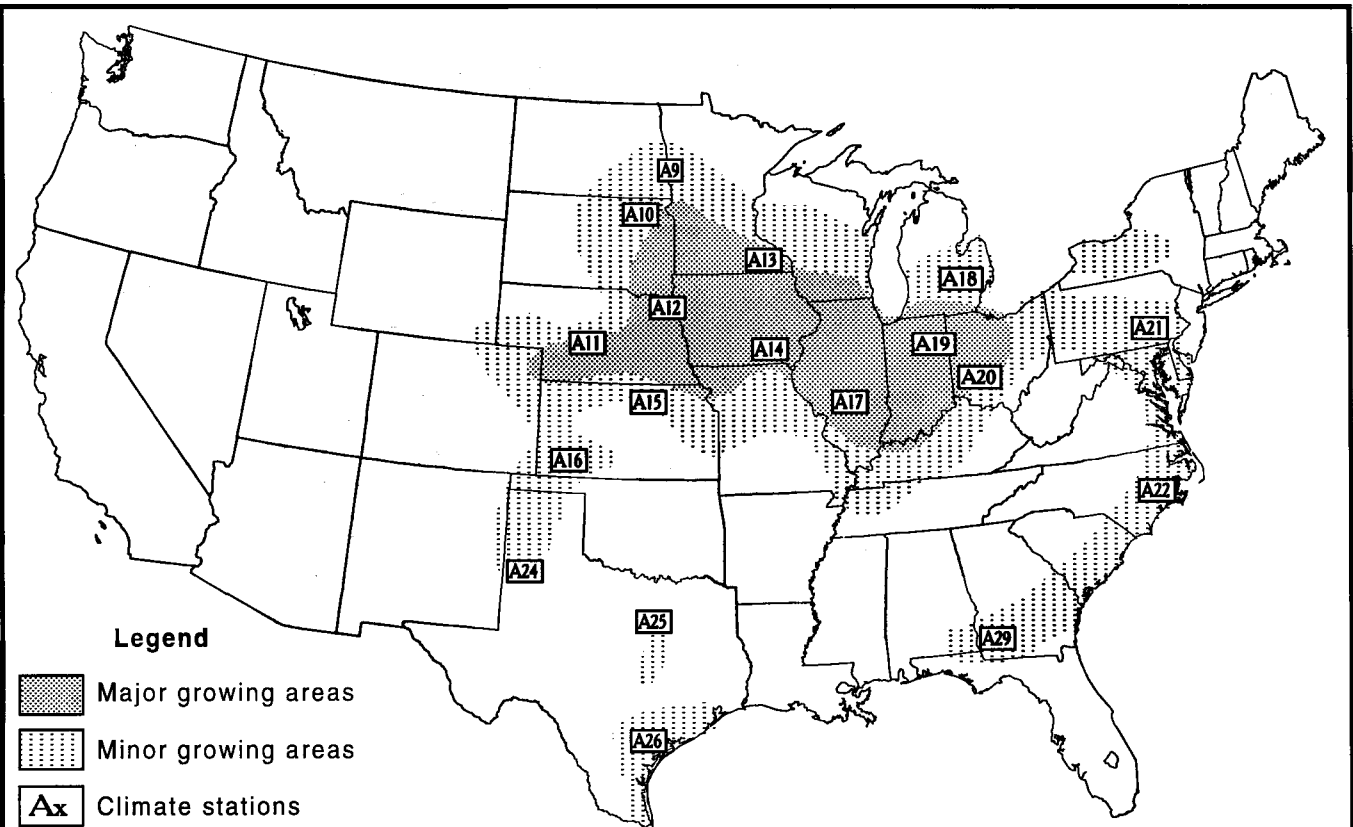
Crop Year	Area	Yield	Prod.
	1,000 ha	t/ha	1,000 t
1988/89	1,152	1.06	1,220
1989/90	1,486	1.69	2,510
1990/91	1,419	2.35	3,332
1991/92	1,294	2.19	2,829
1992/93	991	2.67	2,645
1988/89-1992/93 average	1,269	1.99	2,507

United States: Historical total wheat statistics




Crop Year	Area	Yield	Prod.
	1,000 ha	t/ha	1,000 t
1970/71	17,651	2.08	36,795
1971/72	19,298	2.28	44,052
1972/73	19,143	2.20	42,081
1973/74	21,913	2.12	46,560
1974/75	26,454	1.83	48,496
1975/76	28,126	2.06	57,888
1976/77	28,692	2.04	58,487
1977/78	26,993	2.06	55,684
1978/79	22,865	2.11	48,336
1979/80	25,293	2.30	58,081
1980/81	28,773	2.25	64,797
1981/82	32,618	2.32	75,806
1982/83	31,525	2.39	75,251
1983/84	24,848	2.65	65,856
1984/85	27,085	2.61	70,618
1985/86	26,185	2.52	65,974
1986/87	24,560	2.32	56,896
1987/88	22,640	2.53	57,362
1988/89	21,525	2.29	49,320
1989/90	25,167	2.20	55,428
1990/91	28,038	2.66	74,473
1991/92	23,352	2.31	53,918
1992/93	25,257	2.65	66,922
1988/89-1992/93 average	24,668	2.42	60,012

JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

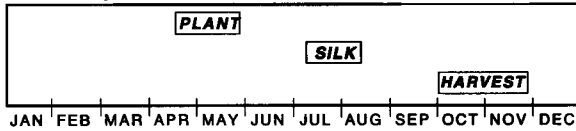
United States: Corn



Legend

-  Major growing areas
-  Minor growing areas
-  Climate stations

Corn crop calendar for most of the Midwest United States



The corn crop calendar is typically 1 month ahead across the southern United States.

United States: Corn statistics by state (1988/89-1992/93 average)

State	Area 1,000 ha	Yield t/ha	Prod. 1,000 t	Pct.
Iowa	4,897	7.51	36,769	19%
Illinois	4,274	7.33	31,331	17%
Nebraska	2,962	7.99	23,658	12%
Minnesota	2,343	7.09	16,619	9%
Indiana	2,199	7.39	16,246	9%
Ohio	1,319	7.12	9,392	5%
Wisconsin	1,125	6.70	7,534	4%
Missouri	880	6.45	5,672	3%
South Dakota	1,182	4.62	5,459	3%
Michigan	829	6.54	5,421	3%
Kansas	584	8.28	4,841	3%
Texas	592	6.65	3,942	2%
Colorado	343	9.54	3,270	2%
Kentucky	488	6.45	3,150	2%
Pennsylvania	380	6.03	2,291	1%
North Carolina	403	5.38	2,169	1%

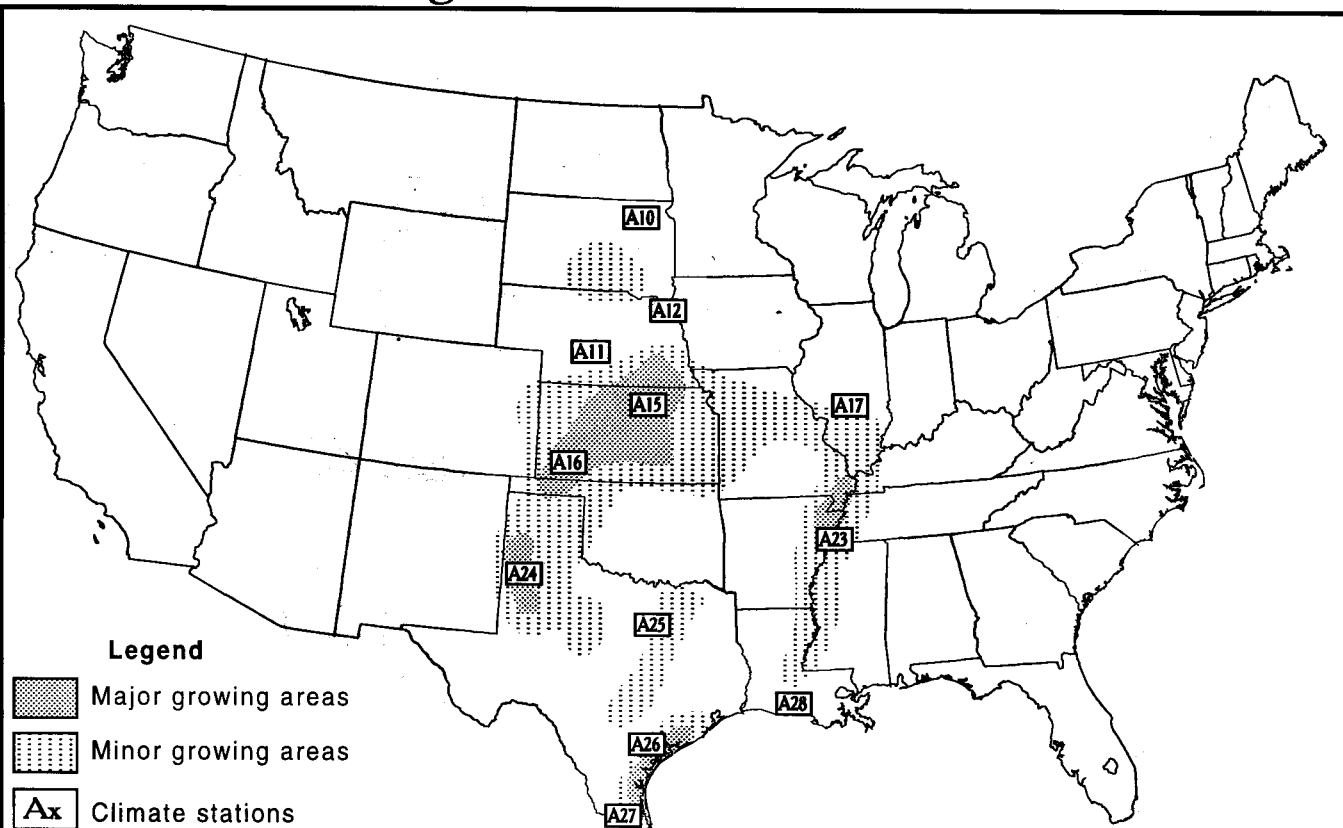
These states account for 95% of total production.

United States: Historical corn statistics

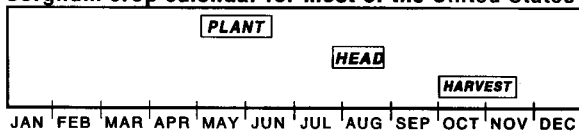
Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1970/71	23,212	4.54	105,472
1971/72	25,950	5.53	143,422
1972/73	23,275	6.09	141,734
1973/74	25,149	5.73	144,043
1974/75	26,469	4.51	119,421
1975/76	27,367	5.42	148,362
1976/77	28,938	5.52	159,752
1977/78	28,981	5.70	165,236
1978/79	29,109	6.34	184,614
1979/80	29,299	6.87	201,384
1980/81	29,526	5.71	168,648
1981/82	30,159	6.84	206,223
1982/83	29,428	7.11	209,181
1983/84	20,833	5.09	106,031
1984/85	29,096	6.70	194,881
1985/86	30,436	7.41	225,447
1986/87	27,886	7.49	208,944
1987/88	24,081	7.52	181,143
1988/89	23,573	5.31	125,194
1989/90	26,184	7.30	191,156
1990/91	27,095	7.44	201,534
1991/92	27,862	6.82	189,886
1992/93	29,203	8.25	240,846
1988/89-1992/93 average	26,783	7.02	189,723

JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

United States: Sorghum



Sorghum crop calendar for most of the United States



The sorghum crop calendar is about 1 month earlier across southern Texas and the Mississippi Delta.

United States: Sorghum statistics by state (1988/89-1992/93 average)

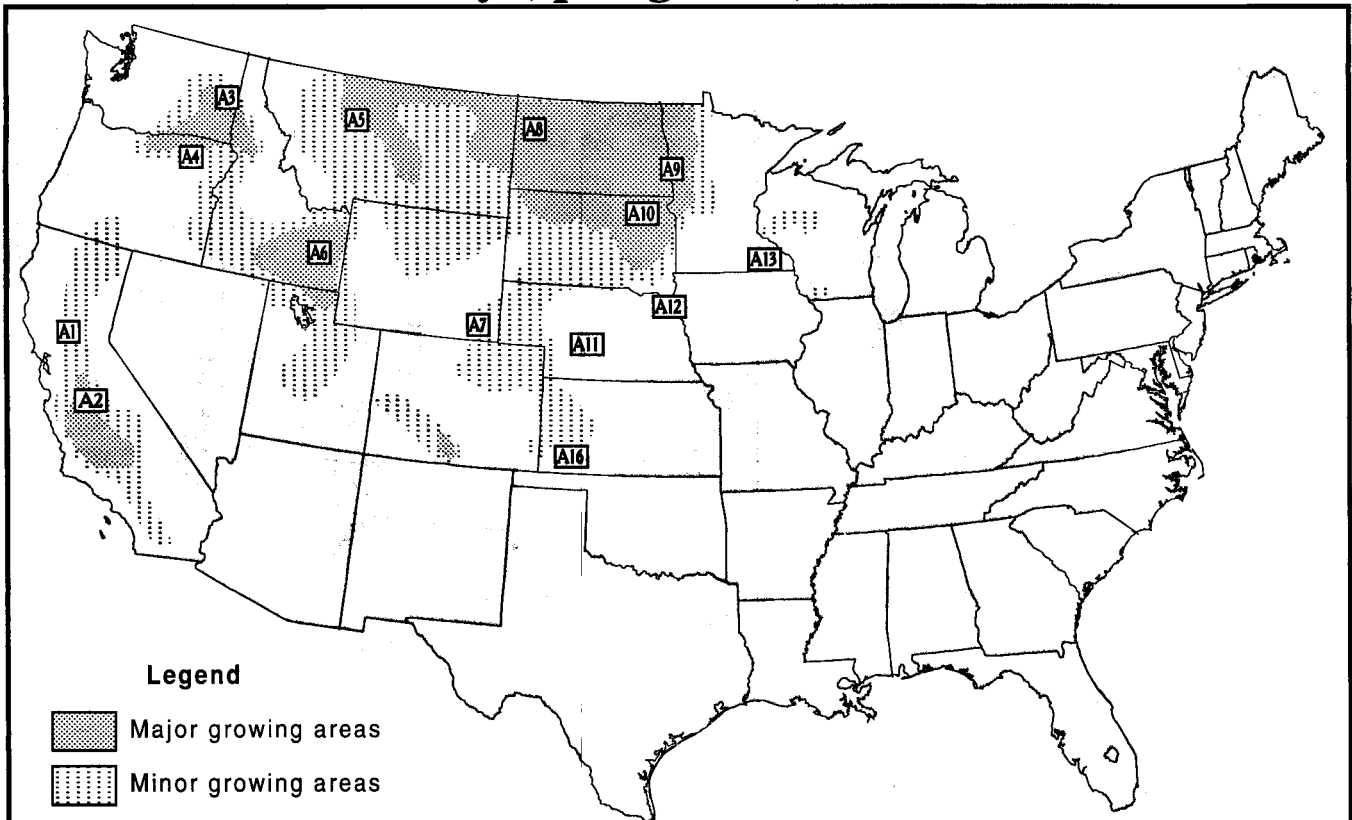
State	Area 1,000 ha	Yield t/ha	Prod. 1,000 t	Pct.
Kansas	1,299	3.94	5,124	31%
Texas	1,234	3.67	4,526	28%
Nebraska	585	4.71	2,757	17%
Missouri	227	5.22	1,184	7%
Arkansas	130	4.18	543	3%
Oklahoma	138	3.00	413	3%
Illinois	69	5.39	370	2%
South Dakota	118	2.70	319	2%
Colorado	96	2.53	243	1%
New Mexico	66	3.59	239	1%
Louisiana	58	3.98	232	1%
Mississippi	44	3.86	170	1%

These states account for 97% of total production.




United States: Historical sorghum statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1970/71	5,491	3.16	17,354
1971/72	6,533	3.37	22,048
1972/73	5,347	3.81	20,355
1973/74	6,354	3.69	23,451
1974/75	5,588	2.83	15,818
1975/76	6,233	3.07	19,161
1976/77	5,854	3.08	18,055
1977/78	5,583	3.55	19,837
1978/79	5,427	3.42	18,575
1979/80	5,221	3.93	20,509
1980/81	5,064	2.91	14,716
1981/82	5,535	4.02	22,247
1982/83	5,721	3.71	21,212
1983/84	4,047	3.06	12,384
1984/85	6,735	3.27	22,004
1985/86	6,791	4.19	28,456
1986/87	5,610	4.25	23,848
1987/88	4,262	4.36	18,563
1988/89	3,659	4.00	14,648
1989/90	4,493	3.48	15,632
1990/91	3,678	3.96	14,563
1991/92	3,994	3.72	14,856
1992/93	4,917	4.57	22,455
1988/89-1992/93 average	4,148	3.95	16,431

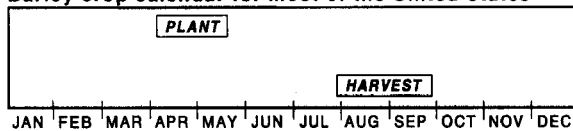
United States: Barley (spring sown)



Legend

-  Major growing areas
-  Minor growing areas
-  Climate stations

Barley crop calendar for most of the United States



United States: Barley statistics by state (1988/89-1992/93 average)

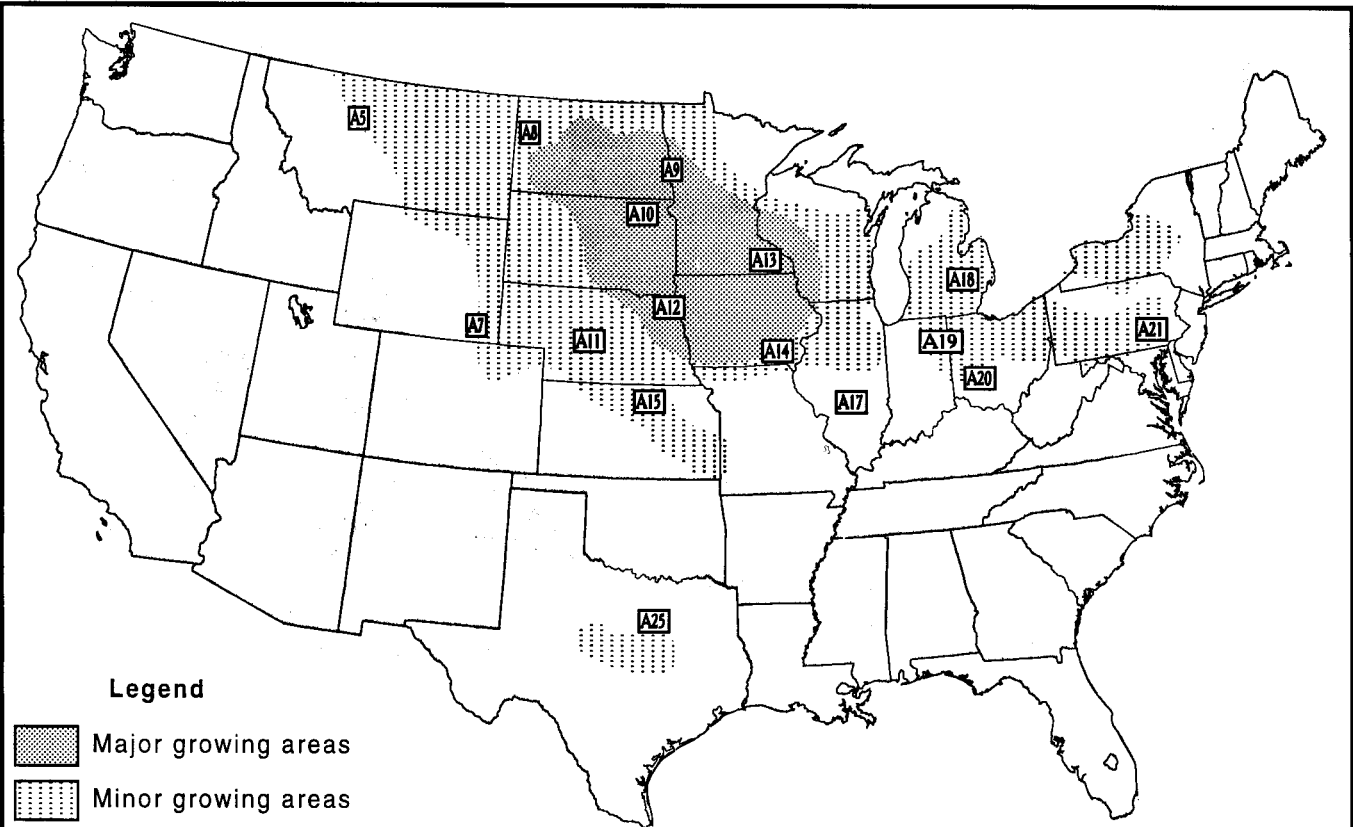
State	Area 1,000 ha	Yield t/ha	Prod. 1,000 t	Pct.
North Dakota	1,030	2.47	2,543	29%
Montana	573	2.23	1,280	14%
Idaho	323	3.77	1,219	14%
Minnesota	324	2.90	940	11%
Washington	198	3.13	621	7%
South Dakota	189	2.08	393	4%
California	89	3.20	285	3%
Oregon	69	3.81	264	3%
Colorado	59	4.05	241	3%
Wyoming	50	3.92	195	2%
Utah	45	4.27	192	2%

These states account for 92% of total production.




United States: Historical barley statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1970/71	3,930	2.31	9,059
1971/72	4,089	2.46	10,068
1972/73	3,903	2.35	9,182
1973/74	4,166	2.18	9,089
1974/75	3,209	2.03	6,503
1975/76	3,487	2.37	8,255
1976/77	3,415	2.44	8,339
1977/78	3,937	2.37	9,314
1978/79	3,743	2.65	9,901
1979/80	3,046	2.74	8,343
1980/81	2,938	2.68	7,863
1981/82	3,658	2.82	10,310
1982/83	3,647	3.08	11,233
1983/84	3,934	2.81	11,066
1984/85	4,540	2.87	13,021
1985/86	4,691	2.74	12,850
1986/87	4,846	2.73	13,249
1987/88	4,029	2.82	11,354
1988/89	3,090	2.04	6,314
1989/90	3,364	2.62	8,800
1990/91	3,047	3.02	9,192
1991/92	3,405	2.97	10,110
1992/93	2,964	3.36	9,970
1988/89-1992/93 average	3,174	2.80	8,877

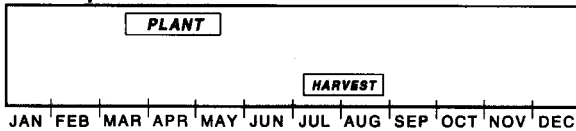
United States: Oats



Legend

-  Major growing areas
-  Minor growing areas
-  Climate stations

Oat crop calendar for most of the United States



United States: Oat statistics by state (1988/89-1992/93 average)

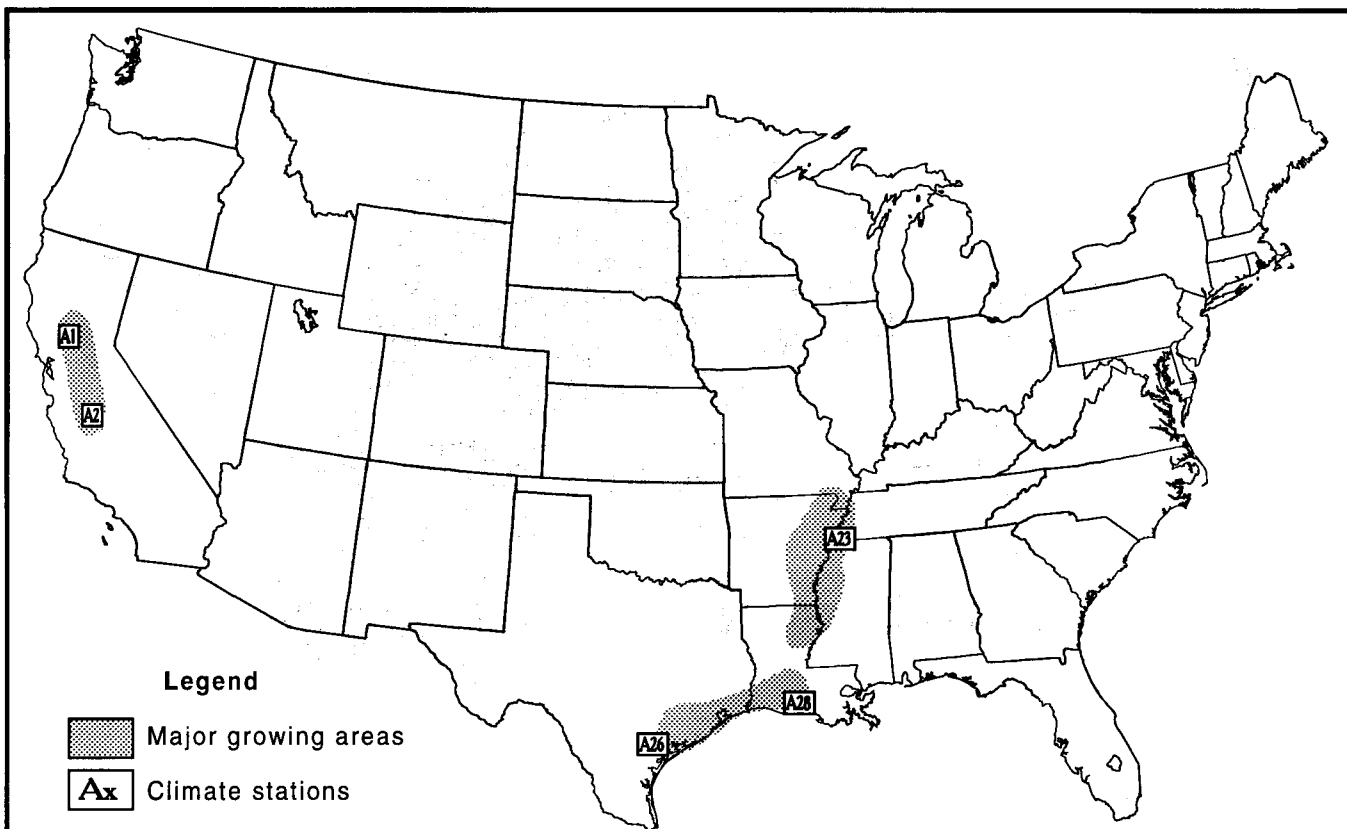
State	Area	Yield	Prod.	Pct.
	1,000 ha	t/ha	1,000 t	
South Dakota	340	1.70	577	13%
Minnesota	275	1.87	515	12%
Wisconsin	250	2.04	508	12%
Iowa	214	2.25	482	11%
North Dakota	231	1.61	371	9%
Pennsylvania	95	1.98	188	4%
Ohio	83	2.22	183	4%
Nebraska	104	1.72	179	4%
Michigan	78	1.97	154	4%
Illinois	65	2.30	149	3%
Texas	76	1.45	110	3%
New York	52	2.09	109	3%

These states account for 82% of total production.

United States: Historical oat statistics

Crop Year	Area	Yield	Prod.
	1,000 ha	t/ha	1,000 t
1970/71	7,525	1.77	13,285
1971/72	6,356	2.01	12,745
1972/73	5,427	1.85	10,024
1973/74	5,573	1.72	9,567
1974/75	5,102	1.71	8,718
1975/76	5,276	1.76	9,274
1976/77	4,789	1.64	7,844
1977/78	5,457	2.00	10,926
1978/79	4,503	1.87	8,443
1979/80	3,918	1.95	7,646
1980/81	3,503	1.90	6,659
1981/82	3,807	1.94	7,396
1982/83	4,151	2.07	8,602
1983/84	3,667	1.89	6,916
1984/85	3,303	2.08	6,875
1985/86	3,297	2.28	7,526
1986/87	2,768	2.02	5,588
1987/88	2,787	1.95	5,424
1988/89	2,239	1.41	3,158
1989/90	2,785	1.95	5,423
1990/91	2,406	2.16	5,189
1991/92	1,945	1.82	3,534
1992/93	1,818	2.35	4,278
1988/89-1992/93 average	2,239	1.94	4,316

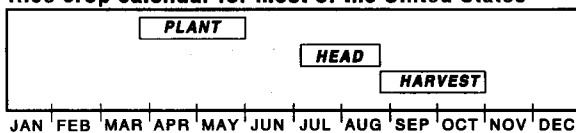
United States: Rice



Legend

- Major growing areas
- Climate stations

Rice crop calendar for most of the United States



United States: Rice statistics by state (1988/89-1992/93 average)

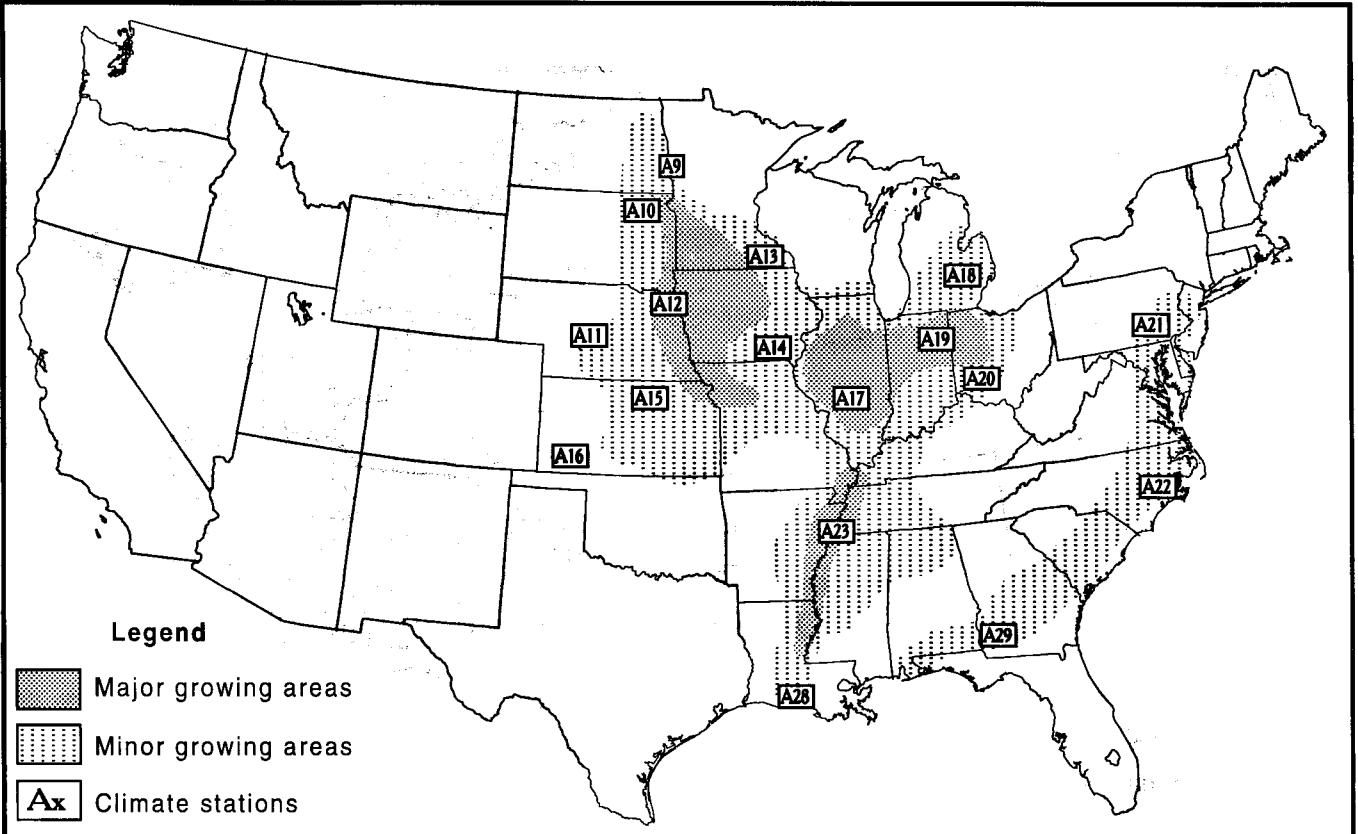
State	Area 1,000 ha	Yield t/ha	Prod. 1,000 t	Pct.
Arkansas	501	6.00	3,005	41%
California	158	8.71	1,374	19%
Louisiana	218	5.22	1,140	16%
Texas	144	6.62	949	13%
Mississippi	100	6.27	630	9%
Missouri	36	5.57	201	2%

These states account for 100% of total production.

United States: Historical rice statistics

Crop Year	Area 1,000 ha	Yield (Rough) t/ha	Prod. (Milled) 1,000 t
1970/71	734	5.18	2,796
1971/72	736	5.29	2,838
1972/73	736	5.26	2,828
1973/74	878	4.79	3,034
1974/75	1,024	4.98	3,667
1975/76	1,140	5.11	4,099
1976/77	1,004	5.22	3,781
1977/78	910	4.95	3,120
1978/79	1,202	5.02	4,271
1979/80	1,161	5.16	4,324
1980/81	1,340	4.95	4,838
1981/82	1,535	5.40	5,974
1982/83	1,320	5.28	4,948
1983/84	878	5.15	3,216
1984/85	1,134	5.55	4,382
1985/86	1,008	6.07	4,333
1986/87	955	6.33	4,307
1987/88	944	6.23	4,111
1988/89	1,174	6.18	5,185
1989/90	1,087	6.45	5,087
1990/91	1,142	6.20	5,098
1991/92	1,123	6.36	5,035
1992/93	1,267	6.43	5,704
1988/89-1992/93 average	1,159	6.32	5,222

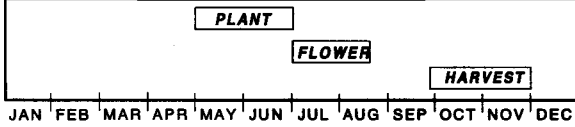
United States: Soybeans



Legend

- Major growing areas
- Minor growing areas
- Climate stations

Soybean crop calendar for most of the United States



United States: Soybean statistics by state (1988/89-1992/93 average)

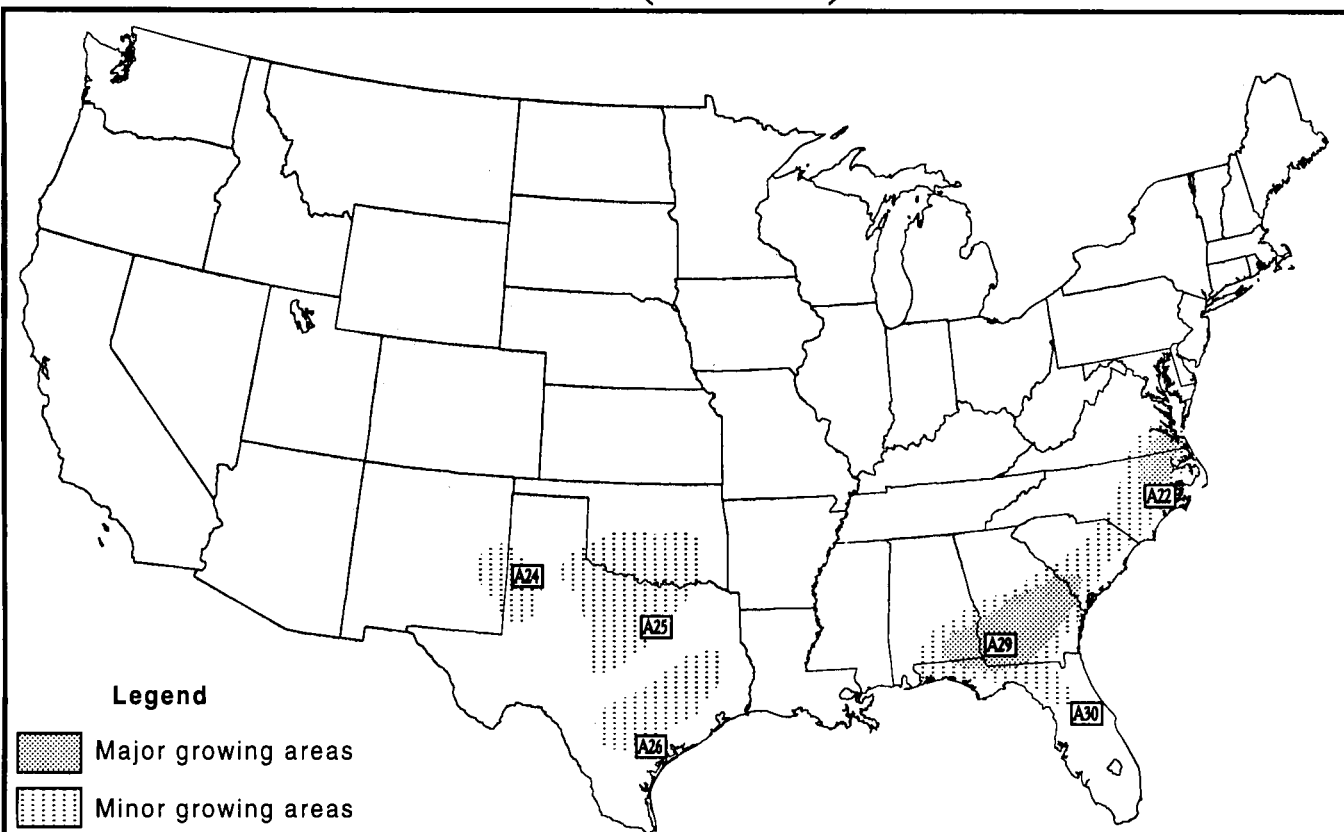
State	Area 1,000 ha	Yield t/ha	Prod. 1,000 t	Pct.
Illinois	3,657	2.52	9,202	18%
Iowa	3,323	2.64	8,761	17%
Minnesota	2,036	2.29	4,666	9%
Indiana	1,771	2.52	4,464	9%
Missouri	1,733	2.06	3,565	7%
Ohio	1,502	2.33	3,494	7%
Arkansas	1,304	1.85	2,410	5%
Nebraska	987	2.31	2,285	4%
South Dakota	805	1.80	1,445	3%
Kansas	773	1.79	1,387	3%
Mississippi	785	1.63	1,283	2%
Michigan	507	2.34	1,185	2%
Louisiana	613	1.77	1,087	2%
North Carolina	556	1.81	1,005	2%
Kentucky	452	2.18	984	2%
Tennessee	463	1.88	872	2%

These states account for 94% of total production.


United States: Historical soybean statistics


Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1970/71	17,098	1.79	30,675
1971/72	17,282	1.85	32,009
1972/73	18,488	1.87	34,581
1973/74	22,528	1.87	42,118
1974/75	20,777	1.59	33,102
1975/76	21,698	1.94	42,139
1976/77	19,992	1.75	35,070
1977/78	23,403	2.06	48,097
1978/79	25,764	1.97	50,859
1979/80	28,467	2.16	61,525
1980/81	27,443	1.78	48,921
1981/82	26,776	2.02	54,135
1982/83	28,102	2.12	59,610
1983/84	25,303	1.76	44,518
1984/85	26,755	1.89	50,644
1985/86	24,929	2.29	57,127
1986/87	23,598	2.24	52,868
1987/88	23,137	2.28	52,746
1988/89	23,218	1.82	42,153
1989/90	24,094	2.17	52,354
1990/91	22,870	2.29	52,416
1991/92	23,477	2.30	54,065
1992/93	23,546	2.53	59,545
1988/89-1992/93 average	23,441	2.22	52,107


United States: Groundnuts (Peanuts)



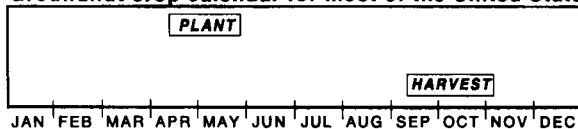
Legend

 Major growing areas

 Minor growing areas

 Climate stations

Groundnut crop calendar for most of the United States



United States: Groundnut statistics by state (1988/89-1992/93 average)

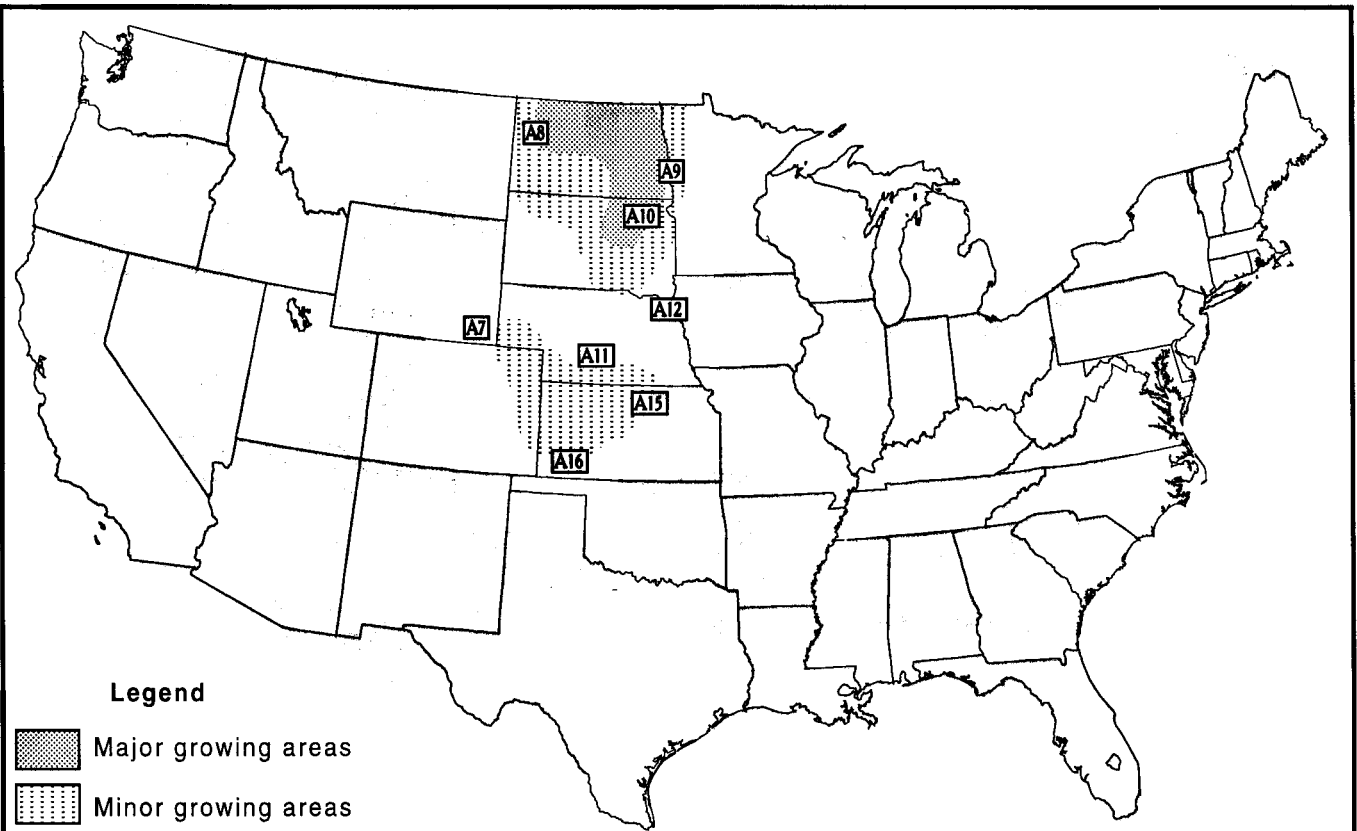
State	Area	Yield	Prod.	Pct.
	1,000 ha	t/ha	1,000 t	
Georgia	300	2.73	821	44%
Texas	116	2.19	254	13%
Alabama	101	2.45	246	13%
North Carolina	63	3.05	194	10%
Virginia	38	3.31	126	7%
Oklahoma	38	2.77	105	6%
Florida	41	2.55	104	5%
New Mexico	8	2.74	21	1%
South Carolina	5	2.73	15	1%

These states account for 100% of total production.




United States: Historical groundnut statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1972/73	601	2.47	1,485
1973/74	605	2.60	1,576
1974/75	596	2.79	1,664
1975/76	609	2.87	1,745
1976/77	616	2.75	1,696
1977/78	614	2.74	1,685
1978/79	611	2.93	1,793
1979/80	615	2.93	1,800
1980/81	566	1.85	1,045
1981/82	602	3.00	1,806
1982/83	517	3.02	1,560
1983/84	556	2.69	1,495
1984/85	618	3.23	1,999
1985/86	594	3.15	1,870
1986/87	621	2.70	1,677
1987/88	626	2.62	1,640
1988/89	659	2.74	1,806
1989/90	666	2.72	1,810
1990/91	732	2.23	1,634
1991/92	816	2.74	2,235
1992/93	677	2.87	1,943
1988/89- 1992/93 average	710	2.66	1,886

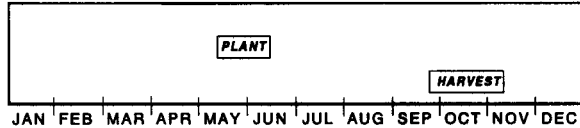
United States: Sunflowerseed



Legend

-  Major growing areas
-  Minor growing areas
-  Climate stations

Sunflower crop calendar for most of the United States



United States: Sunflowerseed statistics by state (1988/89-1992/93 average)

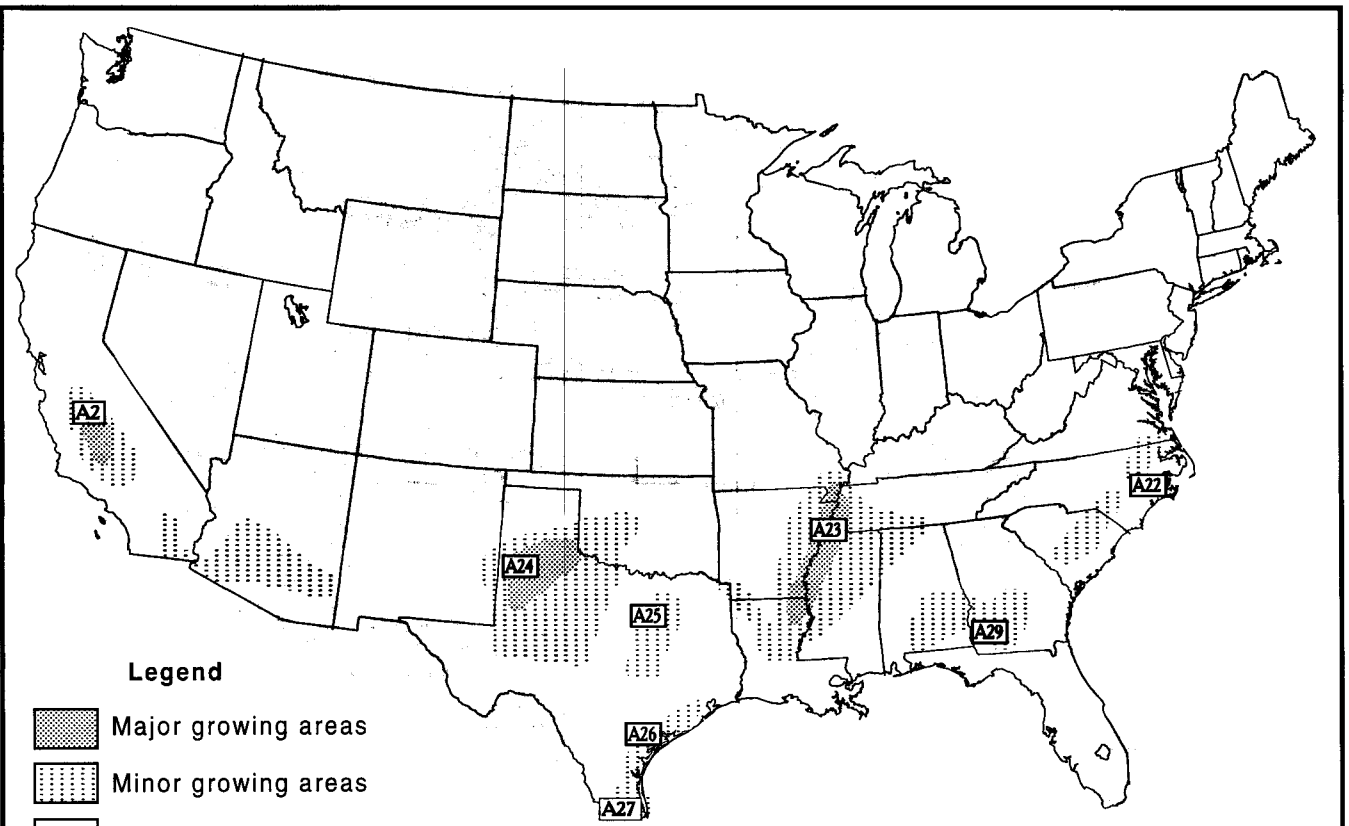
State	Area 1,000 ha	Yield t/ha	Prod. 1,000 t	Pct.
North Dakota	551	1.24	684	63%
South Dakota	131	1.33	175	16%
Minnesota	60	1.81	109	10%
Kansas	52	1.34	70	6%
Texas	13	1.45	19	2%




These states account for 97% of total production.

United States: Historical sunflowerseed statistics

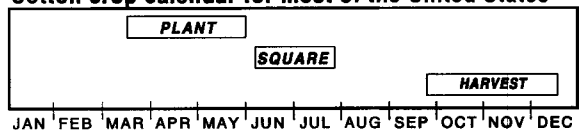
Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1972/73	329	1.02	334
1973/74	301	1.17	353
1974/75	263	1.03	272
1975/76	481	1.12	541
1976/77	425	1.09	463
1977/78	959	1.39	1,330
1978/79	1,192	1.53	1,823
1979/80	2,189	1.51	3,309
1980/81	1,490	1.14	1,697
1981/82	1,542	1.32	2,035
1982/83	1,912	1.27	2,419
1983/84	1,240	1.17	1,451
1984/85	1,494	1.14	1,698
1985/86	1,151	1.24	1,430
1986/87	791	1.53	1,214
1987/88	718	1.65	1,183
1988/89	777	1.05	813
1989/90	723	1.10	798
1990/91	749	1.38	1,031
1991/92	1,082	1.51	1,639
1992/93	839	1.41	1,181
1988/89-1992/93 average	834	1.29	1,092

United States: Cotton



- Legend**
-  Major growing areas
 -  Minor growing areas
 -  Climate stations

Cotton crop calendar for most of the United States



United States: Cotton statistics by state (1988/89-1992/93 average)

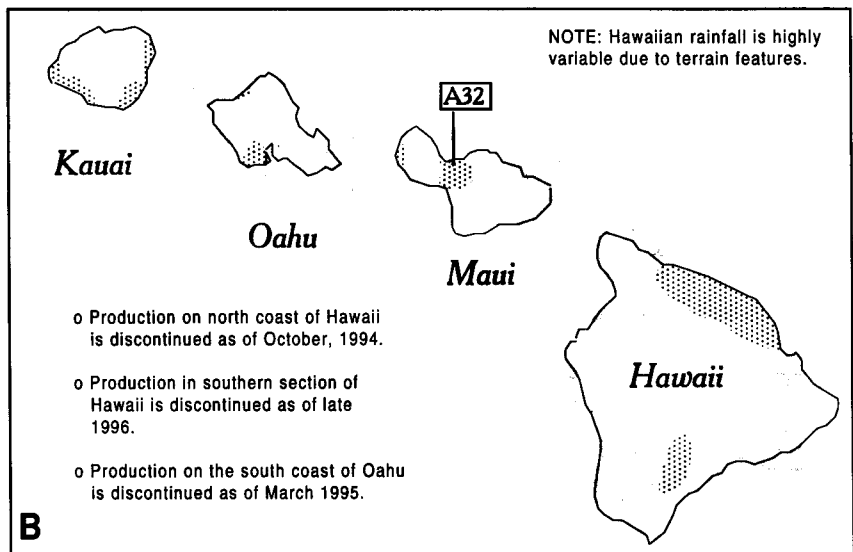
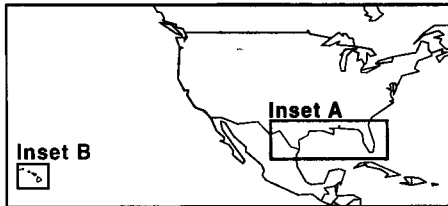
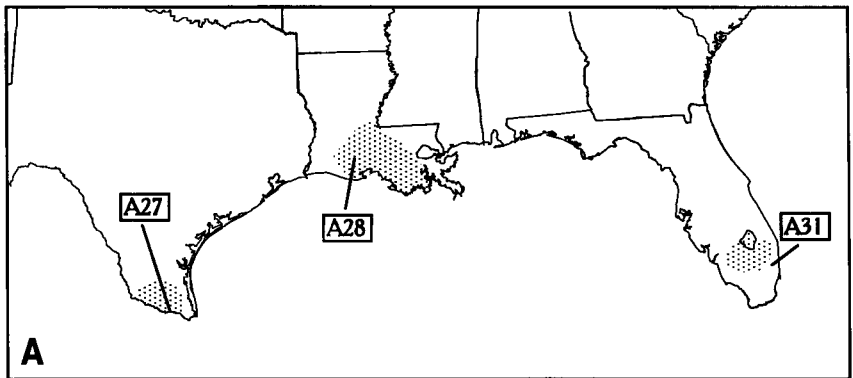
State	Area 1,000 ha	Yield kg/ha	Prod. 1,000 480 lb bales	Pct.
Texas	1,854	490	4,213	28%
California	439	1,357	2,707	18%
Mississippi	486	860	1,922	13%
Arkansas	322	830	1,241	8%
Louisiana	303	814	1,140	8%
Arizona	131	1,318	788	5%
Tennessee	221	603	618	4%
Georgia	146	750	516	3%
Alabama	153	648	459	3%
Missouri	109	735	371	2%
North Carolina	103	681	331	2%
Oklahoma	151	379	264	2%
South Carolina	66	648	201	1%

These states account for 97% of total production.

United States: Historical cotton statistics

Crop Year	Area 1,000 ha	Yield kg/ha	Prod. 1,000 480 lb bales
1970/71	4,514	490	10,192
1971/72	4,643	490	10,476
1972/73	5,255	570	13,705
1973/74	4,844	580	12,975
1974/75	5,086	490	11,542
1975/76	3,560	510	8,304
1976/77	4,417	520	10,582
1977/78	5,372	580	14,390
1978/79	5,018	470	10,858
1979/80	5,193	610	14,628
1980/81	5,348	450	11,124
1981/82	5,601	610	15,648
1982/83	3,939	660	11,965
1983/84	2,973	570	7,771
1984/85	4,200	670	12,984
1985/86	4,140	710	13,434
1986/87	3,427	620	9,732
1987/88	4,061	790	14,762
1988/89	4,835	690	15,409
1989/90	3,860	690	12,194
1990/91	4,748	710	15,506
1991/92	5,245	730	17,614
1992/93	4,510	780	16,218
1988/89-1992/93 average	4,640	720	15,388

United States: Sugarcane



Legend

- Major growing areas
- Climate stations

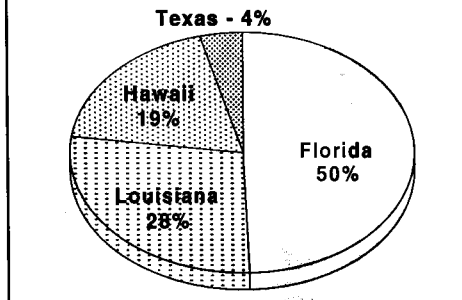
Sugarcane crop calendar for most of the United States

PLANT/ HARVEST	Southeast: 10-12 month crop	PLANT/ HARVEST
Hawaii: 24month crop, year-round harvest (peak May - Sep)		
HARVEST		
JAN	FEB	MAR
APR	MAY	JUN
JUL	AUG	SEP
OCT	NOV	DEC

United States: Historical sugarcane statistics

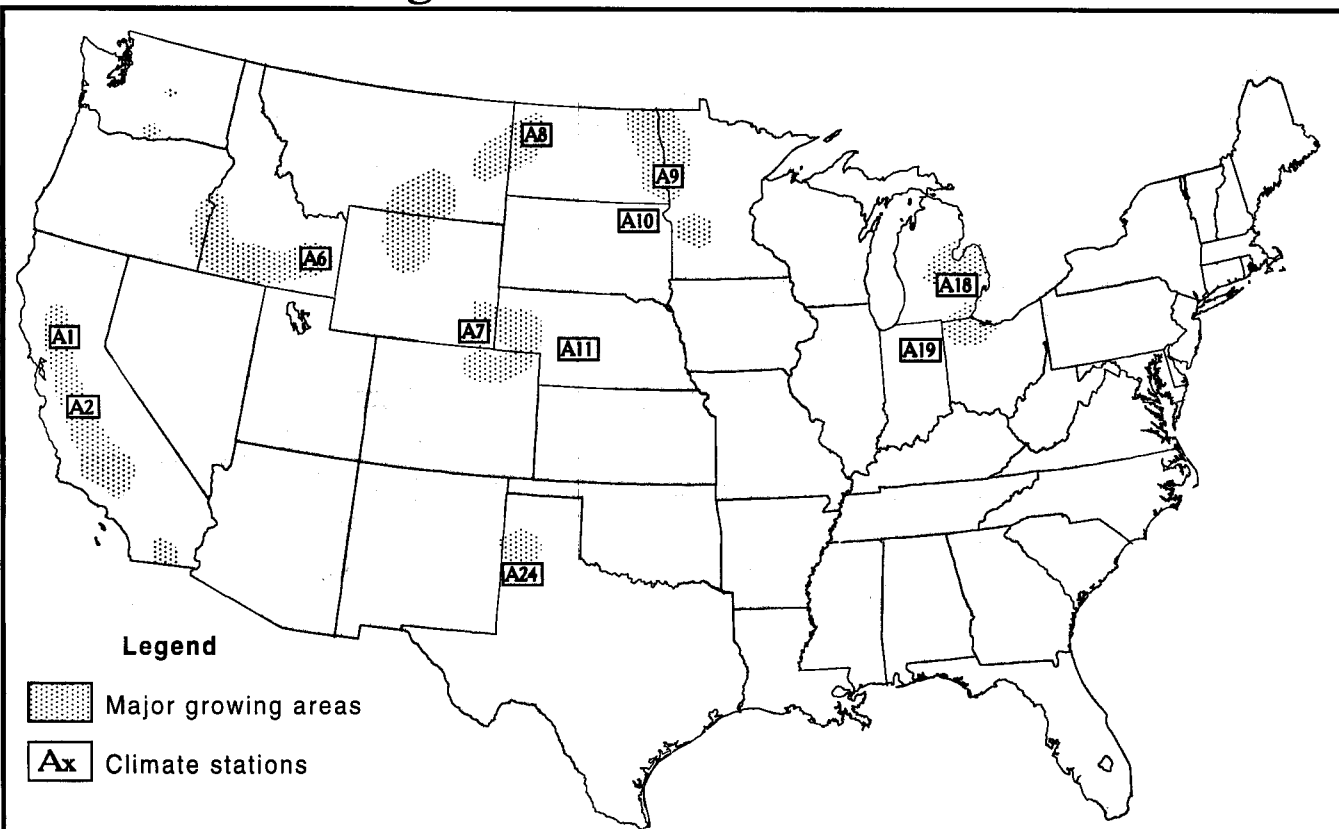
Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t	Raw sugar 1,000 t
1980/81	277	83.84	23,208	2,475
1981/82	290	81.92	23,737	2,570
1982/83	283	91.10	25,809	2,779
1983/84	297	83.19	24,677	2,658
1984/85	284	83.17	23,594	2,728
1985/86	293	83.33	24,383	2,752
1986/87	304	86.37	26,251	2,977
1987/88	315	80.75	25,425	3,024
1988/89	321	80.50	25,836	3,083
1989/90	325	78.36	25,464	2,881
1990/91	294	81.75	24,018	2,859
1991/92	344	76.37	26,273	3,112
1992/93	352	74.39	26,194	3,060
1988/89- 1992/93 average	327	78.28	25,557	2,999

Percent of total production by state (1988/89-1992/93 average)





JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

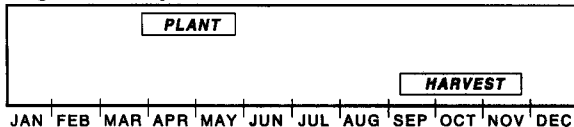
United States: Sugarbeets



Legend

-  Major growing areas
-  Climate stations

Sugarbeet crop calendar for most of the United States



United States: Historical sugarbeet statistics

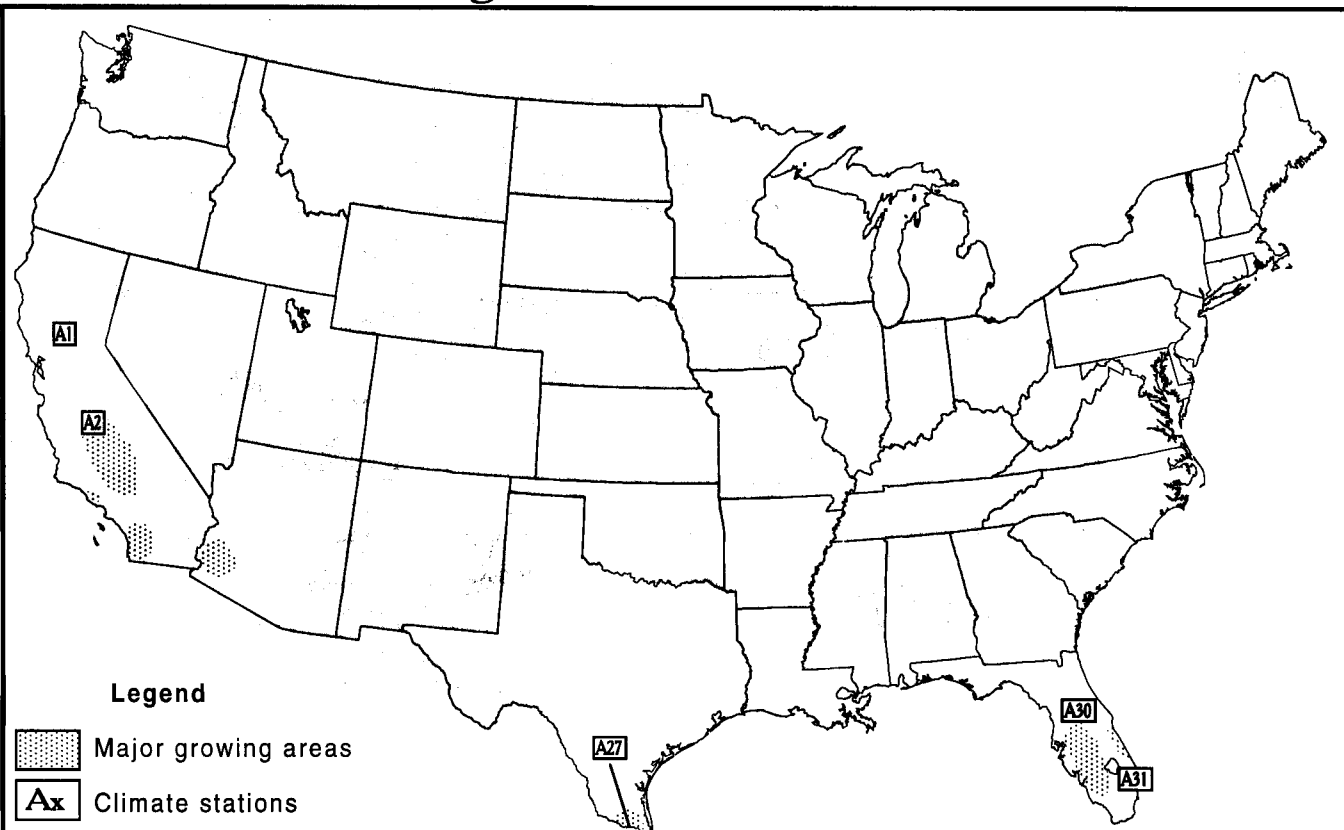
Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t	Raw sugar 1,000 t
1980/81	482	44.27	21,321	2,857
1981/82	497	50.27	24,982	3,074
1982/83	416	45.61	18,955	2,483
1983/84	427	44.56	19,044	2,449
1984/85	444	45.27	20,080	2,635
1985/86	446	45.79	20,438	2,722
1986/87	482	47.36	22,827	3,099
1987/88	507	50.26	25,467	3,627
1988/89	527	42.75	22,508	3,182
1989/90	524	43.54	22,799	3,123
1990/91	557	44.79	24,960	3,485
1991/92	561	45.58	25,586	3,381
1992/93	571	46.27	26,439	3,979
1988/89- 1992/93 average	548	44.58	24,458	3,430

Percent of sugarbeet production by state

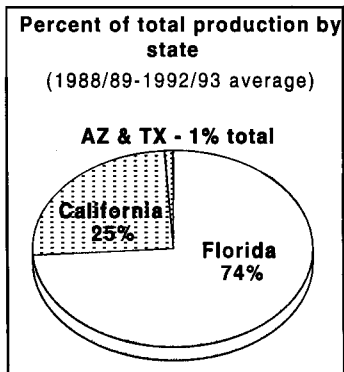
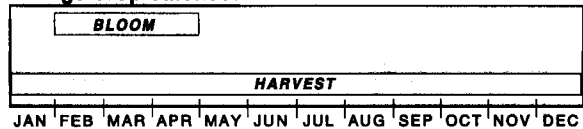
Minnesota	21%
Idaho	17%
California	17%
North Dakota	11%
Michigan	10%
Nebraska	5%
Wyoming	5%
Montana	4%
Colorado	4%
Texas	3%
Oregon	2%
Ohio	1%

These states account for 99%
of total production.

United States: Oranges



Orange crop calendar for most of the United States



United States: Historical orange statistics

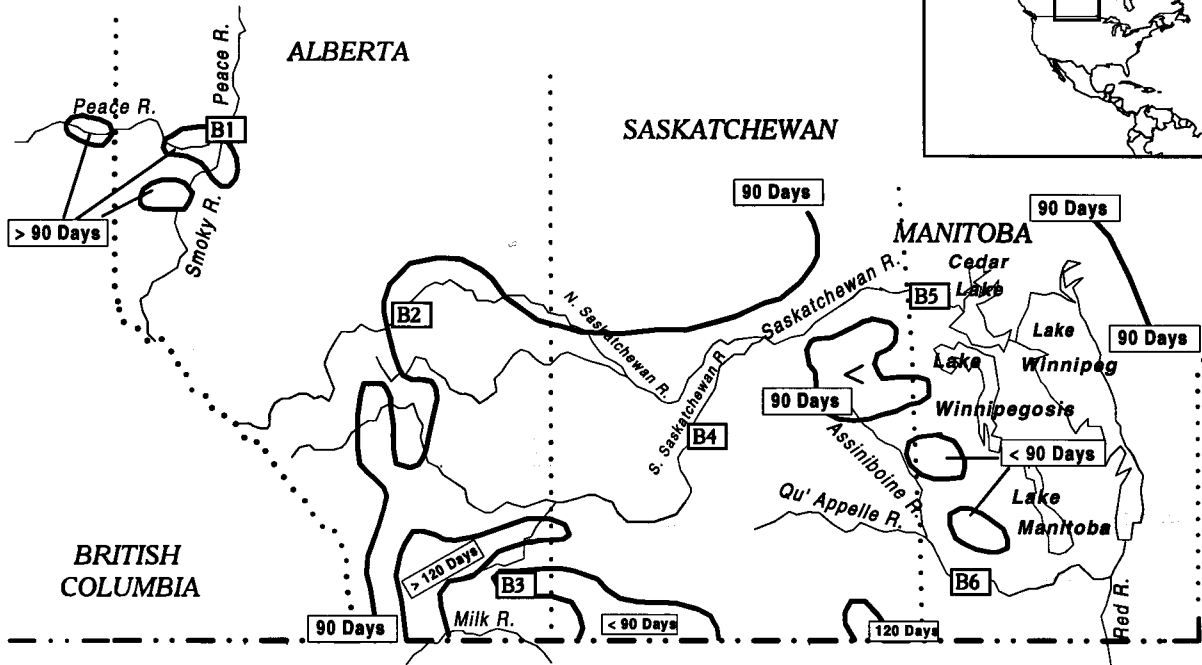
Crop Year	Area* 1,000 ha	Yield t/ha	Prod. 1,000 t
1972/73	351	25.15	8,833
1973/74	351	24.24	8,515
1974/75	349	26.63	9,291
1975/76	343	27.74	9,519
1976/77	338	28.28	9,567
1977/78	329	26.32	8,660
1978/79	324	25.63	8,310
1979/80	326	32.91	10,734
1980/81	322	29.57	9,514
1981/82	315	21.90	6,895
1982/83	304	28.41	8,636
1983/84	278	23.60	6,571
1984/85	250	24.37	6,095
1985/86	227	29.82	6,782
1986/87	231	30.27	6,983
1987/88	232	33.39	7,757
1988/89	238	34.06	8,119
1989/90	242	29.03	7,026
1990/91	248	28.70	7,120
1991/92	259	31.20	8,082
1992/93	278	35.91	9,968
1988/89-1992/93 average	253	31.78	8,063

*Bearing trees.

Canada: Landforms and climate

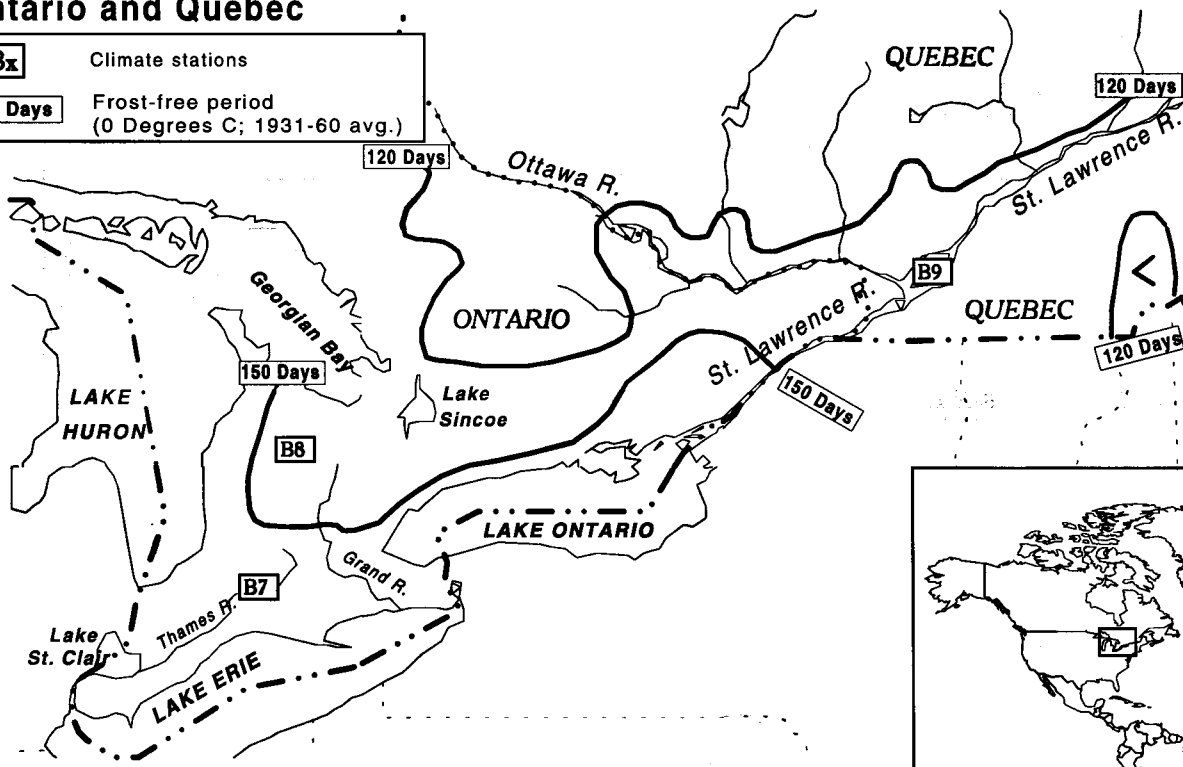
Prairie Provinces

Bx Climate stations
120 Days Frost-free period (0 degrees C; 1931-60 avg.)



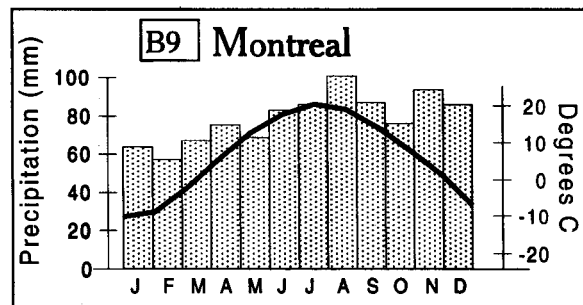
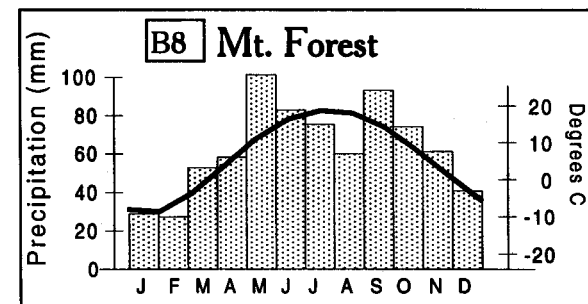
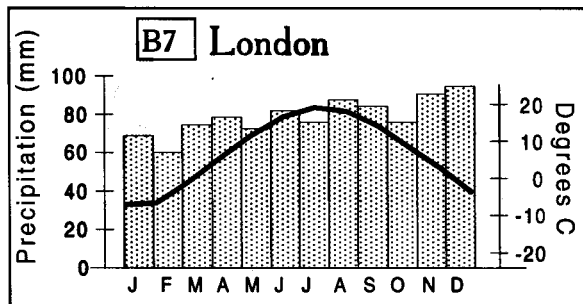
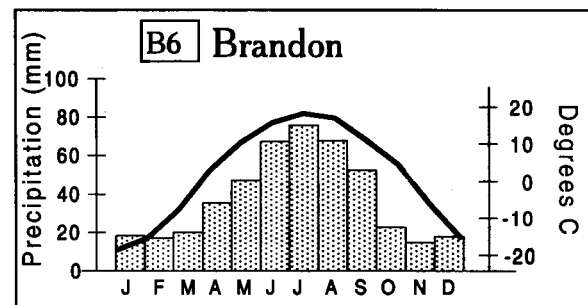
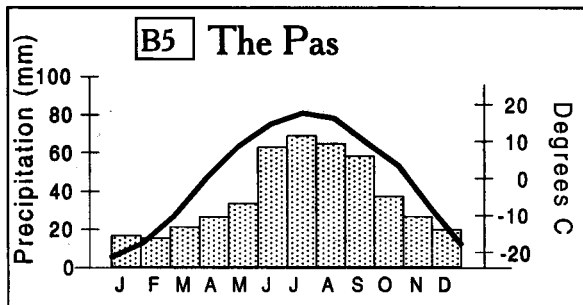
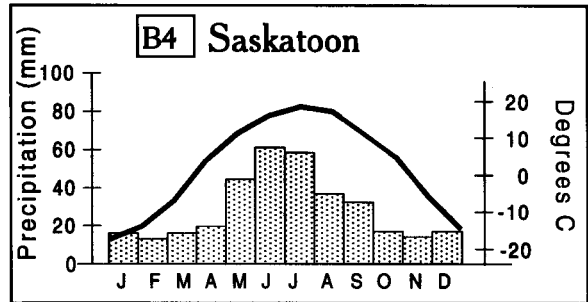
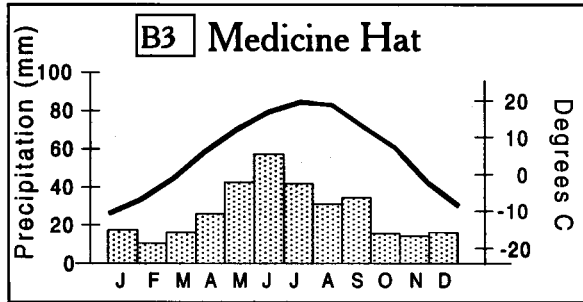
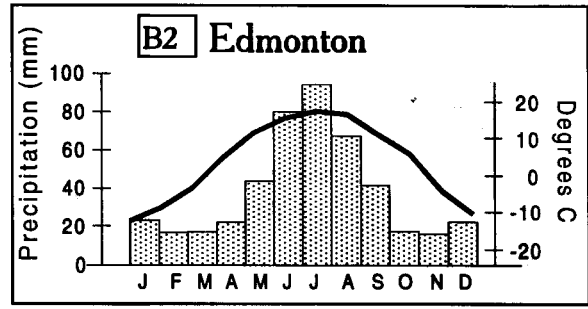
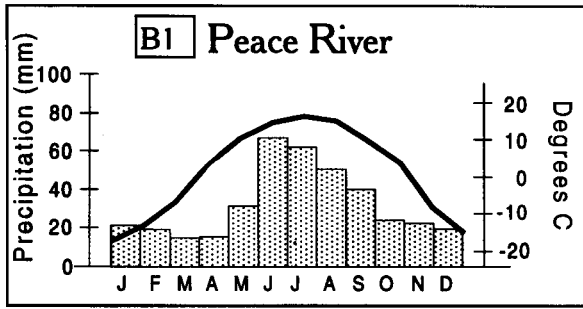
Ontario and Quebec

Bx Climate stations
120 Days Frost-free period (0 Degrees C; 1931-60 avg.)



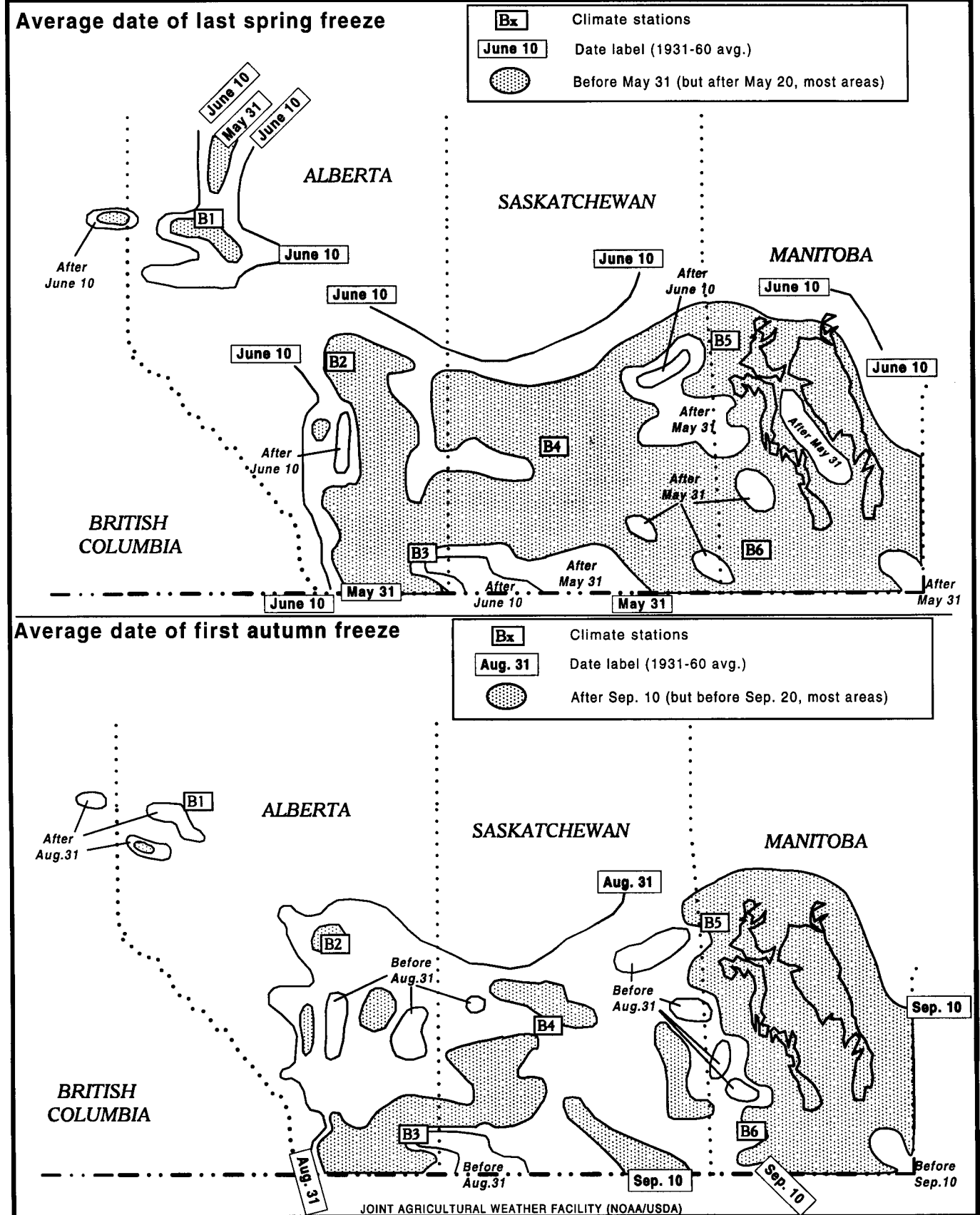
JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Canada: Climate stations

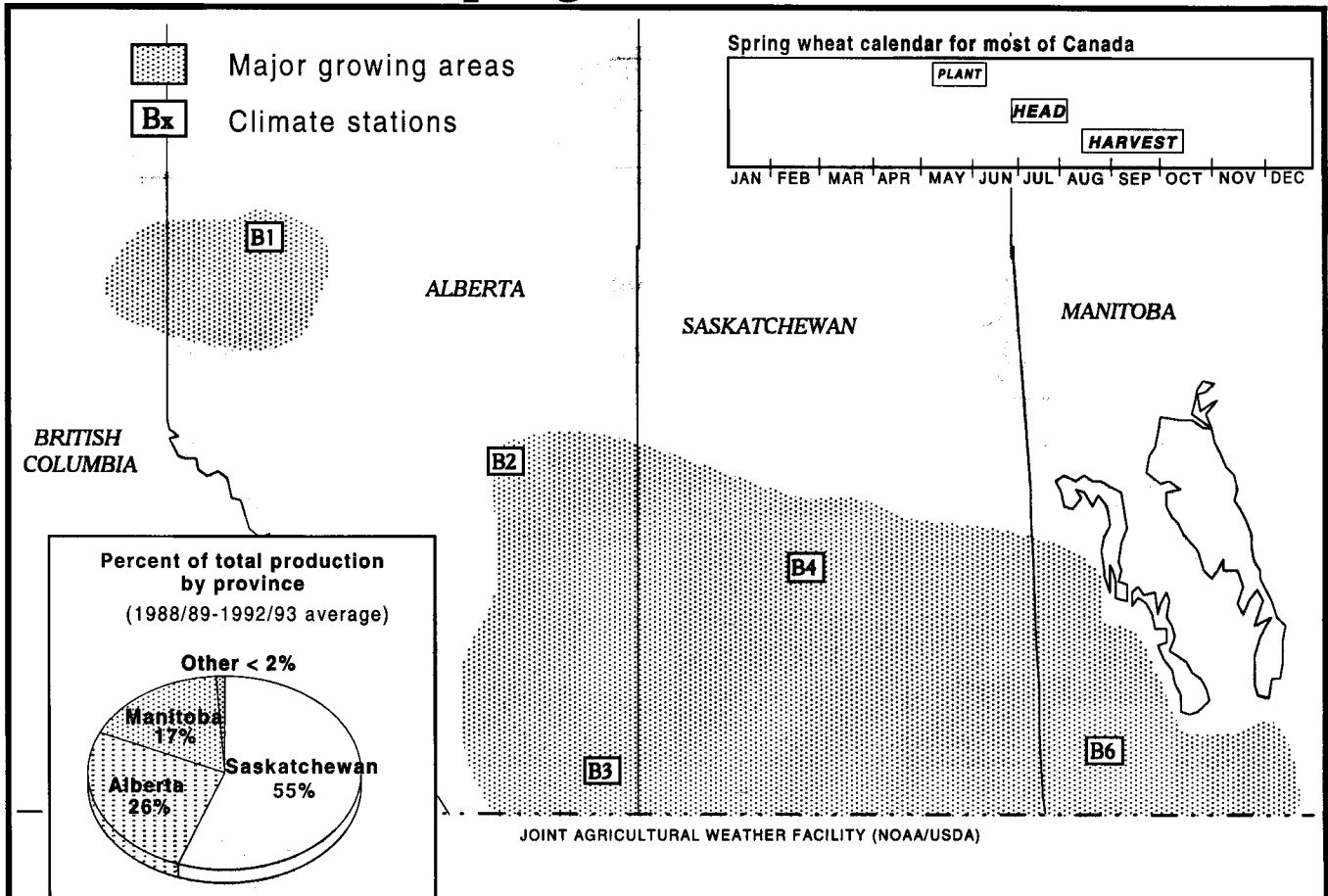


JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Canadian Prairies: Average freeze dates



Canadian Prairies: Spring wheat

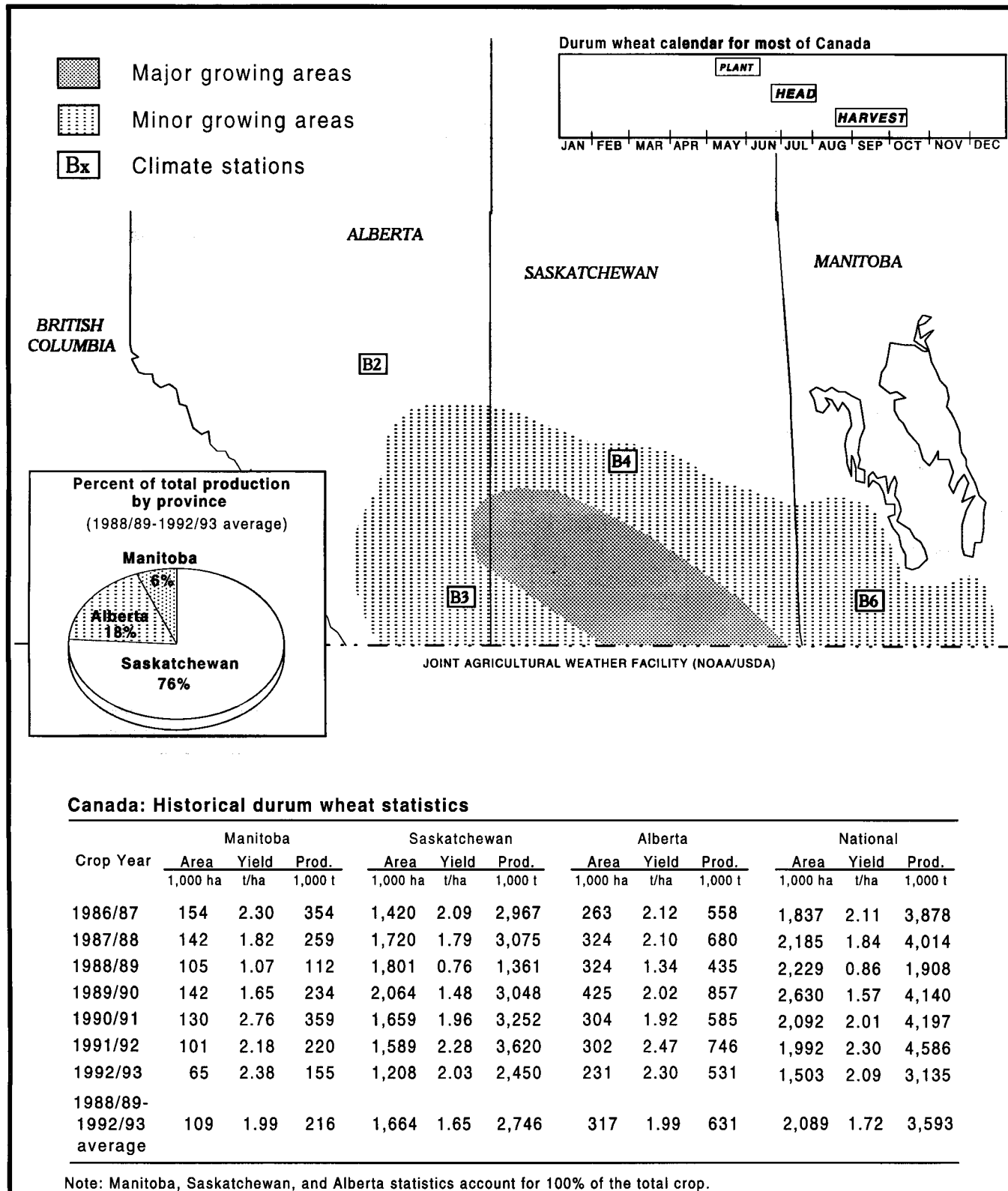


Canada: Historical spring wheat statistics

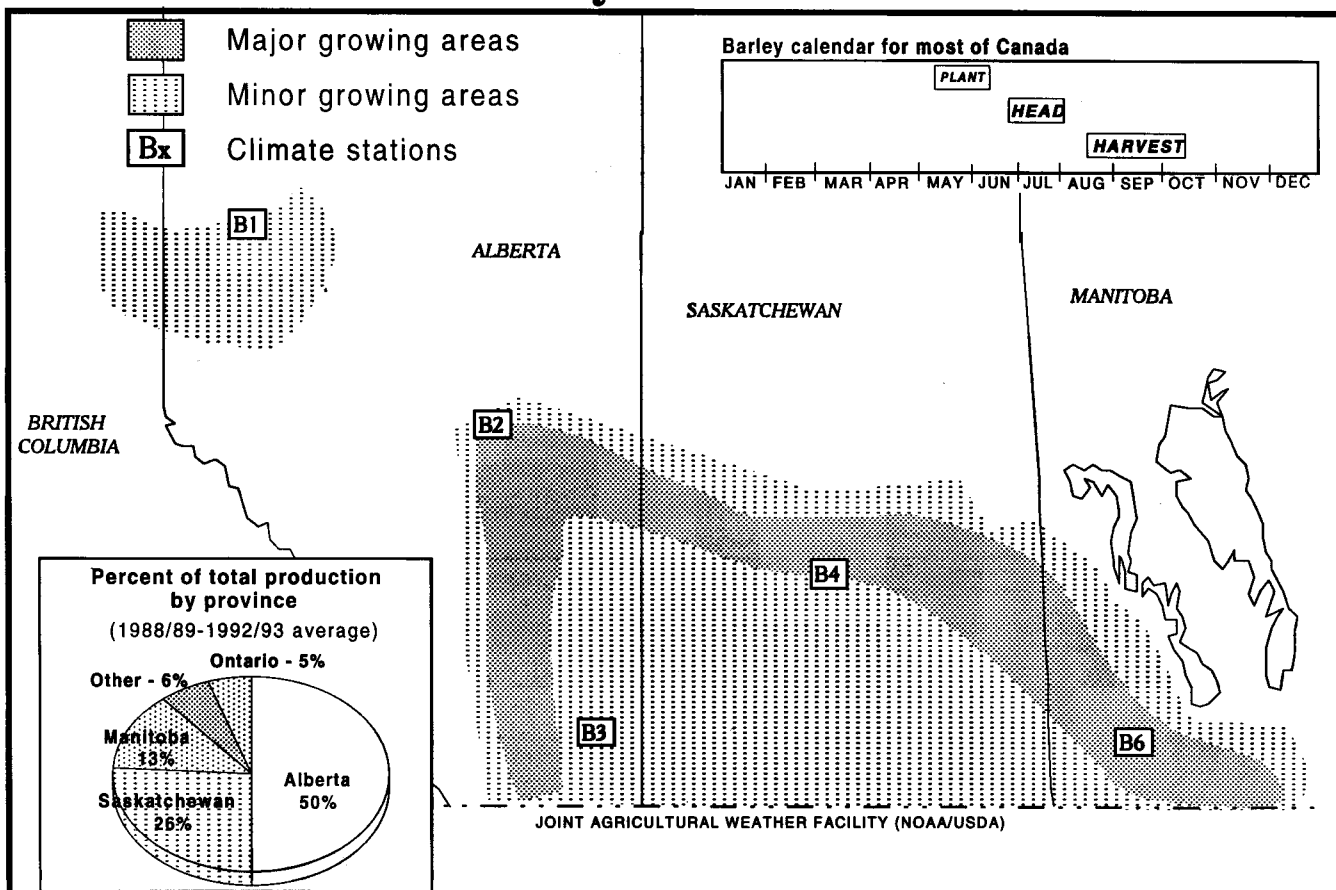
Crop Year	Manitoba			Saskatchewan			Alberta			National		
	Area 1,000 ha	Yield t/ha	Prod. 1,000 t	Area 1,000 ha	Yield t/ha	Prod. 1,000 t	Area 1,000 ha	Yield t/ha	Prod. 1,000 t	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1980/81	1,275	1.43	1,829	5,989	1.54	9,253	2,206	2.24	4,940	9,599	1.71	16,368
1981/82	1,470	2.12	3,115	6,414	1.86	11,961	2,408	2.25	5,416	10,395	2.00	20,750
1982/83	1,532	2.29	3,504	6,677	2.07	13,793	2,489	2.17	5,408	10,796	2.12	22,940
1983/84	1,766	1.84	3,243	7,183	1.81	13,017	2,792	2.19	6,110	11,839	1.91	22,631
1984/85	1,686	2.09	3,520	6,596	1.46	9,607	2,590	1.69	4,379	10,978	1.62	17,787
1985/86	1,797	2.66	4,782	6,657	1.65	10,968	2,671	1.67	4,450	11,247	1.82	20,519
1986/87	1,817	2.24	4,061	7,021	2.13	14,941	2,630	2.35	6,170	11,590	2.20	25,500
1987/88	1,807	2.03	3,663	6,354	1.87	11,907	2,428	1.94	4,708	10,751	1.93	20,720
1988/89	1,821	1.24	2,259	5,888	0.92	5,443	2,347	1.96	4,602	10,194	1.24	12,671
1989/90	1,942	1.96	3,810	5,929	1.61	9,525	2,610	2.11	5,498	10,604	1.81	19,181
1990/91	2,104	2.66	5,604	6,718	2.15	14,424	2,853	2.23	6,368	11,799	2.27	26,758
1991/92	2,087	2.19	4,572	6,992	2.12	14,833	2,786	2.49	6,940	11,933	2.23	26,604
1992/93	2,023	2.80	5,656	7,083	1.92	13,608	2,833	2.06	5,832	12,042	2.11	25,353
1988/89- 1992/93 average	1,995	2.20	4,380	6,522	1.77	11,567	2,686	2.18	5,848	11,314	1.95	22,113

Note: Manitoba, Saskatchewan, and Alberta statistics account for about 98% of the total crop.

Canadian Prairies: Durum wheat



Canadian Prairies: Barley

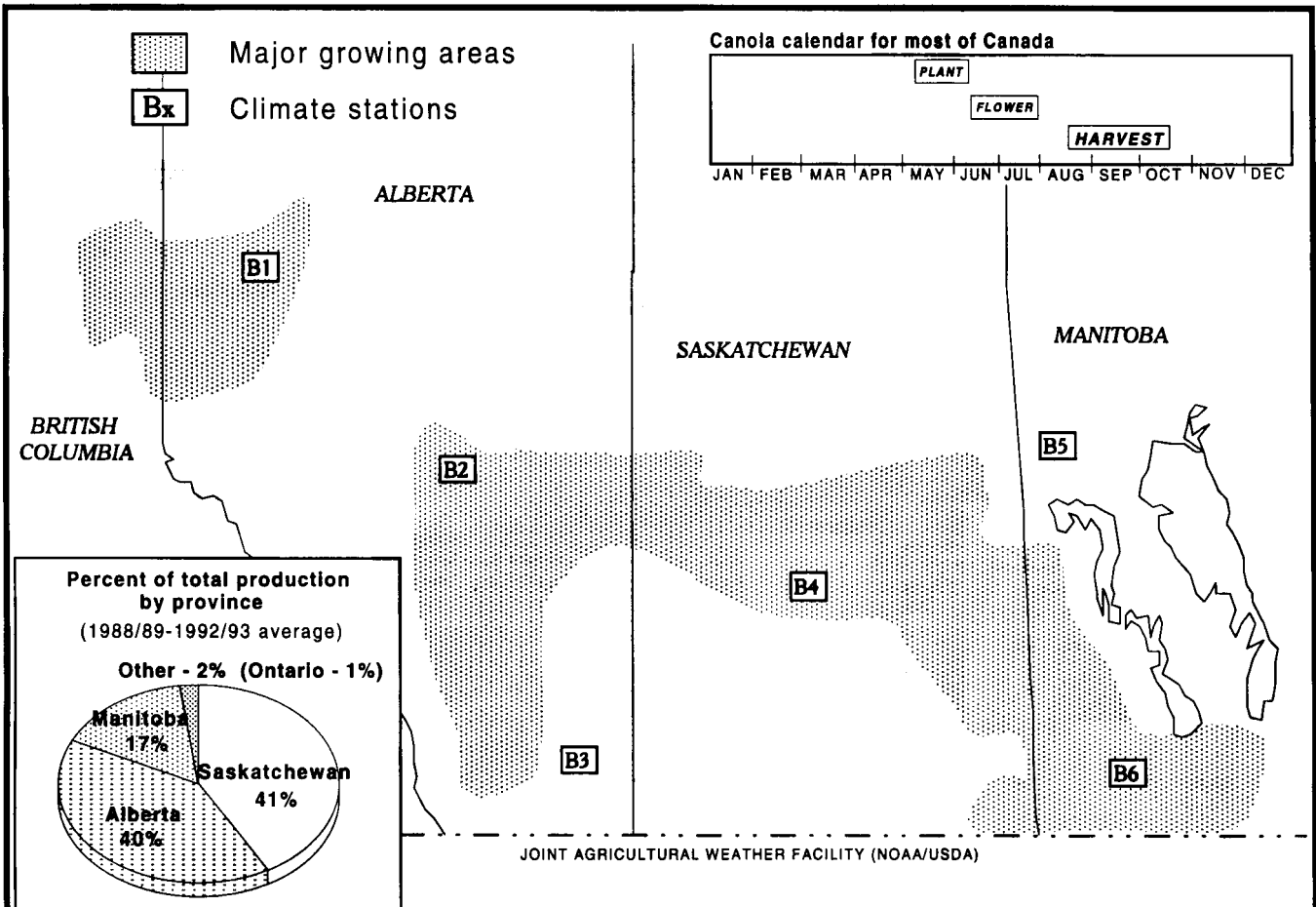


Canada: Historical barley statistics

Crop Year	Manitoba			Saskatchewan			Alberta			Ontario			National		
	Area 1,000 ha	Yield t/ha	Prod. 1,000 t	Area 1,000 ha	Yield t/ha	Prod. 1,000 t	Area 1,000 ha	Yield t/ha	Prod. 1,000 t	Area 1,000 ha	Yield t/ha	Prod. 1,000 t	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1980/81	809	1.94	1,568	1,315	2.12	2,787	2,226	2.73	6,075	164	3.12	511	4,634	2.43	11,259
1981/82	951	2.45	2,330	1,497	2.23	3,331	2,610	2.67	6,967	190	3.07	584	5,476	2.51	13,724
1982/83	809	2.93	2,373	1,396	2.60	3,636	2,469	2.66	6,575	235	3.19	749	5,149	2.71	13,966
1983/84	708	2.24	1,589	1,113	2.17	2,417	2,064	2.47	5,095	212	2.48	526	4,353	2.35	10,209
1984/85	728	2.66	1,938	1,295	1.90	2,460	2,104	2.20	4,638	192	3.20	615	4,566	2.25	10,279
1985/86	749	3.37	2,526	1,416	2.57	3,636	2,125	2.24	4,768	210	3.60	755	4,750	2.61	12,387
1986/87	627	2.95	1,851	1,437	2.79	4,006	2,246	3.20	7,185	239	3.23	771	4,829	3.03	14,634
1987/88	688	2.82	1,938	1,538	2.55	3,919	2,266	2.91	6,586	239	3.28	784	5,004	2.79	13,957
1988/89	567	1.92	1,089	1,234	1.69	2,090	1,902	3.06	5,813	198	2.53	501	4,152	2.46	10,212
1989/90	647	2.39	1,546	1,497	2.01	3,005	2,064	2.76	5,704	194	3.15	612	4,658	2.50	11,666
1990/91	627	3.21	2,014	1,437	2.71	3,897	2,066	3.21	6,641	178	3.26	581	4,702	2.96	13,925
1991/92	506	2.82	1,426	1,265	2.43	3,070	2,023	2.96	5,979	190	2.89	549	4,217	2.76	11,618
1992/93	425	3.69	1,568	1,186	2.57	3,048	1,760	2.76	4,855	174	3.63	631	3,790	2.88	10,919
1988/89-1992/93 average	554	2.76	1,529	1,324	2.28	3,022	1,963	2.95	5,798	187	3.08	575	4,304	2.71	11,668

Note: Manitoba, Saskatchewan, Alberta, and Ontario statistics account for about 94% of the total crop.

Canadian Prairies: Canola

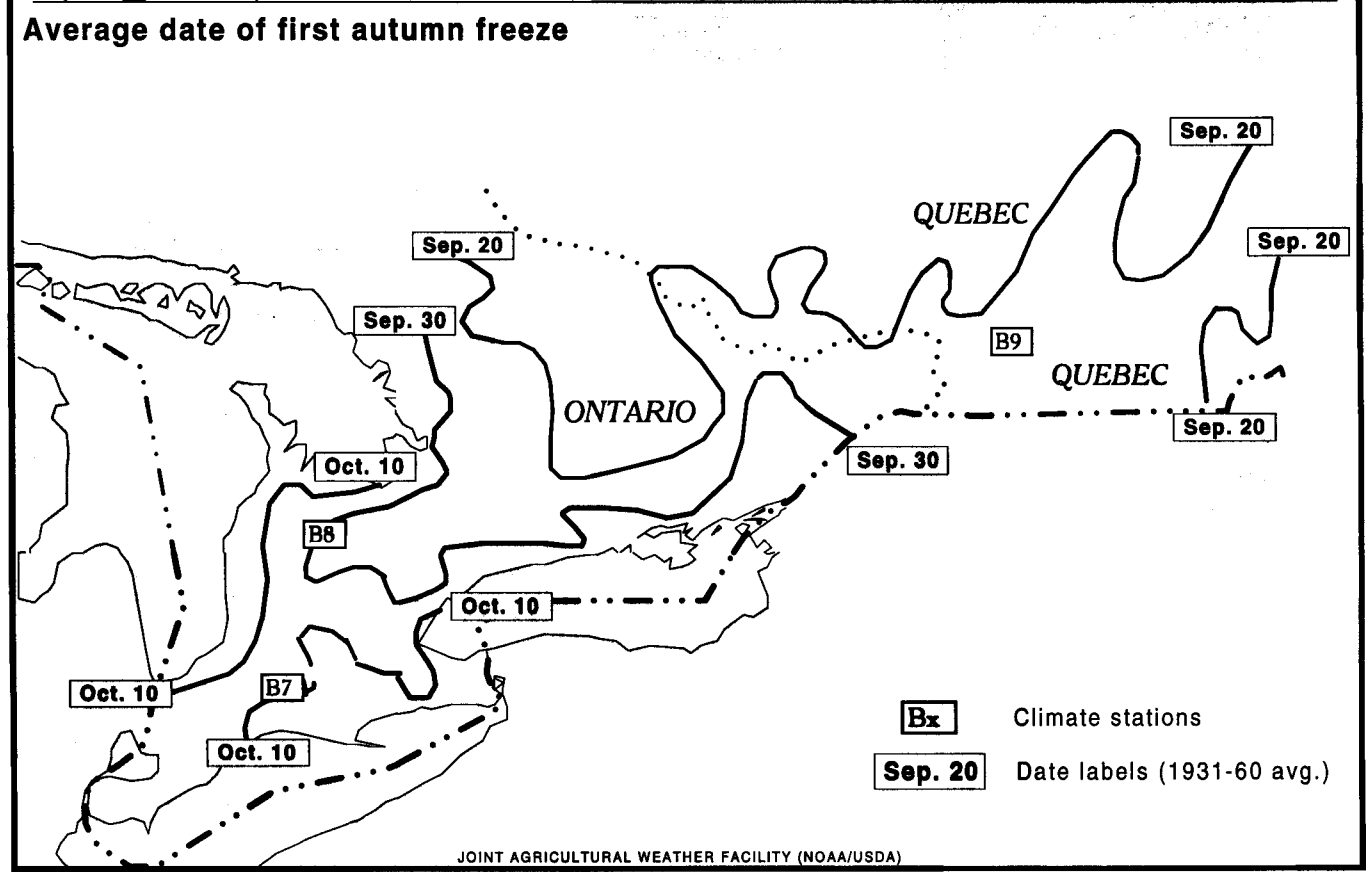
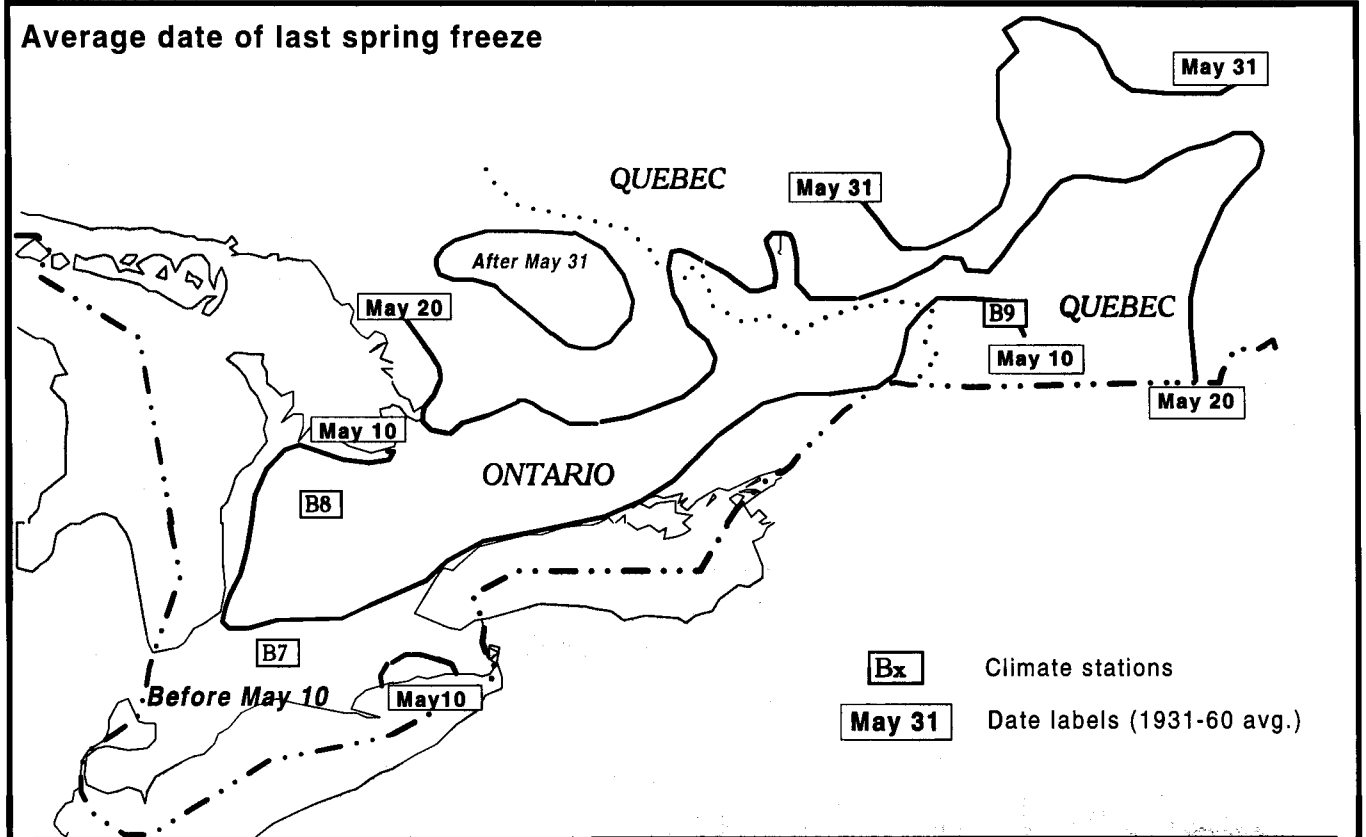


Canada: Historical canola statistics

Crop Year	Manitoba			Saskatchewan			Alberta			National		
	Area 1,000 ha	Yield t/ha	Prod. 1,000 t	Area 1,000 ha	Yield t/ha	Prod. 1,000 t	Area 1,000 ha	Yield t/ha	Prod. 1,000 t	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1980/81	324	0.91	295	809	1.23	998	890	1.27	1,134	2,080	1.19	2,484
1981/82	243	1.26	306	546	1.39	760	587	1.29	760	1,402	1.32	1,849
1982/83	344	1.16	399	607	1.31	794	769	1.27	975	1,777	1.25	2,225
1983/84	384	1.03	397	850	1.25	1,066	1,012	1.05	1,066	2,334	1.12	2,609
1984/85	486	1.12	544	1,295	1.10	1,429	1,214	1.12	1,361	3,071	1.11	3,412
1985/86	405	1.57	635	1,174	1.31	1,542	1,133	1.10	1,247	2,783	1.26	3,498
1986/87	405	1.43	578	1,020	1.47	1,497	1,133	1.40	1,588	2,630	1.41	3,714
1987/88	405	1.44	585	1,052	1.47	1,542	1,153	1.42	1,633	3,019	1.23	3,720
1988/89	627	0.98	612	1,558	1.08	1,682	1,416	1.35	1,905	3,715	1.14	4,218
1989/90	465	0.86	399	1,295	1.00	1,293	1,093	1.22	1,338	2,918	1.10	3,209
1990/91	360	1.31	472	1,133	1.28	1,451	1,032	1.24	1,281	2,529	1.29	3,266
1991/92	508	1.57	798	1,359	1.27	1,724	1,207	1.28	1,542	3,141	1.34	4,224
1992/93	597	1.60	953	1,214	1.18	1,429	1,044	1.21	1,259	2,904	1.27	3,689
1988/89-1992/93 average	511	1.26	647	1,312	1.16	1,516	1,158	1.26	1,465	3,041	1.23	3,721

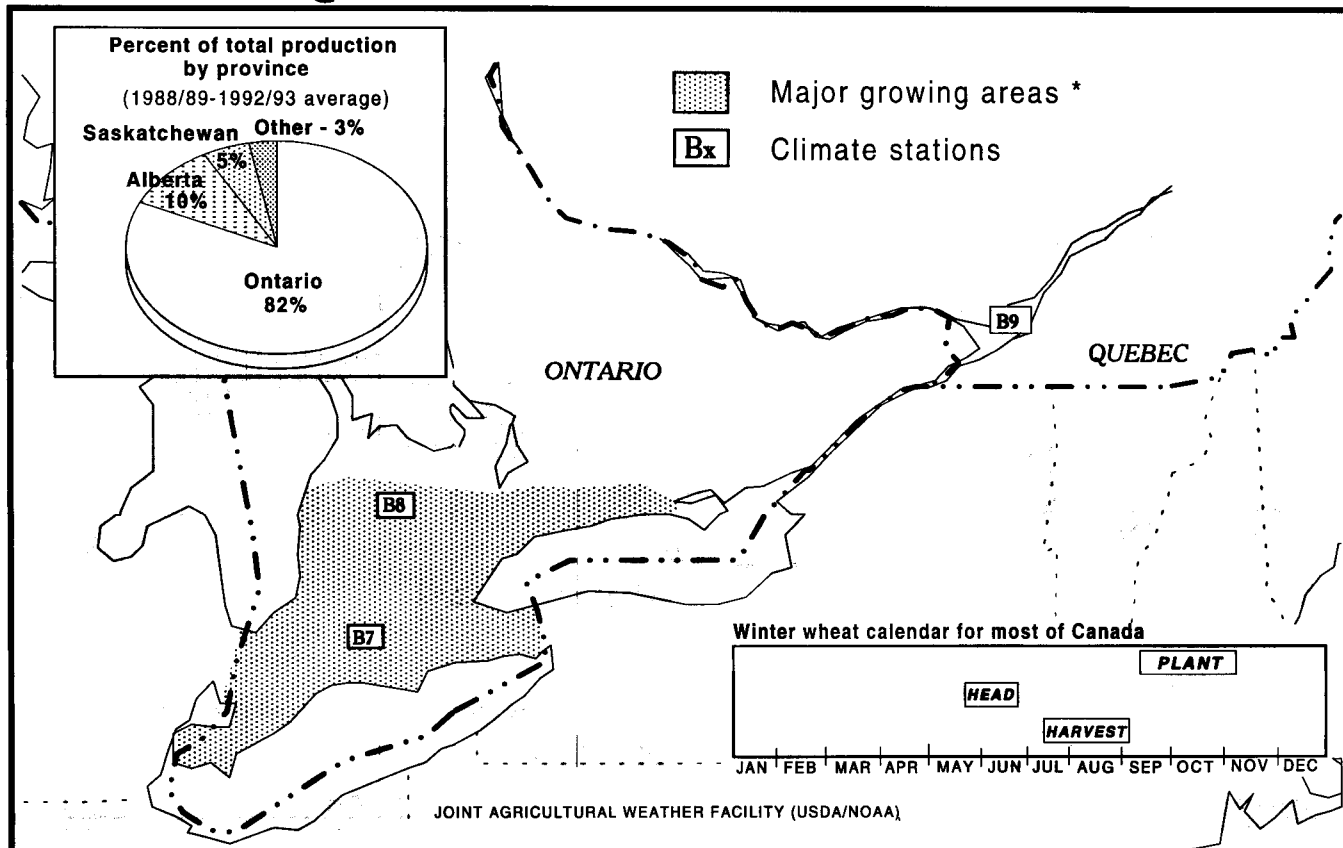
Note: Manitoba, Saskatchewan, and Alberta statistics account for about 98% of the total crop.

Ontario and Quebec: Average freeze dates



JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Ontario and Quebec: Winter wheat



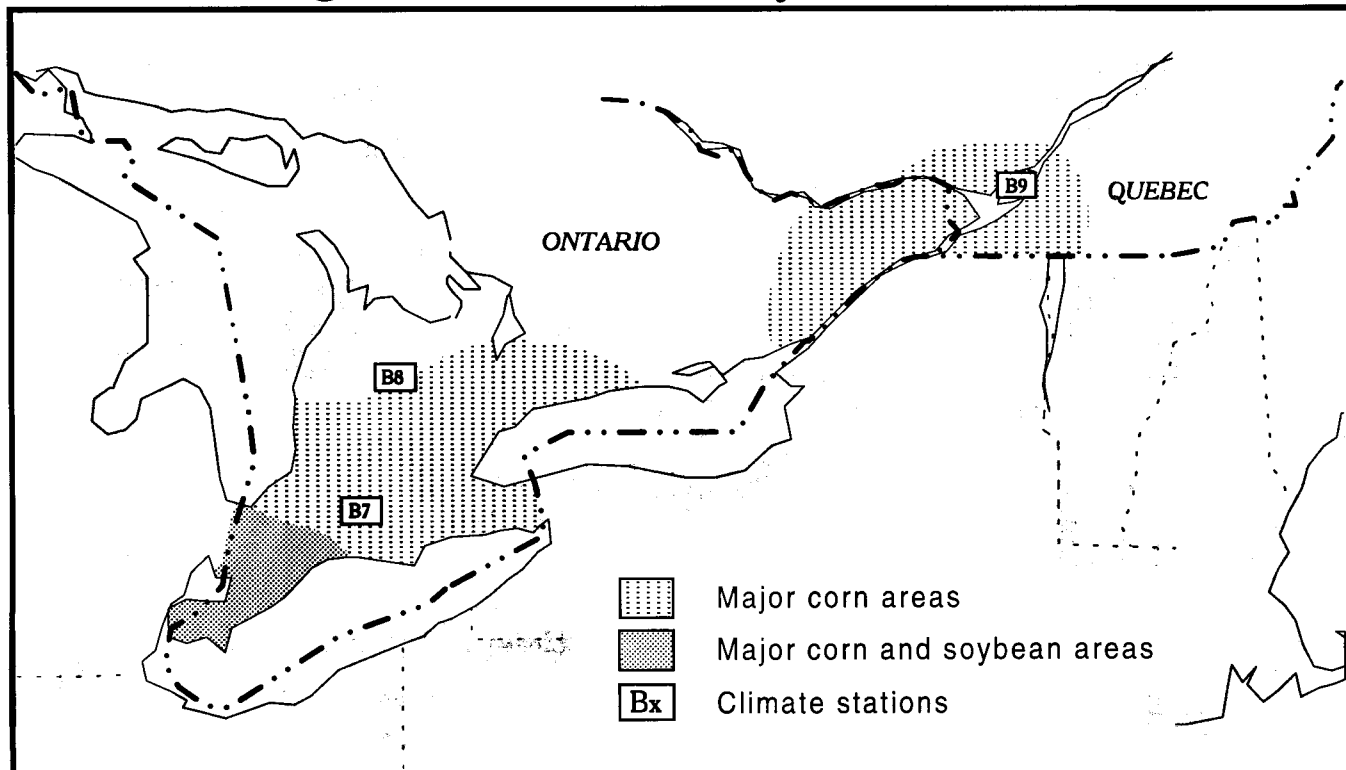
* Prairie growing areas concentrated in southern Alberta, scattered throughout Saskatchewan.




Canada: Historical winter wheat statistics

Crop Year	Ontario			Saskatchewan			Alberta			National		
	Area 1,000 ha	Yield t/ha	Prod. 1,000 t	Area 1,000 ha	Yield t/ha	Prod. 1,000 t	Area 1,000 ha	Yield t/ha	Prod. 1,000 t	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1980/81	194	3.66	711				81	2.19	177	275	3.23	888
1981/82	204	3.48	709	20	2.05	41	101	3.07	310	332	3.24	1,075
1982/83	121	2.92	353	40	2.18	87	81	2.46	199	248	2.64	654
1983/84	229	3.39	776	61	2.10	128	121	2.36	286	425	2.85	1,213
1984/85	206	3.87	797	142	1.73	245	121	1.80	218	483	2.67	1,291
1985/86	212	4.50	954	324	1.54	498	162	1.26	204	713	2.36	1,686
1986/87	260	3.64	947	324	1.43	463	182	2.66	484	804	2.46	1,981
1987/88	150	3.50	525	182	1.42	259	190	2.15	408	548	2.29	1,257
1988/89	279	3.69	1,029	81	0.67	54	142	1.38	196	527	2.55	1,346
1989/90	279	3.71	1,034	49	1.51	74	61	2.15	131	412	3.15	1,299
1990/91	316	4.29	1,357	73	1.49	109	69	2.36	163	481	3.51	1,690
1991/92	164	3.57	585	24	2.00	48	32	2.72	87	239	3.16	756
1992/93	279	4.58	1,277	15	1.73	26	28	2.14	60	329	4.19	1,380
1988/89- 1992/93 average	263	4.01	1,056	48	1.29	62	66	1.92	127	398	3.26	1,294

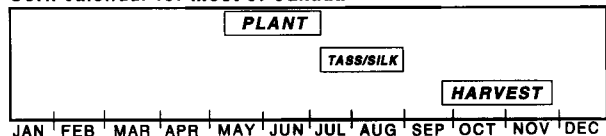
Note: Ontario, Saskatchewan, and Alberta statistics account for about 97% of the total crop.

Ontario and Quebec: Corn and soybeans

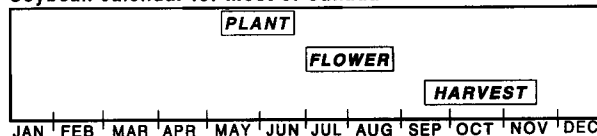


-  Major corn areas
-  Major corn and soybean areas
-  Climate stations

Corn calendar for most of Canada



Soybean calendar for most of Canada



Canada: Historical corn statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1980/81	958	6.01	5,753
1981/82	1,139	5.86	6,673
1982/83	1,107	5.88	6,513
1983/84	1,107	5.36	5,931
1984/85	1,192	5.69	6,778
1985/86	1,123	6.21	6,970
1986/87	994	5.95	5,912
1987/88	1,006	7.02	7,065
1988/89	995	5.48	5,450
1989/90	1,035	6.35	6,571
1990/91	1,062	6.65	7,067
1991/92	1,105	6.71	7,413
1992/93	857	5.70	4,883
1988/89- 1992/93 average	1,011	6.18	6,277

Canada: Historical soybean statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1980/81	277	2.49	690
1981/82	279	2.18	607
1982/83	364	2.33	848
1983/84	364	2.02	735
1984/85	405	2.26	917
1985/86	405	2.50	1,012
1986/87	385	2.49	960
1987/88	461	2.75	1,270
1988/89	533	2.16	1,153
1989/90	540	2.26	1,219
1990/91	484	2.61	1,262
1991/92	598	2.44	1,460
1992/93	560	2.48	1,387
1988/89- 1992/93 average	543	2.39	1,296

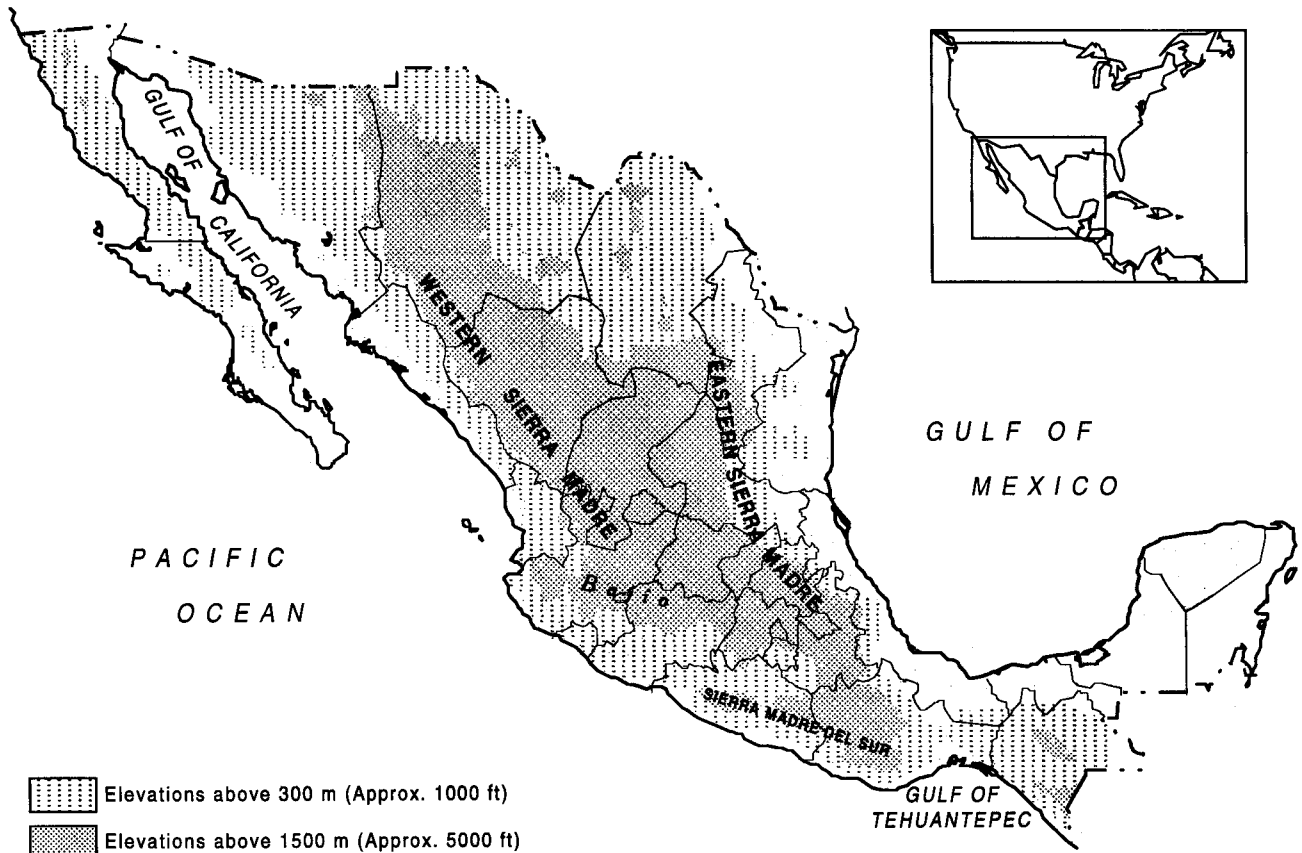
JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Mexico: State names and landforms

State names

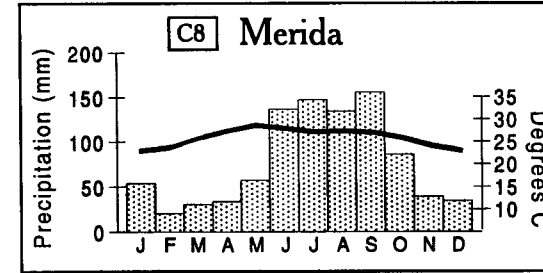
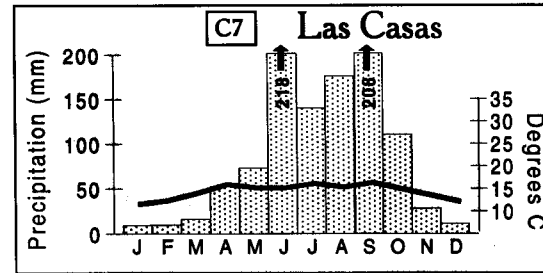
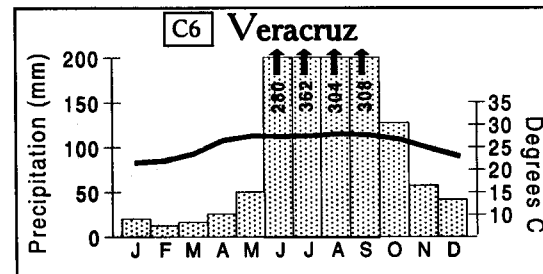
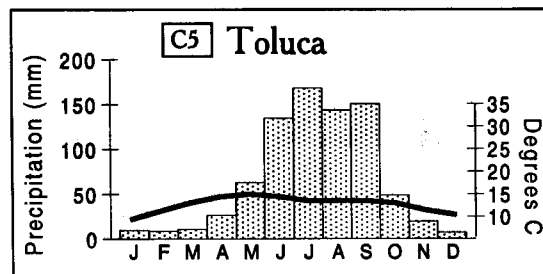
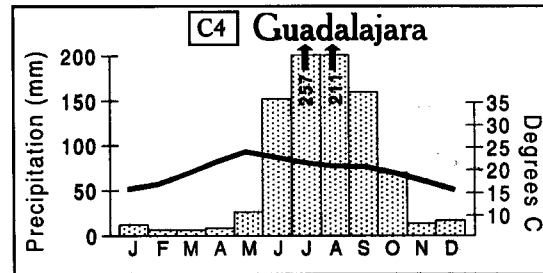
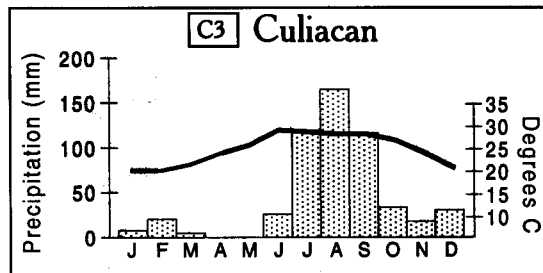
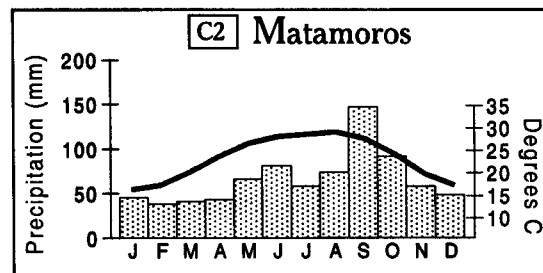
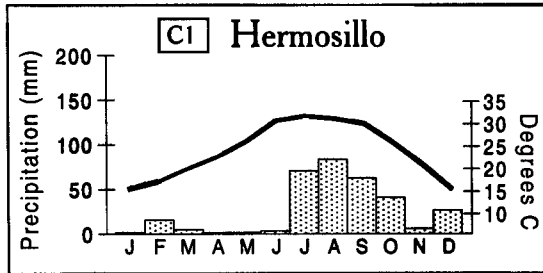
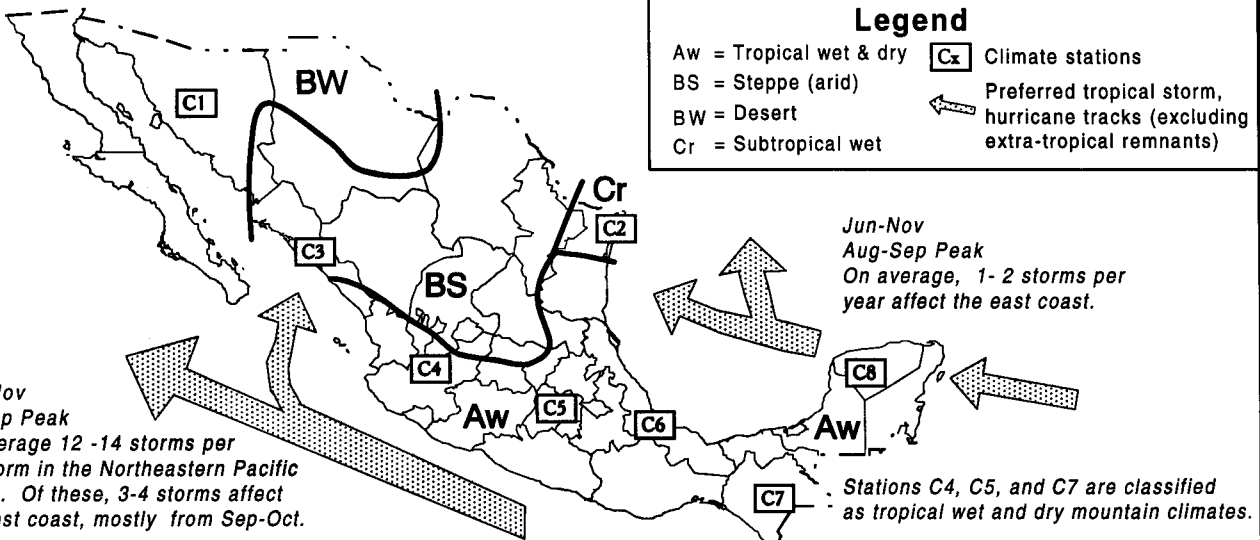


Landforms



JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

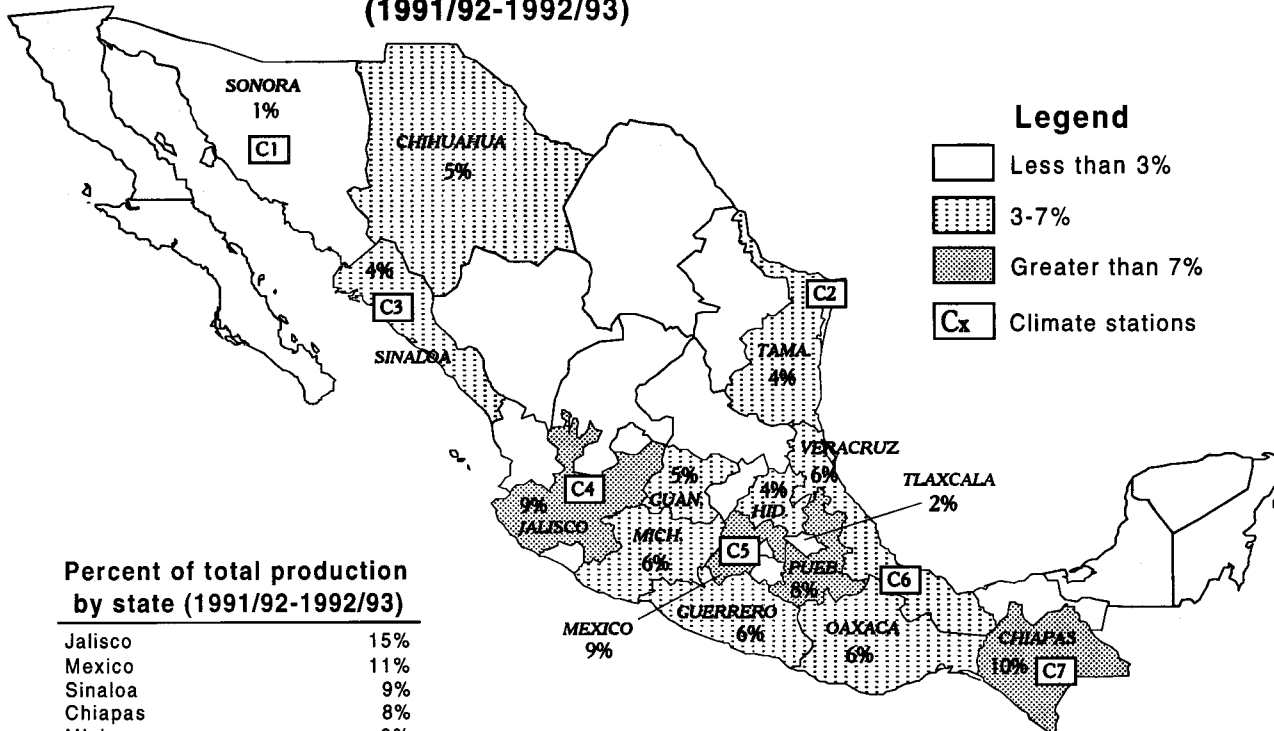
Mexico: Climate



JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Mexico: Corn

**Percent of total corn area by state
(1991/92-1992/93)**



**Percent of total production
by state (1991/92-1992/93)**

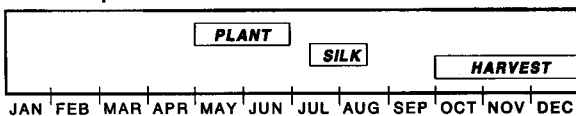
Jalisco	15%
Mexico	11%
Sinaloa	9%
Chiapas	8%
Michoacan	6%
Tamaulipas	6%
Veracruz	6%
Guerrero	5%
Chihuahua	5%
Guanajuato	4%
Puebla	4%
Oaxaca	3%
Hidalgo	3%
Tlaxcala	2%
Sonora	2%

These states account for 89% of 1991/92-1992/93 production.

Mexico: Historical corn statistics

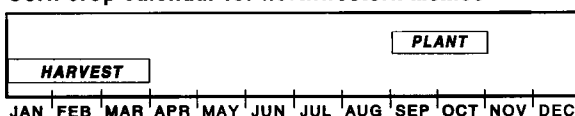
Crop Year	Area	Yield	Prod.
	1,000 ha	t/ha	1,000 t
1970/71	8,000	1.11	8,900
1971/72	8,000	1.14	9,100
1972/73	7,500	1.08	8,100
1973/74	7,900	1.14	9,000
1974/75	7,700	1.01	7,780
1975/76	7,900	1.18	9,300
1976/77	7,870	1.22	9,600
1977/78	7,920	1.22	9,700
1978/79	8,000	1.28	10,200
1979/80	7,600	1.21	9,200
1980/81	8,100	1.28	10,400
1981/82	8,150	1.53	12,500
1982/83	6,000	1.17	7,000
1983/84	6,500	1.43	9,300
1984/85	6,300	1.57	9,900
1985/86	6,200	1.69	10,500
1986/87	6,000	1.67	10,000
1987/88	6,000	1.65	9,900
1988/89	6,000	1.68	10,100
1989/90	5,800	1.68	9,750
1990/91	6,600	2.14	14,100
1991/92	7,700	1.88	14,500
1992/93	8,100	2.10	17,000
1988/89-1992/93-average	6,840	1.90	13,090

Corn crop calendar for most of Mexico



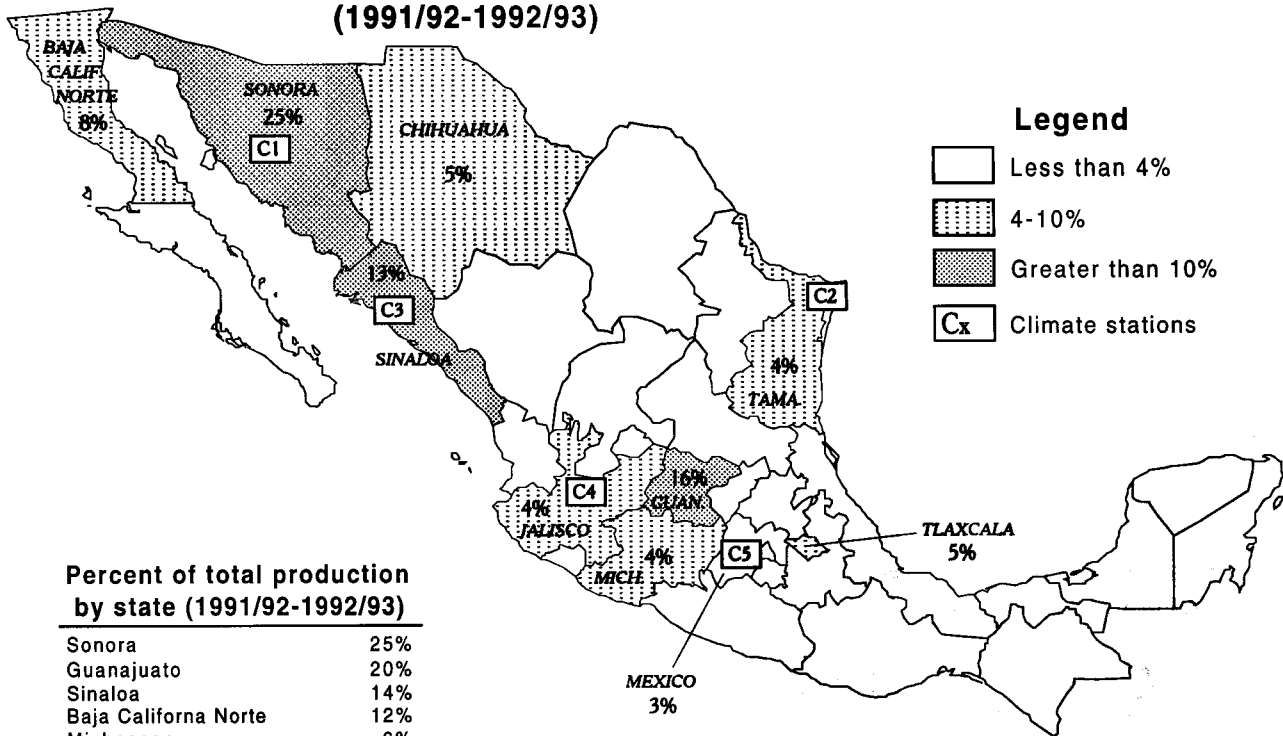
Summer planted corn accounts for about 80-85 percent of total production. Add 1-2 months to the above crop calendar for corn grown in the Yucatan Peninsula.

Corn crop calendar for northwestern Mexico



Mexico: Wheat

Percent of total wheat area by state
(1991/92-1992/93)



Legend

- Less than 4%
- 4-10%
- Greater than 10%
- Climate stations

Percent of total production
by state (1991/92-1992/93)

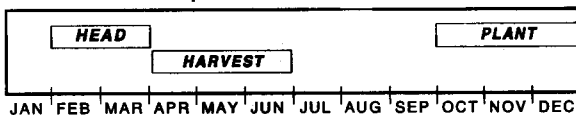
Sonora	25%
Guanajuato	20%
Sinaloa	14%
Baja California Norte	12%
Michoacan	6%
Chihuahua	4%
Jalisco	4%
Tlaxcala	3%
Tamaulipas	2%
Mexico	2%

These states account for 92% of 1991/92-1992/93 production.

Mexico: Historical wheat statistics

Crop Year	Area	Yield	Prod.
	1,000 ha	t/ha	1,000 t
1970/71	763	2.82	2,148
1971/72	697	2.90	2,019
1972/73	680	2.50	1,700
1973/74	720	2.78	2,000
1974/75	790	3.04	2,400
1975/76	802	3.62	2,900
1976/77	885	3.79	3,350
1977/78	775	2.97	2,300
1978/79	760	3.09	2,350
1979/80	620	3.68	2,280
1980/81	740	3.58	2,650
1981/82	850	3.59	3,050
1982/83	950	4.42	4,200
1983/84	840	3.81	3,200
1984/85	950	4.42	4,200
1985/86	1,050	4.19	4,400
1986/87	1,075	4.19	4,500
1987/88	900	4.11	3,700
1988/89	800	4.00	3,200
1989/90	950	4.21	4,000
1990/91	950	4.11	3,900
1991/92	880	4.20	3,700
1992/93	762	4.20	3,200
1988/89- 1992/93- average	868	4.14	3,600

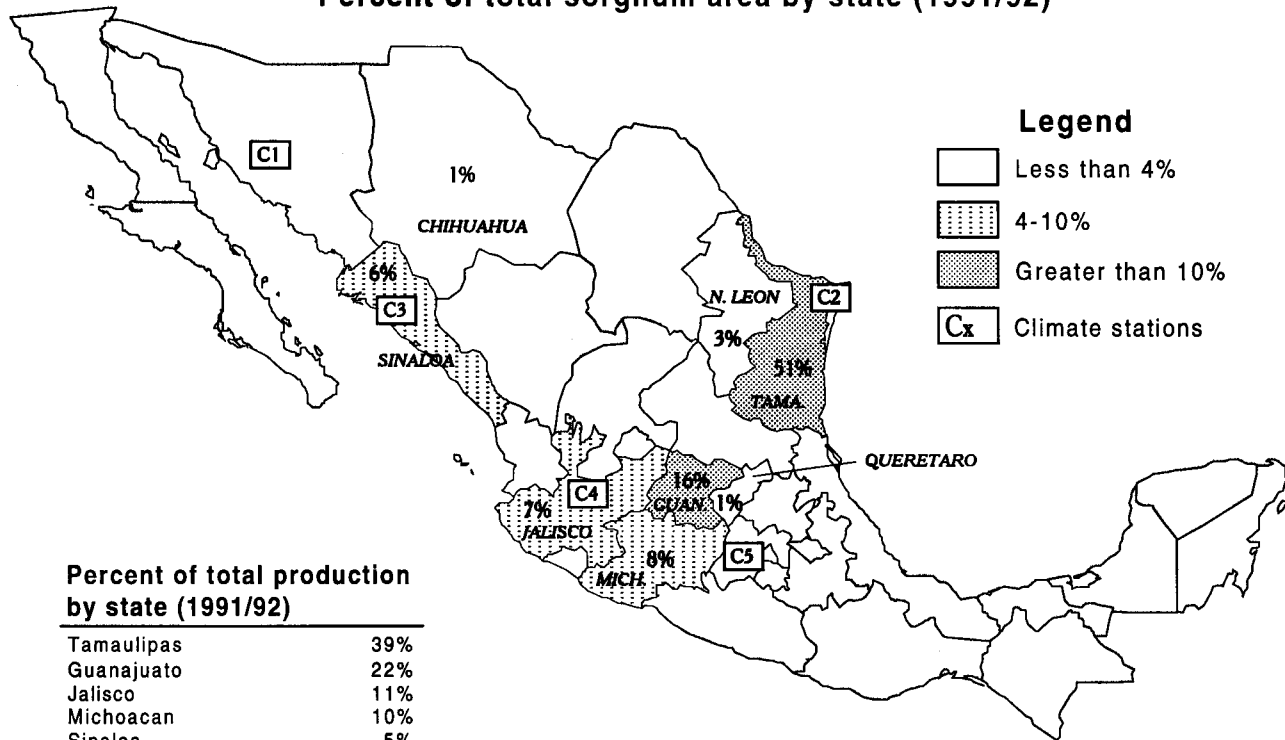
Winter wheat crop calendar for most of Mexico



Winter wheat accounts for about 85-90 percent of the total crop and nearly all is irrigated.

Mexico: Sorghum

Percent of total sorghum area by state (1991/92)

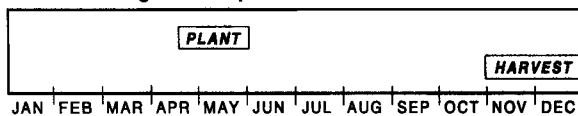


Percent of total production by state (1991/92)

Tamaulipas	39%
Guanajuato	22%
Jalisco	11%
Michoacan	10%
Sinaloa	5%
Nuevo Leon	2%
Queretaro	2%
Chihuahua	2%

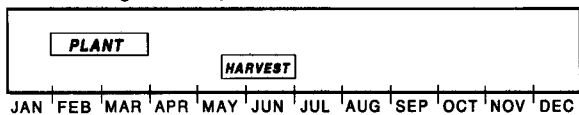
These states account for 93% of 1991/92 production.

Summer sorghum crop calendar for most of Mexico



Summer sorghum accounts for about 60-65 percent of the total crop and is primarily grown in the Bajio.

Winter sorghum crop calendar for most of Mexico



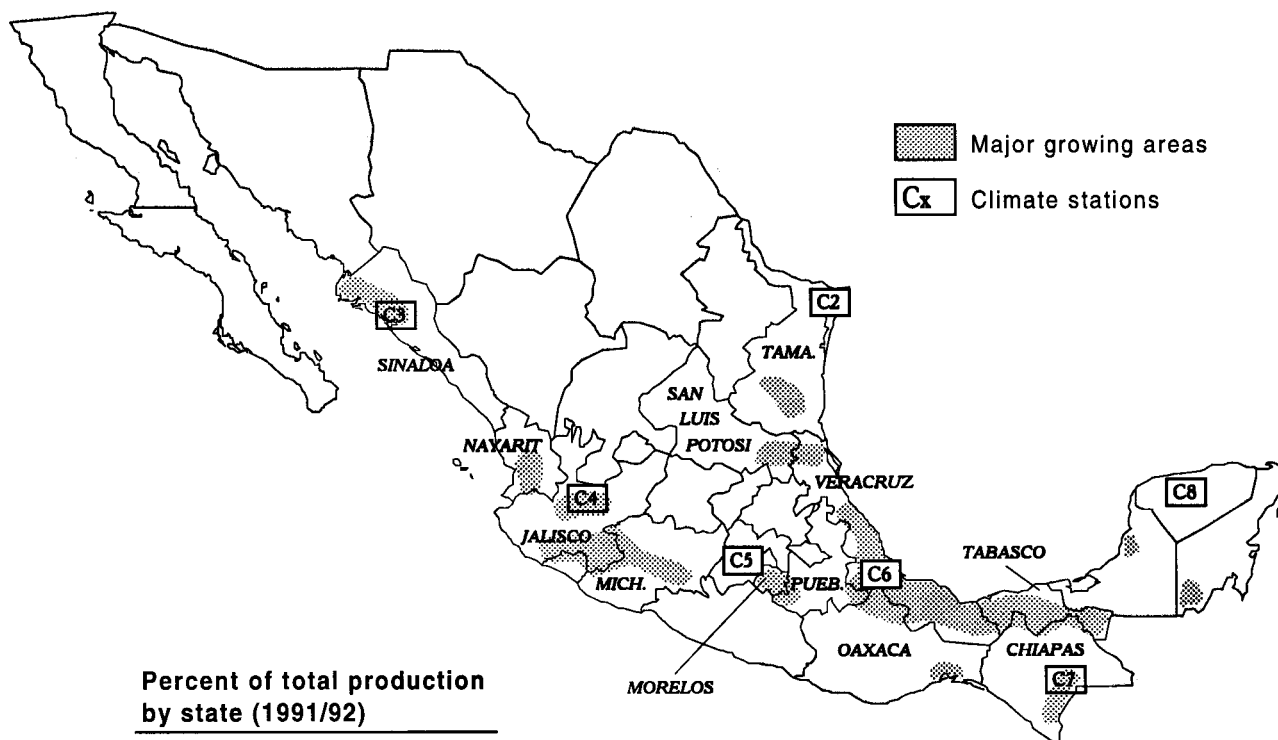
Winter sorghum accounts for about 35-40 percent of the total crop and is primarily grown in the Northeast (Nuevo Leon and Tamaulipas) and west coast (Sinaloa).

Mexico: Historical sorghum statistics

Crop Year	Area	Yield	Prod.
	1,000 ha	t/ha	1,000 t
1970/71	940	2.50	2,350
1971/72	900	2.44	2,200
1972/73	900	2.00	1,800
1973/74	1,160	2.50	2,900
1974/75	1,137	2.43	2,760
1975/76	1,200	2.83	3,400
1976/77	1,170	2.74	3,200
1977/78	1,000	2.80	2,800
1978/79	1,100	2.91	3,200
1979/80	900	2.22	2,000
1980/81	1,100	3.45	3,800
1981/82	1,400	2.86	4,000
1982/83	1,100	2.55	2,800
1983/84	1,400	2.86	4,000
1984/85	1,300	3.15	4,100
1985/86	1,300	2.85	3,700
1986/87	1,350	3.19	4,300
1987/88	1,375	2.91	4,000
1988/89	1,100	2.83	3,110
1989/90	1,300	2.88	3,750
1990/91	1,300	2.85	3,700
1991/92	820	3.17	2,600
1992/93	700	3.40	2,380
1988/89-1992/93 average	1,044	3.00	3,108

JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Mexico: Sugarcane



Percent of total production by state (1991/92)

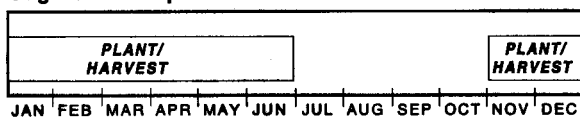
Veracruz	32%
Oaxaca	11%
Jalisco	11%
San Luis Potosi	9%
Sinaloa	6%
Tamaulipas	5%
Morelos	4%
Michoacan	4%
Nayarit	4%
Tabasco	4%
Puebla	3%
Chiapas	3%

These states account for 92% of 1991/92 production.

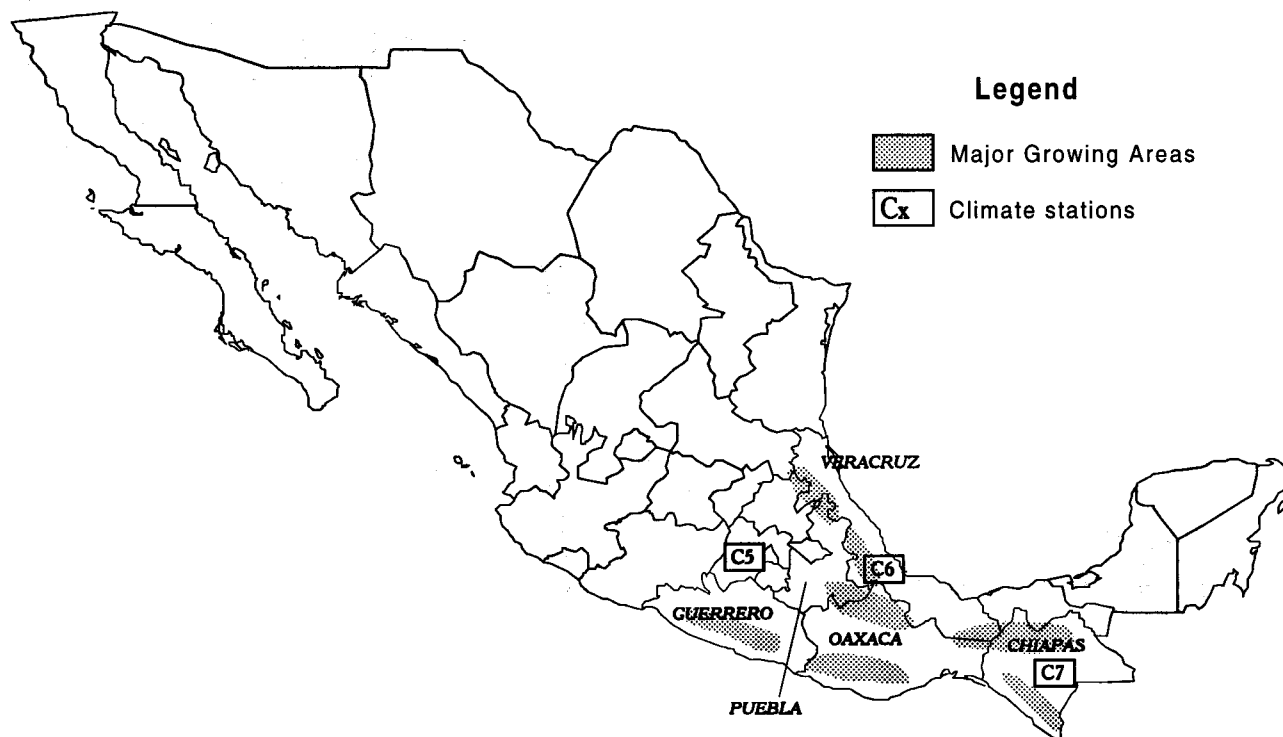
Mexico: Historical sugarcane statistics

Crop Year	Area	Yield	Sugar-cane	Raw sugar
	1,000 ha	t/ha	1,000 t	1,000 t
1970/71	417	62.31	25,985	2,475
1971/72	414	63.42	26,254	2,520
1972/73	440	67.84	29,849	2,769
1973/74	447	68.21	30,492	2,805
1974/75	450	64.33	28,949	2,696
1975/76	435	62.61	27,237	2,698
1976/77	416	67.18	27,947	2,696
1977/78	445	72.69	32,348	3,029
1978/79	463	73.14	33,865	3,058
1979/80	479	65.43	31,343	2,763
1980/81	439	65.32	28,677	2,518
1981/82	450	69.22	31,150	2,842
1982/83	475	68.38	32,482	3,078
1983/84	495	70.19	34,746	3,242
1984/85	540	70.56	38,100	3,436
1985/86	543	74.31	40,350	3,928
1986/87	597	69.30	41,372	3,970
1987/88	561	66.39	37,244	3,806
1988/89	542	66.24	35,900	3,678
1989/90	511	68.10	34,800	3,100
1990/91	525	68.57	36,000	3,900
1991/92	519	68.02	35,300	3,500
1992/93	530	74.90	39,700	4,330
1988/89-1992/93 average	525	69.16	36,340	3,702

Sugarcane crop calendar for most of Mexico



Mexico: Coffee



Percent of total production by state (1992/93)

Chiapas	32%
Veracruz	24%
Oaxaca	19%
Puebla	15%
Guerrero	6%

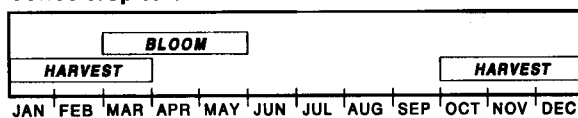
These states account for 96% of 1992/93 production.

Mexico: Historical coffee statistics

Crop Year	Area [*]	Yield	Prod.
	1,000 ha	t/ha	1,000 t
1970/71	329	9.73	3,200
1971/72	381	8.92	3,400
1972/73	374	10.47	3,914
1973/74	379	9.23	3,500
1974/75	363	11.10	4,030
1975/76	373	11.09	4,136
1976/77	356	9.64	3,431
1977/78	356	9.27	3,301
1978/79	356	11.30	4,022
1979/80	356	10.11	3,600
1980/81	356	10.85	3,862
1981/82	356	10.96	3,900
1982/83	395	11.47	4,530
1983/84	390	11.62	4,530
1984/85	380	11.18	4,250
1985/86	400	12.07	4,826
1986/87	404	13.11	5,297
1987/88	440	10.72	4,717
1988/89	580	9.48	5,500
1989/90	530	9.62	5,100
1990/91	530	8.58	4,550
1991/92	580	7.97	4,620
1992/93	570	7.33	4,180
1988/89- 1992/93- average	558	8.60	4,790

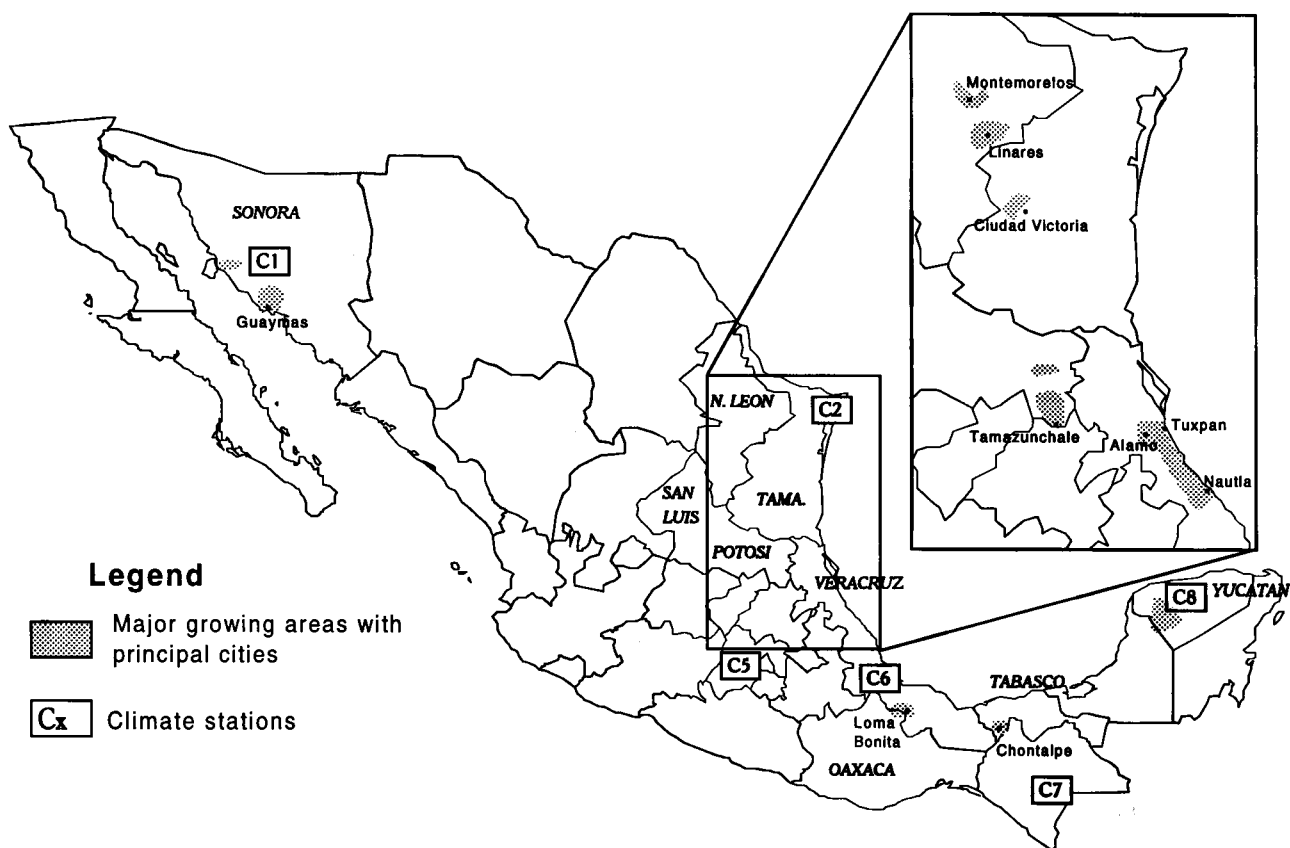
* Bearing trees.

Coffee crop calendar for most of Mexico



JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Mexico: Oranges



Legend

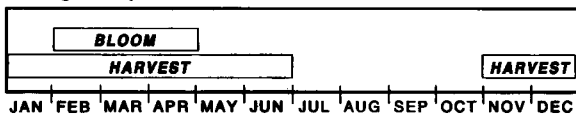
- Major growing areas with principal cities
- Climate stations

Percent of total production by state (1991/92)

Veracruz	55%
San Luis Potosi	12%
Tamaulipas	8%
Sonora	6%
Yucatan	5%
Nuevo Leon	4%

These states account for 90% of 1991/92 production.

Orange crop calendar for most of Mexico



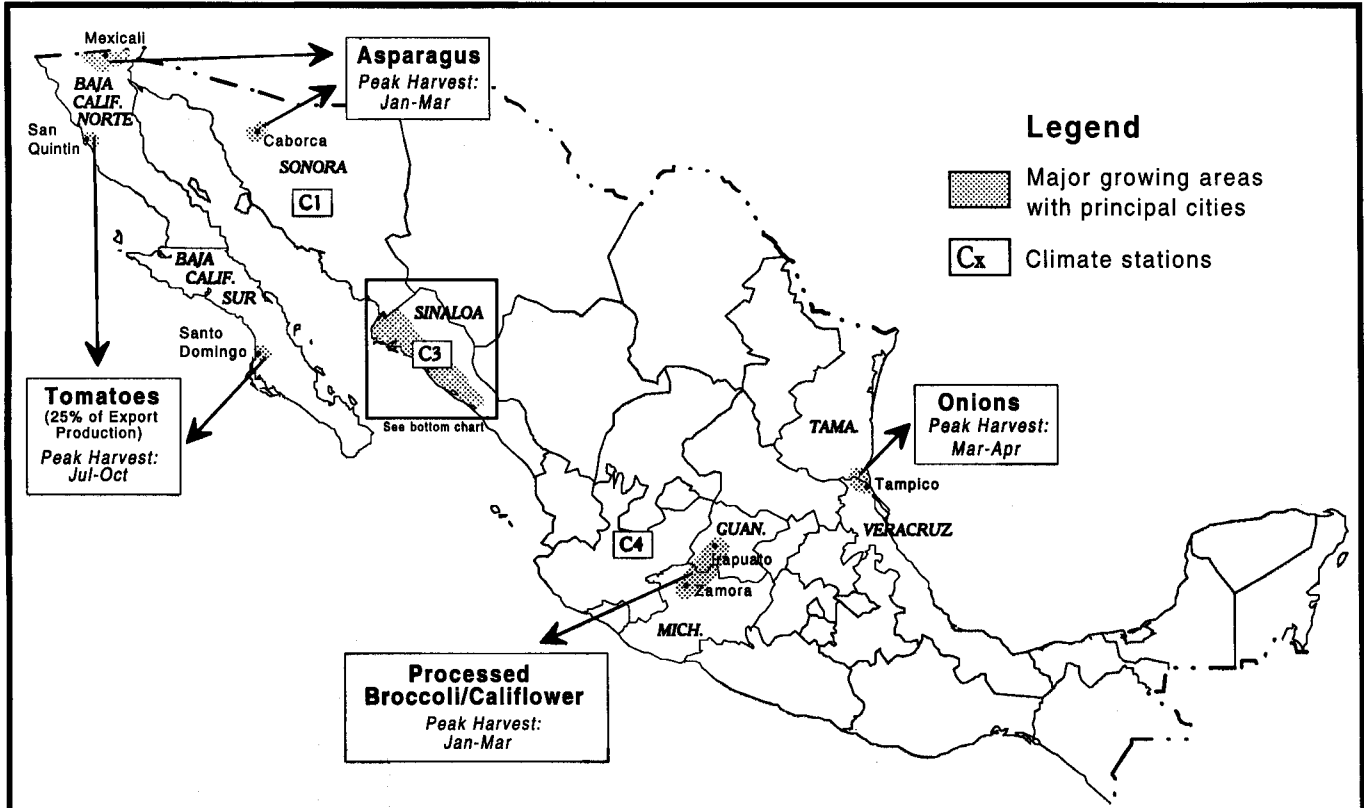
Mexico: Historical orange statistics

Crop Year	Area*		Prod.
	1,000 ha	t/ha	
1970/71	na	na	1,310
1971/72	na	na	1,130
1972/73	na	na	1,410
1973/74	na	na	1,280
1974/75	na	na	1,230
1975/76	na	na	1,280
1976/77	na	na	1,710
1977/78	na	na	1,290
1978/79	na	na	1,280
1979/80	na	na	1,630
1980/81	na	na	1,600
1981/82	na	na	1,650
1982/83	na	na	1,380
1983/84	94	13.83	1,300
1984/85	65	15.38	1,000
1985/86	70	20.14	1,410
1986/87	73	23.05	1,683
1987/88	96	19.79	1,900
1988/89	112	17.86	2,000
1989/90	160	11.88	1,900
1990/91	170	13.53	2,300
1991/92	185	11.89	2,200
1992/93	205	13.17	2,700
1988/89-1992/93-average	166	13.67	2,220

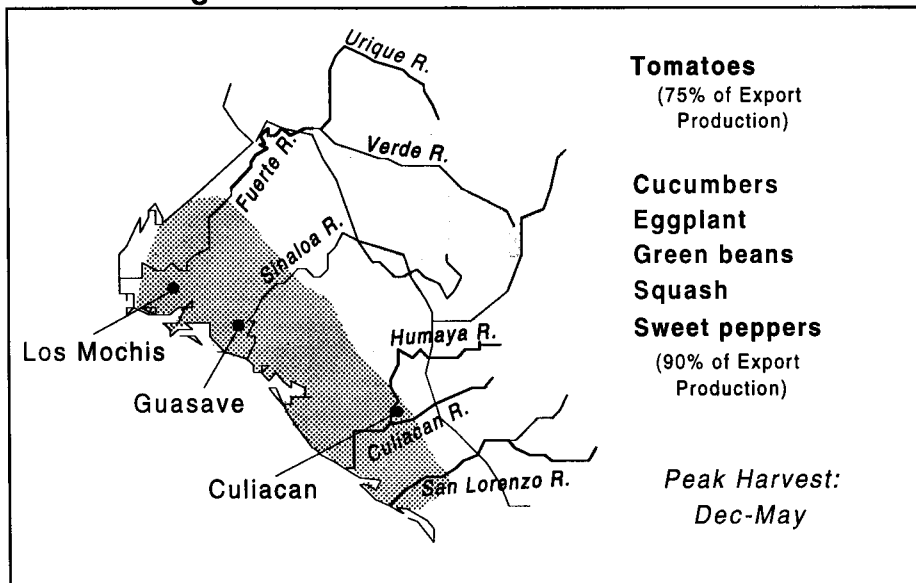
na = Not available

* Bearing trees.

Mexico: Vegetable crops for export

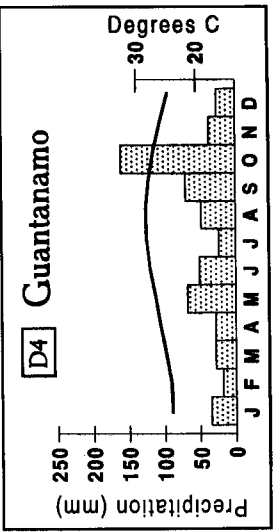
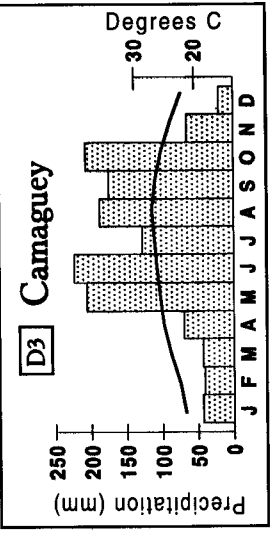
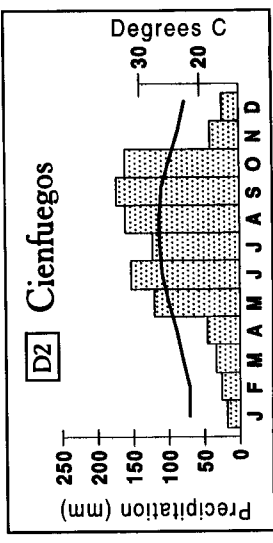
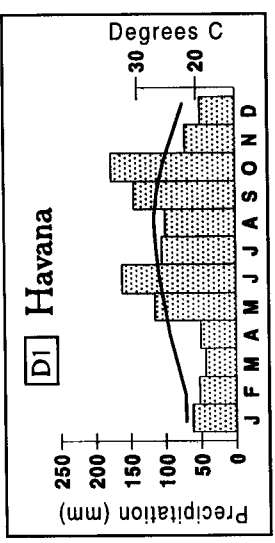
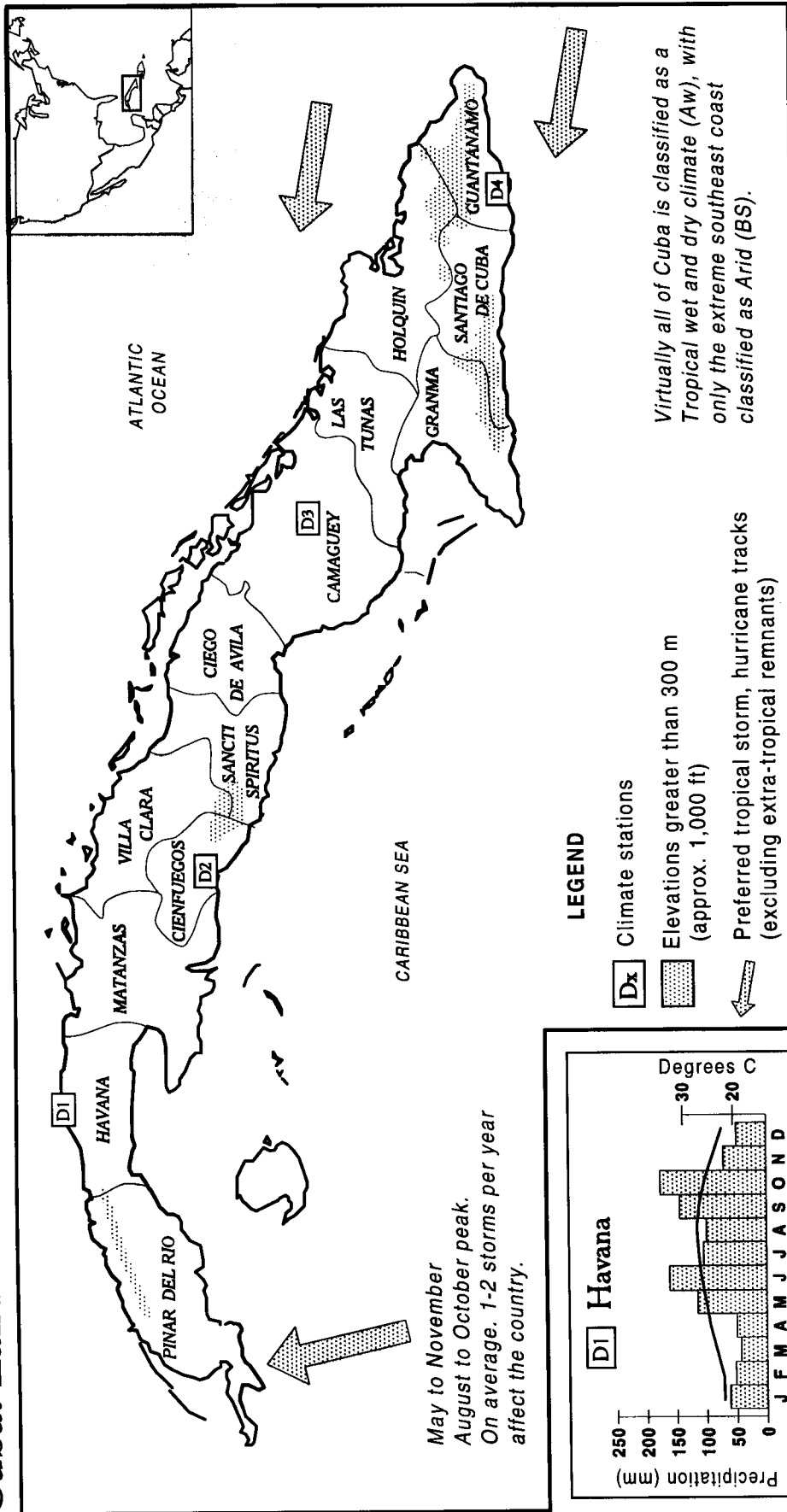


Sinaloa vegetable area



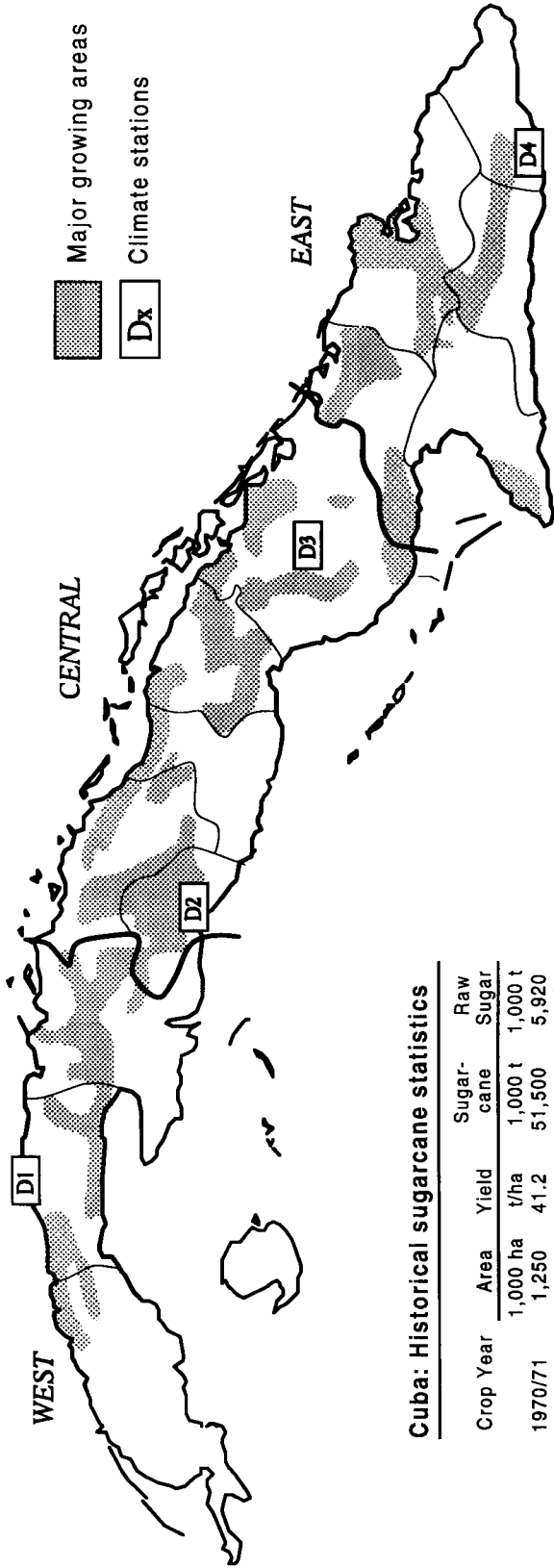
JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Cuba: Landforms and climate



JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

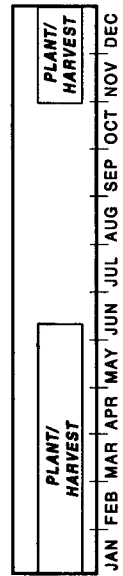
Cuba: Sugarcane



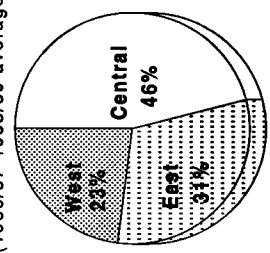
Cuba: Historical sugarcane statistics

Crop Year	Area 1,000 ha	Yield t/ha	Sugar-	
			cane 1,000 t	Raw Sugar 1,000 t
1970/71	1,250	41.2	51,500	5,920
1971/72	1,180	36.9	43,500	4,320
1972/73	1,070	44.4	47,500	5,250
1973/74	1,100	45.1	49,600	5,930
1974/75	1,180	43.1	50,800	6,310
1975/76	1,220	42.6	52,000	6,160
1976/77	1,140	49.3	56,200	6,490
1977/78	1,240	54.0	67,000	7,350
1978/79	1,310	55.7	73,000	7,990
1979/80	1,390	44.3	61,600	6,670
1980/81	1,210	54.9	66,400	7,360
1981/82	1,330	55.3	73,500	8,210
1982/83	1,200	57.3	68,700	7,110
1983/84	1,350	58.1	78,400	8,210
1984/85	1,350	49.5	66,800	8,000
1985/86	1,330	51.4	68,300	7,250
1986/87	1,360	49.2	66,900	7,120
1987/88	1,300	52.6	68,400	7,420
1988/89	1,350	54.4	73,500	8,120
1989/90	1,350	51.9	70,000	8,000
1990/91	1,350	50.0	67,500	7,620
1991/92	1,200	45.0	54,000	7,000
1992/93	1,150	36.5	42,000	4,280
1988/89- 1992/93 average	1,280	47.6	61,400	7,004

SUGARCANE CROP CALENDAR FOR MOST OF CUBA

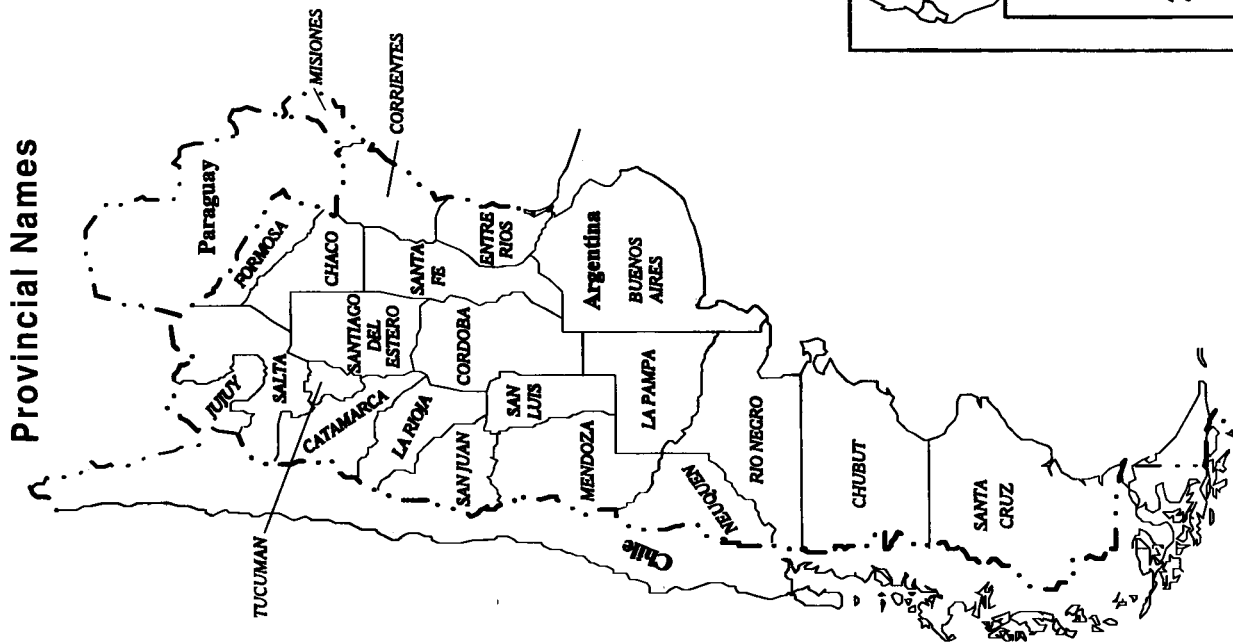


Percent of sugarcane production by region
(1986/87-1988/89 average)

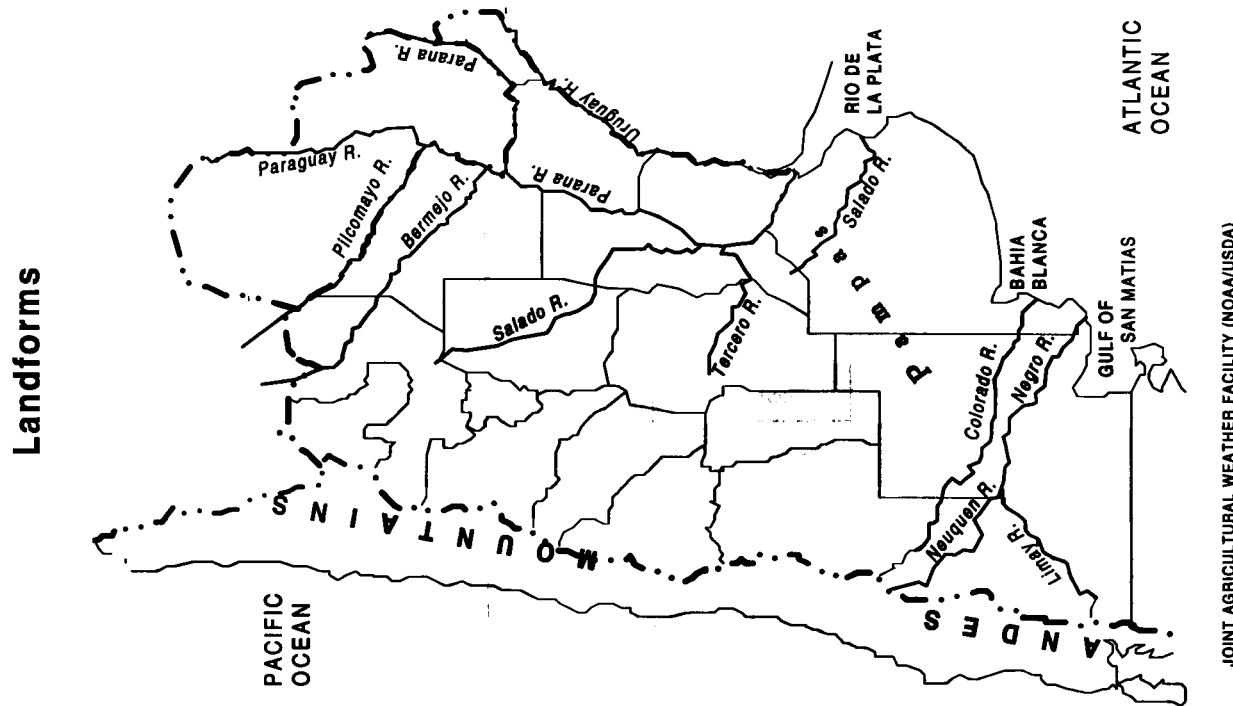


Argentina, Chile, and Paraguay: Provincial names and landforms

Provincial Names



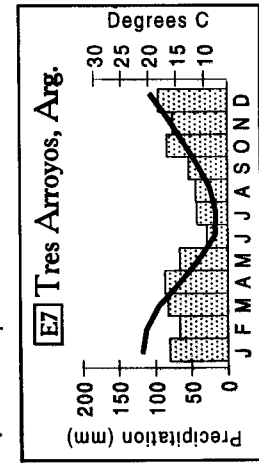
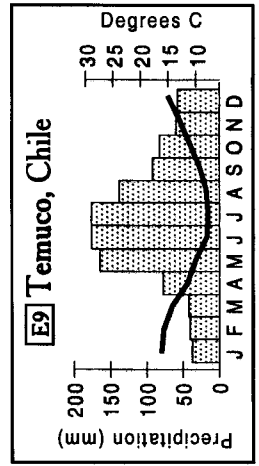
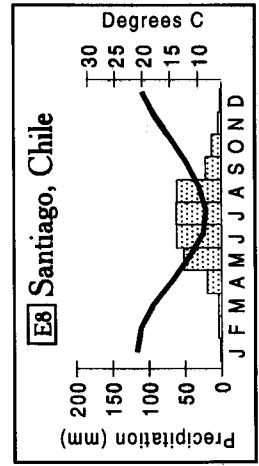
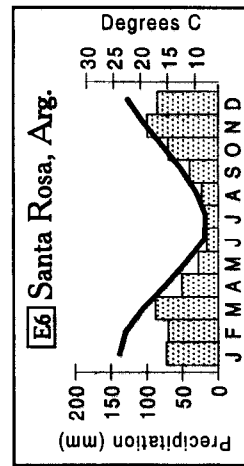
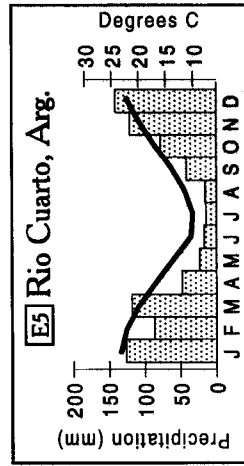
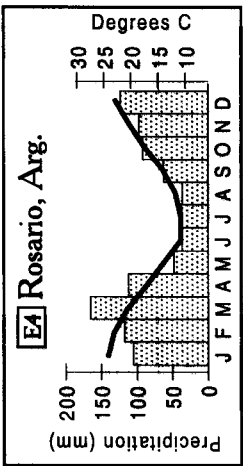
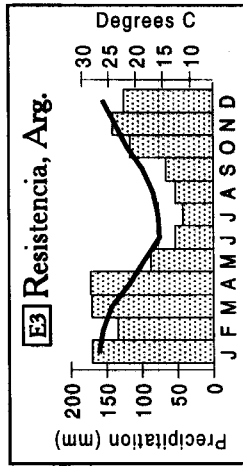
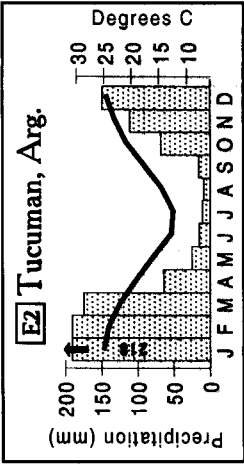
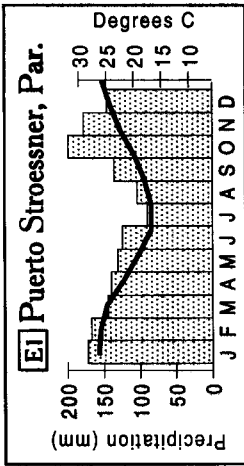
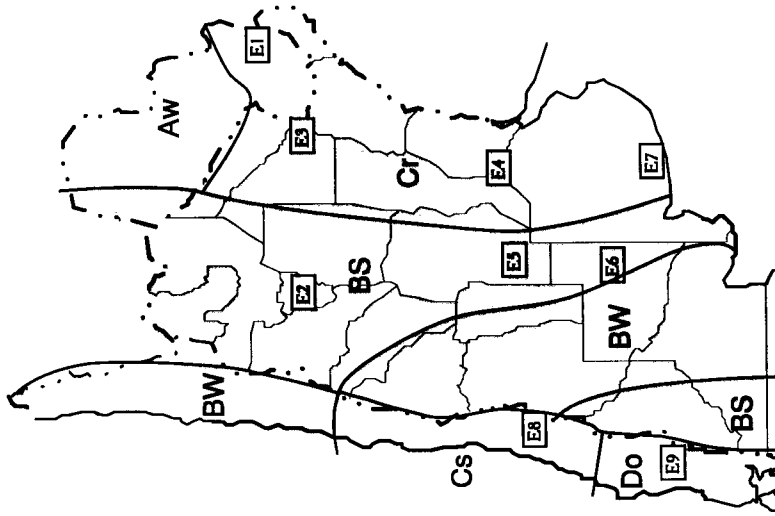
Landforms



JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

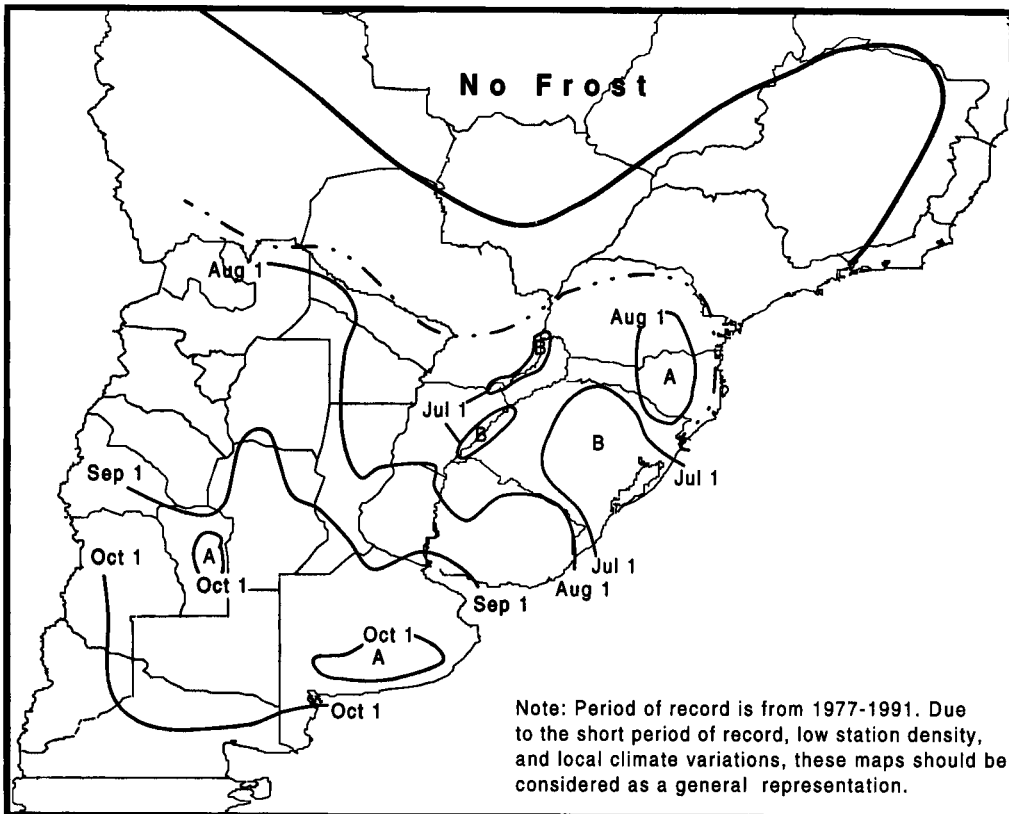
Argentina, Chile, and Paraguay: Climate

Legend
 Aw = Tropical wet and dry
 Bs = Steppe (arid)
 Bw = Desert
 Cr = Subtropical wet
 Cs = Subtropical winter rain
 Do = Temperate oceanic
 Ex = Climate stations

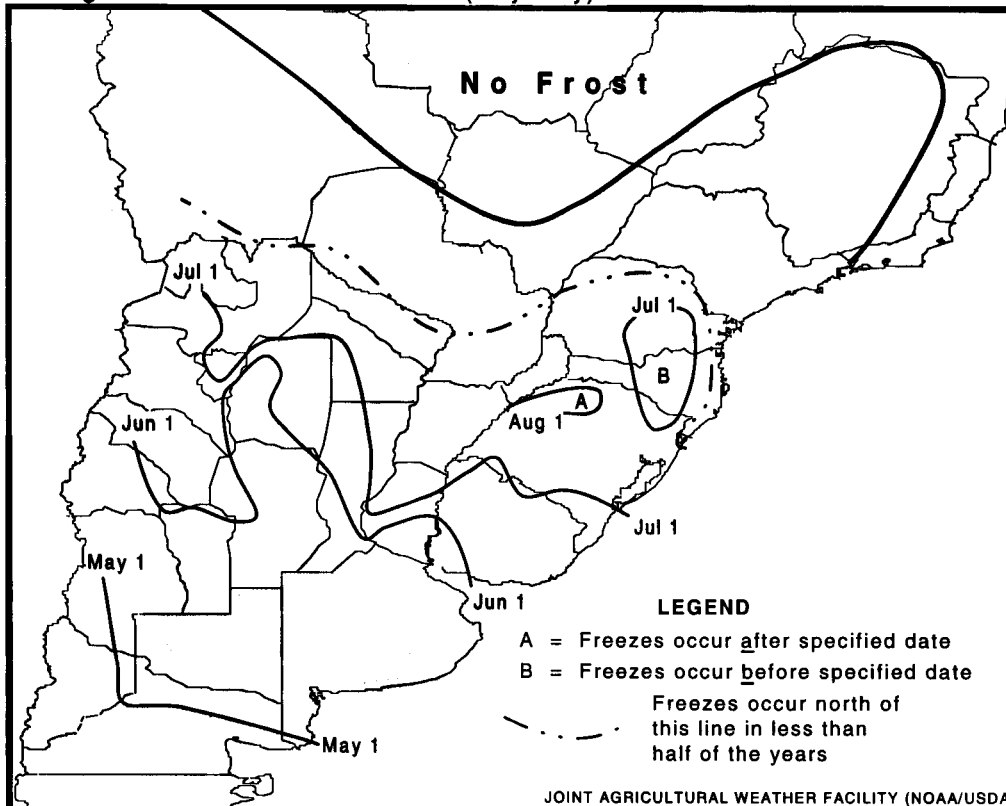


South America: Average freeze dates (0° C)

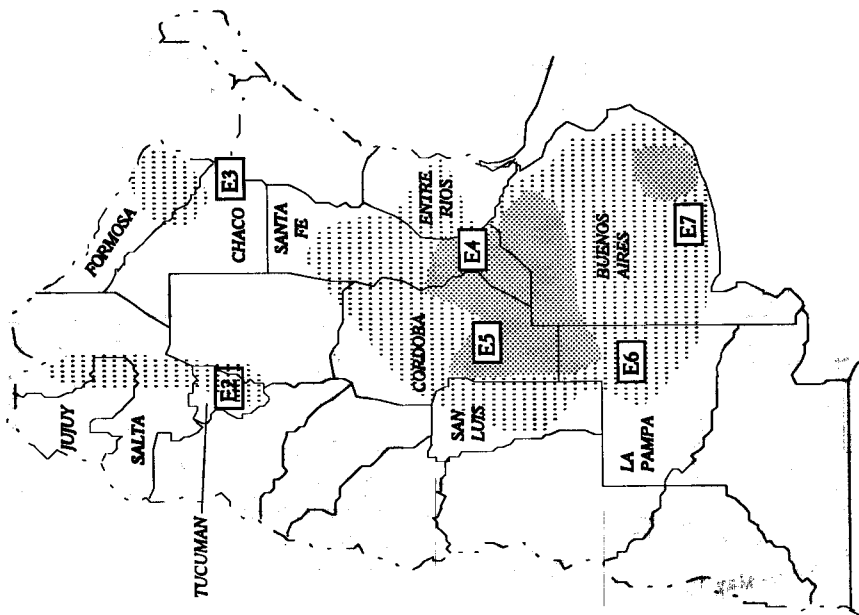
Average date of last spring freeze (August-October)






Average date of first autumn freeze (May-July)



Argentina: Corn

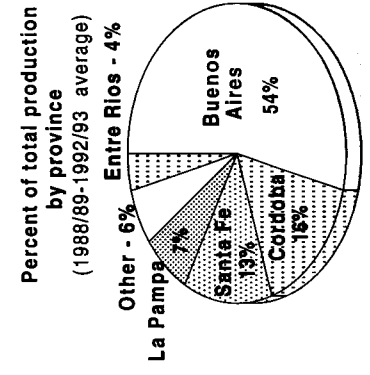
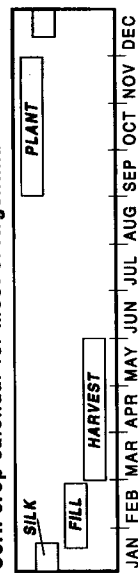


- Legend**
-  Major growing areas
 -  Minor growing areas
 -  Climate stations

Argentina: Historical corn statistics

	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1988/89-1992/93 average
Buenos Aires											
Area (1,000 ha)	1,046	1,190	1,125	1,040	898	750	680	790	1,010	1,105	867
Yield (t/ha)	3.95	3.93	4.27	3.46	4.48	3.60	4.60	4.67	5.19	5.00	4.61
Prod. (1,000 t)	4,132	4,680	4,800	3,595	4,023	2,700	3,125	3,690	5,240	5,525	4,056
Cordoba											
Area (1,000 ha)	814	916	980	835	576	300	230	420	475	500	385
Yield (t/ha)	3.12	3.94	3.55	2.99	3.60	1.85	2.00	3.83	4.00	3.90	3.12
Prod. (1,000 t)	2,540	3,612	3,475	2,500	2,076	554	460	1,610	1,900	1,950	1,295
Entre Rios											
Area (1,000 ha)	85	116	95	92	97	45	65	80	110	140	88
Yield (t/ha)	1.50	1.70	2.79	2.53	4.11	1.58	2.85	3.75	4.27	4.40	3.37
Prod. (1,000 t)	127	197	264	233	400	71	185	300	470	616	328
La Pampa											
Area (1,000 ha)	119	180	168	149	187	100	170	195	260	350	215
Yield (t/ha)	2.26	2.00	3.10	2.97	2.10	2.17	2.21	2.82	3.00	2.95	2.59
Prod. (1,000 t)	270	360	520	441	392	217	375	510	780	1,033	563
Santa Fe											
Area (1,000 ha)	432	441	465	478	329	200	190	200	300	330	244
Yield (t/ha)	2.94	4.04	4.67	3.81	4.27	2.68	2.79	4.80	5.70	5.20	4.23
Prod. (1,000 t)	1,270	1,780	2,170	1,823	1,403	535	530	960	1,710	1,716	1,090
National											
Area (1,000 ha)	3,024	3,340	3,351	2,900	2,600	1,700	1,700	1,950	2,400	2,450	2,040
Yield (t/ha)	3.14	3.56	3.70	3.19	3.46	2.94	3.06	3.90	4.42	4.16	3.70
Prod. (1,000 t)	9,500	11,900	12,400	9,250	9,000	5,000	5,200	7,600	10,600	10,200	7,720

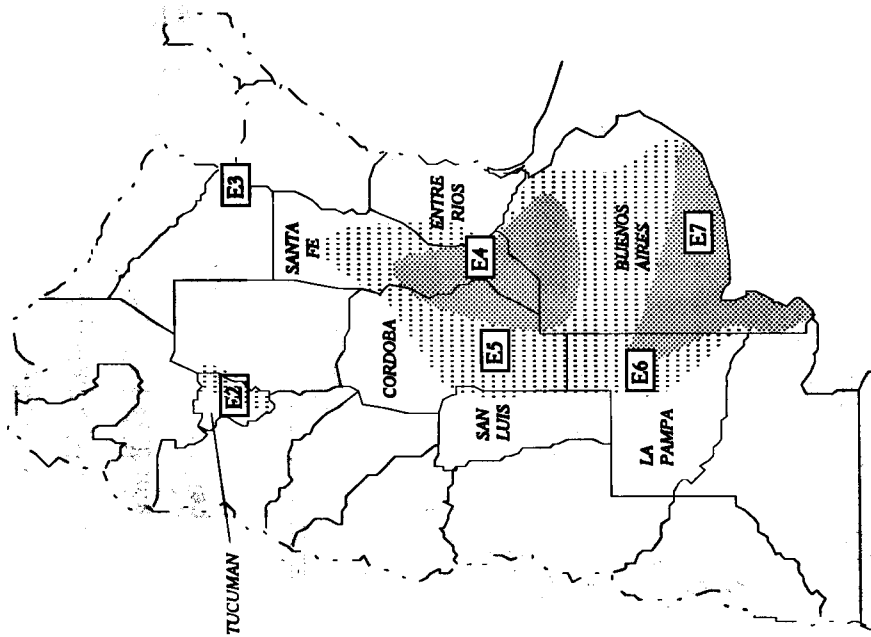
Corn crop calendar for most of Argentina






Argentina: Wheat

Argentina: Historical wheat statistics

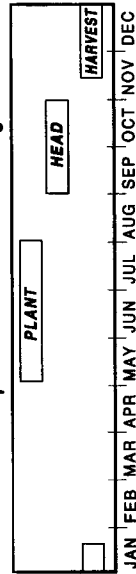
	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1988/89-1992/93 average
Buenos Aires											
Area (1,000 ha)	4,420	3,854	3,495	3,233	2,838	2,796	3,109	3,386	2,644	2,618	2,911
Yield (t/ha)	1.87	2.34	1.63	1.97	1.79	1.87	2.10	2.02	2.02	2.02	2.01
Prod. (1,000 t)	8,270	8,999	5,704	6,374	5,086	5,234	6,517	6,840	5,342	5,288	5,844
Cordoba											
Area (1,000 ha)	869	432	383	337	558	439	660	752	500	387	548
Yield (t/ha)	1.69	2.32	1.67	1.40	1.91	1.75	1.11	1.57	1.57	1.57	1.51
Prod. (1,000 t)	1,470	1,000	639	470	1,067	770	734	1,181	785	608	816
La Pampa											
Area (1,000 ha)	560	549	416	390	420	348	605	610	500	470	507
Yield (t/ha)	1.25	1.87	1.35	1.28	1.67	1.32	1.73	1.41	1.41	1.41	1.46
Prod. (1,000 t)	700	1,028	560	500	700	460	1,047	860	705	663	747
Santa Fe											
Area (1,000 ha)	1,025	840	841	730	804	765	741	892	655	677	746
Yield (t/ha)	2.01	2.44	1.68	1.80	2.25	2.04	1.79	2.19	2.19	2.19	2.08
Prod. (1,000 t)	2,060	2,050	1,410	1,315	1,810	1,560	1,330	1,953	1,434	1,483	1,552
National											
Area (1,000 ha)	6,880	5,950	5,270	4,982	4,789	4,700	5,450	5,700	4,550	4,400	4,960
Yield (t/ha)	1.85	2.22	1.61	1.79	1.84	1.79	1.86	1.91	2.17	2.20	1.99
Prod. (1,000 t)	12,750	13,200	8,500	8,930	8,800	8,400	10,150	10,900	9,880	9,700	9,806



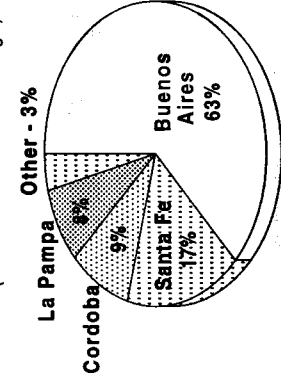
Legend

-  Major growing areas
-  Minor growing areas
-  Climate stations

Winter wheat crop calendar for most of Argentina



Percent of total production by province (1988/89-1992/93 average)

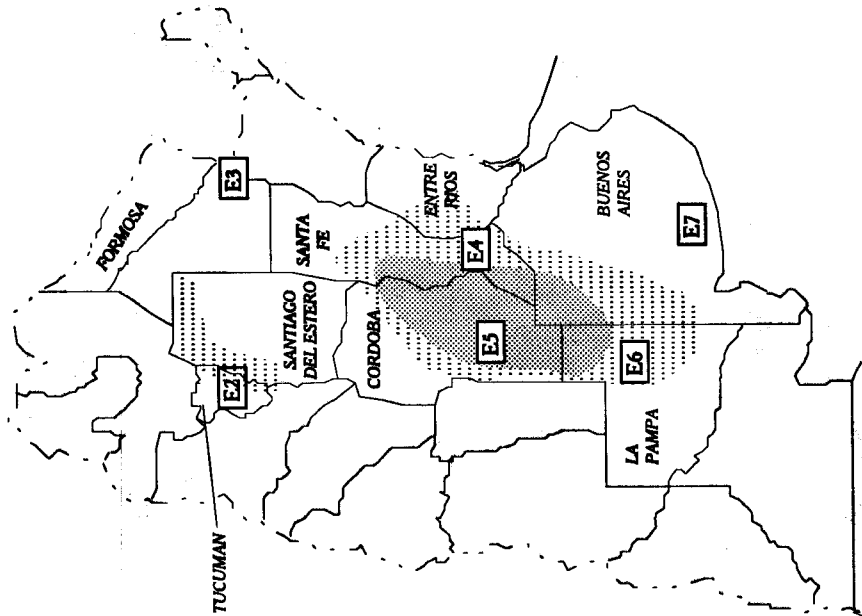


Argentina: Sorghum




Argentina: Historical sorghum statistics

	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1988/89-1992/93 average
Buenos Aires											
Area (1,000 ha)	360	280	202	152	147	64	35	38	45	45	45
Yield (t/ha)	3.89	3.50	3.62	3.03	3.67	3.03	3.57	4.03	3.50	3.50	3.53
Prod. (1,000 t)	1,400	980	730	460	540	194	125	153	158	158	157
Cordoba											
Area (1,000 ha)	650	536	294	267	296	148	180	193	196	191	182
Yield (t/ha)	3.23	4.00	3.46	3.87	3.85	2.50	3.06	4.05	4.03	3.42	3.41
Prod. (1,000 t)	2,100	2,140	1,018	1,030	1,140	370	550	782	790	653	629
Entre Ríos											
Area (1,000 ha)	226	175	127	102	89	44	76	78	79	79	71
Yield (t/ha)	2.30	2.60	2.93	2.60	3.71	1.85	3.20	3.29	2.92	2.92	2.84
Prod. (1,000 t)	518	455	373	265	330	82	243	257	232	232	209
La Pampa											
Area (1,000 ha)	230	197	161	131	126	105	n.a.	163	173	145	146
Yield (t/ha)	2.62	2.77	3.24	2.80	2.30	1.91	n.a.	1.68	2.72	2.68	2.25
Prod. (1,000 t)	603	545	521	366	290	200	n.a.	273	470	387	333
Santa Fe											
Area (1,000 ha)	412	380	203	134	141	114	110	100	109	109	108
Yield (t/ha)	2.43	2.82	3.07	3.39	3.66	2.11	3.17	3.65	3.33	3.33	3.12
Prod. (1,000 t)	1,000	1,072	623	452	515	240	348	365	364	364	336
Santiago del Estero											
Area (1,000 ha)	178	130	129	72	29	37	n.a.	70	70	70	62
Yield (t/ha)	2.61	2.31	3.08	1.73	2.27	1.63	n.a.	3.49	3.02	3.02	2.79
Prod. (1,000 t)	463	300	399	124	65	60	n.a.	244	211	211	182
National											
Area (1,000 ha)	2,370	1,965	1,400	1,100	1,000	600	700	675	720	750	689
Yield (t/ha)	2.91	3.16	3.00	2.82	3.00	2.33	2.86	3.33	3.84	4.00	3.27
Prod. (1,000 t)	6,900	6,200	4,200	3,100	3,000	1,400	2,000	2,250	2,766	3,000	2,283

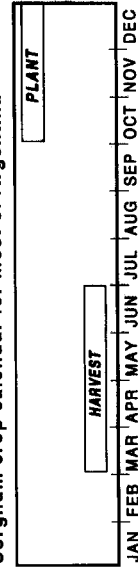
n. a. = not available



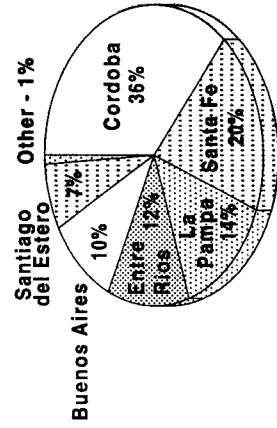
Legend

-  Major growing areas
-  Minor growing areas
-  Climate stations

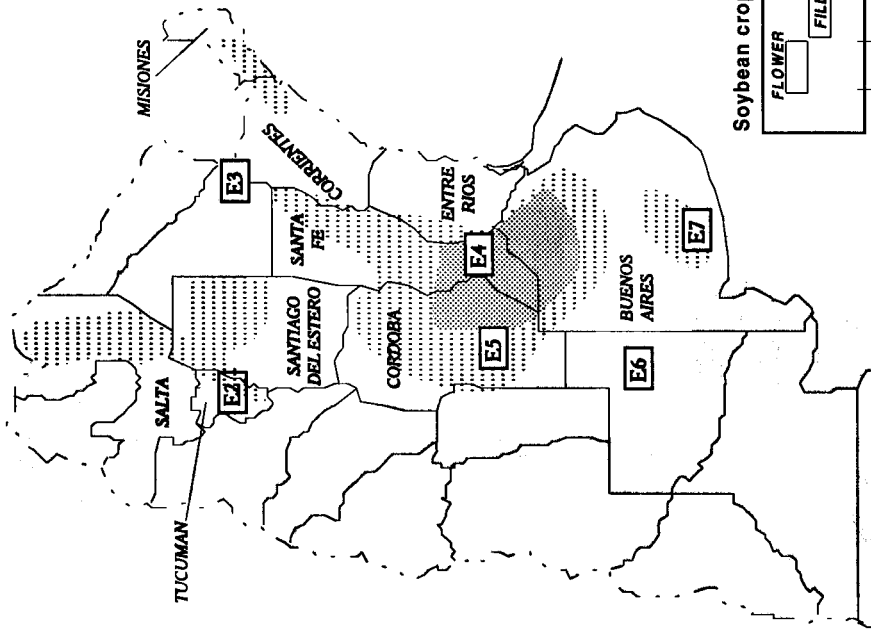
Sorghum crop calendar for most of Argentina



Percent of total production by province (1988/89-1992/93 average)



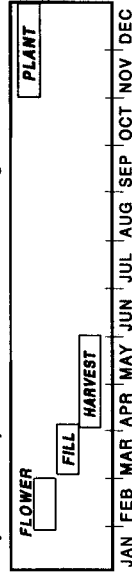
Argentina: Soybeans



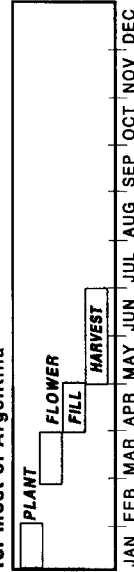
Argentina: Historical soybean statistics

	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1988/89-1992/93 average
Buenos Aires											
Area (1,000 ha)	714	825	849	835	984	1,080	1,240	1,225	1,150	1,105	1,160
Yield (t/ha)	2.34	1.94	2.34	2.11	2.19	1.90	2.25	2.29	2.20	1.99	2.13
Prod. (1,000 t)	1,670	1,600	1,988	1,760	2,150	2,050	2,788	2,799	2,530	2,193	2,472
Cordoba											
Area (1,000 ha)	863	990	948	1,061	1,294	1,156	1,360	1,300	1,230	1,375	1,284
Yield (t/ha)	2.45	1.82	1.83	1.74	2.28	1.35	2.05	2.34	2.30	2.46	2.10
Prod. (1,000 t)	2,113	1,800	1,730	1,850	2,944	1,559	2,788	3,038	2,829	3,383	2,719
Santa Fe											
Area (1,000 ha)	1,066	1,245	1,293	1,380	1,644	1,391	1,859	1,870	1,960	1,920	1,800
Yield (t/ha)	2.53	2.17	2.32	1.96	2.36	1.60	2.26	2.34	2.44	2.42	2.21
Prod. (1,000 t)	2,687	2,700	3,001	2,706	3,886	2,230	4,199	4,376	4,782	4,646	4,047
National											
Area (1,000 ha)	2,910	3,270	3,316	3,510	4,260	4,000	4,950	4,750	4,800	4,900	4,680
Yield (t/ha)	2.41	2.06	2.20	1.99	2.28	1.63	2.17	2.42	2.32	2.24	2.16
Prod. (1,000 t)	7,000	6,750	7,300	7,000	9,700	6,500	10,750	11,500	11,150	11,000	10,180

Soybean crop calendar for most of Argentina






Double-cropped (after wheat) soybean crop calendar for most of Argentina

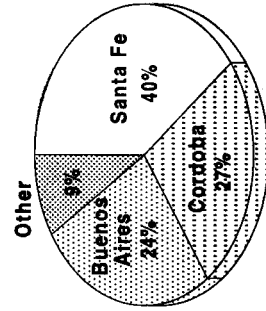


Double-cropped soybeans account for about 25% of total soybean production. They account for about 40% of planted acreage in Buenos Aires, 40% in Santa Fe and 20% in Cordoba.

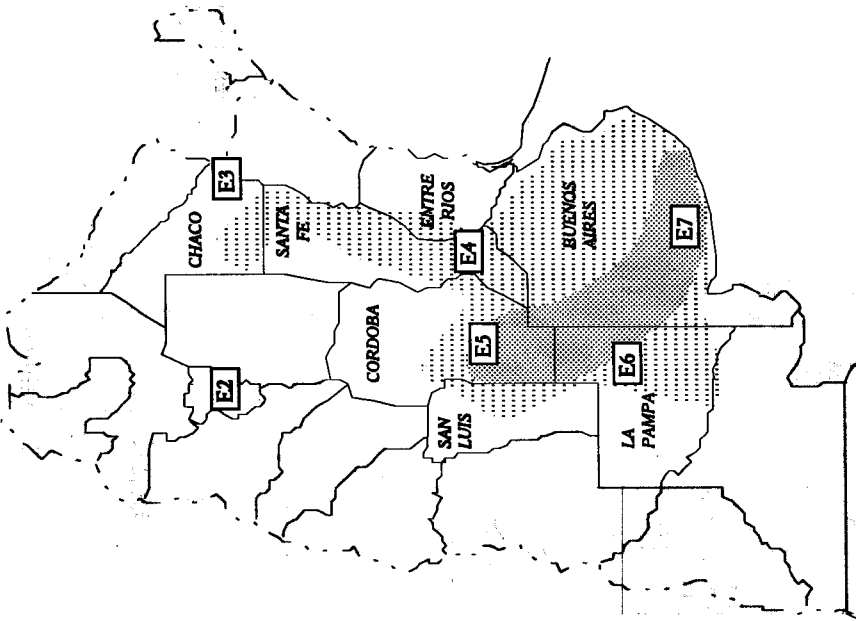
Legend

-  Major growing areas
-  Minor growing areas
-  Climate stations

Percent of total production by province (1988/89-1992/93 average)



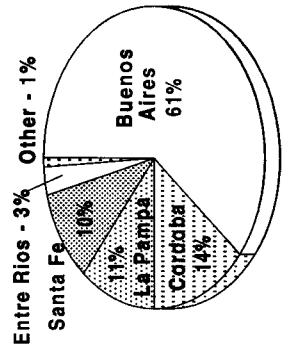
Argentina: Sunflowerseed



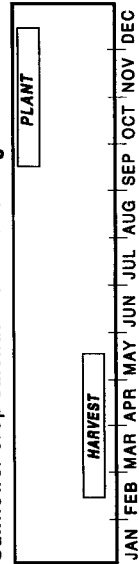
Argentina: Historical sunflowerseed statistics

	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1988/89-1992/93 average
Buenos Aires											
Area (1,000 ha)	1,300	1,445	1,749	1,034	1,210	1,320	1,520	1,320	1,455	1,400	1,403
Yield (t/ha)	1.12	1.48	1.38	1.22	1.38	1.50	1.52	1.76	1.31	1.49	1.52
Prod. (1,000 t)	1,450	2,140	2,414	1,260	1,670	1,980	2,310	2,321	1,910	2,079	2,120
Cordoba											
Area (1,000 ha)	263	308	395	197	216	239	320	295	360	375	318
Yield (t/ha)	1.19	1.52	1.29	1.44	1.67	1.33	2.00	1.46	1.56	1.56	1.49
Prod. (1,000 t)	314	468	510	283	360	318	360	590	524	585	475
Entre Rios											
Area (1,000 ha)	23	27	39	20	40	55	80	60	65	70	66
Yield (t/ha)	0.92	0.99	1.24	1.30	1.61	1.23	1.25	1.67	1.69	1.57	1.48
Prod. (1,000 t)	19	27	48	25	65	68	100	100	110	110	98
La Pampa											
Area (1,000 ha)	138	181	310	199	180	255	320	245	285	230	267
Yield (t/ha)	1.01	1.35	1.29	1.46	1.44	1.44	1.28	1.71	1.36	1.45	1.45
Prod. (1,000 t)	140	245	400	290	260	366	410	420	388	334	393
Santa Fe											
Area (1,000 ha)	141	164	249	150	157	200	260	215	330	245	250
Yield (t/ha)	1.14	1.50	1.45	1.33	1.66	1.40	1.40	1.67	1.33	1.45	1.45
Prod. (1,000 t)	160	245	360	200	260	280	365	360	440	355	360
National											
Area (1,000 ha)	1,989	2,350	3,046	1,800	2,058	2,200	2,800	2,300	2,800	2,300	2,480
Yield (t/ha)	1.11	1.45	1.35	1.39	1.36	1.45	1.36	1.83	1.36	1.35	1.47
Prod. (1,000 t)	2,200	3,400	4,100	2,500	2,800	3,200	3,800	4,200	3,800	3,100	3,620

Percent of total production by province (1988/89-1992/93 average)



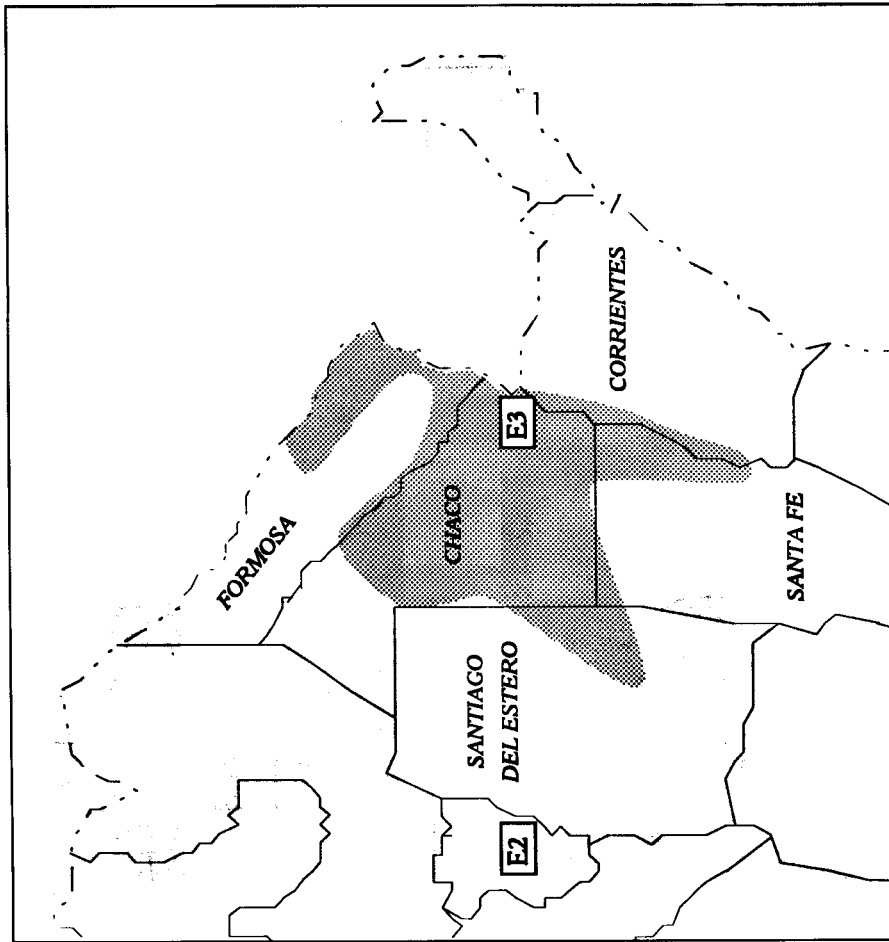
Sunflower crop calendar for most of Argentina





Legend

- Major growing areas
- Minor growing areas
- Climate stations

Argentina: Cotton



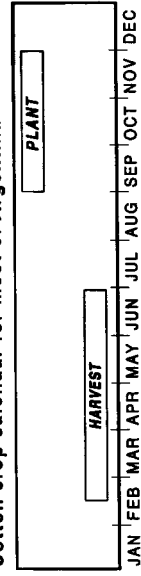
Legend

-  Major growing areas
-  Climate stations

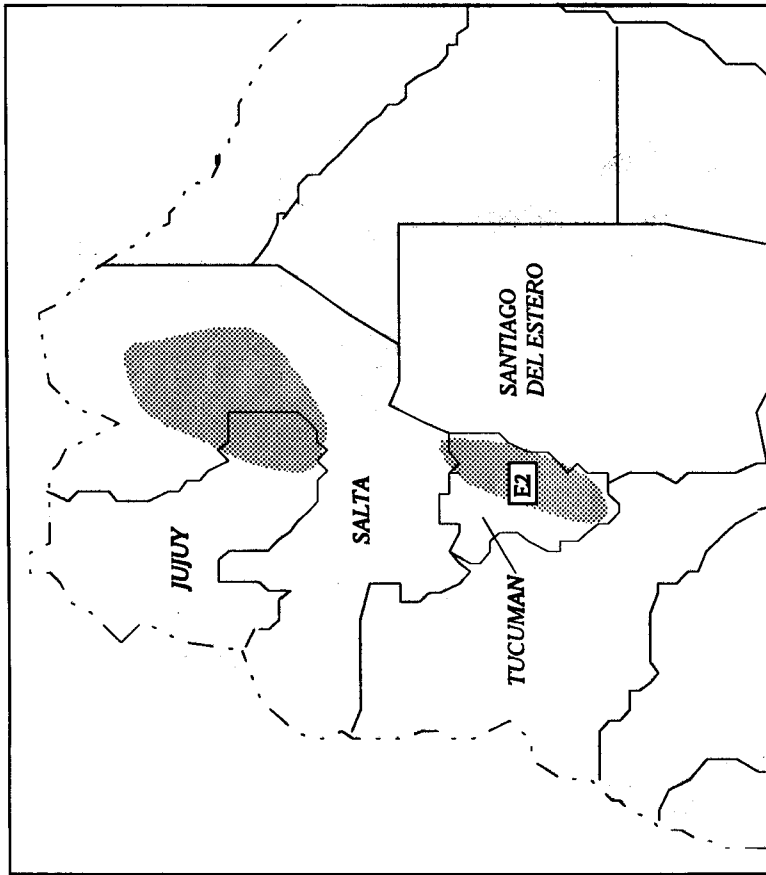
Argentina: Historical cotton statistics

Crop Year	Yield		Prod. 1,000,480 lb. bales
	Area 1,000 ha	kg/ha	
1970/71	367	230	386
1971/72	398	230	413
1972/73	445	270	560
1973/74	473	270	579
1974/75	506	340	790
1975/76	413	340	643
1976/77	518	310	735
1977/78	618	370	1,056
1978/79	669	260	799
1979/80	565	280	735
1980/81	300	280	390
1981/82	399	380	703
1982/83	360	310	510
1983/84	470	380	827
1984/85	447	380	785
1985/86	320	370	547
1986/87	330	320	482
1987/88	515	550	1,295
1988/89	501	390	896
1989/90	570	490	1,272
1990/91	630	470	1,355
1991/92	580	430	1,148
1992/93	325	450	666
1988/89- 1992/93- average	521	446	1,067



Cotton crop calendar for most of Argentina



Argentina: Sugarcane



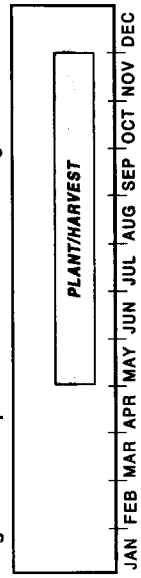
Legend

-  Major growing areas
-  Climate stations

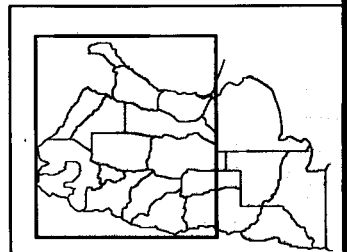
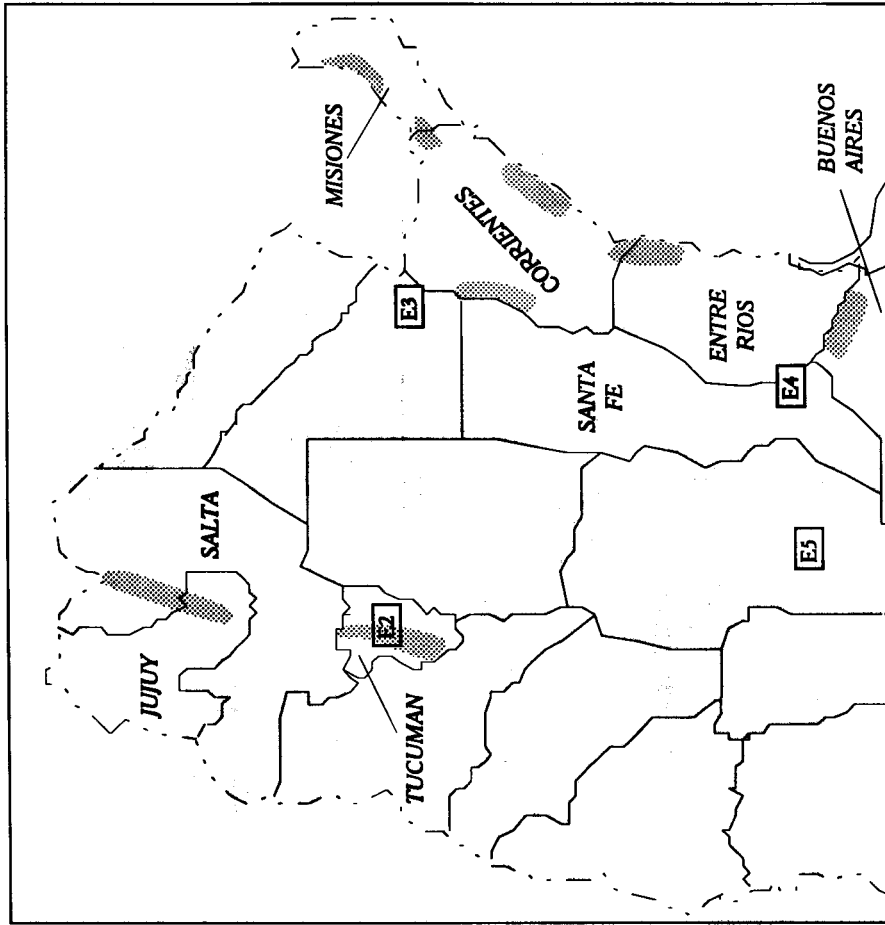
Argentina: Historical sugarcane statistics

Crop Year	Area 1,000 ha	Yield t/ha	Sugar- cane 1,000 t	Raw sugar 1,000 t
1975/76	293	53.24	15,600	1,349
1976/77	339	47.49	16,100	1,592
1977/78	320	50.00	16,000	1,665
1978/79	217	60.71	13,175	1,387
1979/80	215	58.37	12,550	1,395
1980/81	280	58.69	16,432	1,715
1981/82	255	58.37	14,884	1,618
1982/83	250	57.75	14,437	1,617
1983/84	250	59.62	14,904	1,621
1984/85	230	60.74	13,971	1,534
1985/86	180	60.24	10,844	1,160
1986/87	160	60.01	9,601	1,107
1987/88	185	58.38	10,800	1,100
1988/89	243	50.39	12,244	1,284
1989/90	240	44.19	10,606	944
1990/91	265	47.25	12,520	1,300
1991/92	280	51.14	14,320	1,550
1992/93	260	50.40	13,100	1,350
1988/89- 1992/93 average	258	48.67	12,558	1,286



Sugarcane crop calendar for most of Argentina



Argentina: Citrus



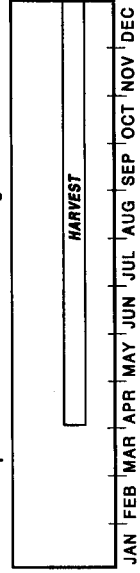
Legend

-  Major growing areas
-  Climate stations

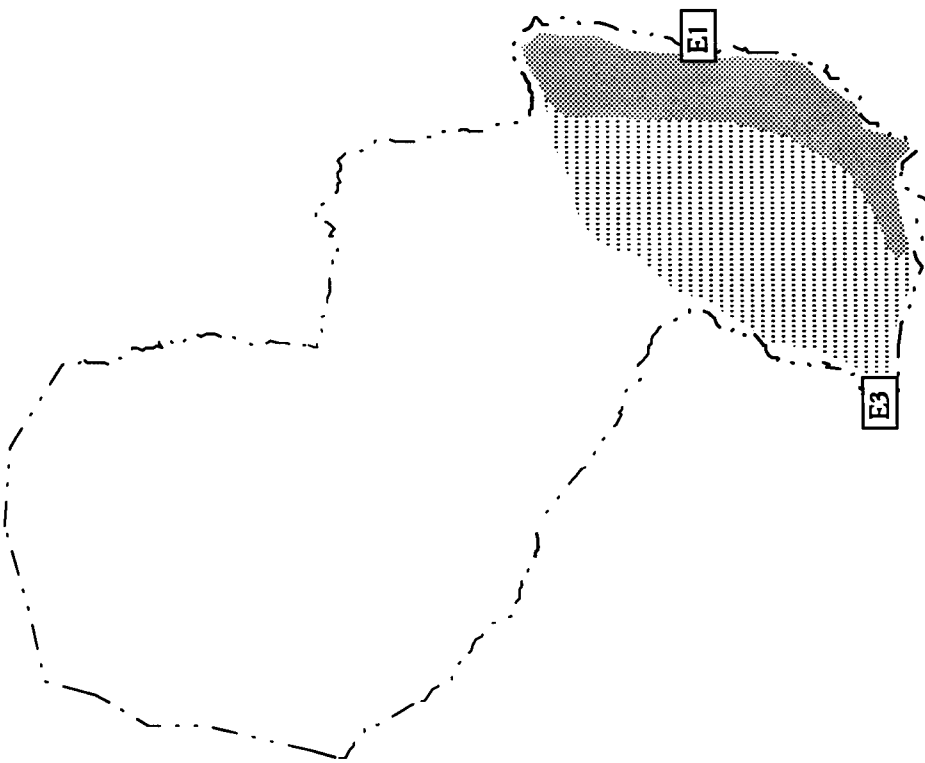
Argentina: Historical citrus statistics




Crop Year	Production (1,000 t)			Other Citrus
	Oranges	Lemons		
1970/71	990	199		409
1971/72	750	186		354
1972/73	783	232		413
1973/74	833	306		407
1974/75	729	339		415
1975/76	743	247		409
1976/77	740	320		420
1977/78	670	280		400
1978/79	706	301		358
1979/80	704	396		378
1980/81	653	409		392
1981/82	606	384		403
1982/83	639	382		391
1983/84	500	320		330
1984/85	653	360		398
1985/86	623	450		421
1986/87	621	460		442
1987/88	650	517		459
1988/89	620	350		445
1989/90	750	400		440
1990/91	600	550		360
1991/92	640	530		390
1992/93	660	590		522
1988/89-1992/93 average	654	484		431

Citrus crop calendar for most of Argentina



Paraguay: Soybeans

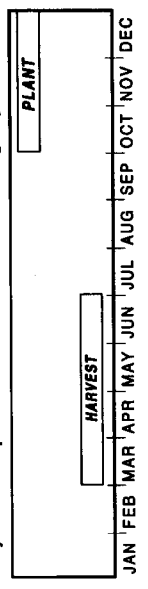


- Legend**
-  Major growing areas
 -  Minor growing areas
 -  Climate stations

Paraguay: Historical soybean statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1970/71	54	1.39	75
1971/72	76	1.28	97
1972/73	81	1.51	122
1973/74	127	1.43	181
1974/75	151	1.46	220
1975/76	173	1.64	284
1976/77	229	1.65	377
1977/78	272	1.22	333
1978/79	360	1.53	549
1979/80	400	1.44	575
1980/81	400	1.50	600
1981/82	420	1.43	600
1982/83	350	1.49	520
1983/84	420	1.31	550
1984/85	550	1.73	950
1985/86	550	1.09	600
1986/87	530	1.79	950
1987/88	615	1.79	1,100
1988/89	850	1.90	1,615
1989/90	980	1.61	1,575
1990/91	890	1.46	1,300
1991/92	900	1.44	1,300
1992/93	980	1.79	1,750
1988/89- 1992/93 average	920	1.64	1,508




Soybean crop calendar for most of Paraguay



Paraguay: Cotton



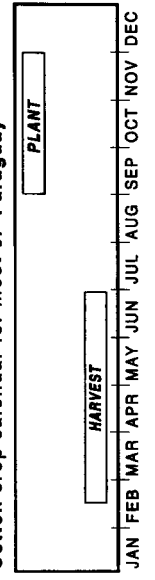
Legend

-  Major growing areas
-  Minor growing areas
-  Climate stations

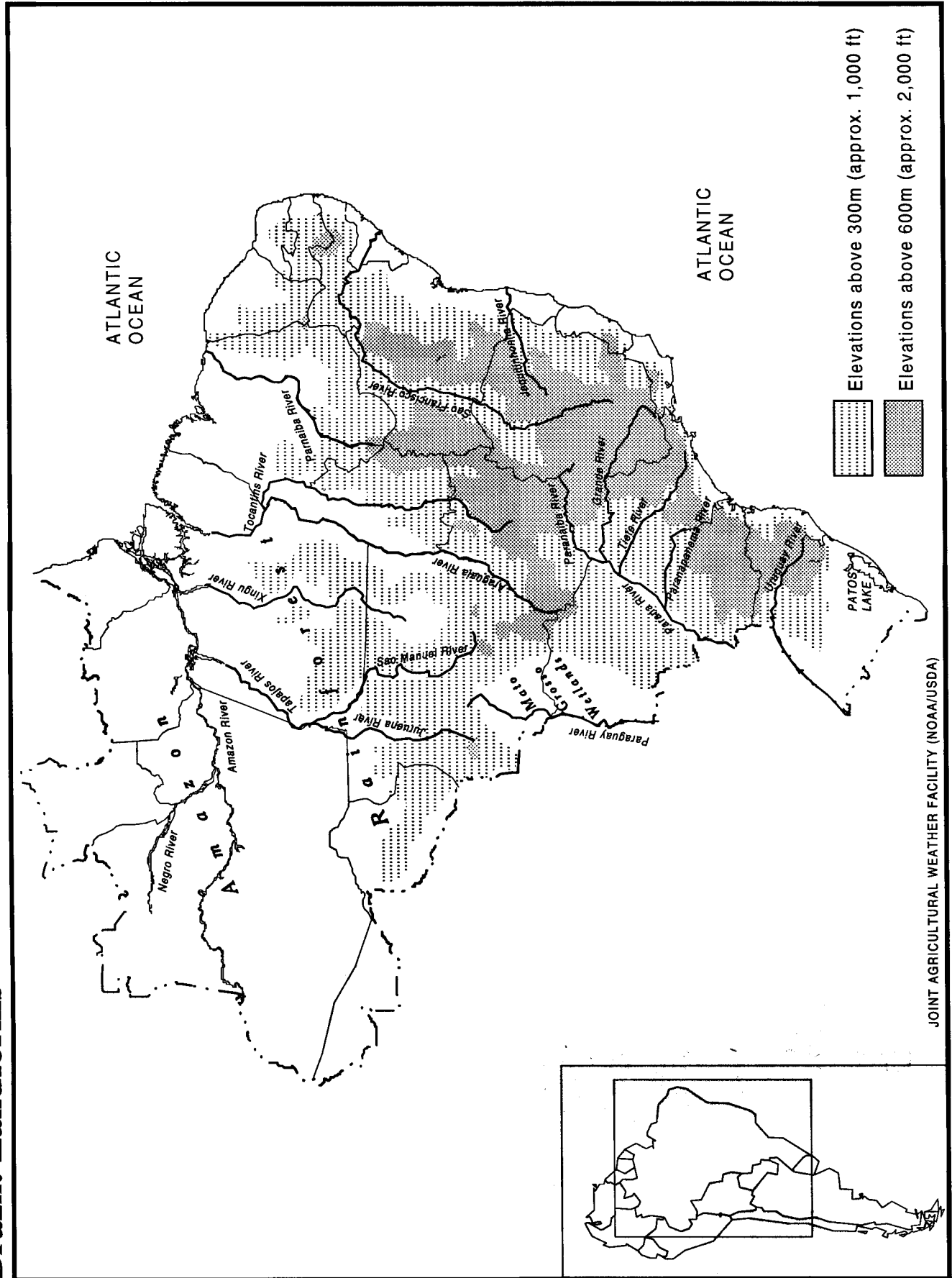
Paraguay: Historical cotton statistics

Crop Year	Area		Yield kg/ha	Prod	
	1,000 ha	1,000,480 lb. bales		1,000,480 lb. bales	1,000,480 lb. bales
1970/71	34	32	190	32	60
1971/72	57	60	230	60	101
1972/73	81	101	270	101	110
1973/74	93	110	260	110	142
1974/75	100	152	310	152	335
1975/76	110	335	300	335	413
1976/77	200	413	360	413	331
1977/78	285	331	320	331	344
1978/79	325	344	220	344	363
1979/80	220	344	340	344	450
1980/81	316	363	250	363	363
1981/82	290	363	340	363	413
1982/83	260	363	300	363	735
1983/84	297	413	300	413	491
1984/85	417	735	380	735	386
1985/86	340	491	310	491	873
1986/87	280	386	300	386	1,001
1987/88	405	873	470	873	1,010
1988/89	440	1,001	500	1,001	1,203
1989/90	530	1,010	410	1,010	620
1990/91	560	1,203	470	1,203	652
1991/92	480	620	280	620	
1992/93	265	652	540	652	
1988/89-1992/93 average	455	440	440	897	

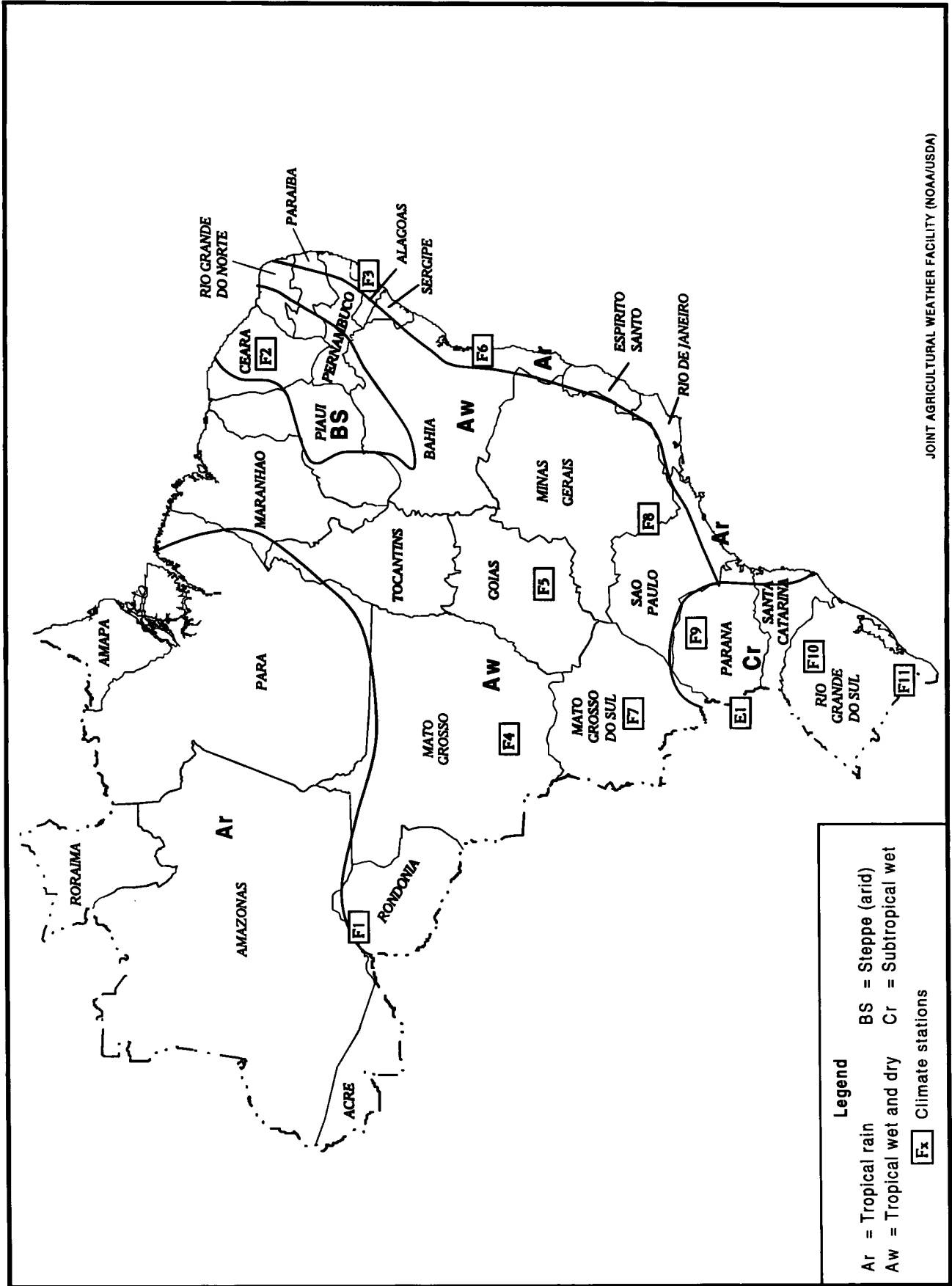
Cotton crop calendar for most of Paraguay



Brazil: Landforms



Brazil: Climate



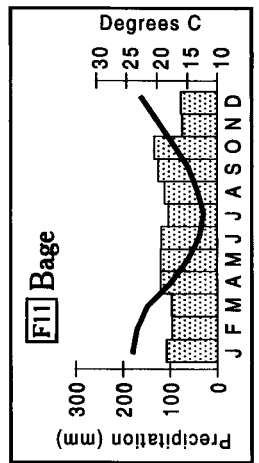
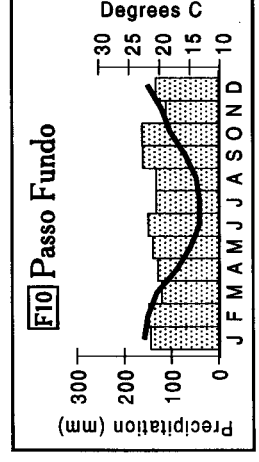
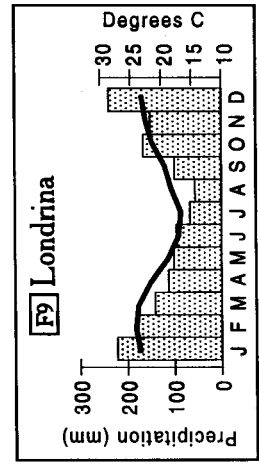
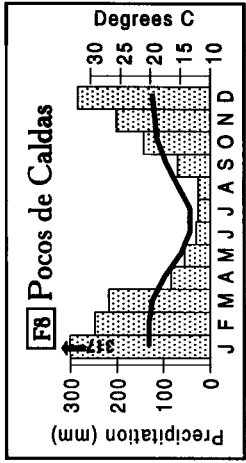
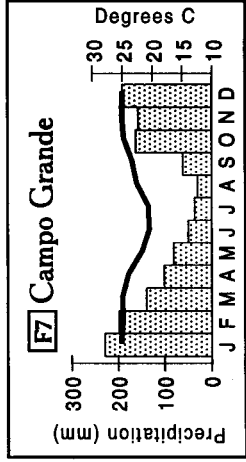
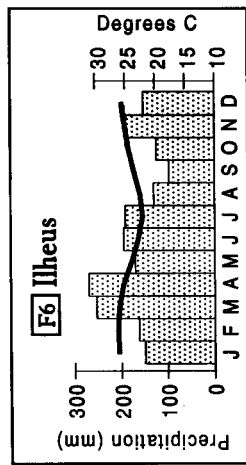
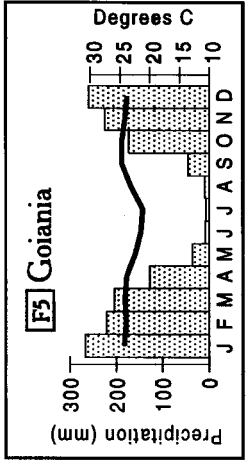
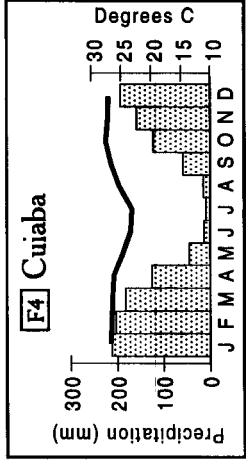
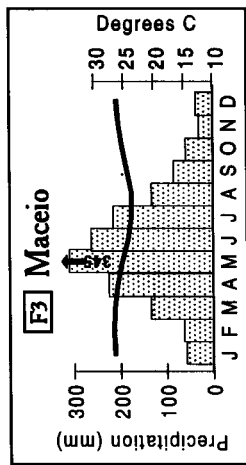
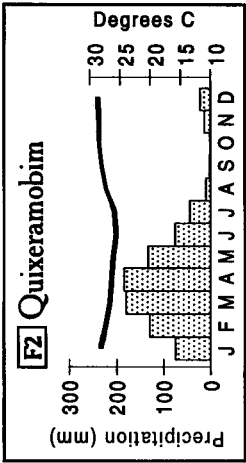
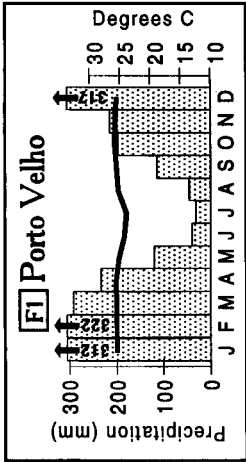
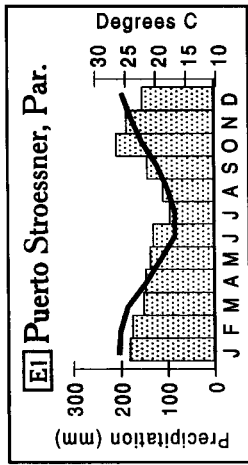
Legend

Ar = Tropical rain BS = Steppe (arid)
 AW = Tropical wet and dry Cr = Subtropical wet

F_x Climate stations

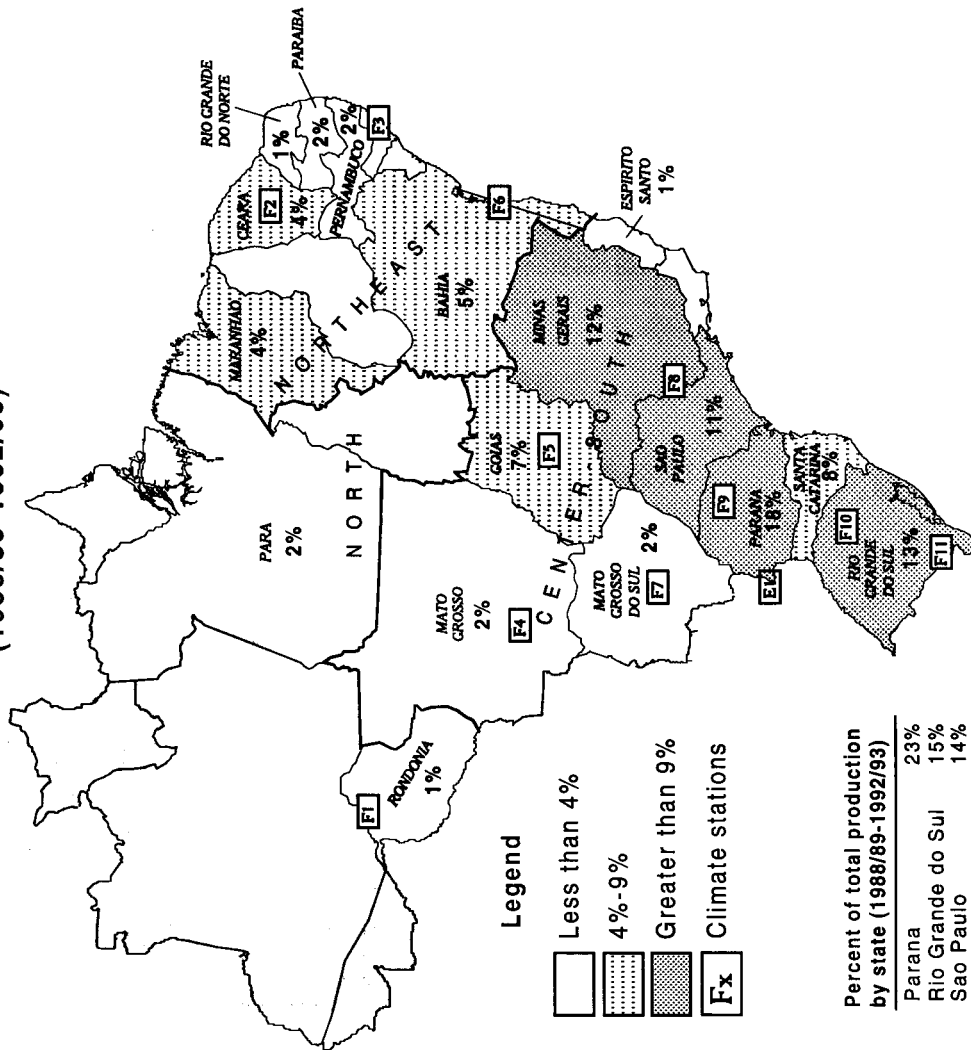
JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Brazil: Climate stations



Brazil: Corn

Percent of total corn area by state
(1988/89-1992/93)

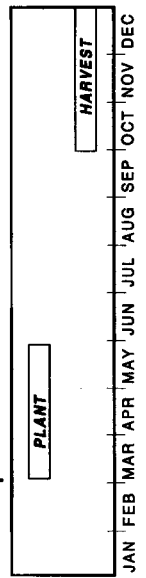


Percent of total production by state (1988/89-1992/93)

Parana	23%
Rio Grande do Sul	15%
Sao Paulo	14%
Minas Gerais	13%
Goiás	10%
Santa Catarina	10%
Mato Grosso do Sul	3%
Mato Grosso	3%

These states account for 91% of total production.

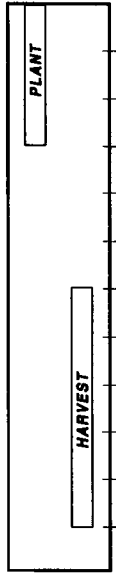
Corn crop calendar for most of Northeast Brazil



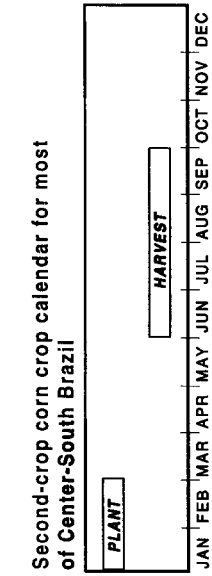
Brazil: Historical corn statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod 1,000 t
1970/71	10,550	1.34	14,130
1971/72	10,539	1.41	14,891
1972/73	9,908	1.42	14,109
1973/74	11,262	1.45	16,284
1974/75	10,800	1.51	16,354
1975/76	11,118	1.60	17,751
1976/77	11,797	1.63	19,256
1977/78	11,125	1.22	13,569
1978/79	11,317	1.44	16,310
1979/80	11,621	1.74	20,214
1980/81	12,810	1.76	22,555
1981/82	13,382	1.71	22,932
1982/83	11,050	1.76	19,500
1983/84	12,200	1.74	21,180
1984/85	11,940	1.77	21,170
1985/86	12,710	1.59	20,264
1986/87	14,610	1.83	26,760
1987/88	13,375	1.89	25,220
1988/89	12,970	2.03	26,270
1989/90	12,100	1.84	22,300
1990/91	13,490	1.80	24,330
1991/92	14,030	2.20	30,800
1992/93	12,400	2.35	29,200
1988/89-1992/93 average	12,998	2.04	26,580

First-crop corn crop calendar for most of Center-South Brazil

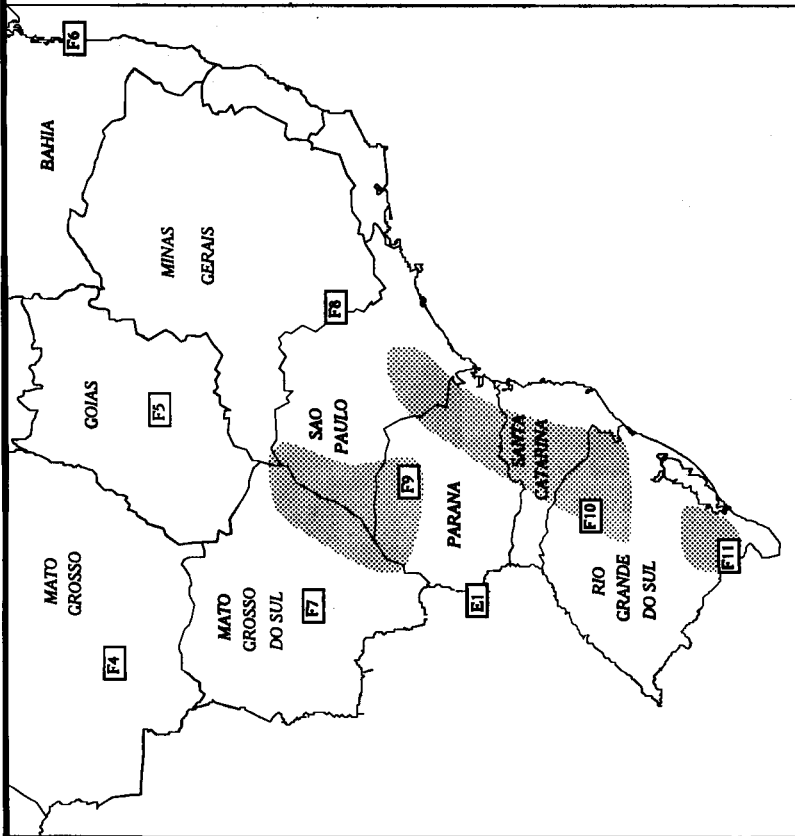


Second-crop corn crop calendar for most of Center-South Brazil



80-90% of second-crop corn is grown in the Center-South region of Brazil.

Brazil: Wheat



Percent of total production by state (1988/89-1992/93)

Parana	55%
Rio Grande do Sul	27%
Mato Grosso do Sul	6%
Sao Paulo	6%
Santa Catarina	3%

These states account for 97% of total production.

Legend

Major growing areas



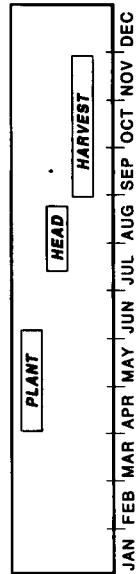
Climate stations



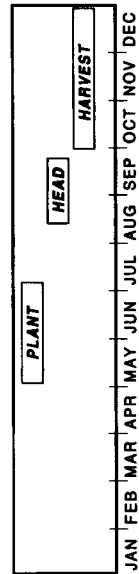
Brazil : Historical wheat statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1970/71	1,895	0.92	1,735
1971/72	2,261	0.90	2,034
1972/73	1,500	0.46	694
1973/74	1,839	1.10	2,031
1974/75	2,471	1.16	2,858
1975/76	2,931	0.61	1,788
1976/77	3,540	0.91	3,216
1977/78	3,153	0.66	2,066
1978/79	2,812	0.96	2,691
1979/80	3,832	0.75	2,879
1980/81	3,062	0.87	2,676
1981/82	1,922	1.15	2,217
1982/83	2,828	0.65	1,849
1983/84	1,900	1.11	2,100
1984/85	2,010	1.01	2,030
1985/86	2,610	1.65	4,300
1986/87	3,820	1.47	5,600
1987/88	3,475	1.76	6,100
1988/89	3,450	1.68	5,800
1989/90	3,355	1.65	5,550
1990/91	3,280	1.01	3,300
1991/92	2,145	1.43	3,078
1992/93	1,997	1.37	2,739
1988/89-1992/93 average	2,845	1.43	4,093

Winter wheat crop calendar for most of Center-South Brazil

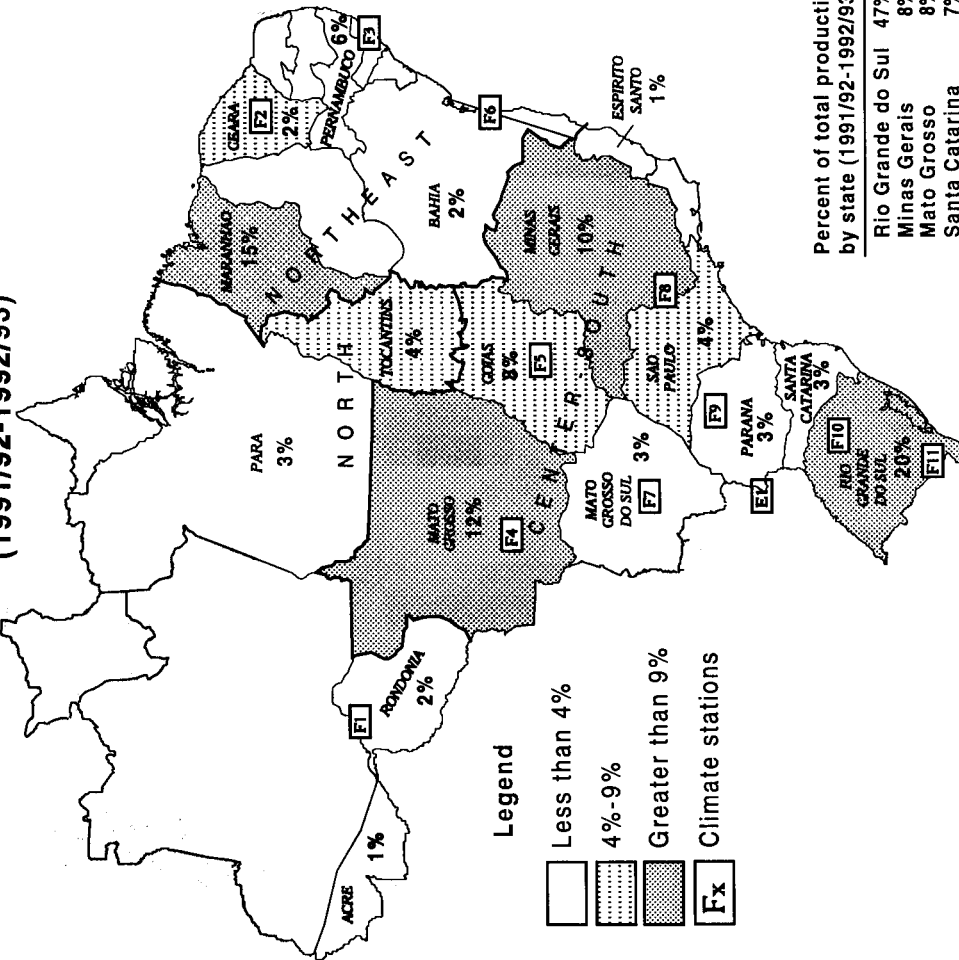


Winter wheat crop calendar for Rio Grande do Sul



Brazil: Rice

Percent of total rice area by state (1991/92-1992/93)



Percent of total production by state (1991/92-1992/93)

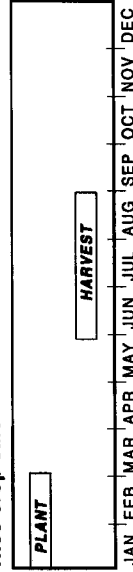
Rio Grande do Sul	47%
Minas Gerais	8%
Mato Grosso	8%
Santa Catarina	7%
Goias	5%
Maranhao	5%
Tocantins	3%
Sao Paulo	3%
Mato Grosso do Sul	2%
Parana	2%
Para	2%

These states account for 92% of total production.

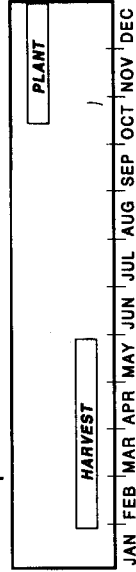
Brazil: Historical rice statistics

Crop Year	Area 1,000 ha	Yield (Rough) t/ha	Prod. (Milled) 1,000 t
1970/71	4,764	1.13	3,668
1971/72	4,821	1.27	4,170
1972/73	4,794	1.38	4,510
1973/74	4,463	1.45	4,408
1974/75	5,250	1.33	4,760
1975/76	6,000	1.42	5,780
1976/77	5,400	1.48	5,440
1977/78	5,200	1.44	5,087
1978/79	5,425	1.40	5,163
1979/80	6,469	1.49	6,554
1980/81	6,100	1.42	5,874
1981/82	5,963	1.54	6,225
1982/83	5,100	1.53	5,304
1983/84	5,350	1.68	6,120
1984/85	4,820	1.82	5,960
1985/86	5,585	1.76	6,675
1986/87	5,980	1.77	7,193
1987/88	5,961	1.98	8,024
1988/89	5,350	2.07	7,540
1989/90	4,180	1.91	5,420
1990/91	4,230	2.36	6,800
1991/92	4,614	2.19	6,868
1992/93	4,384	2.26	6,733
1988/89-1992/93 average	4,552	2.16	6,672

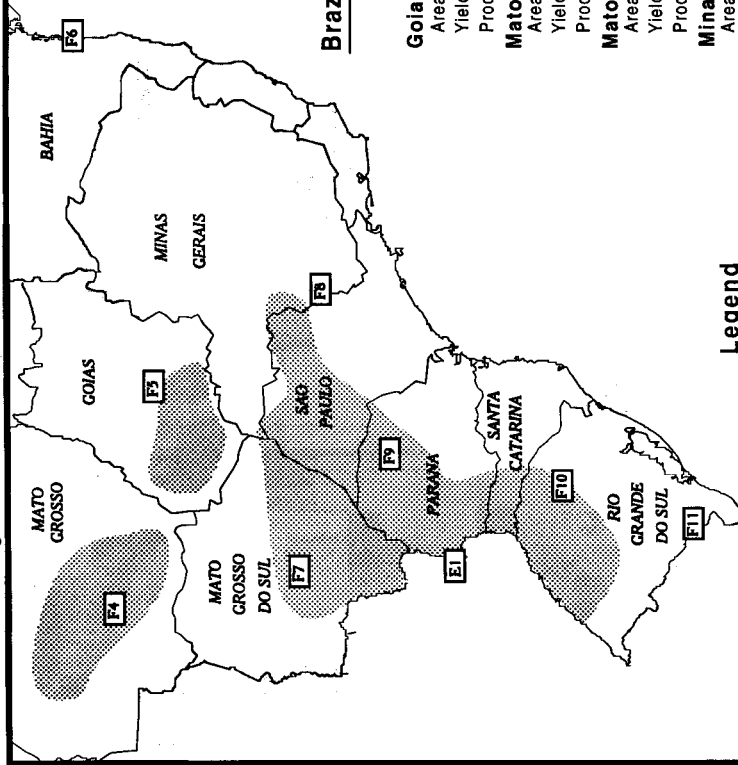
Rice crop calendar for most of North & Northeast Brazil



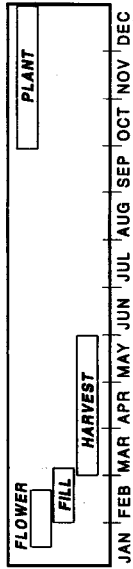
Rice crop calendar for most of Center-South Brazil



Brazil: Soybeans



Soybean crop calendar for most of Center-South Brazil



Brazil: Historical soybean statistics

	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1988/89-1992/93 average
Goiás											
Area (1,000 ha)	586	734	622	548	775	990	970	795	860	965	916
Yield (t/ha)	1.54	1.85	1.82	1.94	1.94	2.00	1.49	2.01	2.13	2.12	1.95
Prod. (1,000 t)	900	1,356	1,133	1,065	1,500	1,980	1,440	1,600	1,835	2,050	1,781
Mato Grosso											
Area (1,000 ha)	524	795	913	1,100	1,320	1,705	1,550	1,160	1,460	1,665	1,508
Yield (t/ha)	2.00	2.08	2.10	2.17	2.04	2.16	1.97	2.16	2.38	2.37	2.21
Prod. (1,000 t)	1,050	1,656	1,921	2,387	2,695	3,680	3,050	2,500	3,480	3,950	3,332
Mato Grosso do Sul											
Area (1,000 ha)	1,165	1,308	1,234	1,215	1,170	1,300	1,250	1,025	980	1,090	1,129
Yield (t/ha)	1.67	1.96	1.59	1.99	2.12	2.17	1.60	2.15	1.94	2.02	1.98
Prod. (1,000 t)	1,950	2,559	1,965	2,420	2,480	2,825	2,000	2,200	1,900	2,200	2,225
Minas Gerais											
Area (1,000 ha)	331	447	439	415	490	580	560	475	480	550	529
Yield (t/ha)	1.60	1.98	1.82	1.98	1.97	2.02	1.56	2.02	2.03	2.09	1.94
Prod. (1,000 t)	530	883	797	820	965	1,170	875	960	975	1,150	1,026
Parana											
Area (1,000 ha)	2,200	2,196	1,932	1,776	2,125	2,400	2,270	2,000	1,800	1,980	2,090
Yield (t/ha)	1.88	2.01	1.63	2.17	2.25	2.10	2.05	1.78	1.94	2.37	2.05
Prod. (1,000 t)	4,136	4,413	3,150	3,854	4,770	5,050	4,650	3,550	3,500	4,700	4,290
Rio Grande do Sul											
Area (1,000 ha)	3,654	3,637	3,261	3,160	3,435	3,680	3,550	3,150	2,950	3,090	3,284
Yield (t/ha)	1.45	1.57	1.06	1.60	1.06	1.70	1.78	0.98	1.92	1.94	1.66
Prod. (1,000 t)	5,300	5,711	3,465	5,056	3,630	6,250	6,325	3,100	5,675	6,000	5,470
Santa Catarina											
Area (1,000 ha)	437	420	406	370	390	435	365	300	260	280	328
Yield (t/ha)	1.30	1.34	1.25	1.27	1.33	1.45	1.64	1.42	1.50	1.61	1.52
Prod. (1,000 t)	570	564	508	468	520	630	600	425	390	450	499
Sao Paulo											
Area (1,000 ha)	480	499	476	462	515	595	560	500	465	500	524
Yield (t/ha)	1.80	1.92	1.93	2.12	1.94	2.25	1.72	1.84	1.94	2.10	1.97
Prod. (1,000 t)	864	960	918	978	1,000	1,340	965	920	900	1,050	1,035
National											
Area (1,000 ha)	9,421	10,153	9,450	9,270	10,550	12,150	11,550	9,750	9,700	10,600	10,750
Yield (t/ha)	1.65	1.80	1.49	1.87	1.71	1.94	1.76	1.62	1.99	2.10	1.88
Prod. (1,000 t)	15,541	18,278	14,100	17,300	18,020	23,600	20,340	15,750	19,300	22,300	20,258

Legend

Major growing areas

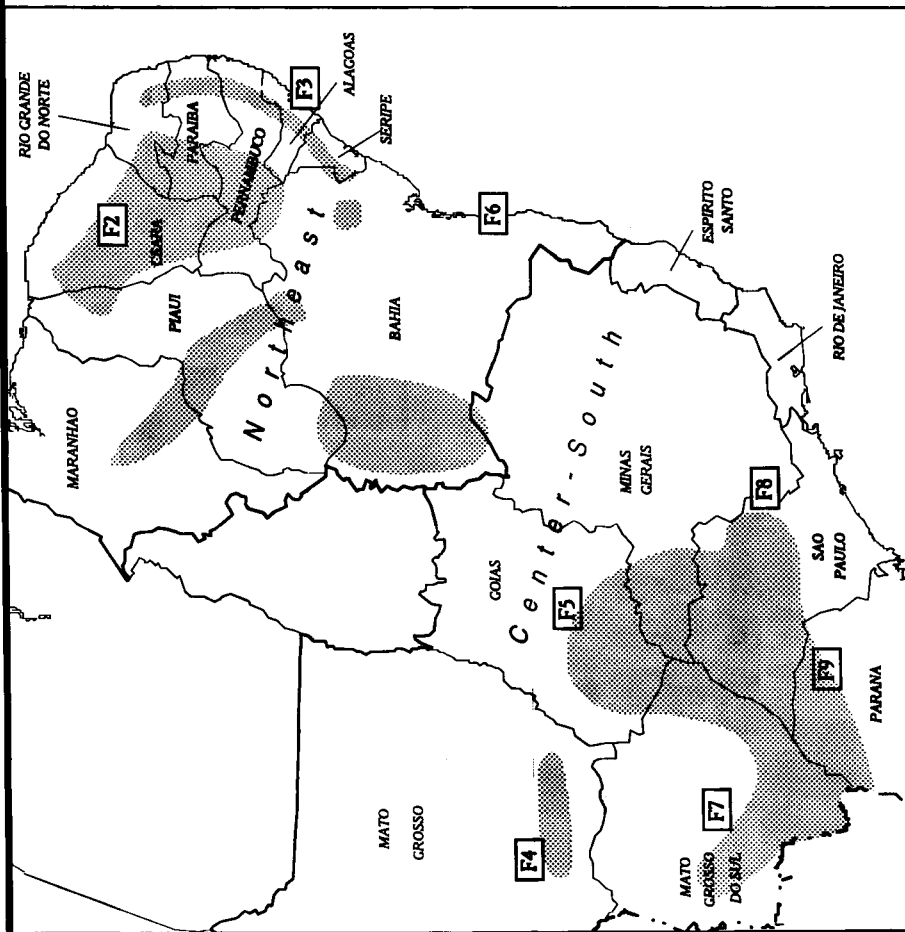
Climate stations

Percent of total production by state (1988/89-1992/93)

Rio Grande do Sul	27%
Parana	21%
Mato Grosso	16%
Mato Grosso do Sul	11%
Goiás	9%
Minas Gerais	5%
Sao Paulo	5%
Santa Catarina	2%

These states account for 96% of total production.

Brazil: Cotton

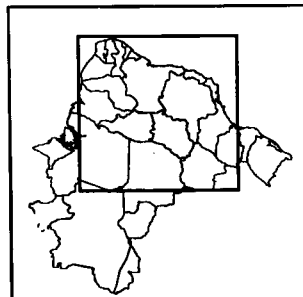


Percent of total production by state (1988/89-1992/93)

Parana	43%
Sao Paulo	21%
Bahia	8%
Rest of Northeast	8%
Minas Gerais	5%
Mato Grosso	5%
Goiás	4%
Mato Grosso do Sul	4%
These states account for 98% of total production.	

Legend

- Major growing areas
- Climate stations

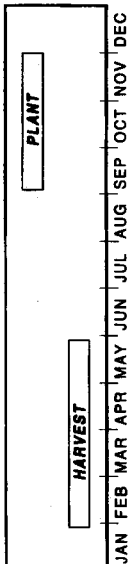


JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

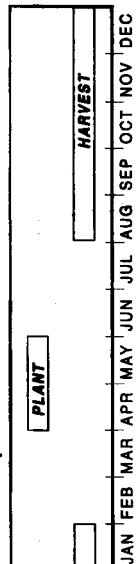
Brazil: Historical cotton statistics

Crop Year	Area	Yield	Prod.
	1,000 ha	kg/ha	1,000 480 lb. bales
1970/71	2,469	200	2,251
1971/72	2,590	260	3,119
1972/73	2,307	280	2,976
1973/74	2,287	250	2,659
1974/75	2,216	230	2,338
1975/76	1,815	220	1,814
1976/77	1,990	280	2,526
1977/78	2,015	240	2,195
1978/79	1,965	300	2,664
1979/80	1,975	290	2,659
1980/81	2,015	310	2,857
1981/82	2,070	310	2,962
1982/83	2,113	310	2,985
1983/84	1,960	280	2,554
1984/85	2,420	400	4,423
1985/86	2,290	360	3,812
1986/87	2,130	320	3,123
1987/88	2,156	350	3,514
1988/89	2,367	310	3,376
1989/90	1,900	350	3,031
1990/91	1,977	350	3,215
1991/92	1,969	380	3,445
1992/93	1,485	310	2,113
1988/89-1992/93 average	1,940	340	3,036

Cotton crop calendar for most of Center-South Brazil

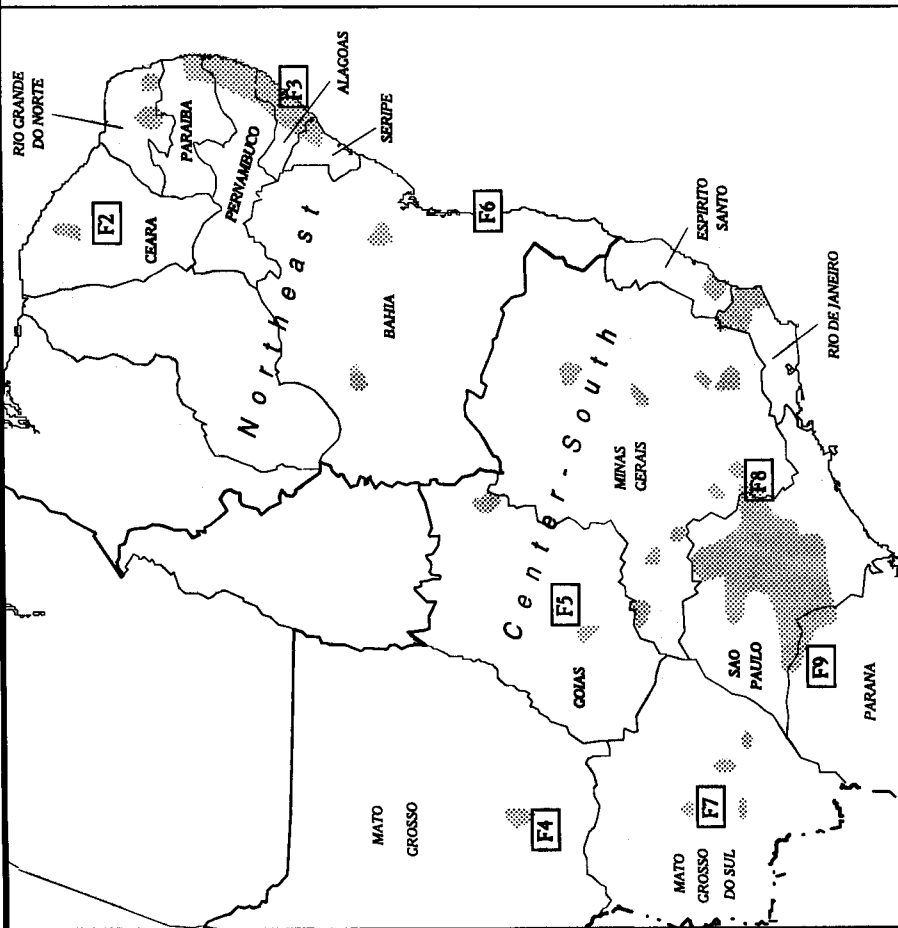


Cotton crop calendar for most of Northeast Brazil



The majority of cotton grown in Northeast Brazil is low-yielding tree cotton.

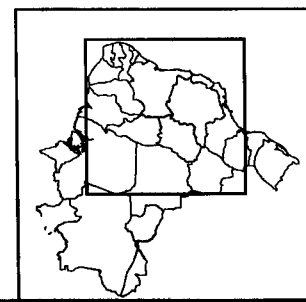
Brazil: Sugarcane



Percent of total raw sugar production by state

Sao Paulo	50%
Pernambuco	16%
Alagoas	14%
Rio de Janeiro	6%
Minas Gerais	6%
Parana	3%
Rest of Northeast	4%

These states account for 99% of total production.



Legend

- Major growing areas
- Climate stations

Brazil: Historical sugarcane statistics *

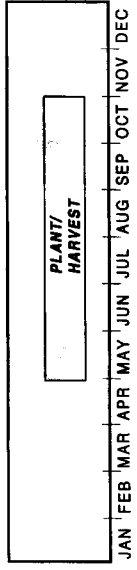
Crop Year	Area		Yield	Sugar-		Raw sugar
	1,000 ha	t/ha		cane	sugar	
1975/76	1,133	60.02	1,000 t	68,000	1,000 t	6,180
1976/77	1,335	65.92	88,000	88,000		7,598
1977/78	1,680	60.12	101,000	101,000		8,756
1978/79	1,350	65.19	88,000	88,000		7,767
1979/80	1,420	56.34	80,000	80,000		7,027
1980/81	1,730	54.34	94,000	94,000		8,547
1981/82	1,700	53.53	91,000	91,000		8,393
1982/83	1,980	51.52	102,000	102,000		9,302
1983/84	1,925	55.06	106,000	106,000		9,561
1984/85	1,950	50.26	98,000	98,000		9,324
1985/86	1,700	51.18	87,000	87,000		8,270
1986/87	1,700	55.88	95,000	95,000		8,650
1987/88	1,500	58.67	88,000	88,000		8,457
1988/89	1,400	62.86	88,000	88,000		8,582
1989/90	1,210	60.33	73,000	73,000		7,793
1990/91	1,170	64.10	75,000	75,000		7,900
1991/92	1,220	71.31	87,000	87,000		8,936
1992/93	1,650	54.50	90,000	90,000		9,800
1988/89-1992/93 average	1,330	62.62	82,600	82,600		8,602

* Excludes sugarcane for alcohol production.

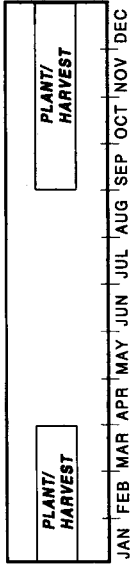
Regional statistics

	Center-South	Northeast
Sugarcane prod.	75-80%	20-25%
Raw sugar prod.	60-65%	35-40%
Ethanol prod.	80-85%	15-20%
Sugar for export	25-30%	70-75%

Sugarcane crop calendar for most of Center-South Brazil



Sugarcane crop calendar for most of Northeast Brazil

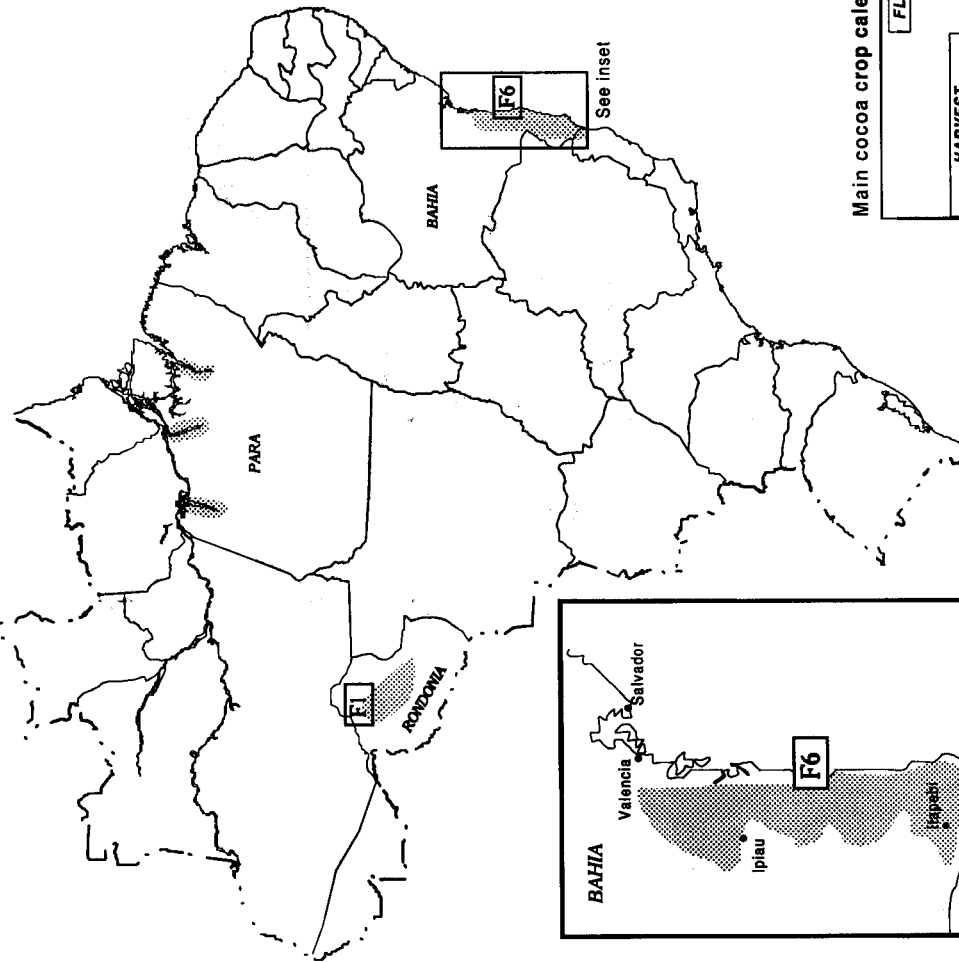


Brazil: Cocoa

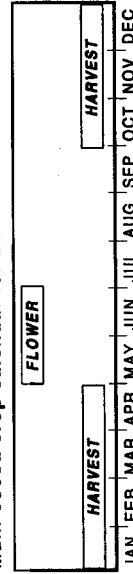
Brazil: Historical cocoa statistics

Crop Year	Area* 1,000 ha	Yield t/ha	Prod. 1,000 t
1970/71	352	0.52	182
1971/72	367	0.45	165
1972/73	382	0.42	159
1973/74	396	0.62	246
1974/75	412	0.65	267
1975/76	416	0.62	257
1976/77	421	0.56	234
1977/78	430	0.66	283
1978/79	462	0.68	314
1979/80	485	0.61	296
1980/81	512	0.69	351
1981/82	540	0.58	315
1982/83	550	0.62	339
1983/84	606	0.51	309
1984/85	606	0.68	415
1985/86	630	0.60	380
1986/87	630	0.58	365
1987/88	630	0.63	400
1988/89	630	0.53	334
1989/90	630	0.57	356
1990/91	630	0.60	375
1991/92	630	0.48	301
1992/93	630	0.52	330
1988/89- 1992/93 average	630	0.54	339

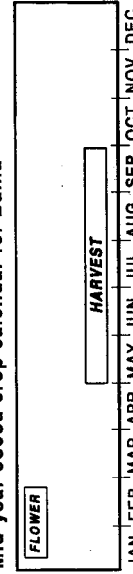
* Bearing trees.



Main cocoa crop calendar for Bahia



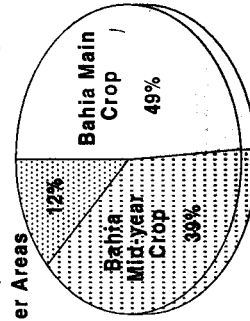
Mid-year cocoa crop calendar for Bahia



Legend

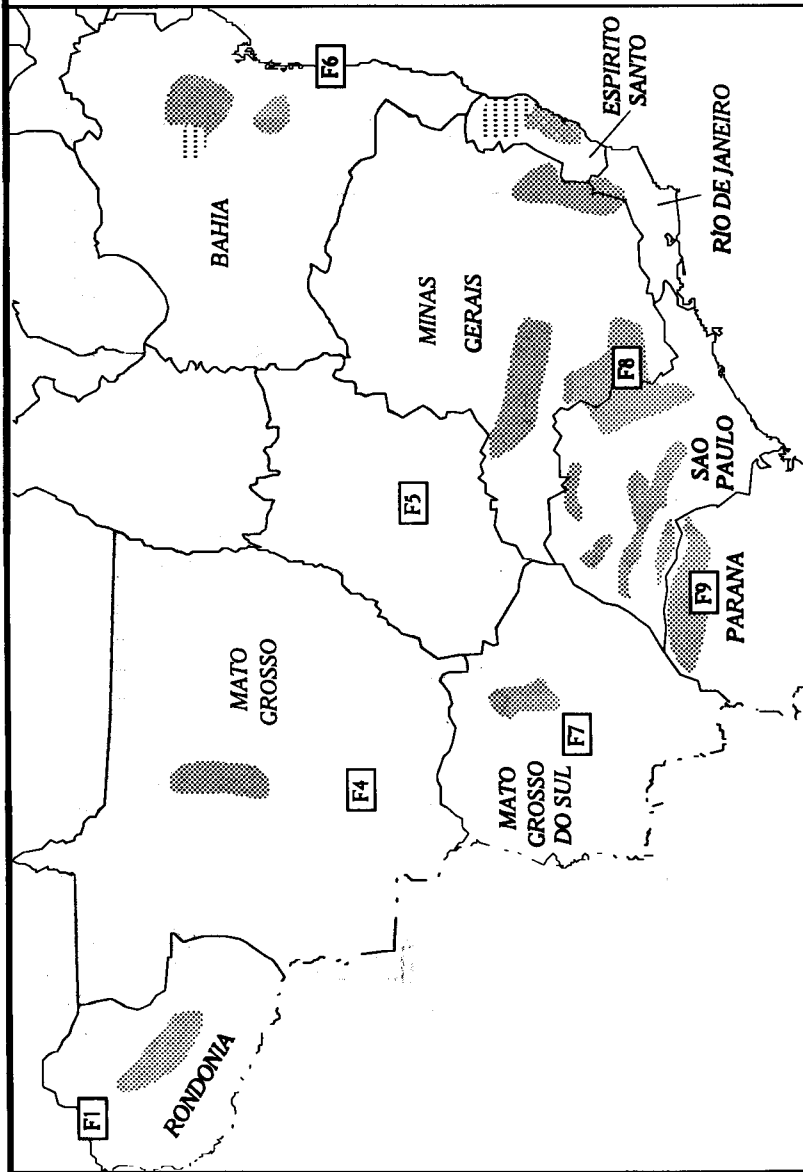
- Major growing areas
- Climate stations

Percent of total production
by province
(1989/90-1992/93 average)



JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Brazil: Coffee



Brazil: Historical coffee statistics

Crop Year	Area [*] 1,000 ha	Yield bags/ha	Prod.	
			60-kb bags	1,000
1970/71	2,379	4.62	11,000	
1971/72	2,365	10.40	24,600	
1972/73	2,190	11.19	24,500	
1973/74	2,065	6.92	14,300	
1974/75	2,169	12.68	27,500	
1975/76	2,251	10.22	23,000	
1976/77	1,895	4.91	9,300	
1977/78	1,946	8.99	17,500	
1978/79	2,234	8.95	20,000	
1979/80	2,460	8.94	22,000	
1980/81	2,700	7.96	21,500	
1981/82	2,800	11.79	33,000	
1982/83	2,900	6.12	17,750	
1983/84	3,000	10.00	30,000	
1984/85	3,030	8.91	27,000	
1985/86	3,045	10.84	33,000	
1986/87	3,045	4.56	13,900	
1987/88	3,245	11.71	38,000	
1988/89	3,295	7.59	25,000	
1989/90	3,310	7.85	26,000	
1990/91	3,370	9.20	31,000	
1991/92	3,400	8.38	28,500	
1992/93	2,400	10.00	24,000	
1988/89-1992/93 average	3,115	8.60	26,900	

^{*}Bearing trees.




Arabica coffee accounts for about 85% of total production.

Percent of total production by state (1990/91-1993/94)

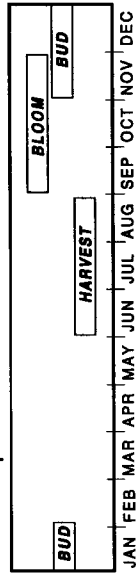
Minas Gerais	40%
Sao Paulo	22%
Espirito Santo	18%
Parana	10%
Bahia	3%
Rondonia	3%
Mato Grosso	1%
Rio de Janeiro	1%

These states account for 98% of total production.

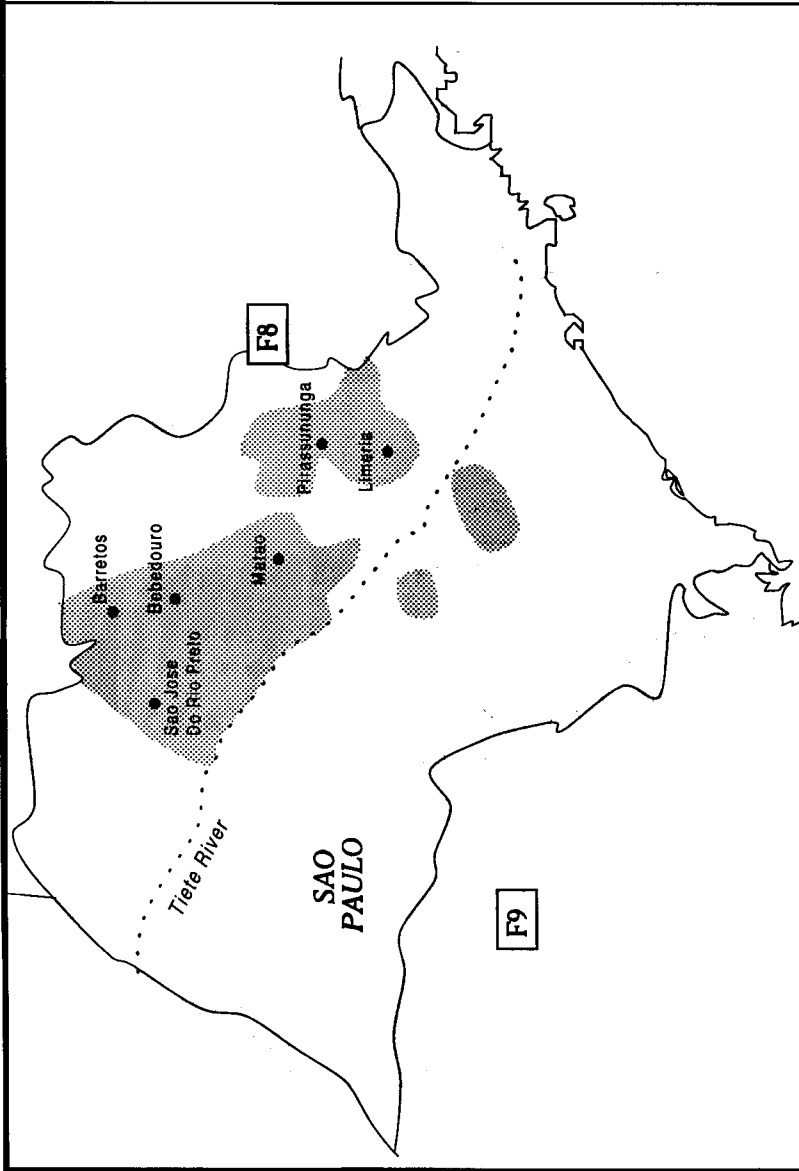
Legend

-  Major Arabica coffee areas
-  Major Robusta coffee areas
-  Climate stations

Coffee crop calendar for most of Brazil



Brazil: Oranges



Brazil: Historical orange statistics

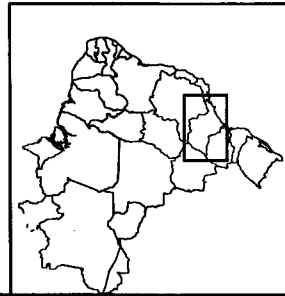
Crop Year	Area [*] 1,000 ha	Yield t/ha	Prod. 1,000 t
1970/71	n.a.	n.a.	3,250
1971/72	n.a.	n.a.	3,936
1972/73	n.a.	n.a.	3,908
1973/74	n.a.	n.a.	5,291
1974/75	n.a.	n.a.	5,169
1975/76	n.a.	n.a.	5,888
1976/77	n.a.	n.a.	5,505
1977/78	n.a.	n.a.	8,158
1978/79	n.a.	n.a.	8,227
1979/80	n.a.	n.a.	8,525
1980/81	567	15.65	8,871
1981/82	567	16.37	9,281
1982/83	590	16.90	9,969
1983/84	624	16.04	10,011
1984/85	658	15.67	10,309
1985/86	718	15.34	11,015
1986/87	642	16.59	10,650
1987/88	650	16.00	10,400
1988/89	690	20.51	14,150
1989/90	720	16.72	12,036
1990/91	735	16.82	12,362
1991/92	667	22.45	14,974
1992/93	722	19.55	14,117
1988/89- 1992/93- average	707	19.21	13,528

*Bearing trees.
n.a. = not available

Legend

Major growing areas

Climate stations

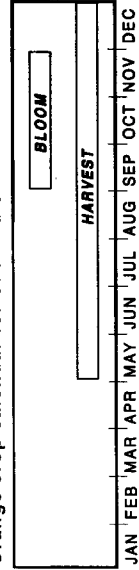


Percent of total production by state

Sao Paulo	84%
Sergipe	4%
Rio de Janeiro	3%
Bahia	2%
Rio Grande do Sul	2%
Minas Gerais	2%

These states account for 97% of total production.

Orange crop calendar for Sao Paulo



Europe: Political boundaries, leading producers



Top 5 European producers for selected crops (1988/89-1992/93 average)

Barley

Germany	20%
France	15%
Spain	13%
United Kingdom	11%
Denmark	7%

Corn

France	24%
Former Yugoslavia	16%
Romania	15%
Italy	12%
Hungary	7%

Rapeseed

Germany	24%
France	24%
Poland	14%
United Kingdom	14%
Denmark	7%

Sugarbeets*

France	21%
Germany	19%
Poland	8%
Italy	8%
United Kingdom	6%

Sunflowerseed

France	37%
Spain	18%
Hungary	12%
Romania	10%
Bulgaria	7%

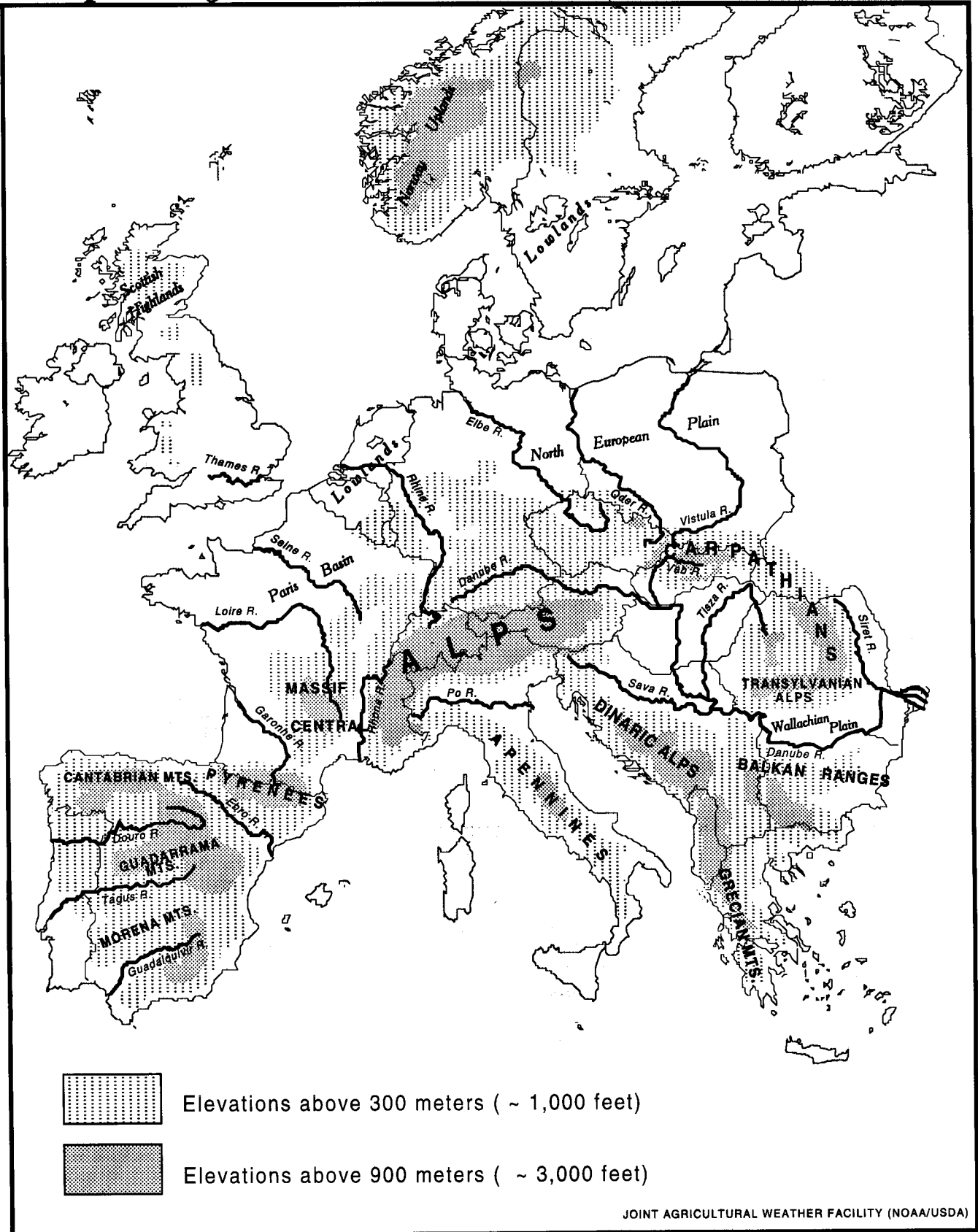
Wheat

France	26%
Germany	12%
United Kingdom	11%
Italy	7%
Poland	7%

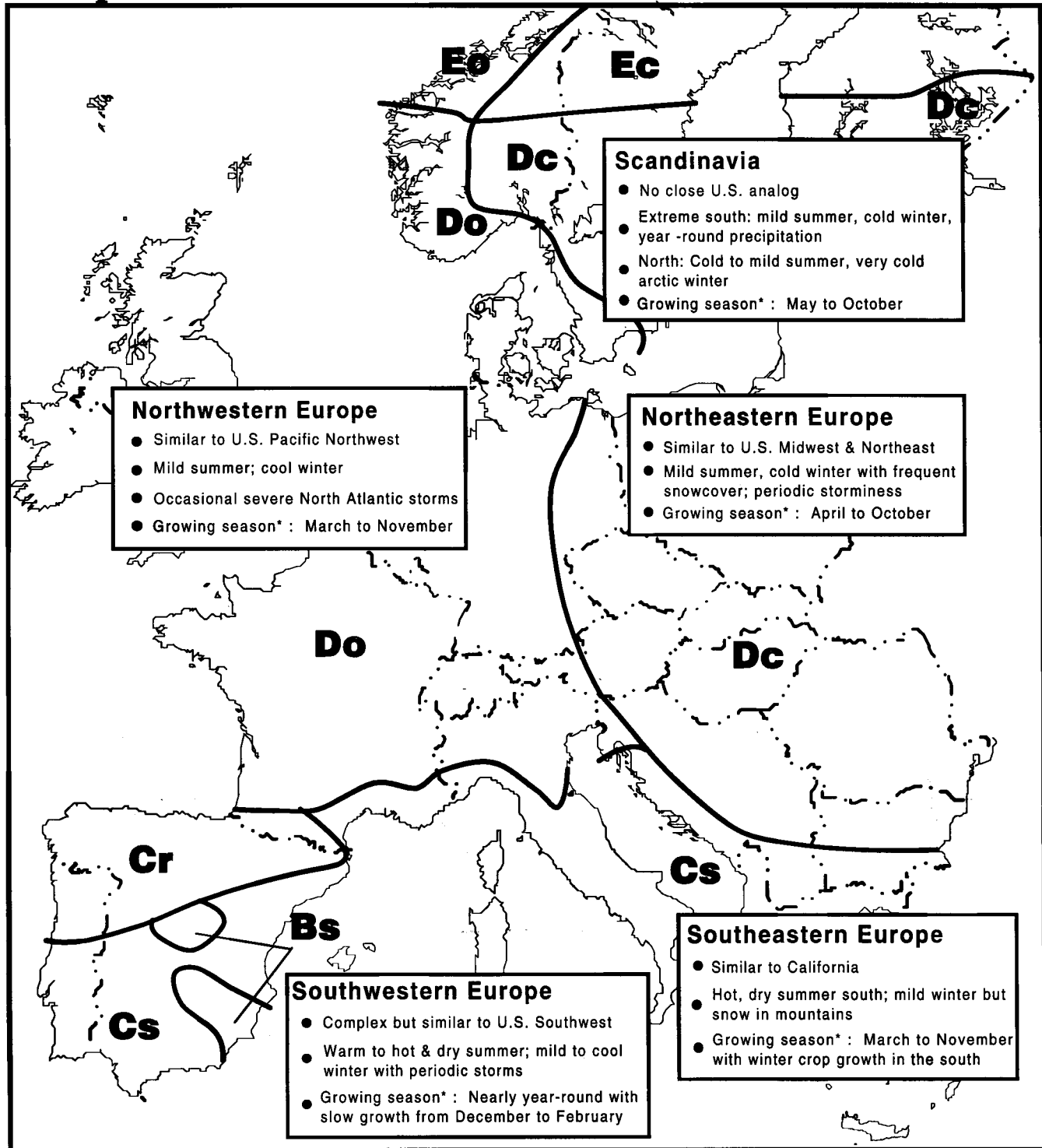
* Based on total raw sugar production.

JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Europe: Major landforms



Europe: General climate features



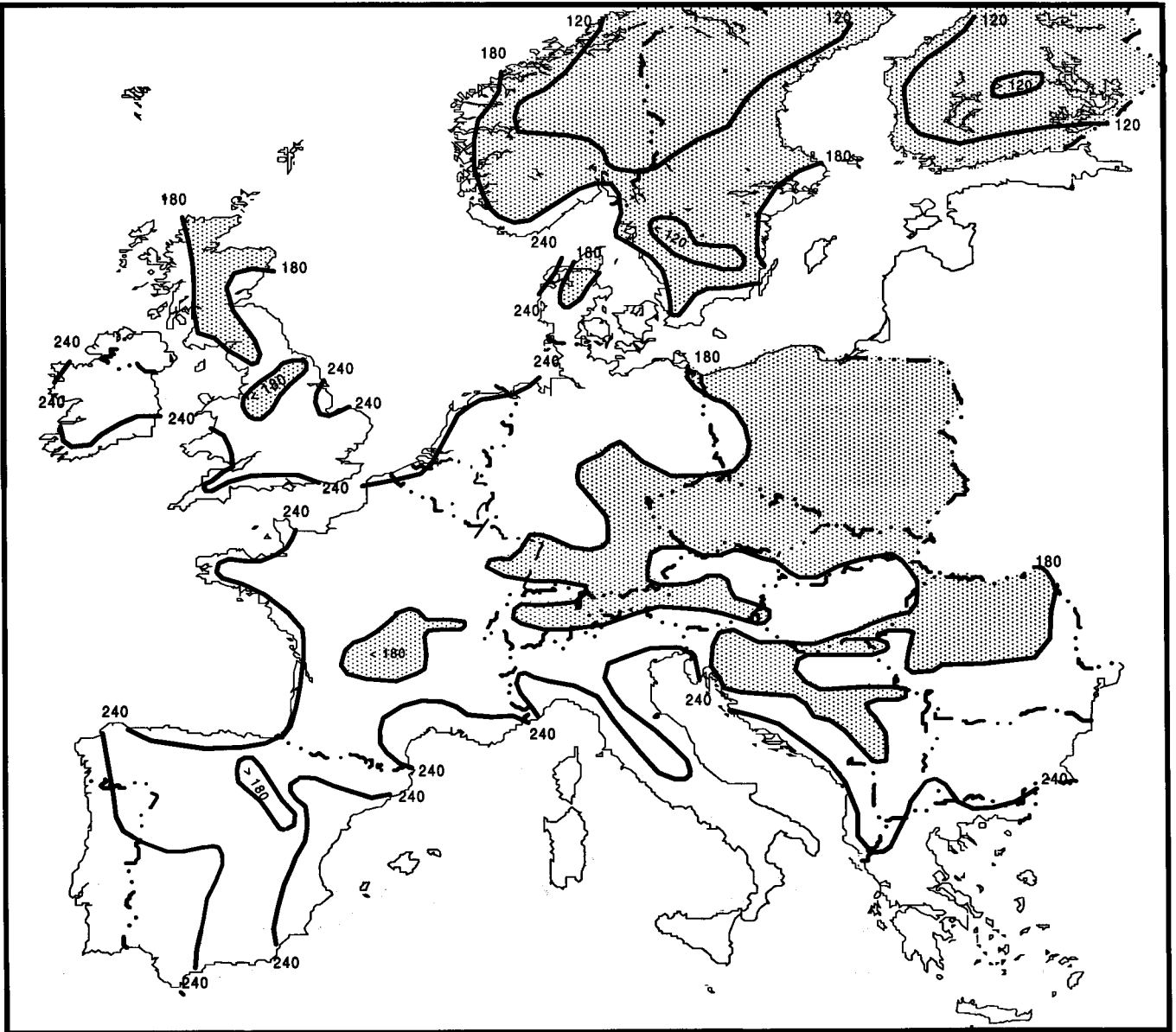
This climate classification is based on the Koppen-Trewartha system as presented in "World Climates" by Willy Rudloff (1981):

Bs - Steppe or Semi-Arid; Cr - Subtropical rain; Cs - Subtropical winter rain; Do - Temperate Oceanic; Dc - Temperate Continental; Eo - Subarctic Oceanic; Ec - Subarctic Continental.

*Growing season based on average temperatures of at least 5° C for cool-season crops and 10° C for warm-season crops.

JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Europe: Average length of growing season (days)

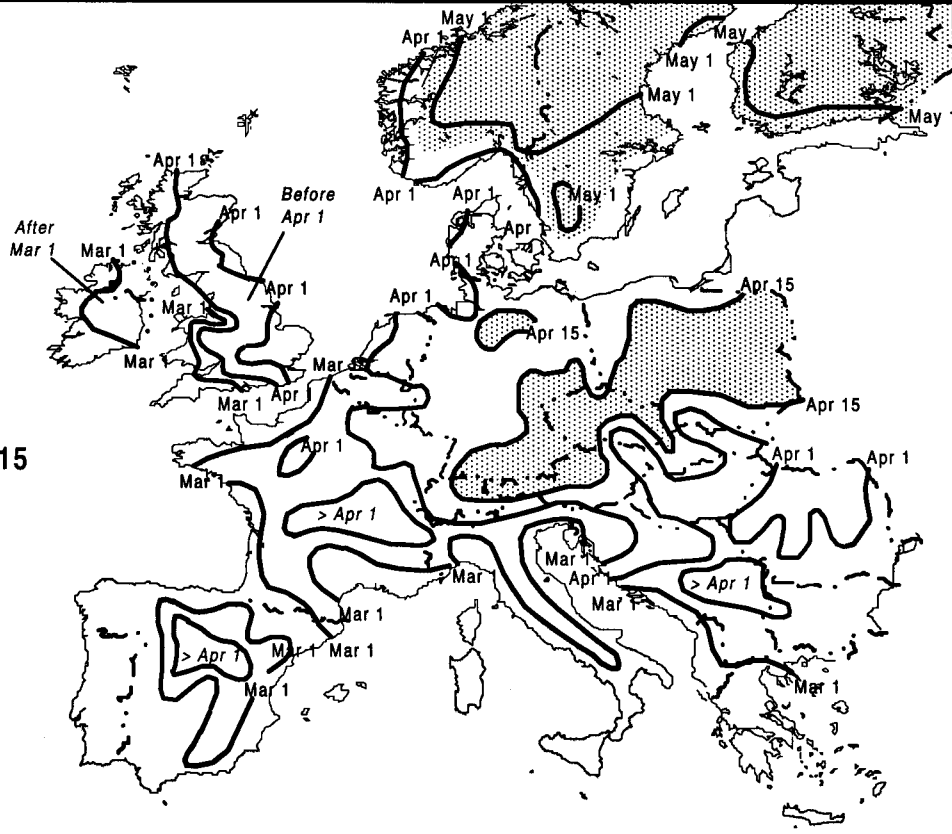


 180 Days or less

Europe: Average freeze dates

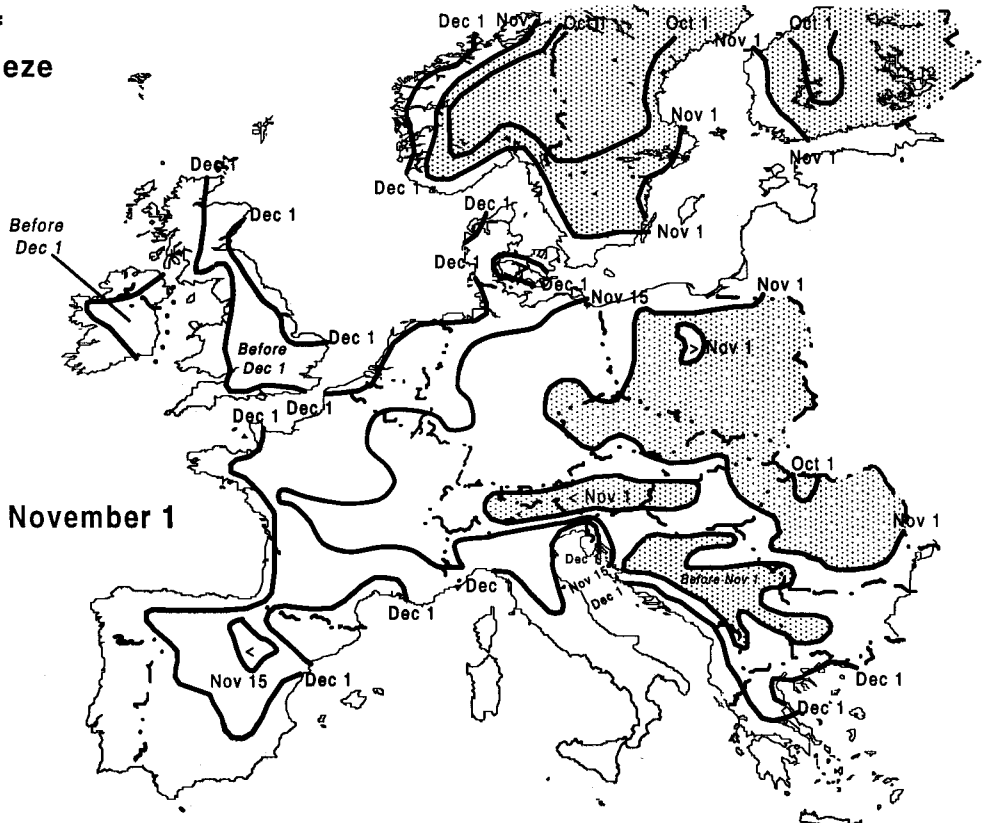
Average date of last spring freeze

○ After April 15

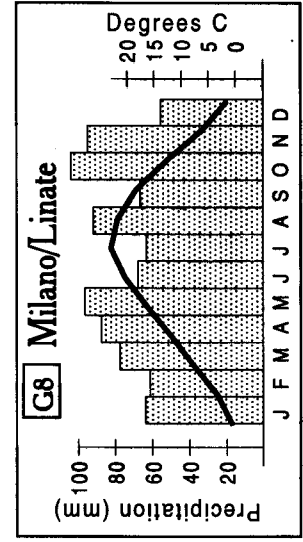
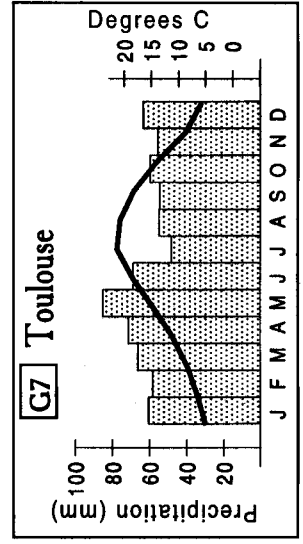
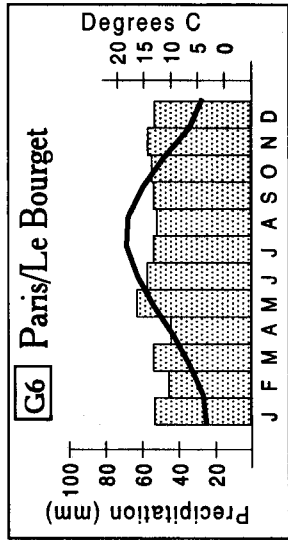
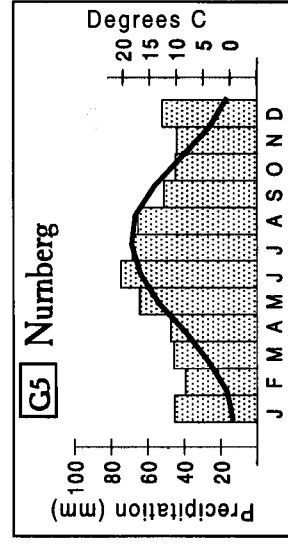
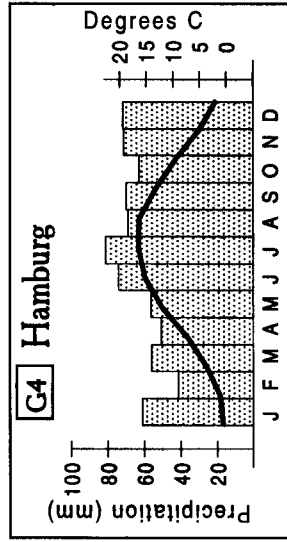
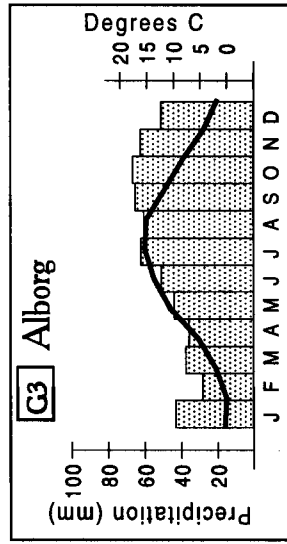
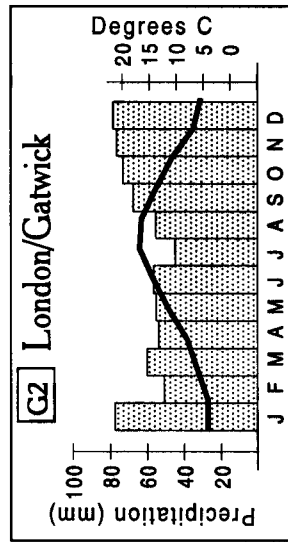
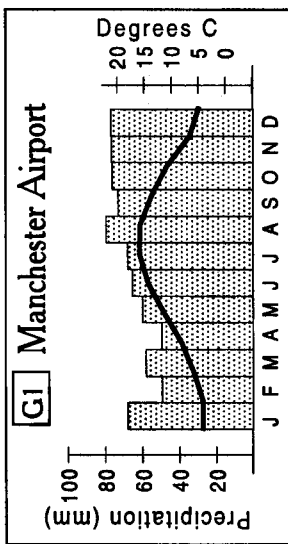
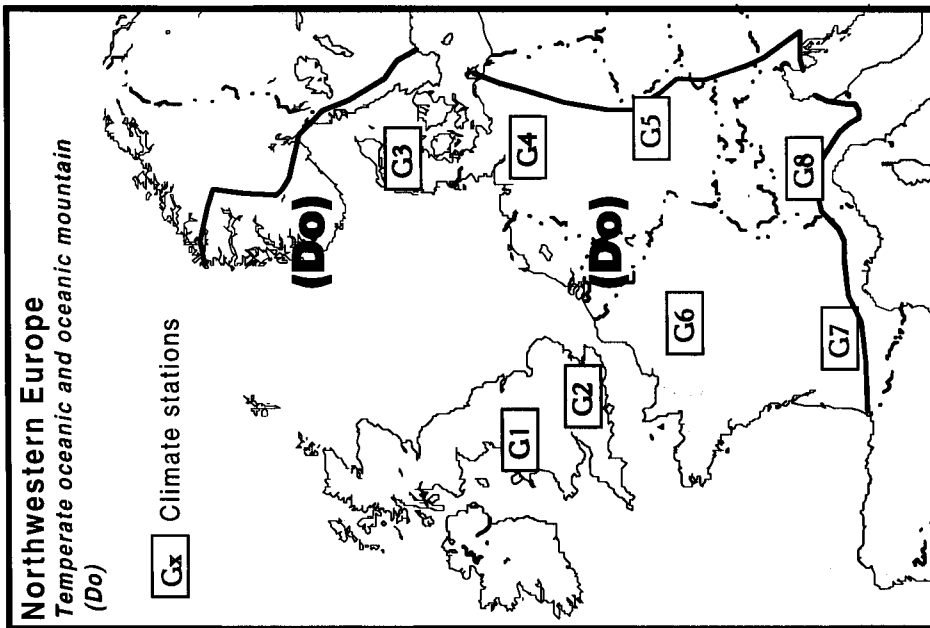


Average date of first autumn freeze

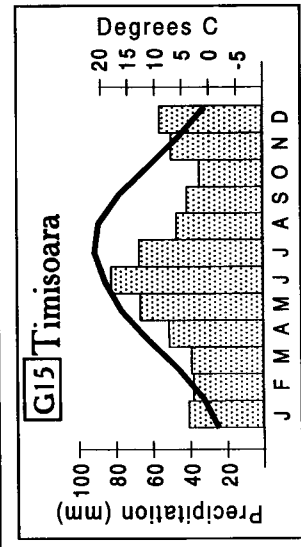
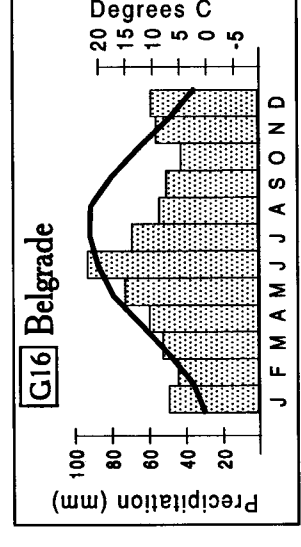
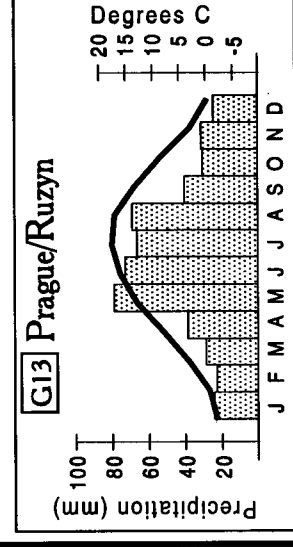
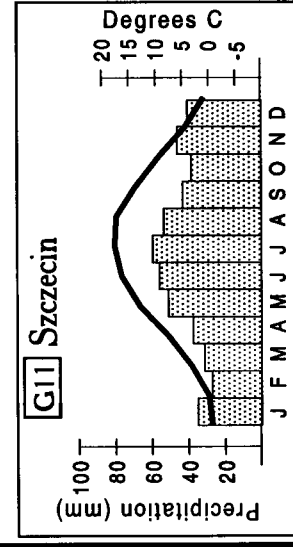
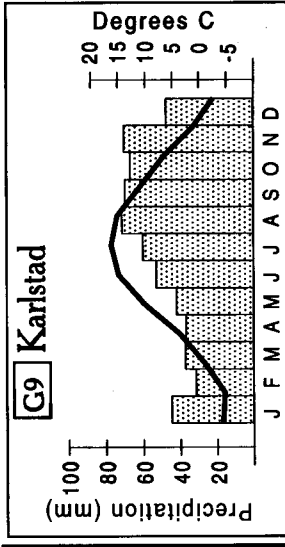
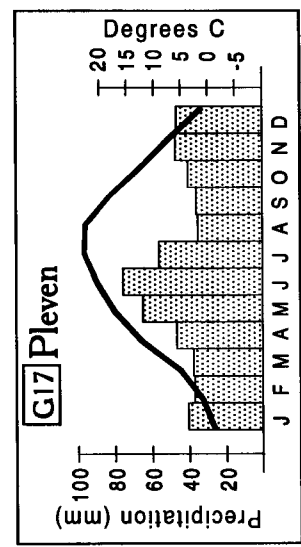
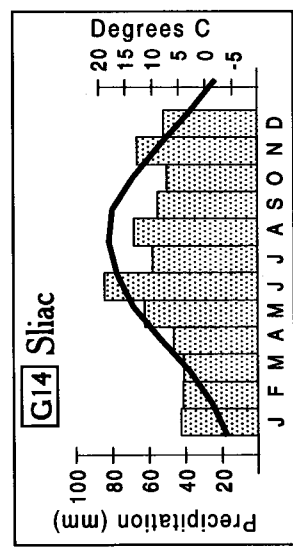
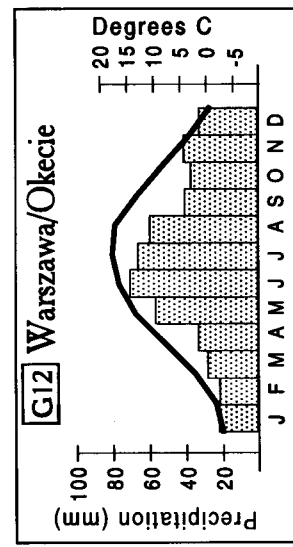
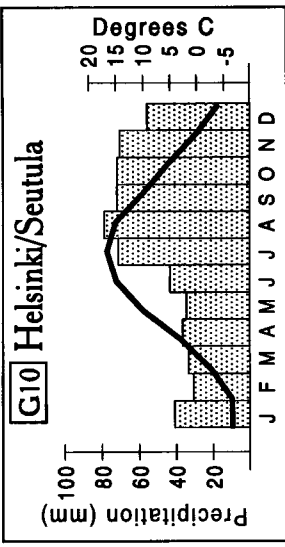
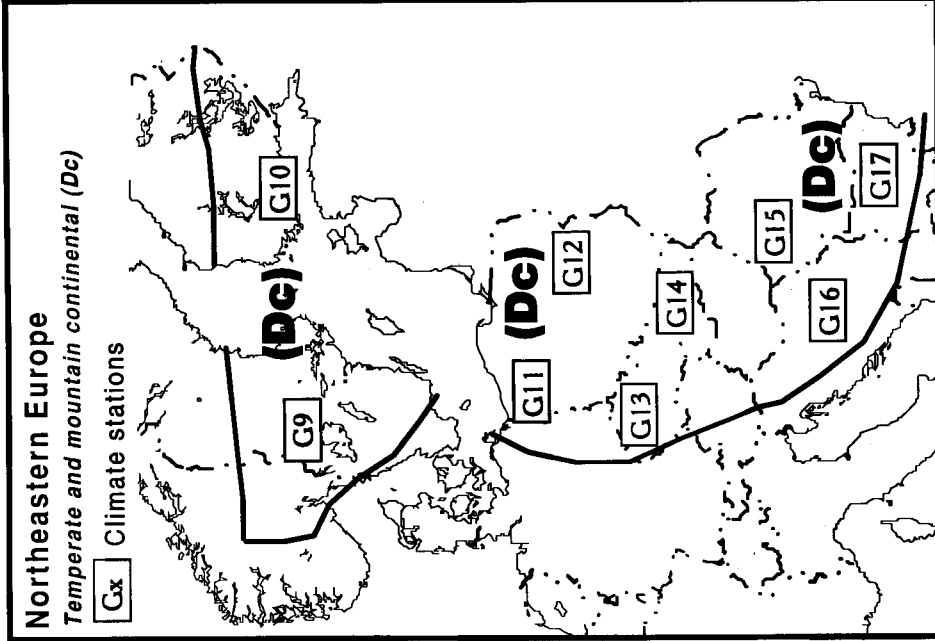
○ Before November 1



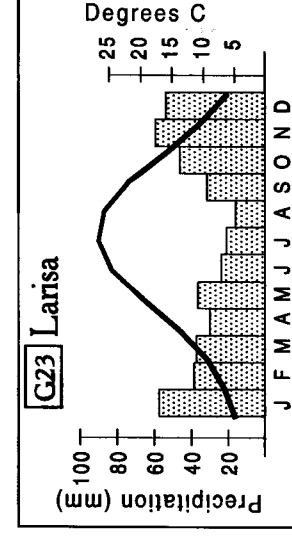
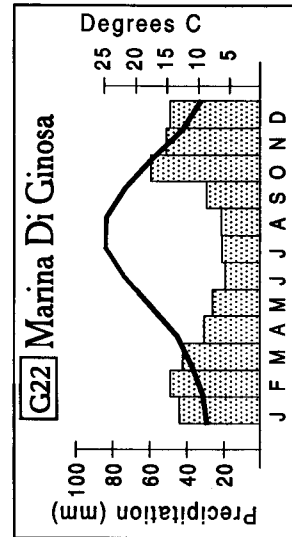
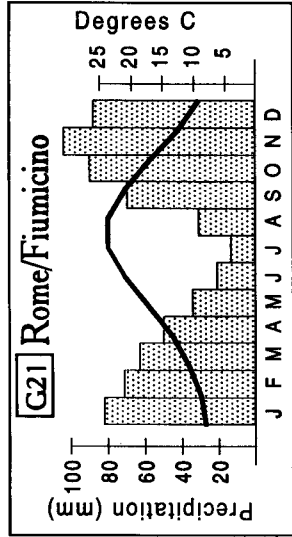
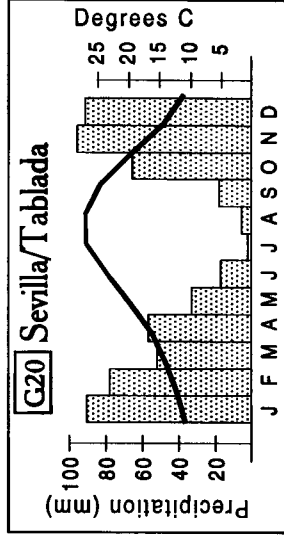
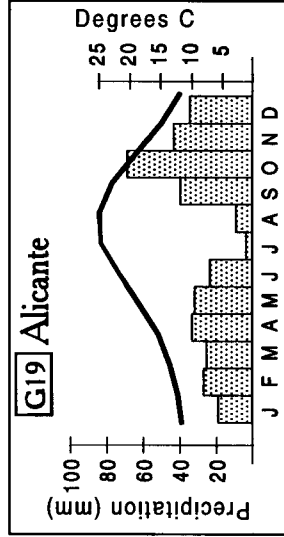
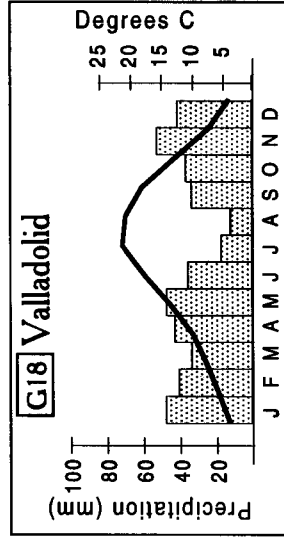
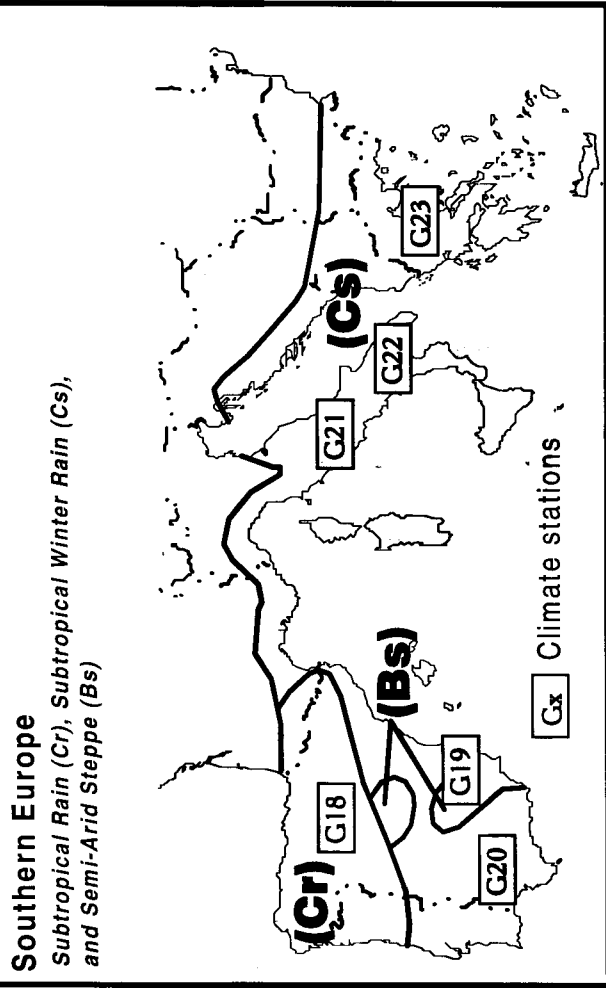
Northwestern Europe: Climate



Northeastern Europe: Climate

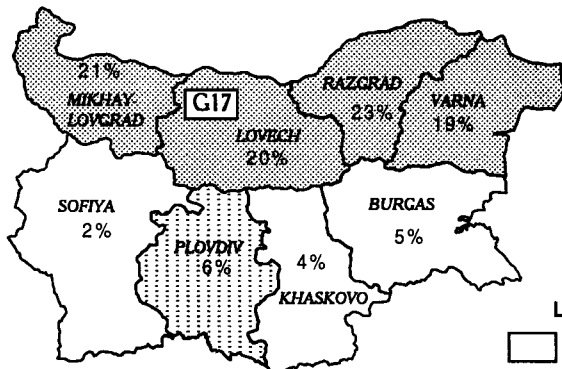


Southern Europe: Climate

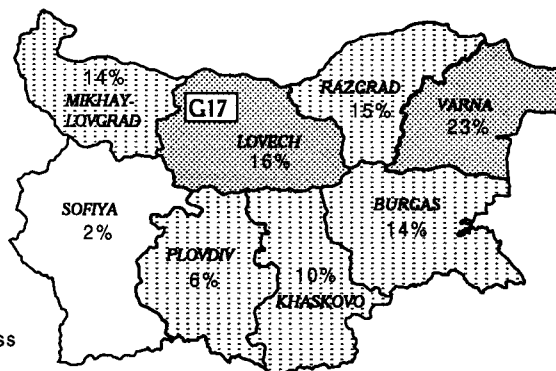


Bulgaria: Corn and wheat

Percent of total corn area by province



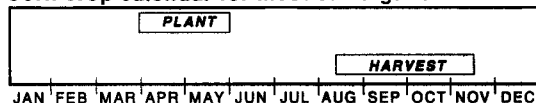
Percent of total wheat area by province



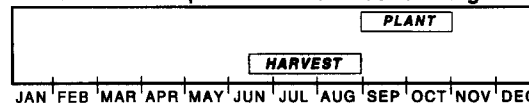
Legend

- 5% or less
- 6-15%
- 16% or more
- Gx Climate stations

Corn crop calendar for most of Bulgaria



Winter wheat crop calendar for most of Bulgaria



Bulgaria: Historical corn statistics

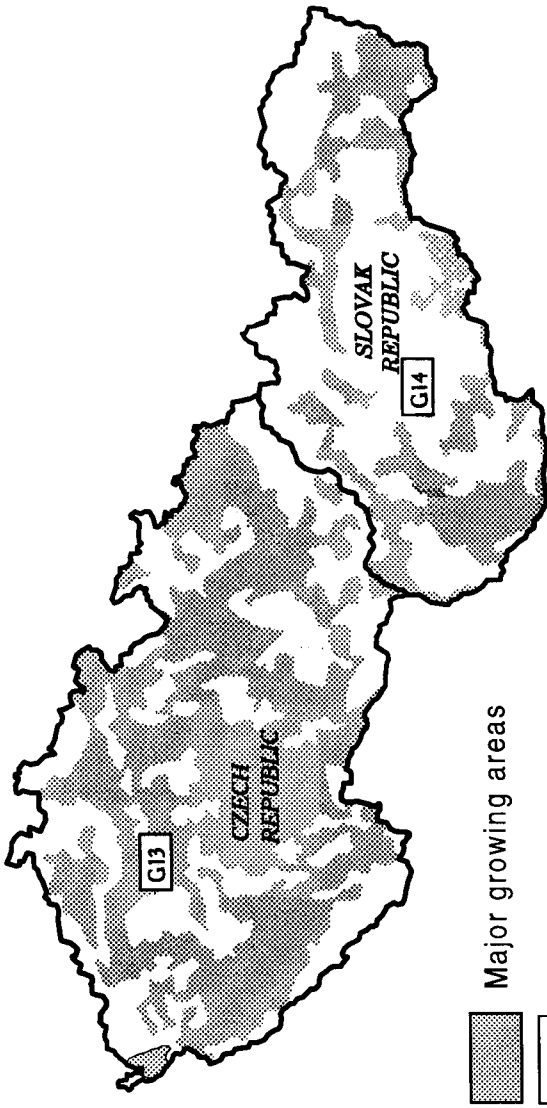
Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1970/71	635	3.74	2,375
1971/72	655	3.84	2,518
1972/73	689	4.32	2,974
1973/74	627	4.12	2,586
1974/75	523	3.11	1,626
1975/76	652	4.33	2,822
1976/77	731	4.15	3,031
1977/78	702	3.58	2,513
1978/79	601	3.72	2,236
1979/80	666	4.84	3,223
1980/81	584	3.86	2,256
1981/82	563	4.26	2,401
1982/83	621	5.50	3,418
1983/84	596	5.23	3,115
1984/85	542	5.52	2,994
1985/86	435	3.10	1,350
1986/87	573	4.97	2,848
1987/88	497	3.74	1,858
1988/89	490	3.18	1,557
1989/90	563	4.30	2,421
1990/91	400	3.10	1,241
1991/92	560	4.96	2,775
1992/93	615	1.59	980
1988/89-1992/93 average	526	3.43	1,795



Bulgaria: Historical wheat statistics

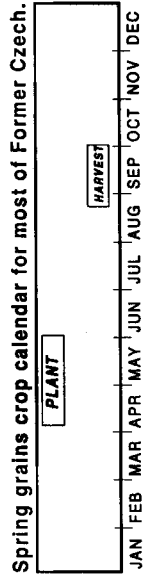
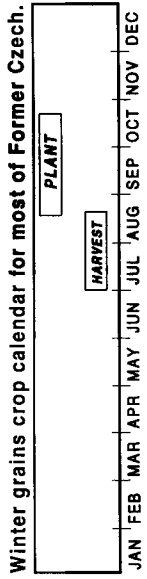
Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1970/71	1,014	2.99	3,032
1971/72	1,013	3.06	3,095
1972/73	961	3.73	3,582
1973/74	934	3.49	3,258
1974/75	904	3.36	3,034
1975/76	912	3.29	2,996
1976/77	918	3.82	3,511
1977/78	910	3.72	3,384
1978/79	935	3.71	3,466
1979/80	958	3.50	3,355
1980/81	968	3.97	3,847
1981/82	1,032	4.31	4,443
1982/83	1,059	4.64	4,913
1983/84	1,128	3.19	3,600
1984/85	1,126	4.29	4,836
1985/86	1,067	2.88	3,068
1986/87	1,127	3.84	4,327
1987/88	1,085	3.82	4,149
1988/89	1,182	4.01	4,743
1989/90	1,138	4.75	5,402
1990/91	1,163	4.38	5,095
1991/92	1,200	3.75	4,500
1992/93	1,107	3.11	3,440
1988/89-1992/93 average	1,158	4.00	4,636

JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

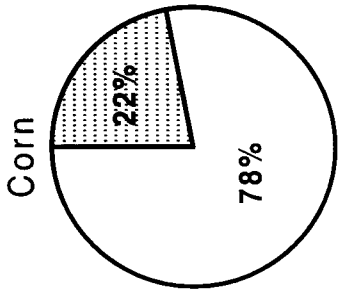
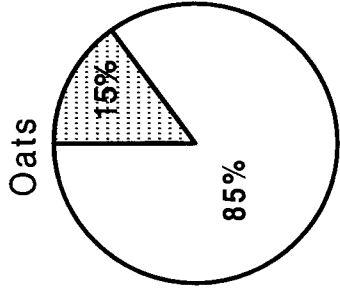
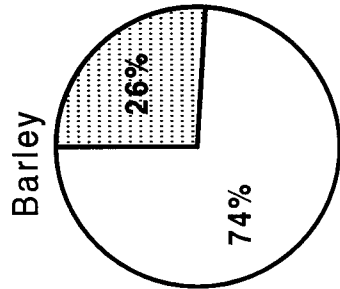
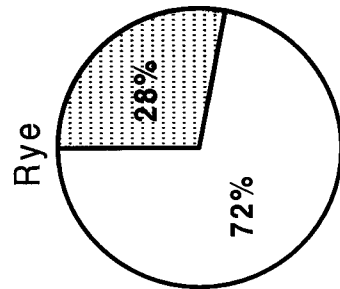
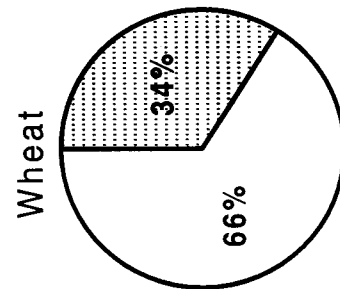
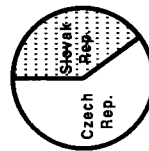
Former Czechoslovakia: Crop statistics



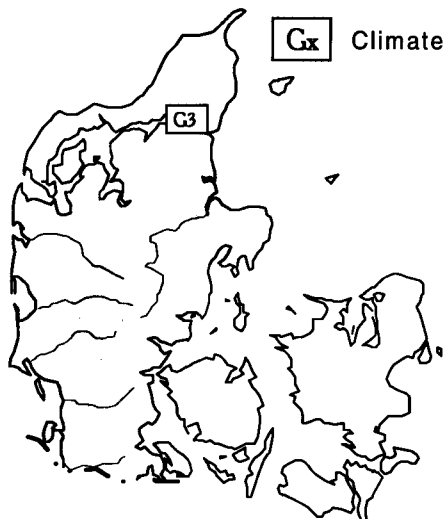
 Major growing areas
 Climate stations



Percent of total crop area by country (1990/91)

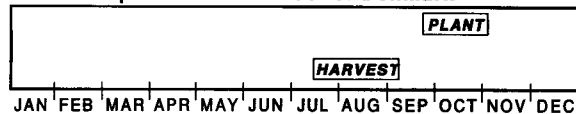


Denmark: Barley, rapeseed, and wheat

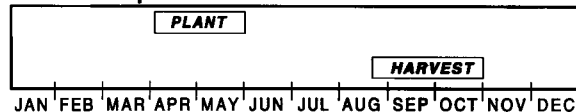


Gx Climate stations

Winter crop calendar for most of Denmark



Summer crop calendar for most of Denmark



Denmark: Historical barley statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1970/71	1,352	3.56	4,813
1971/72	1,370	3.98	5,458
1972/73	1,406	3.96	5,571
1973/74	1,468	3.75	5,507
1974/75	1,437	4.15	5,967
1975/76	1,443	3.57	5,156
1976/77	1,478	3.25	4,801
1977/78	1,527	4.02	6,143
1978/79	1,570	4.01	6,301
1979/80	1,629	4.09	6,657
1980/81	1,577	3.83	6,044
1981/82	1,541	3.92	6,044
1982/83	1,485	4.28	6,357
1983/84	1,359	3.25	4,423
1984/85	1,180	5.15	6,072
1985/86	1,104	4.76	5,251
1986/87	1,078	4.76	5,134
1987/88	943	4.55	4,292
1988/89	1,165	4.65	5,419
1989/90	988	5.02	4,959
1990/91	910	5.48	4,988
1991/92	944	5.34	5,041
1992/93	892	3.33	2,974
1988/89- 1992/93 average	980	4.76	4,676

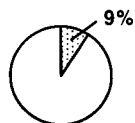
Denmark: Historical rapeseed statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1970/71	13	2.08	27
1971/72	25	2.00	50
1972/73	31	1.45	45
1973/74	46	2.00	92
1974/75	48	2.33	112
1975/76	72	1.82	131
1976/77	44	1.84	81
1977/78	39	1.97	77
1978/79	47	1.94	91
1979/80	65	2.31	150
1980/81	103	2.18	225
1981/82	132	2.20	290
1982/83	152	2.20	335
1983/84	162	1.91	309
1984/85	191	2.48	474
1985/86	217	2.51	544
1986/87	227	2.72	618
1987/88	250	2.22	556
1988/89	199	2.53	504
1989/90	231	2.84	655
1990/91	270	2.94	793
1991/92	280	2.59	726
1992/93	171	2.37	406
1988/89- 1992/93 average	230	2.65	617

Denmark: Historical wheat statistics

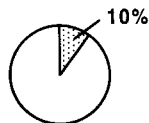
Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1970/71	114	4.49	512
1971/72	121	4.83	585
1972/73	135	4.39	592
1973/74	123	4.41	542
1974/75	110	5.38	592
1975/76	102	5.10	520
1976/77	127	4.66	592
1977/78	116	5.22	606
1978/79	122	5.26	642
1979/80	110	5.35	589
1980/81	139	4.69	652
1981/82	150	5.57	835
1982/83	180	6.71	1,207
1983/84	243	6.37	1,548
1984/85	333	7.35	2,446
1985/86	340	5.80	1,972
1986/87	354	6.15	2,177
1987/88	398	5.74	2,285
1988/89	309	6.73	2,080
1989/90	446	7.23	3,224
1990/91	534	7.40	3,953
1991/92	521	7.04	3,670
1992/93	581	6.17	3,583
1988/89- 1992/93 average	478	6.91	3,302

Percent of European Union
barley production
(1988/89-1992/93 average)



Spring barley is about 80 percent of total barley production.

Percent of European Union
rapeseed production
(1988/89-1992/93 average)



Winter rapeseed is about 76 percent of total rapeseed production.

Percent of European Union
wheat production
(1988/89-1992/93 average)

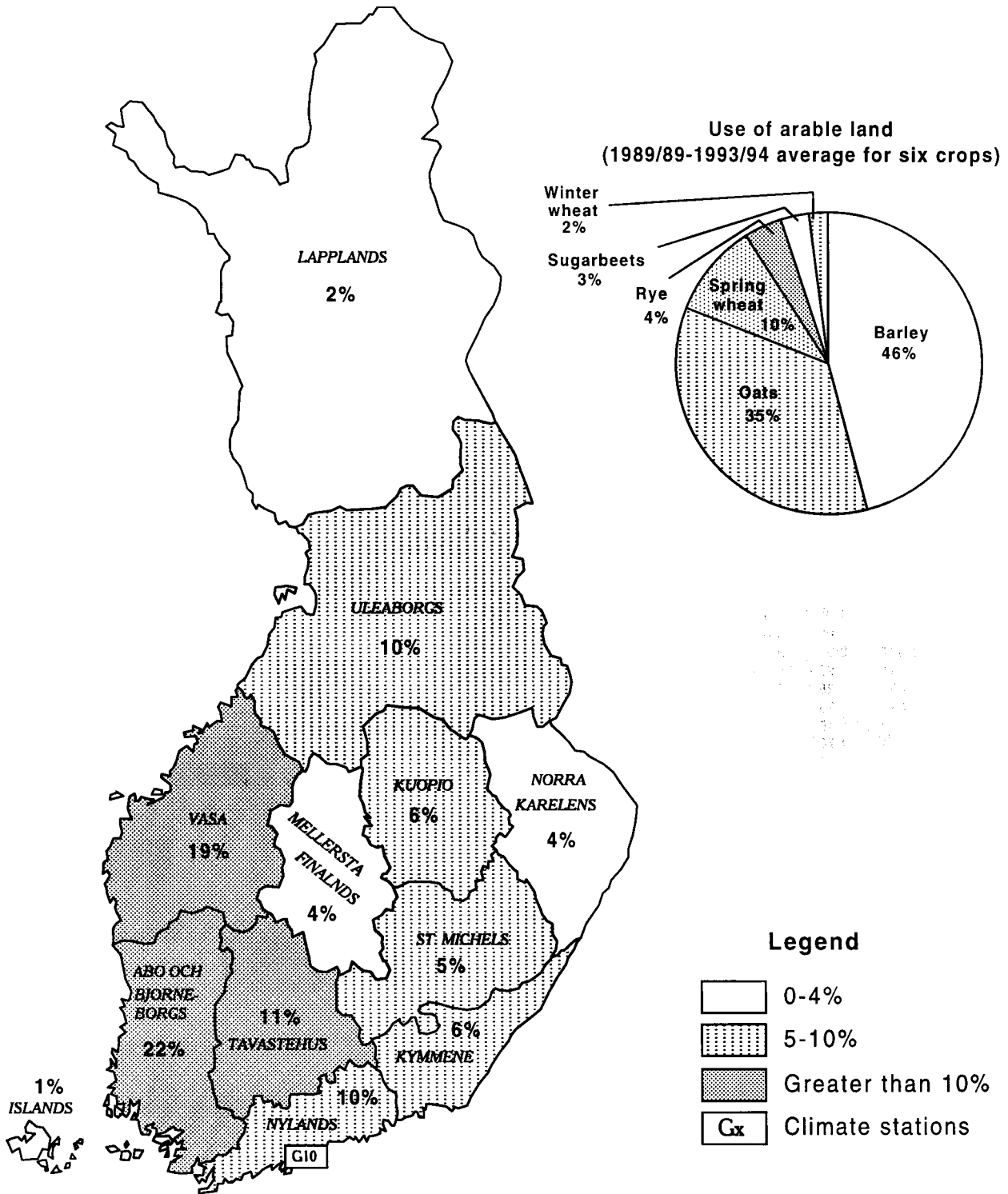


Winter wheat is about 97 percent of total wheat production.

JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Finland: Crop statistics

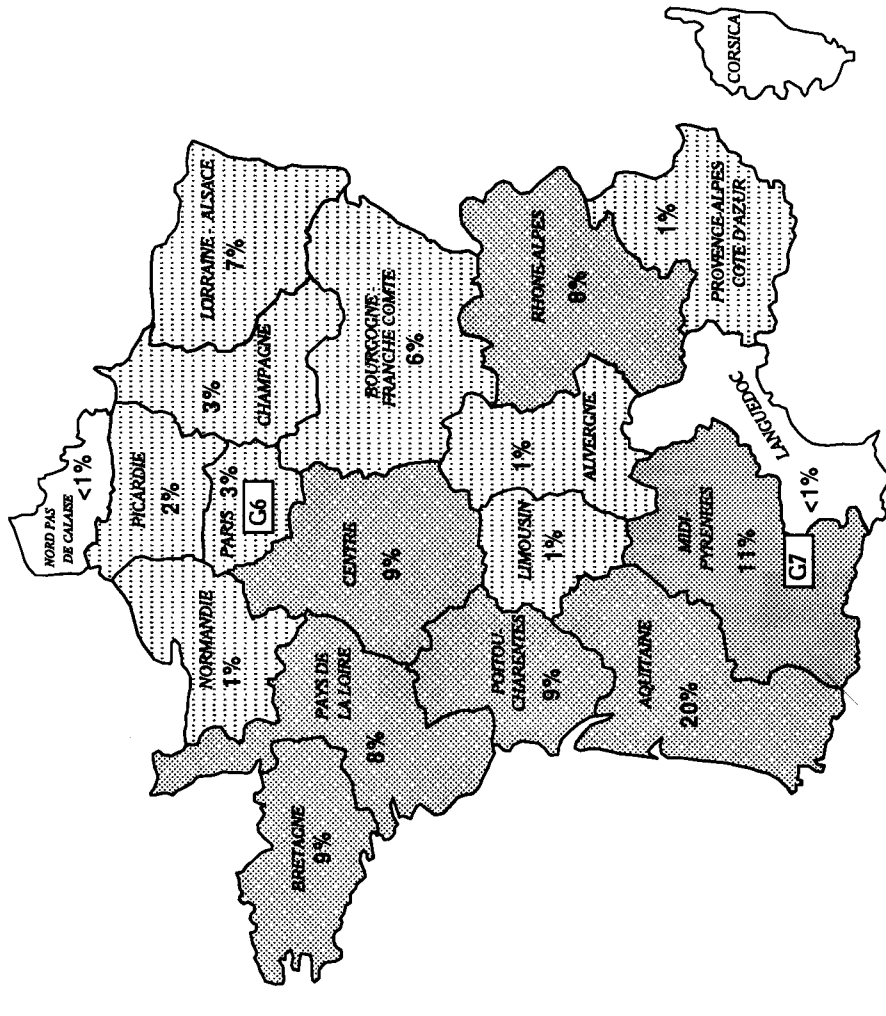
Percent of total arable land under cultivation by province



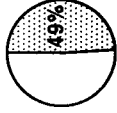
JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

France: Corn

Percent of total area by region



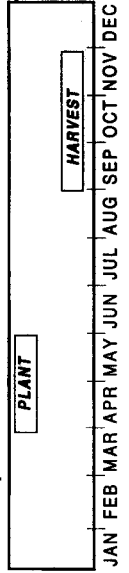
Percent of European Union corn production (1988/89-1992/93 average)



France: Historical corn statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1970/71	1,483	5.11	7,581
1971/72	1,685	5.25	8,840
1972/73	1,877	4.36	8,177
1973/74	1,952	5.47	10,671
1974/75	1,907	4.56	8,699
1975/76	1,960	4.18	8,194
1976/77	1,394	4.02	5,603
1977/78	1,627	5.29	8,614
1978/79	1,803	5.29	9,531
1979/80	1,997	5.22	10,427
1980/81	1,757	5.25	9,219
1981/82	1,571	5.70	8,956
1982/83	1,646	6.32	10,400
1983/84	1,654	6.29	10,400
1984/85	1,730	6.00	10,384
1985/86	1,857	6.66	12,367
1986/87	1,869	6.14	11,470
1987/88	1,737	7.17	12,454
1988/89	1,995	7.31	14,578
1989/90	1,910	7.02	13,400
1990/91	1,600	5.94	9,500
1991/92	1,774	7.29	12,928
1992/93	1,863	7.98	14,872
1988/89-1992/93 average	1,828	7.11	13,056

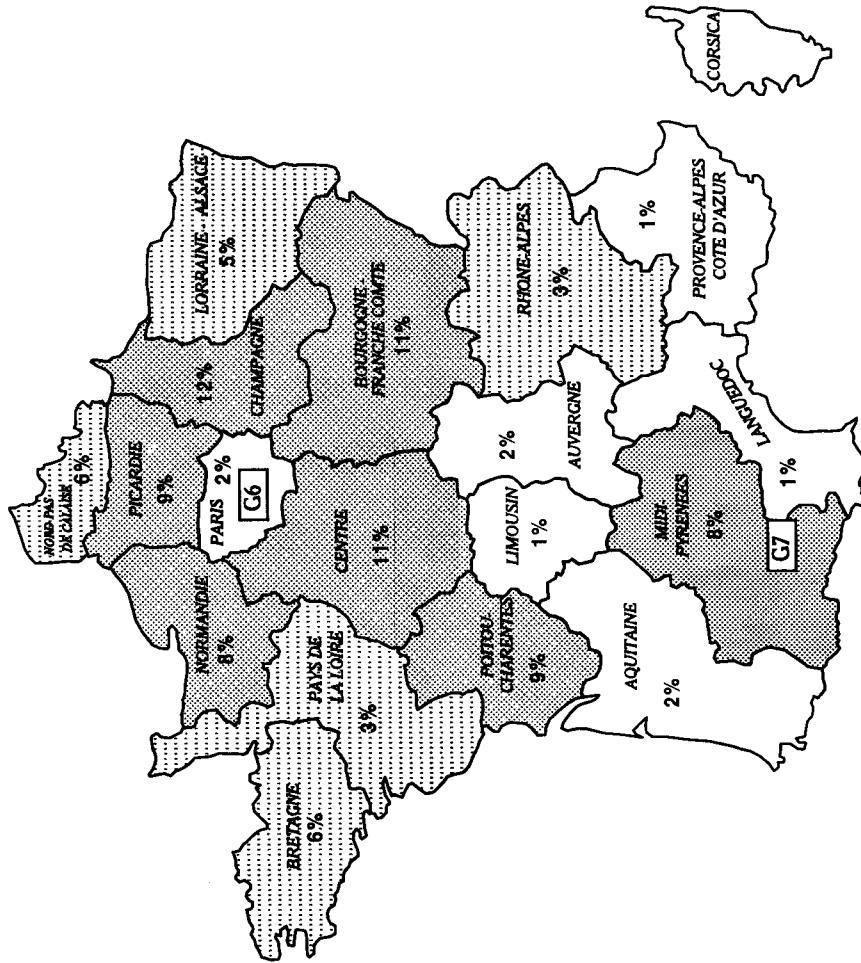
Corn crop calendar for most of France



JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

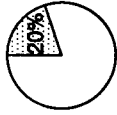
France: Barley

Percent of total area by region



Winter barley accounts for about 80 percent of total production.

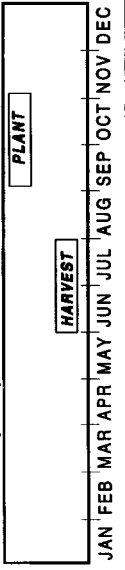
Percent of European Union barley production (1988/89-1992/93 average)



France: Historical barley statistics

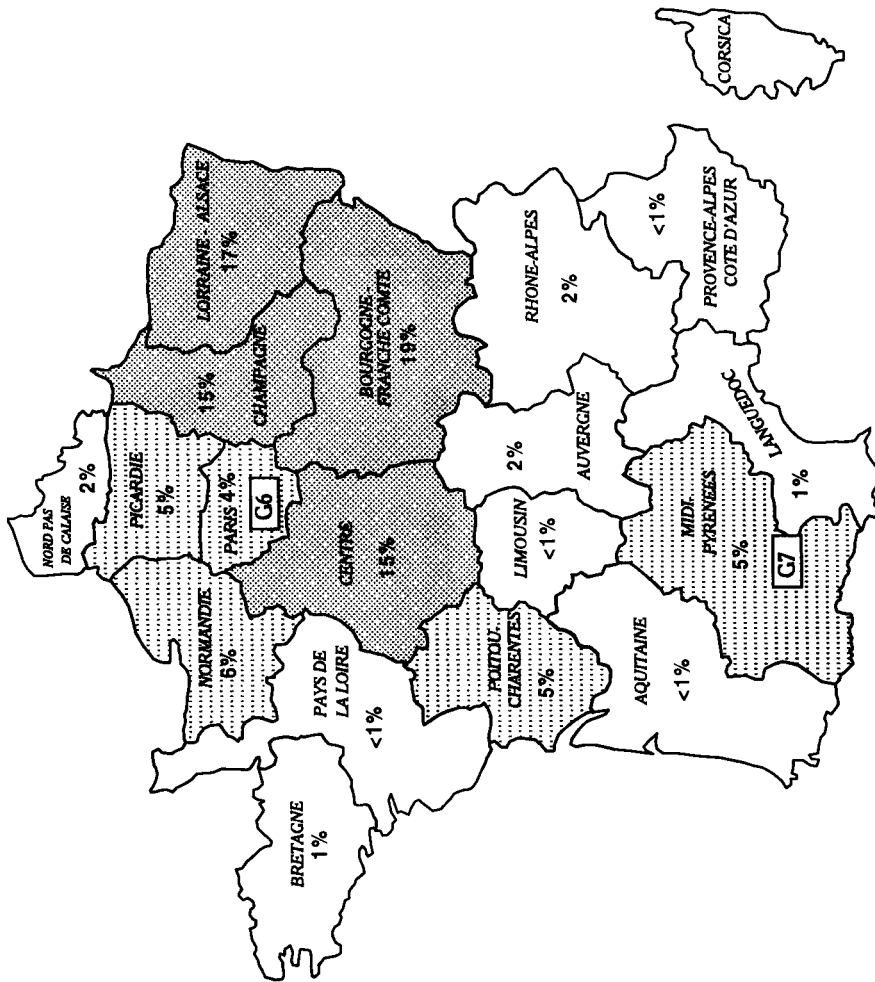
Crop Year	Area 1,000 ha	Yield U/ha	Prod. 1,000 t
1970/71	2,953	2.75	8,126
1971/72	2,668	3.35	8,930
1972/73	2,673	3.90	10,425
1973/74	2,788	3.89	10,844
1974/75	2,713	3.70	10,037
1975/76	2,770	3.37	9,344
1976/77	2,780	3.07	8,530
1977/78	2,909	3.54	10,290
1978/79	2,813	4.02	11,321
1979/80	2,802	4.00	11,196
1980/81	2,650	4.44	11,758
1981/82	2,679	3.82	10,231
1982/83	2,388	4.20	10,036
1983/84	2,140	4.09	8,759
1984/85	2,117	5.53	11,699
1985/86	2,248	5.10	11,470
1986/87	2,075	4.80	9,950
1987/88	1,967	5.35	10,528
1988/89	1,862	5.26	9,800
1989/90	1,810	5.44	9,840
1990/91	1,770	5.73	10,150
1991/92	1,742	6.19	10,789
1992/93	1,798	5.88	10,580
1988/89-1992/93 average	1,796	5.70	10,232

Winter barley crop calendar for most of France

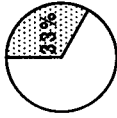


France: Rapeseed

Percent of total area by region



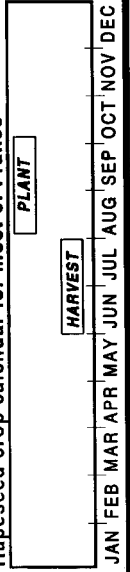
Percent of European Union rapeseed production (1988/89-1992/93 average)



France: Historical rapeseed statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1970/71	311	1.87	582
1971/72	322	2.06	663
1972/73	314	2.26	711
1973/74	327	1.93	631
1974/75	318	2.07	657
1975/76	261	1.82	474
1976/77	282	1.90	536
1977/78	275	1.41	388
1978/79	253	2.25	568
1979/80	223	2.29	510
1980/81	395	2.79	1,103
1981/82	469	2.11	990
1982/83	476	2.41	1,147
1983/84	463	1.96	906
1984/85	430	3.03	1,304
1985/86	461	2.91	1,340
1986/87	388	2.76	1,071
1987/88	740	3.57	2,645
1988/89	869	2.65	2,302
1989/90	633	2.76	1,748
1990/91	693	2.80	1,937
1991/92	739	3.07	2,270
1992/93	686	2.64	1,810
1988/89-1992/93 average	724	2.78	2,013

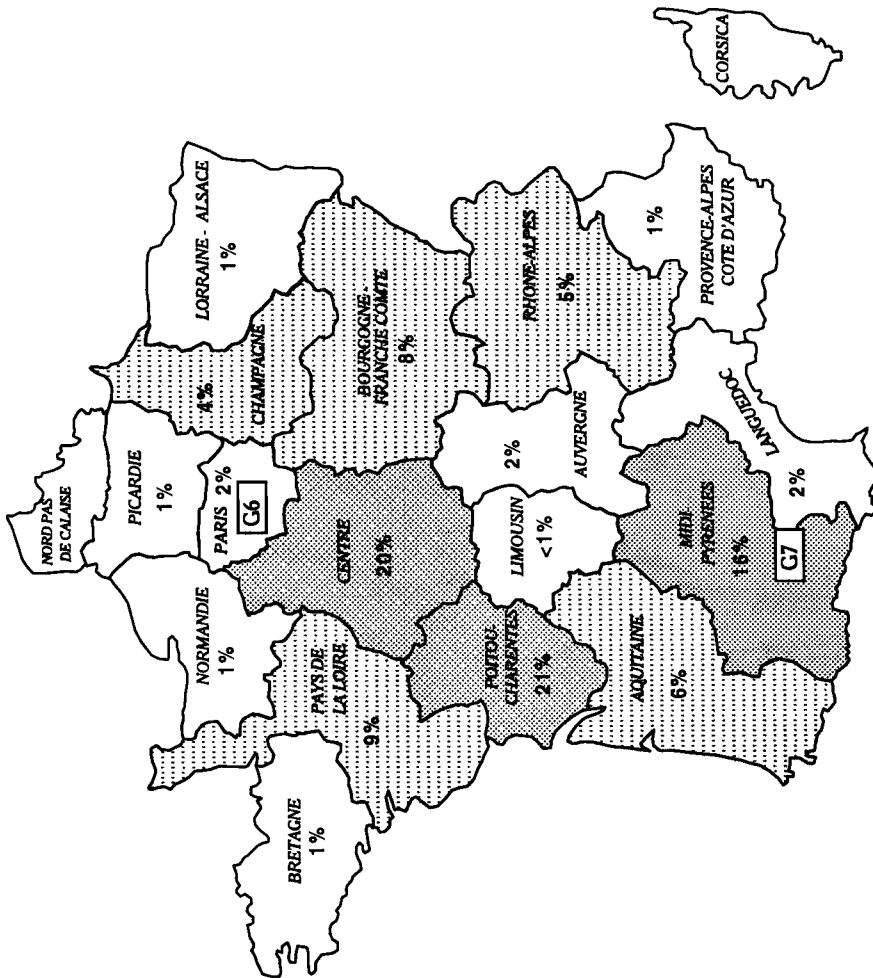
Rapeseed crop calendar for most of France



JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

France: Sunflowerseed

Percent of total area by region



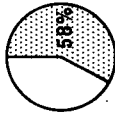
Gx Climate stations

1-2%

3-10%

Greater than 10%

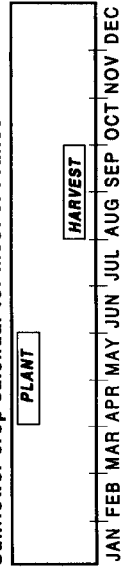
Percent of European Union sunflowerseed production (1988/89-1992/93 average)



France: Historical sunflowerseed statistics

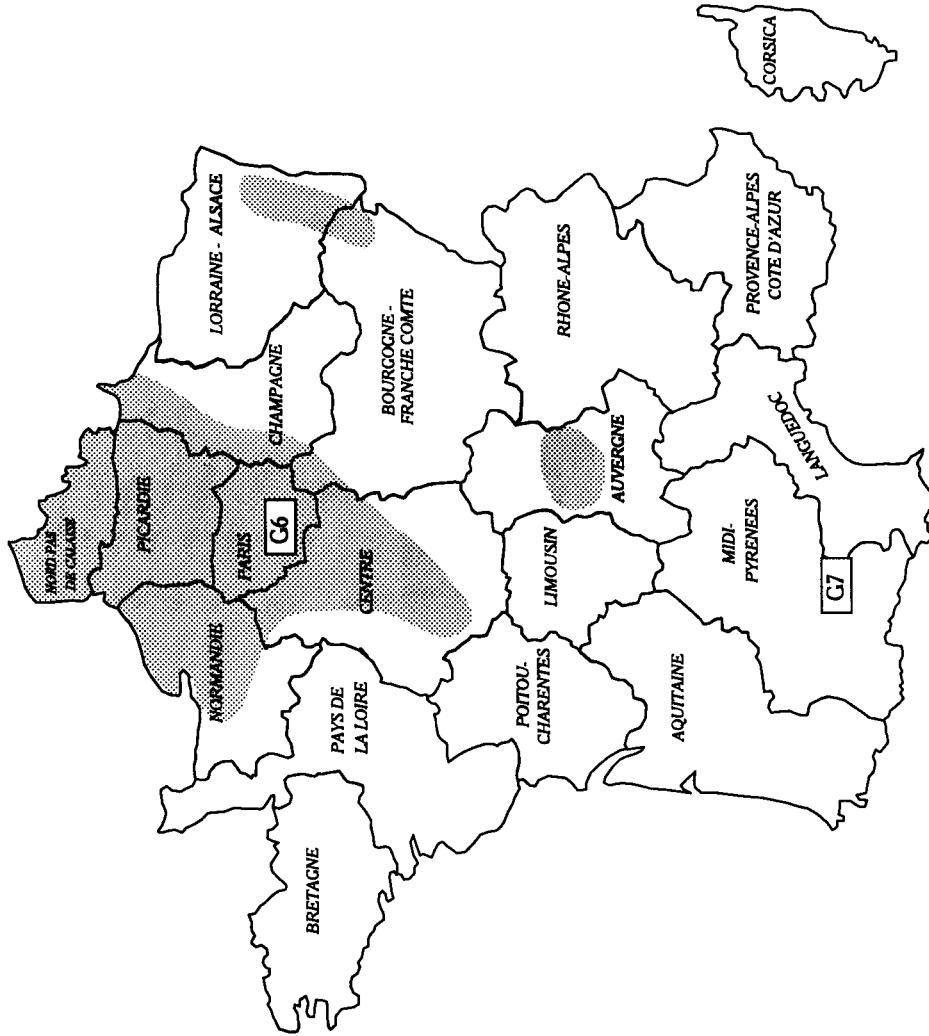
Year	Area		Yield		Prod. 1,000 t
	1,000 ha	ha	t/ha	1,000 t	
1975/76	61	1.62	99	99	99
1976/77	45	1.38	62	62	62
1977/78	38	1.82	69	69	69
1978/79	39	1.95	76	76	76
1979/80	83	1.92	159	159	159
1980/81	98	2.32	227	227	227
1981/82	155	2.57	398	398	398
1982/83	282	2.30	650	650	650
1983/84	416	1.99	828	828	828
1984/85	476	2.01	958	958	958
1985/86	591	2.50	1,477	1,477	1,477
1986/87	849	2.24	1,902	1,902	1,902
1987/88	965	2.60	2,508	2,508	2,508
1988/89	951	2.46	2,335	2,335	2,335
1989/90	907	2.34	2,125	2,125	2,125
1990/91	1,140	2.12	2,415	2,415	2,415
1991/92	1,071	2.40	2,570	2,570	2,570
1992/93	985	2.14	2,110	2,110	2,110
1988/89-1992/93 average	1,011	2.29	2,311	2,311	2,311

Sunflower crop calendar for most of France

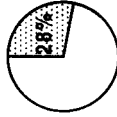


JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

France: Sugarbeets



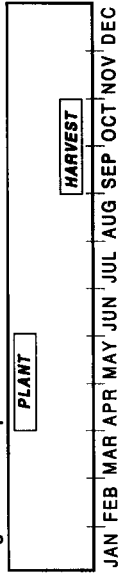
Percent of European Union
sugarbeet production
(1988/89-1992/93 average)



France: Historical sugarbeet statistics

Crop Year	Area		Yield t/ha	Prod.		Raw sugar 1,000 t
	1,000 ha	1,000 t		1,000 t	1,000 t	
1980/81	526	48.0	25,248	4,262		
1981/82	616	54.1	33,332	5,576		
1982/83	539	55.1	29,680	4,833		
1983/84	466	48.6	22,643	3,872		
1984/85	506	53.0	26,803	4,301		
1985/86	464	51.2	23,764	4,297		
1986/87	421	50.8	21,387	3,707		
1987/88	450	53.6	24,115	3,966		
1988/89	430	59.0	25,380	4,372		
1989/90	427	56.0	23,915	4,204		
1990/91	478	53.4	25,520	4,736		
1991/92	455	53.6	24,403	4,413		
1992/93	457	58.0	26,491	4,723		
1988/89- 1992/93 average	449	56.0	25,142	4,490		

Sugarbeet crop calendar for most of France

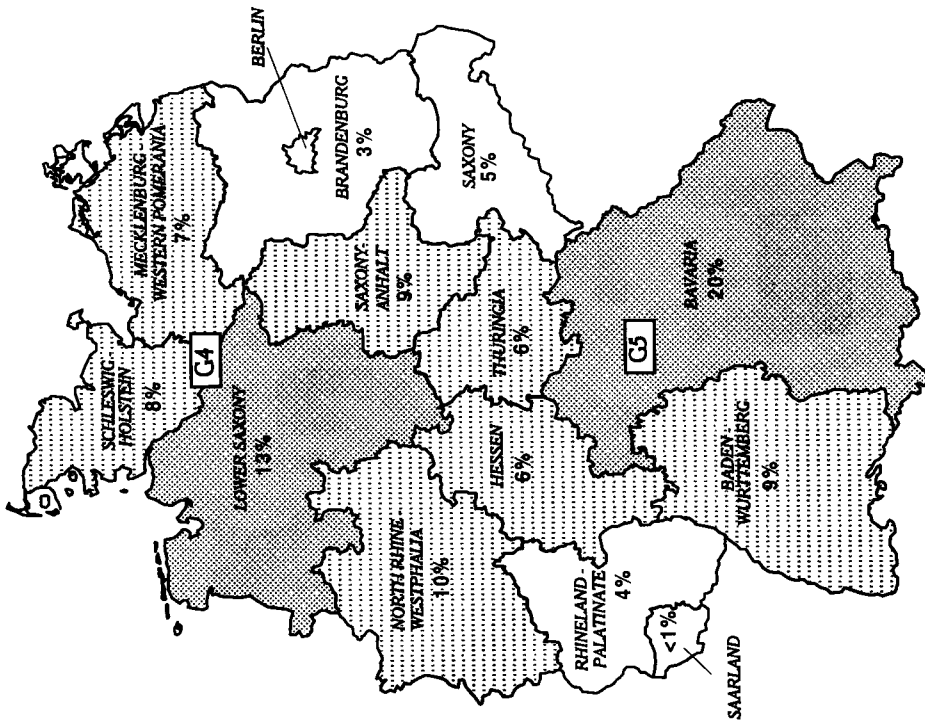


Gx Climate stations

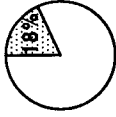
Major growing areas

Germany: Wheat

Percent of total area by state



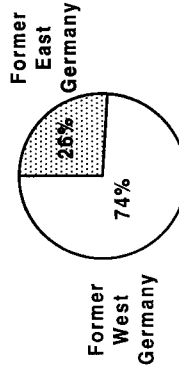
Percent of European Union wheat production (1988/89-1992/93 average)



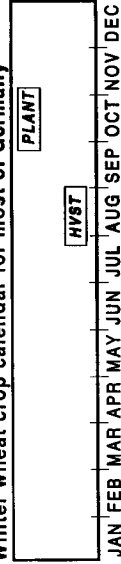
Germany: Historical wheat statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1991/92	2,453	6.77	16,610
1992/93	2,598	5.98	15,542
1991/92-1992/93 average	2,526	6.38	16,076

Percent of total German wheat production (1986/87-1990/91 average)



Winter wheat crop calendar for most of Germany



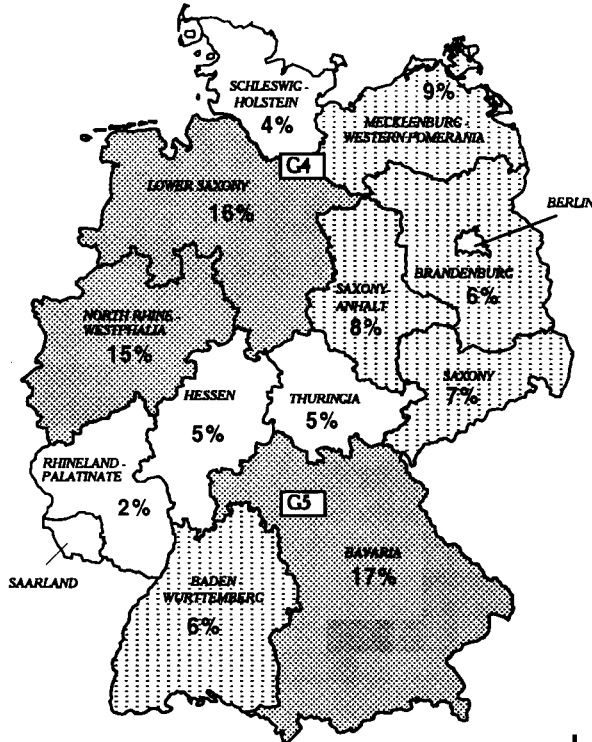
Legend

- 0-5%
- 6-10%
- Greater than 10%
- Climate stations

Germany: Winter and spring barley

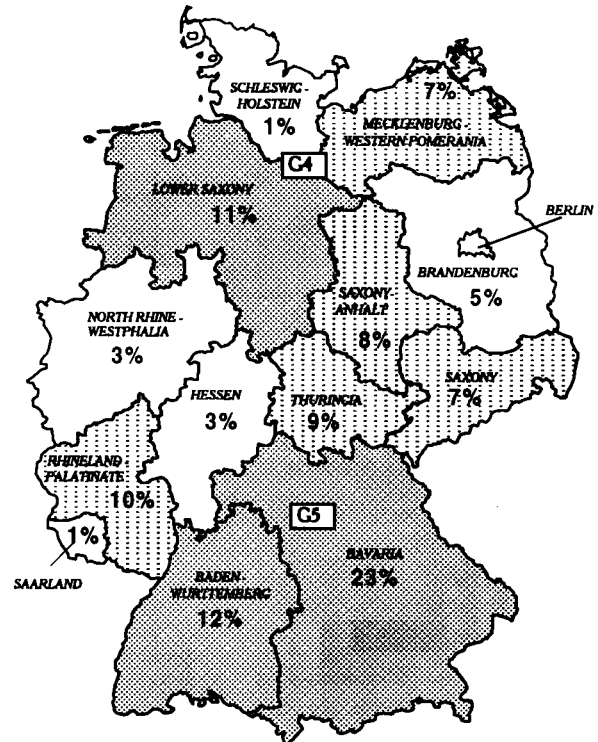
Percent of total winter barley area

(60% of total barley area)



Percent of total spring barley area

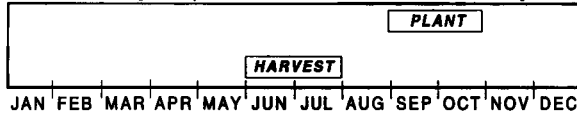
(40% of total barley area)



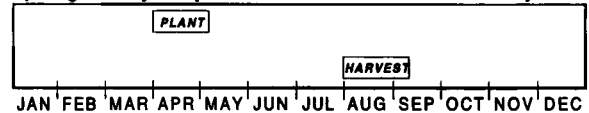
Legend



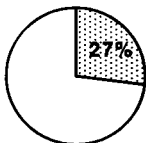
Winter barley crop calendar for most of Germany



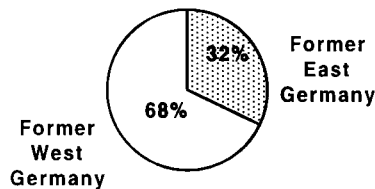
Spring barley crop calendar for most of Germany



Percent of European Union barley production (1988/89-1992/93 average)



Percent of total German barley production (1988/89-1992/93 average)

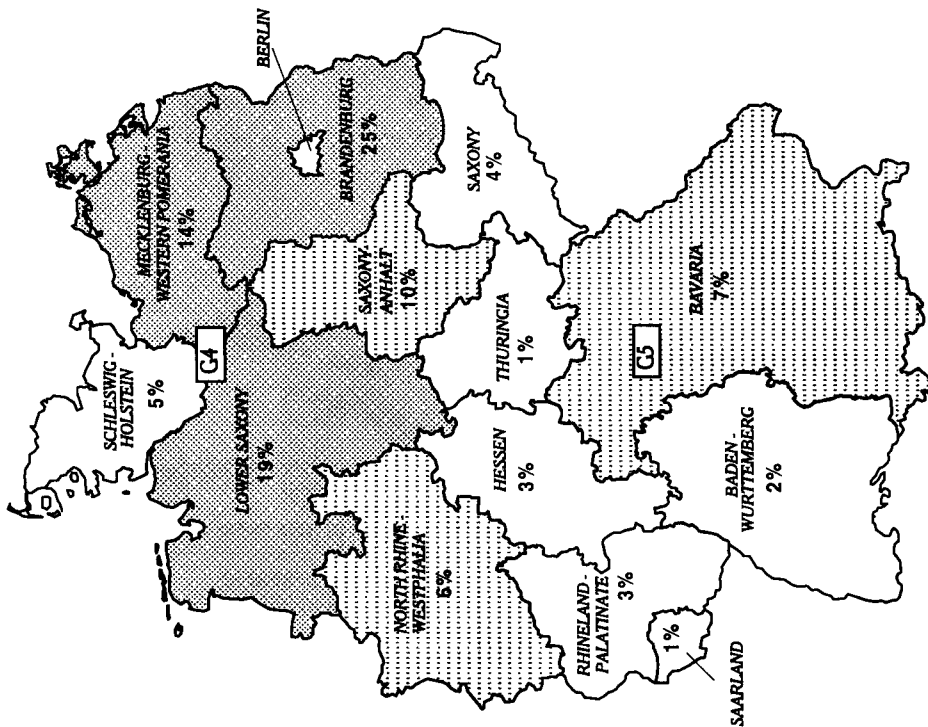


Germany: Historical barley statistics

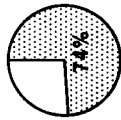
Crop Year	Area (1,000 ha)	Yield (t/ha)	Prod. (1,000 t)
1991/92	2,535	5.72	14,494
1992/93	2,408	5.06	12,196
1991/92-1992/93 average	2,472	5.39	13,345

Germany: Rye

Percent of total area by state



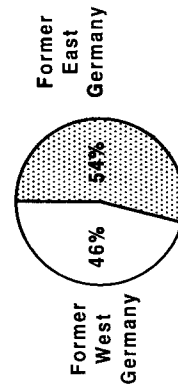
Percent of European Union rye production (1988/89-1992/93 average)



Germany: Historical rye statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1991/92	711	4.68	3,324
1992/93	615	3.94	2,422
1991/92-1992/93 average	663	4.31	2,873

Percent of total German rye production (1986/87-1990/91 average)



Legend

- 0-4%
- 5-9%
- Greater than 10%
- Climate stations

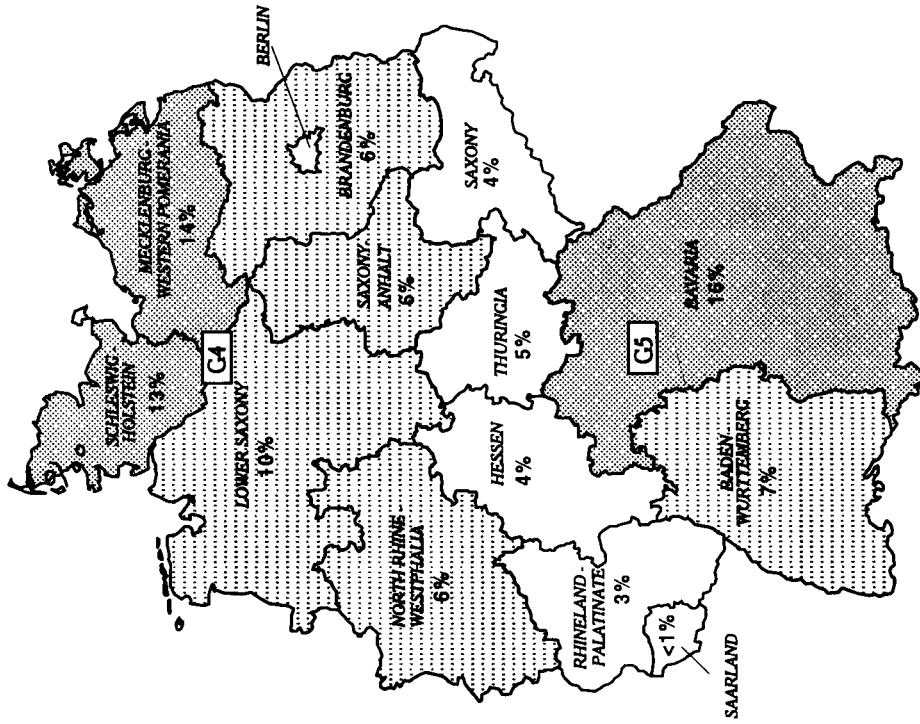
Rye crop calendar for most of Germany



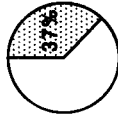
JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Germany: Rapeseed

Percent of total area by state
(98% is winter rapeseed)



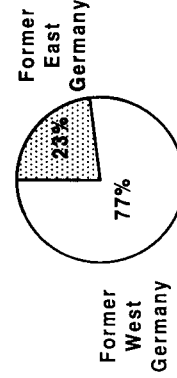
Percent of European Union rapeseed production (1988/89-1992/93 average)



Germany: Historical rapeseed statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1991/92	950	3.19	3,030
1992/93	1,001	2.61	2,617
1991/92-1992/93 average	976	2.90	2,824

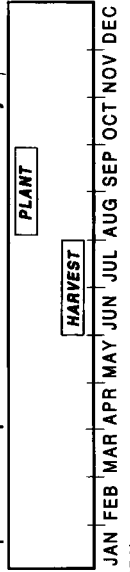
Percent of total German rapeseed production (1986/87-1990/91 average)



Legend

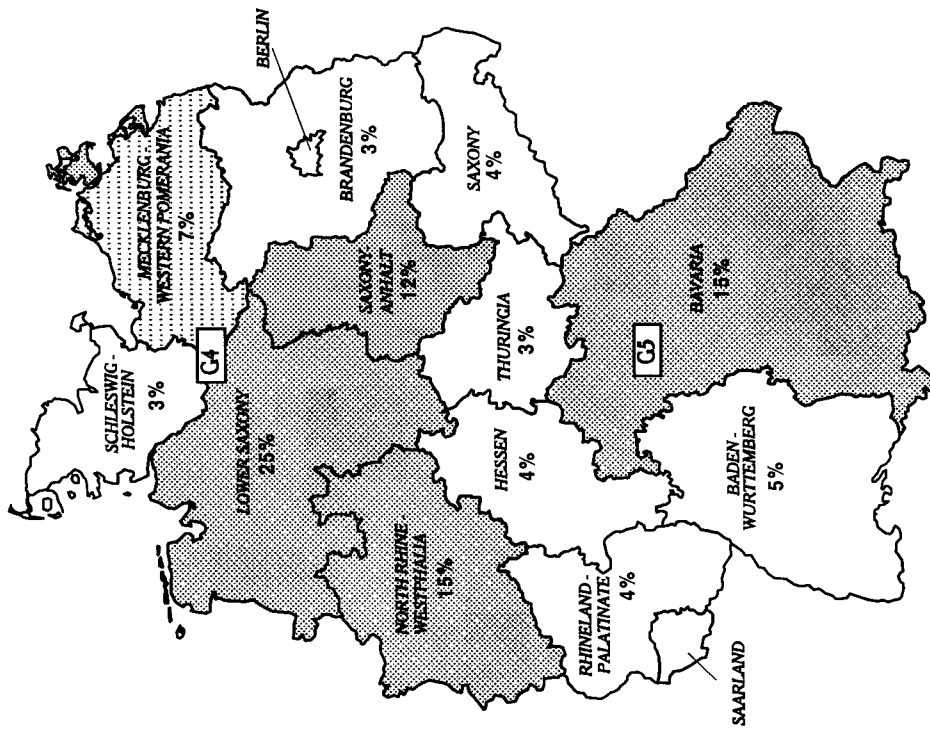
- 0-5%
- 6-10%
- Greater than 10%
- Climate stations

Rapeseed crop calendar for most of Germany

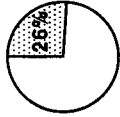


Germany: Sugarbeets

Percent of total area by state



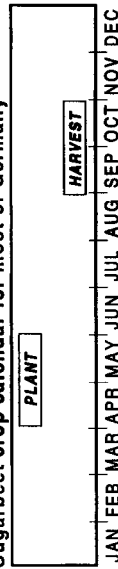
Percent of European Union
sugarbeet production
(1988/89-1992/93 average)



Germany: Historical sugarbeet statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t	Raw sugar 1,000 t
1991/92	574	45.2	25,926	4,250
1992/93	552	49.2	27,177	4,401
1991/92- 1992/93 average	563	47.2	26,552	4,326

Sugarbeet crop calendar for most of Germany



Legend

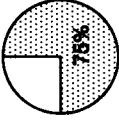
- 0-5%
- 6-10%
- Greater than 10%
- Climate stations

JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Greece: Cotton



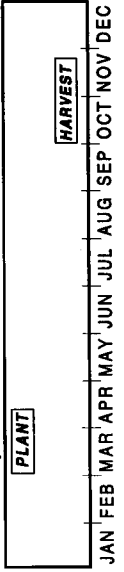
Percent of European Union cotton production (1988/89-1992/93 average)



Greece: Historical cotton statistics

Crop Year	Area		Yield t/ha	Prod. 1,000 lbs.	Prod. bales
	1,000 ha	ha			
1970/71	132	833	833	505	505
1971/72	130	892	892	533	533
1972/73	167	838	838	643	643
1973/74	147	728	728	491	491
1974/75	154	818	818	579	579
1975/76	136	956	956	597	597
1976/77	149	792	792	542	542
1977/78	183	836	836	703	703
1978/79	168	911	911	703	703
1979/80	142	754	754	491	491
1980/81	141	823	823	533	533
1981/82	126	952	952	551	551
1982/83	137	693	693	436	436
1983/84	168	762	762	588	588
1984/85	192	755	755	666	666
1985/86	203	828	828	772	772
1986/87	205	1,024	1,024	965	965
1987/88	202	861	861	799	799
1988/89	256	914	914	1,075	1,075
1989/90	278	917	917	1,171	1,171
1990/91	282	745	745	965	965
1991/92	230	939	939	992	992
1992/93	276	942	942	1,194	1,194
1988/89-1992/93 average	264	891	891	1,079	1,079

Cotton crop calendar for most of Greece



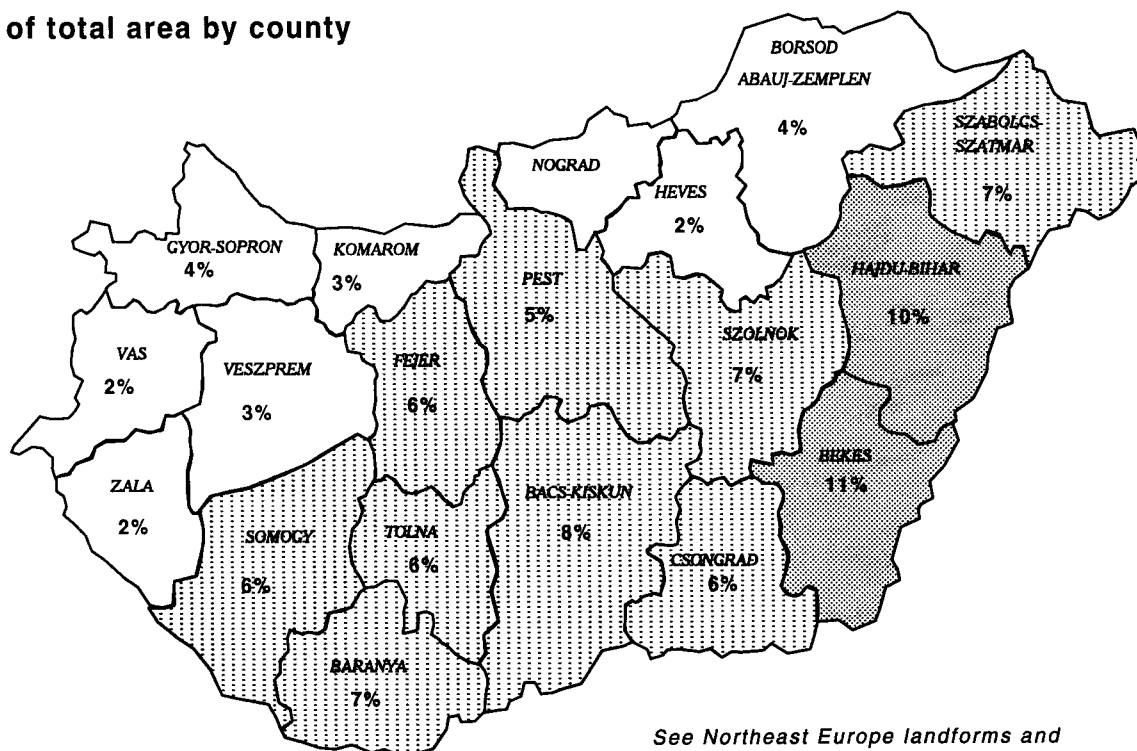
Cx Climate stations

Major growing areas

JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

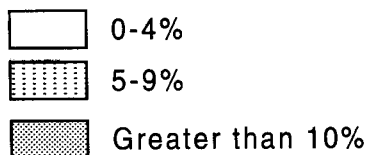
Hungary: Corn

Percent of total area by county

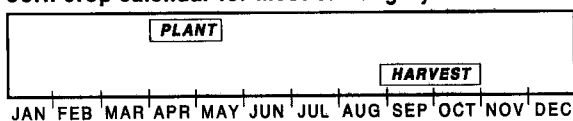


See Northeast Europe landforms and climate map for nearby climate stations.

Legend



Corn crop calendar for most of Hungary



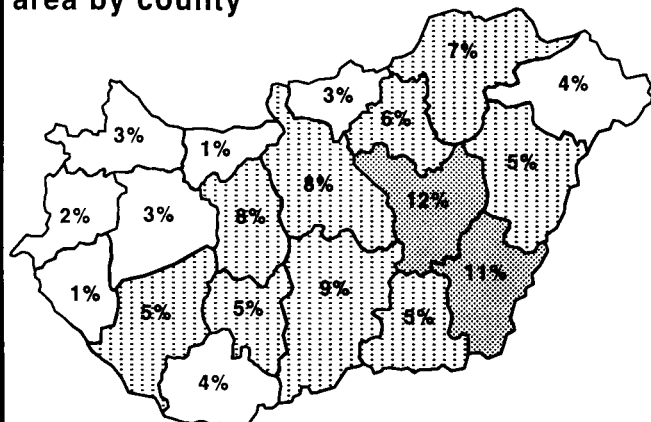
Hungary: Historical corn statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1970/71	1,189	3.38	4,013
1971/72	1,321	3.58	4,732
1972/73	1,392	3.99	5,554
1973/74	1,461	4.08	5,963
1974/75	1,461	4.24	6,195
1975/76	1,413	5.01	7,080
1976/77	1,339	3.84	5,141
1977/78	1,281	4.69	6,007
1978/79	1,283	5.19	6,655
1979/80	1,352	5.47	7,396
1980/81	1,229	5.43	6,673
1981/82	1,163	6.02	6,998
1982/83	1,130	6.86	7,752
1983/84	1,102	5.68	6,256
1984/85	1,107	5.88	6,514
1985/86	1,053	6.47	6,818
1986/87	1,118	6.49	7,261
1987/88	1,144	6.32	7,234
1988/89	1,103	5.47	6,028
1989/90	1,084	6.22	6,747
1990/91	1,082	3.99	4,317
1991/92	1,106	7.00	7,745
1992/93	1,164	3.70	4,301
1988/89-1992/93 average	1,108	5.28	5,828

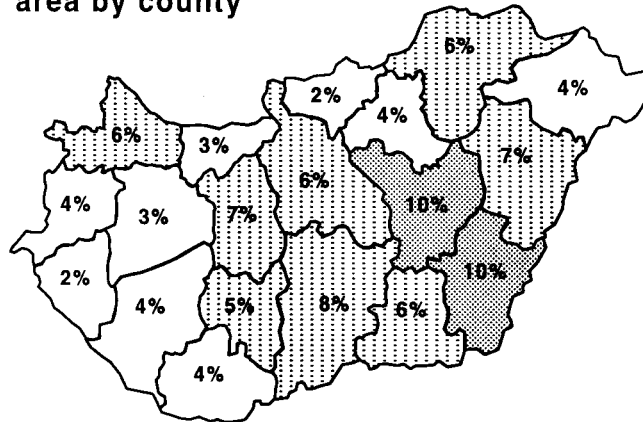
JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Hungary: Sunflowerseed and wheat

Percent of total sunflowerseed area by county



Percent of total wheat area by county

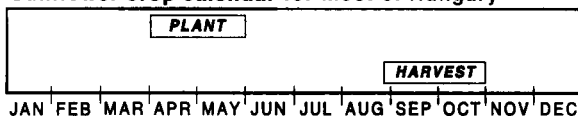


Legend



See Northeast Europe landforms and climate map for nearby climate stations; Hungary corn map for county names.

Sunflower crop calendar for most of Hungary



Winter wheat crop calendar for most of Hungary



Hungary: Historical sunflowerseed statistics

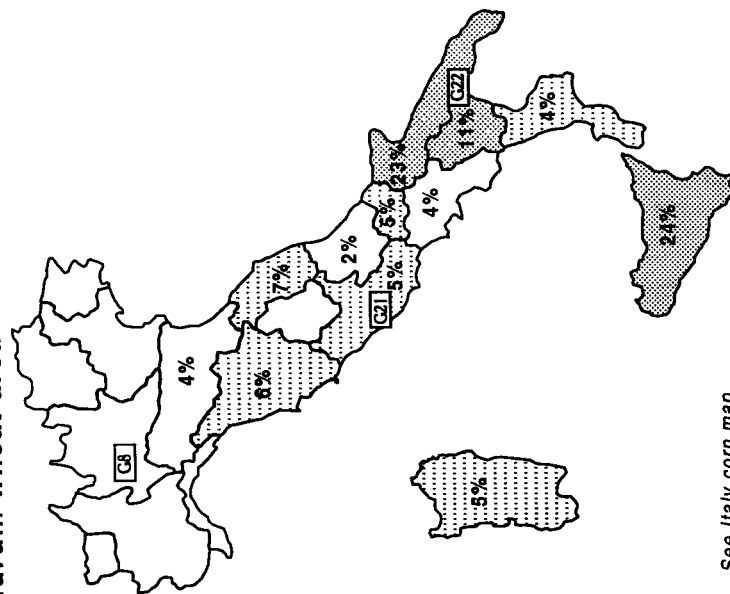
Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1975/76	129	1.19	154
1976/77	135	1.37	185
1977/78	138	1.53	211
1978/79	151	1.48	223
1979/80	228	1.83	417
1980/81	273	1.67	456
1981/82	302	2.08	627
1982/83	297	1.96	582
1983/84	287	2.07	593
1984/85	317	1.89	600
1985/86	343	1.96	673
1986/87	391	2.19	857
1987/88	376	2.09	787
1988/89	363	1.95	708
1989/90	356	1.94	692
1990/91	346	1.95	673
1991/92	389	2.05	797
1992/93	427	1.77	756
1988/89-1992/93 average	376	1.93	725

Hungary: Historical wheat statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1970/71	1,274	2.13	2,718
1971/72	1,273	3.08	3,915
1972/73	1,317	3.10	4,089
1973/74	1,294	3.48	4,498
1974/75	1,324	3.75	4,968
1975/76	1,251	3.20	4,005
1976/77	1,325	3.88	5,143
1977/78	1,311	4.05	5,315
1978/79	1,324	4.28	5,673
1979/80	1,135	3.26	3,703
1980/81	1,276	4.76	6,077
1981/82	1,151	4.01	4,614
1982/83	1,310	4.39	5,751
1983/84	1,355	4.40	5,968
1984/85	1,361	5.41	7,367
1985/86	1,358	4.84	6,578
1986/87	1,318	4.40	5,793
1987/88	1,301	4.42	5,748
1988/89	1,281	5.44	6,975
1989/90	1,242	5.24	6,509
1990/91	1,121	5.50	6,161
1991/92	1,152	5.22	6,008
1992/93	848	4.06	3,444
1988/89-1992/93 average	1,129	5.09	5,819

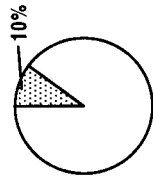
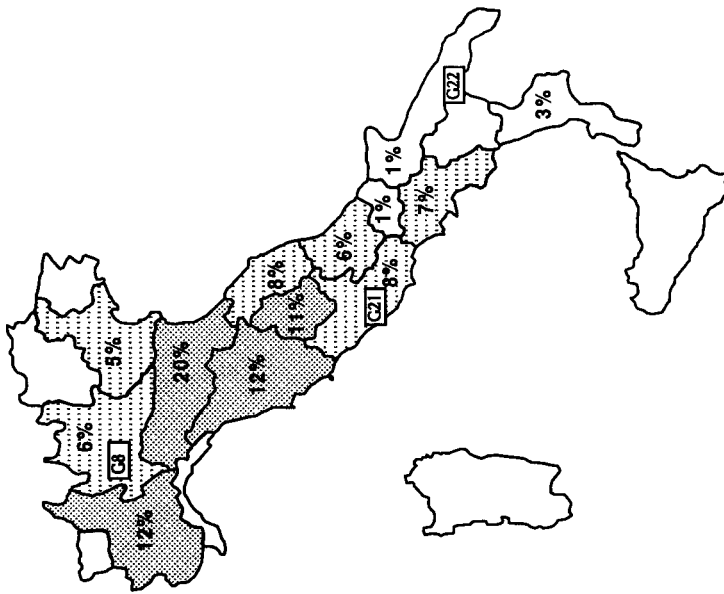
Italy: Wheat

Percent of total durum wheat area



See Italy corn map for region names.

Percent of total soft wheat area



Percent of European Union wheat production (1988/89-1992/93 average)

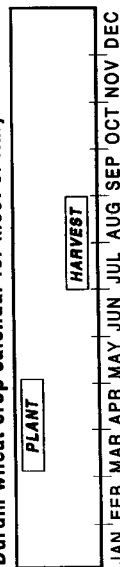
Italy: Historical wheat statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1970/71	4,138	2.33	9,630
1971/72	3,952	2.55	10,070
1972/73	3,804	2.48	9,421
1973/74	3,590	2.48	8,921
1974/75	3,713	2.61	9,697
1975/76	3,545	2.71	9,610
1976/77	3,544	2.57	9,106
1977/78	2,786	2.23	6,218
1978/79	3,472	2.65	9,191
1979/80	3,452	2.60	8,980
1980/81	3,405	2.69	9,150
1981/82	3,258	2.71	8,828
1982/83	3,326	2.68	8,903
1983/84	3,328	2.56	8,514
1984/85	3,274	3.07	10,057
1985/86	3,034	2.79	8,461
1986/87	3,136	2.90	9,102
1987/88	3,087	3.04	9,381
1988/89	2,876	2.76	7,952
1989/90	2,943	2.52	7,413
1990/91	2,773	2.92	8,108
1991/92	2,663	3.51	9,416
1992/93	2,519	3.55	8,943
1988/89-1992/93 average	2,759	3.05	8,366

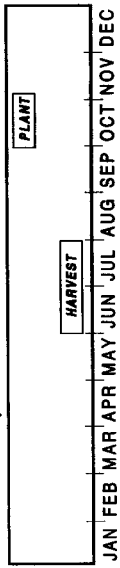
Legend

- 0-4%
- 5-9%
- Greater than 10%
- Climate stations

Durum wheat crop calendar for most of Italy



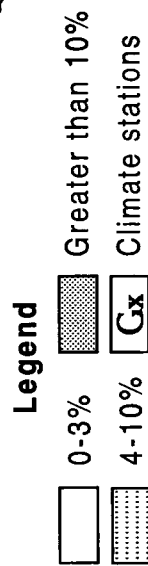
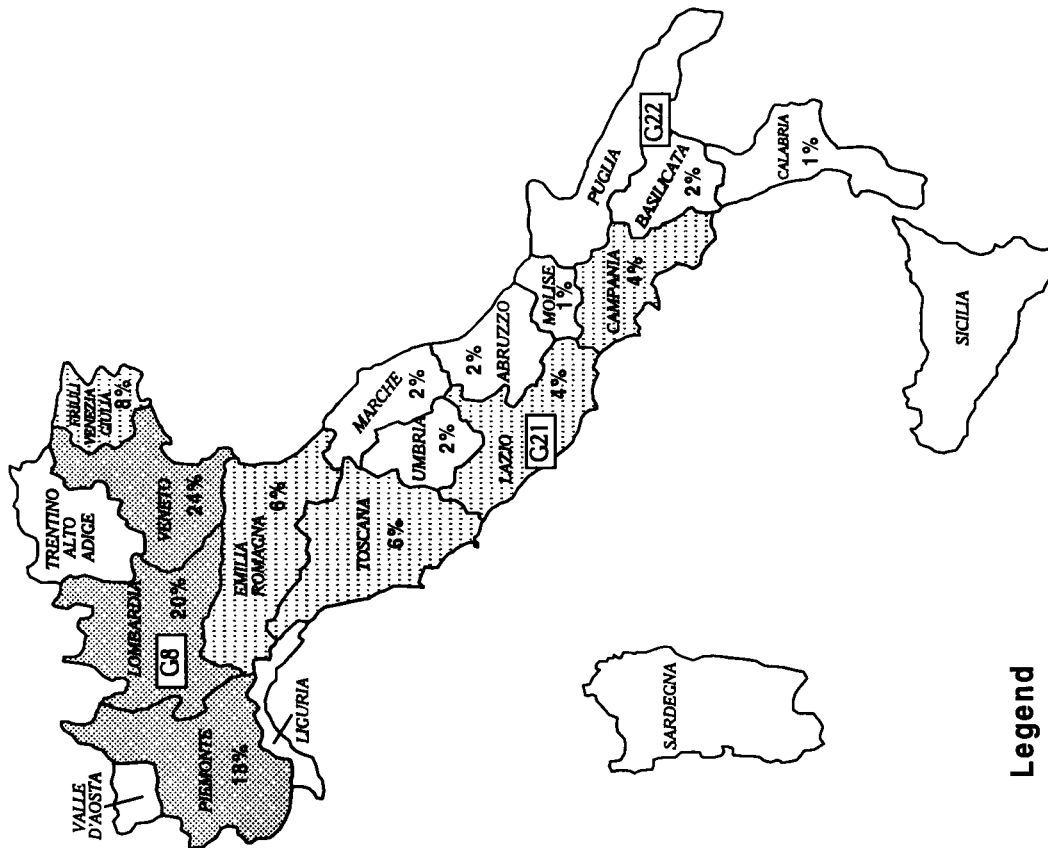
Soft wheat crop calendar for most of Italy



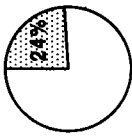
JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Italy: Corn

Percent of total area by region



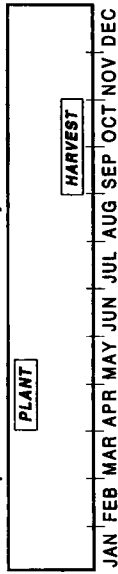
Percent of European Union corn production (1988/89-1992/93 average)



Italy: Historical corn statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1970/71	1,026	4.61	4,729
1971/72	936	4.77	4,469
1972/73	891	5.37	4,789
1973/74	891	5.71	5,088
1974/75	890	5.67	5,043
1975/76	897	5.94	5,326
1976/77	889	5.84	5,196
1977/78	983	6.51	6,396
1978/79	928	6.64	6,162
1979/80	936	6.62	6,197
1980/81	936	6.81	6,377
1981/82	998	7.21	7,197
1982/83	1,011	6.77	6,847
1983/84	986	6.76	6,669
1984/85	961	6.94	6,672
1985/86	923	6.89	6,357
1986/87	849	7.54	6,401
1987/88	768	7.50	5,762
1988/89	843	7.49	6,318
1989/90	804	7.91	6,359
1990/91	768	7.64	5,864
1991/92	859	7.26	6,238
1992/93	854	8.68	7,413
1988/89-1992/93 average	826	7.80	6,438

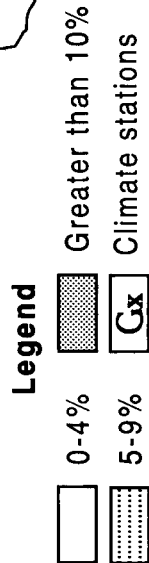
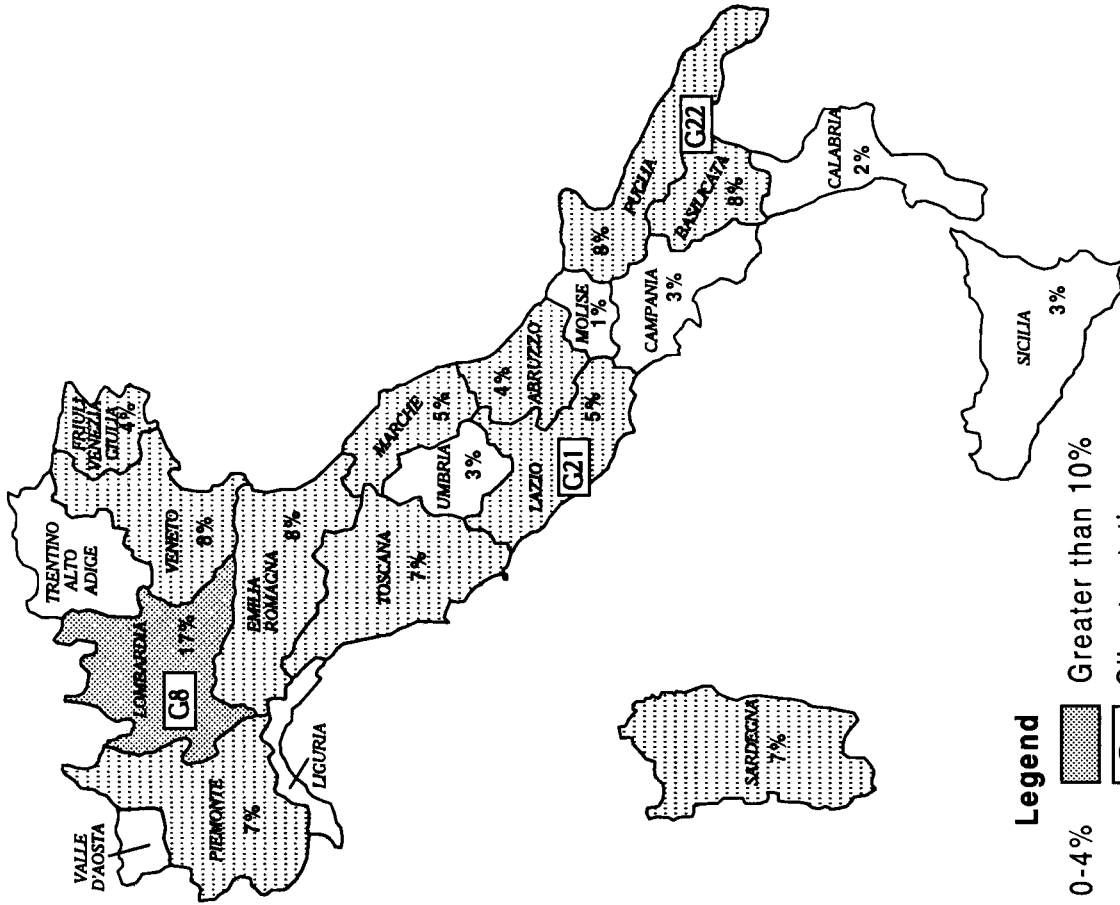
Corn crop calendar for most of Italy



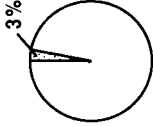
JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Italy: Barley

Percent of total area by region



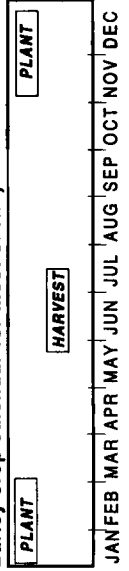
Percent of European Union
barley production
(1988/89-1992/93 average)



Italy: Historical barley statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1970/71	179	1.76	315
1971/72	185	2.02	373
1972/73	186	2.10	390
1973/74	203	2.26	458
1974/75	224	2.50	560
1975/76	249	2.60	648
1976/77	274	2.65	725
1977/78	290	2.30	668
1978/79	294	2.79	819
1979/80	308	2.64	813
1980/81	330	2.87	947
1981/82	338	2.91	983
1982/83	352	3.01	1,060
1983/84	383	3.07	1,174
1984/85	434	3.73	1,618
1985/86	468	3.48	1,630
1986/87	465	3.32	1,543
1987/88	445	3.84	1,708
1988/89	450	3.47	1,561
1989/90	471	3.49	1,644
1990/91	467	3.64	1,702
1991/92	472	3.80	1,793
1992/93	450	3.87	1,741
1988/89-1992/93 average	462	3.65	1,688

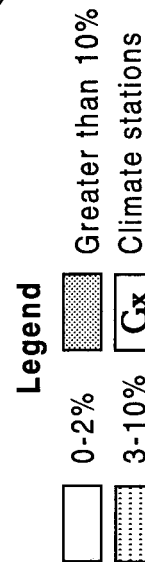
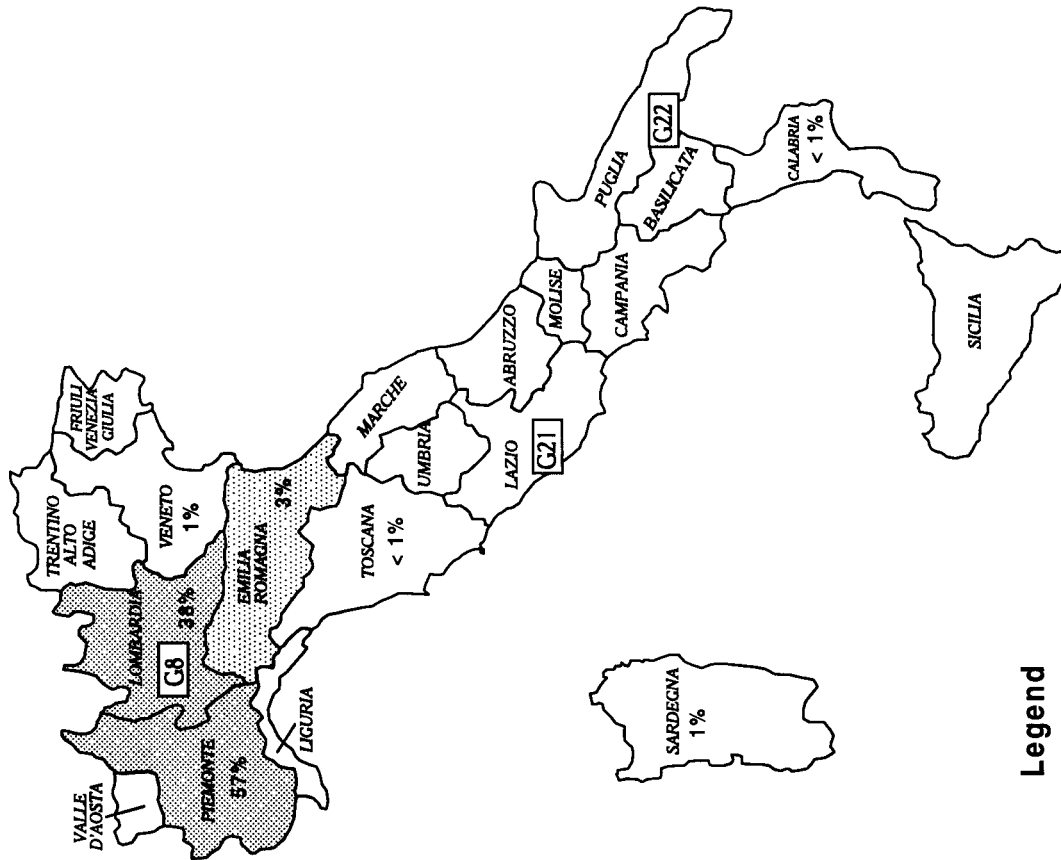
Barley crop calendar for most of Italy



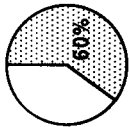
JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Italy: Rice

Percent of total area by region



Percent of European Union rice production (1988/89-1992/93 average)



Italy: Historical rice statistics

Crop Year	Area 1,000 ha	Yield		Prod. (Milled) 1,000 t
		(Rough)	t/ha	
1970/71	173	4.73	5.73	573
1971/72	175	5.09	6.24	624
1972/73	183	4.10	5.26	526
1973/74	190	5.49	7.31	731
1974/75	188	5.57	7.33	733
1975/76	174	5.80	7.06	706
1976/77	182	4.98	6.35	635
1977/78	186	3.87	5.03	503
1978/79	191	5.01	6.69	669
1979/80	183	6.16	7.89	789
1980/81	176	5.51	6.78	678
1981/82	169	5.68	6.24	624
1982/83	178	5.36	6.20	620
1983/84	184	5.59	6.48	648
1984/85	180	5.62	6.58	658
1985/86	187	6.38	7.99	799
1986/87	193	5.72	7.28	728
1987/88	191	5.83	7.46	746
1988/89	199	5.62	7.50	750
1989/90	206	6.67	9.21	921
1990/91	215	6.75	9.72	972
1991/92	206	6.45	8.50	850
1992/93	216	5.95	7.97	797
1988/89-1992/93 average	208	6.29	8.58	858

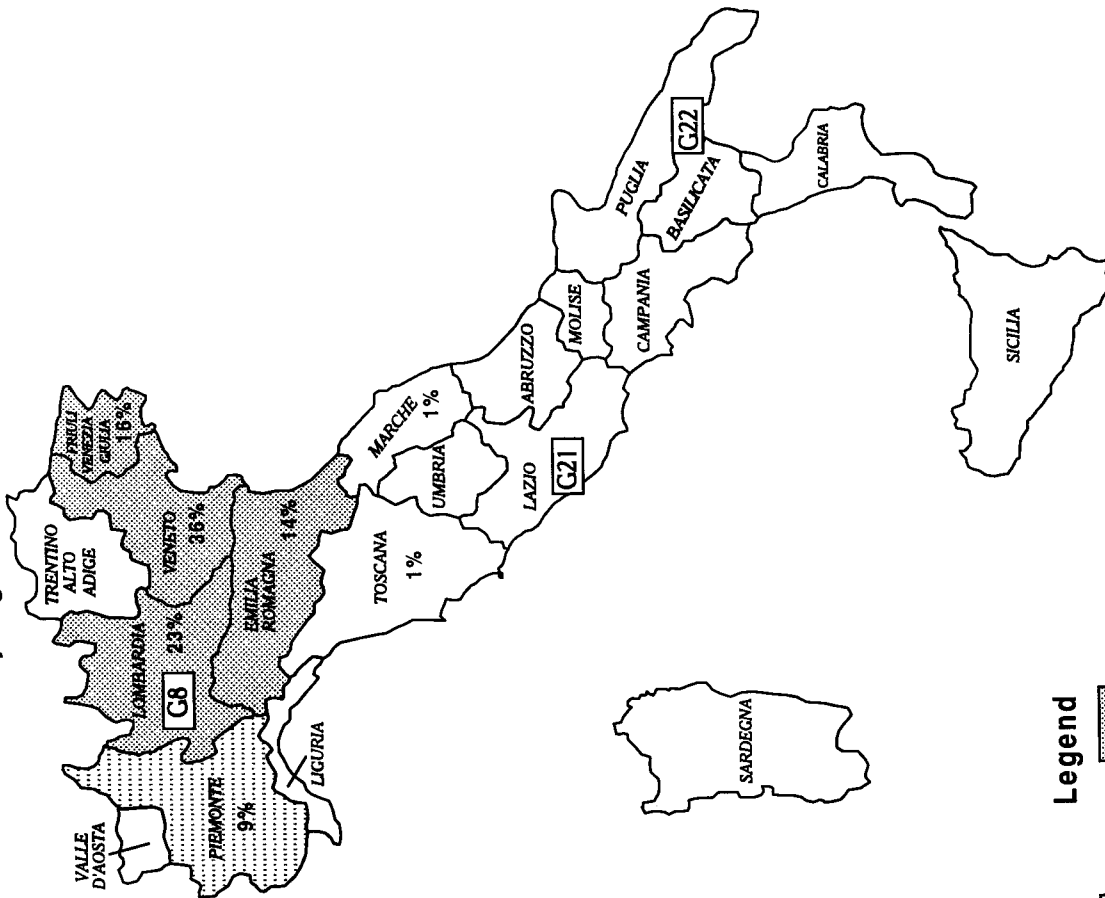
Rice crop calendar for most of Italy



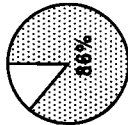
JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Italy: Soybeans

Percent of total area by region



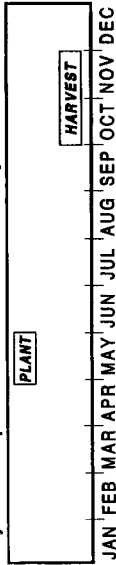
Percent of European Union soybean production (1988/89-1992/93 average)



Italy: Historical soybean statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1983/84	25	2.48	62
1984/85	36	3.06	110
1985/86	94	3.04	286
1986/87	232	3.47	806
1987/88	481	3.30	1,589
1988/89	432	3.26	1,408
1989/90	477	3.40	1,624
1990/91	521	3.36	1,751
1991/92	413	3.20	1,320
1992/93	355	3.00	1,065
1988/89-1992/93 average	440	3.24	1,434

Soybean crop calendar for most of Italy



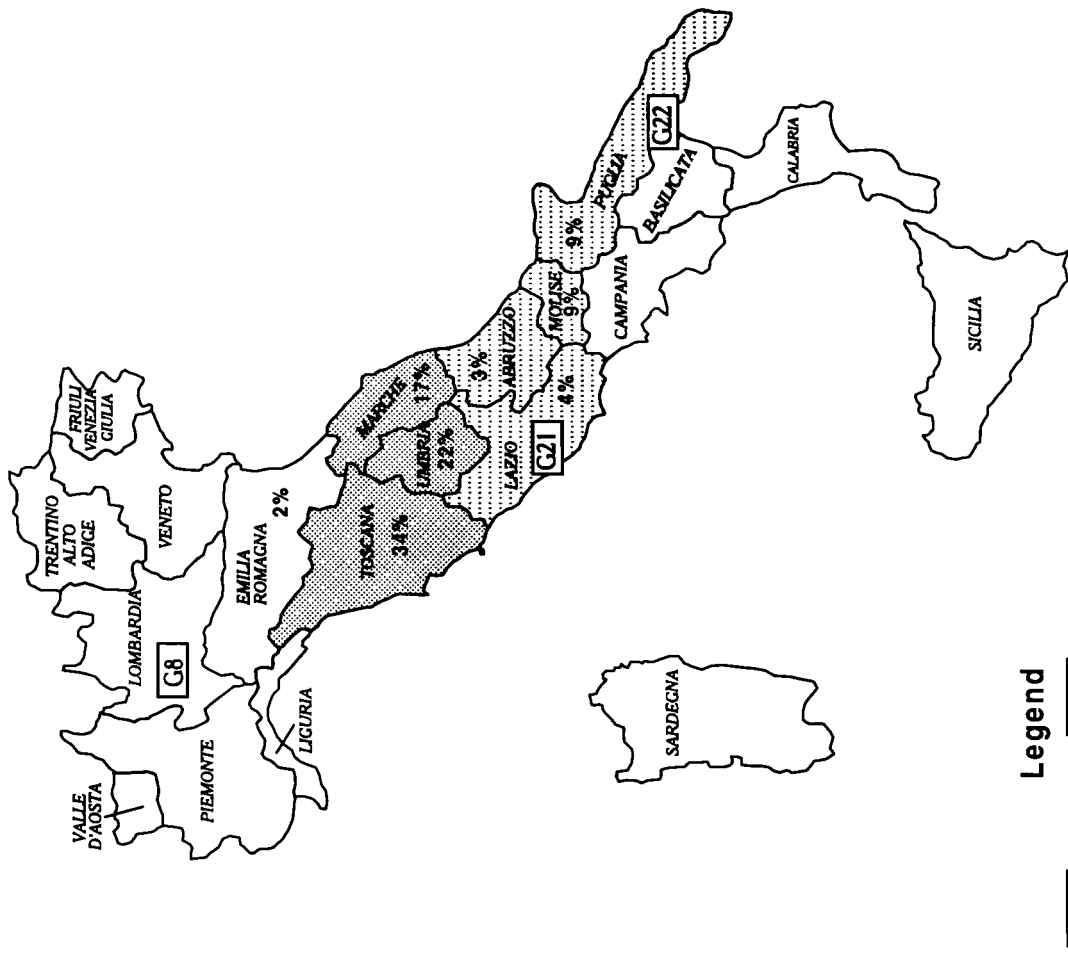
Legend

- 0-3%
- 4-10%
- Greater than 10%
- Cx Climate stations

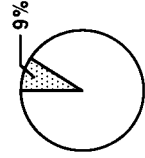
JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Italy: Sunflowerseed

Percent of total area by region



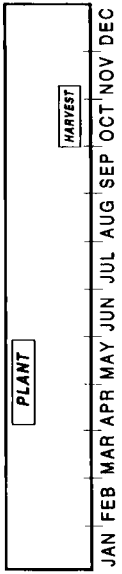
Percent of European Union sunflowerseed production (1988/89-1992/93 average)



Italy: Historical sunflowerseed statistics

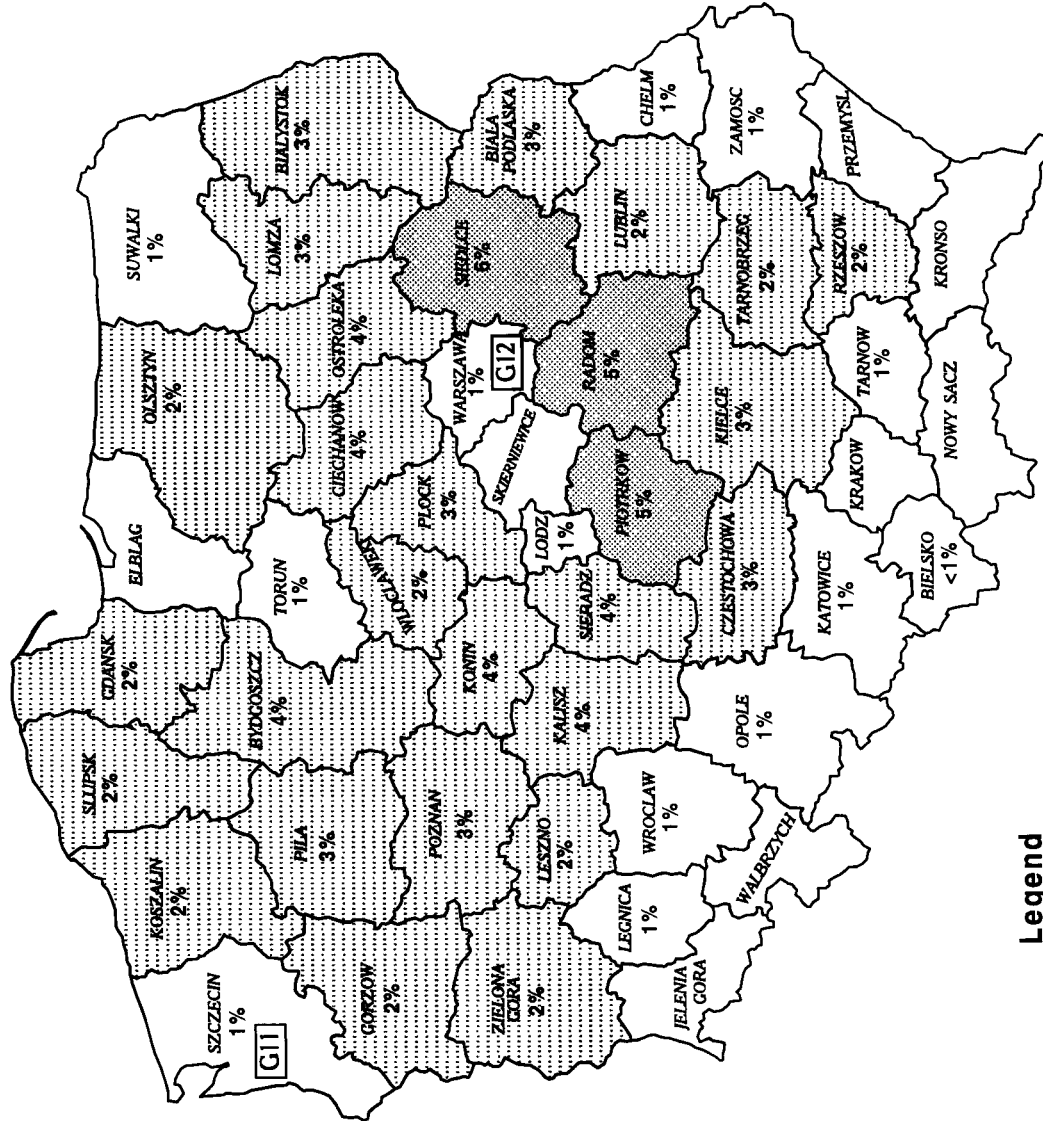
Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1975/76	25	1.84	46
1976/77	25	2.00	50
1977/78	31	1.65	51
1978/79	23	1.83	42
1979/80	34	1.62	55
1980/81	32	1.78	57
1981/82	43	2.00	86
1982/83	51	1.78	91
1983/84	72	1.82	131
1984/85	83	1.76	146
1985/86	94	1.72	162
1986/87	104	2.45	255
1987/88	200	2.25	450
1988/89	165	2.21	365
1989/90	134	2.54	340
1990/91	173	2.33	403
1991/92	132	2.44	322
1992/93	120	2.16	259
1988/89-1992/93 average	145	2.34	338

Sunflower crop calendar for most of Italy



Poland: Rye

Percent of total area by province



Poland: Historical rye statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1970/71	3,413	1.59	5,433
1971/72	3,711	2.11	7,827
1972/73	3,543	2.30	8,149
1973/74	3,415	2.42	8,268
1974/75	3,137	2.51	7,881
1975/76	2,792	2.25	6,270
1976/77	2,934	2.36	6,922
1977/78	3,116	2.01	6,250
1978/79	3,030	2.45	7,434
1979/80	2,868	1.81	5,201
1980/81	3,039	2.16	6,566
1981/82	3,002	2.24	6,731
1982/83	3,273	2.38	7,792
1983/84	3,448	2.55	8,781
1984/85	3,545	2.69	9,540
1985/86	3,083	2.47	7,600
1986/87	2,760	2.56	7,074
1987/88	2,647	2.58	6,817
1988/89	2,325	2.37	5,501
1989/90	2,275	2.73	6,216
1990/91	2,314	2.61	6,044
1991/92	2,290	2.58	5,899
1992/93	2,034	1.96	3,981
1988/89-1992/93 average	2,248	2.45	5,528

Rye crop calendar for most of Poland

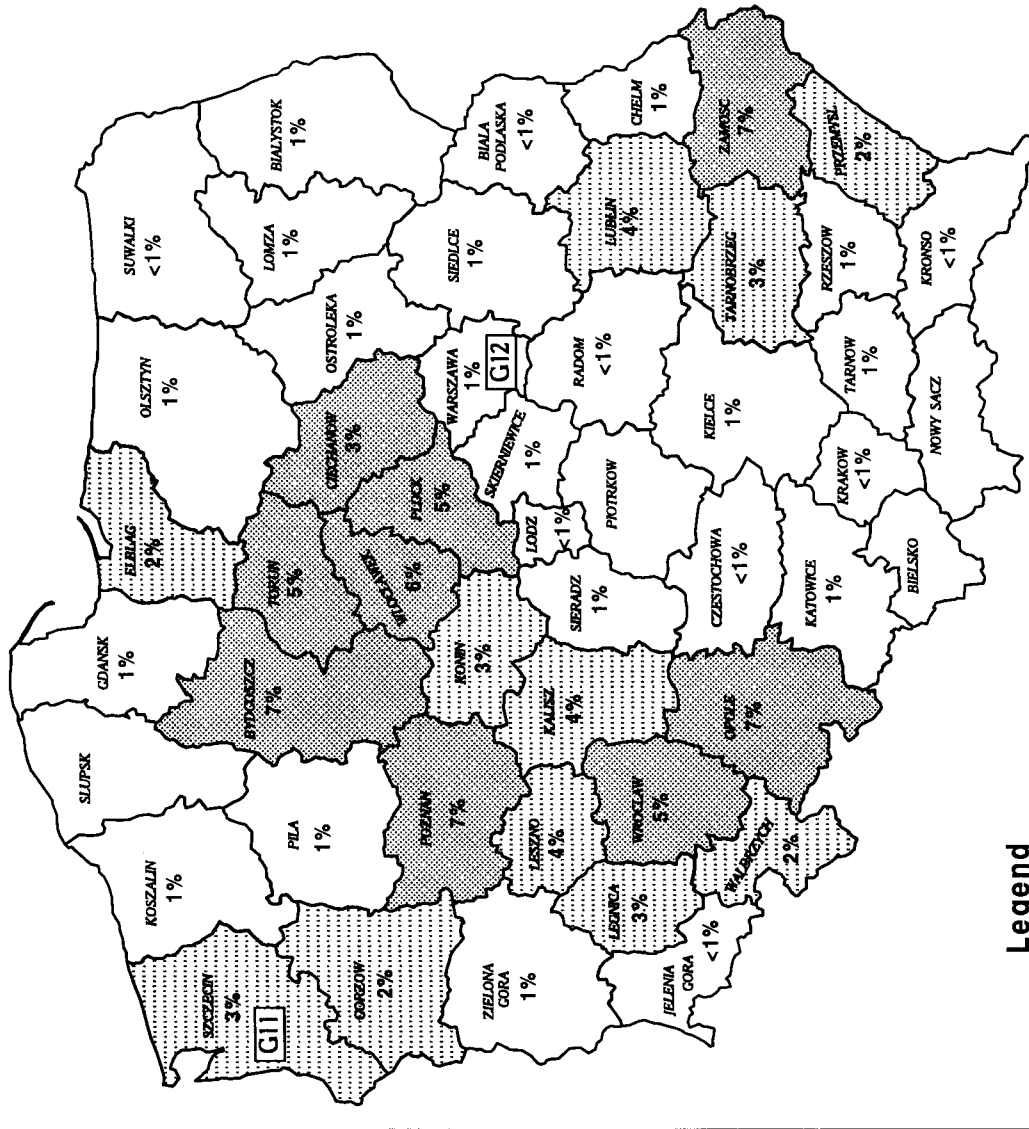


- Legend**
- 0-1%
 - 2-4%
 - Greater than 4%
 - Gx Climate stations

JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Poland: Sugarbeets

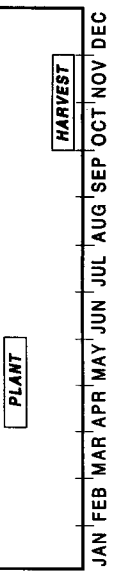
Percent of total area by province



Poland: Historical sugarbeet statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. Raw sugar	
			1,000 t	1,000 t
1980/81	460	22.0	10,139	1,134
1981/82	470	33.8	15,867	1,873
1982/83	486	33.7	16,364	2,009
1983/84	486	33.7	16,364	2,141
1984/85	474	33.9	16,048	1,878
1985/86	436	33.6	14,664	1,811
1986/87	423	33.6	14,217	1,891
1987/88	422	33.1	13,989	1,823
1988/89	412	34.1	14,089	1,825
1989/90	423	34.0	14,374	1,865
1990/91	440	38.0	16,721	2,214
1991/92	361	31.6	11,412	1,640
1992/93	376	29.4	11,052	1,567
1988/89-1992/93 average	402	33.4	13,526	1,822

Sugarbeet crop calendar for most of Poland



- 0-1%
- Greater than 4%
- 2-4%
- Climate stations

JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Romania: Wheat

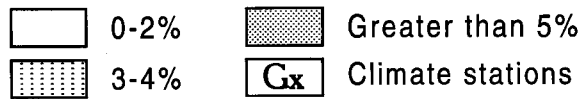
Percent of total area by county



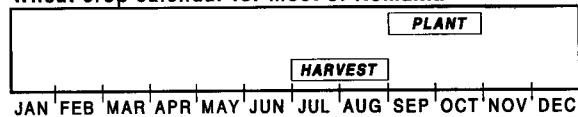
Romania: Historical wheat statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1970/71	2,321	1.45	3,356
1971/72	2,501	2.24	5,595
1972/73	2,522	2.40	6,047
1973/74	2,352	2.33	5,478
1974/75	2,385	2.09	4,994
1975/76	2,345	2.07	4,860
1976/77	2,388	2.82	6,724
1977/78	2,269	2.85	6,463
1978/79	2,284	2.74	6,250
1979/80	2,100	2.22	4,666
1980/81	2,244	2.86	6,427
1981/82	2,106	2.52	5,305
1982/83	2,151	3.01	6,465
1983/84	2,232	2.34	5,220
1984/85	2,360	3.21	7,578
1985/86	2,355	2.41	5,665
1986/87	2,530	2.65	6,700
1987/88	2,400	2.50	6,000
1988/89	2,400	3.50	8,400
1989/90	2,319	3.39	7,857
1990/91	2,263	3.23	7,311
1991/92	2,180	2.52	5,490
1992/93	1,475	2.07	3,048
1988/89-1992/93 average	2,127	2.94	6,421

Legend



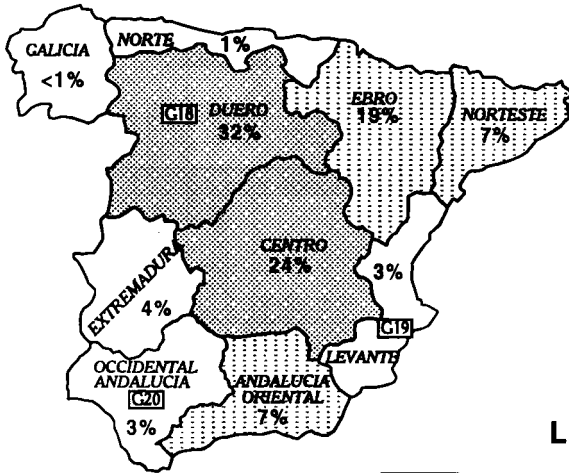
Wheat crop calendar for most of Romania



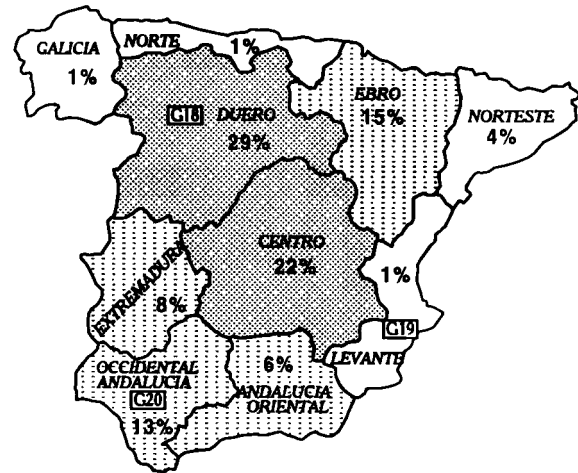
JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Spain: Barley and wheat

Percent of barley area by region



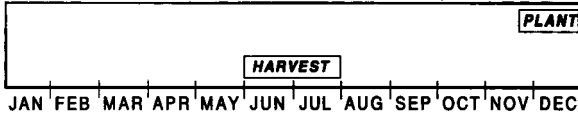
Percent of wheat area by region



Legend



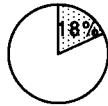
Winter barley crop calendar for most of Spain



Winter wheat crop calendar for most of Spain



Percent of European Union barley production (1988/89-1992/93 average)



Percent of European Union wheat production (1988/89-1992/93 average)



Spain: Historical barley statistics

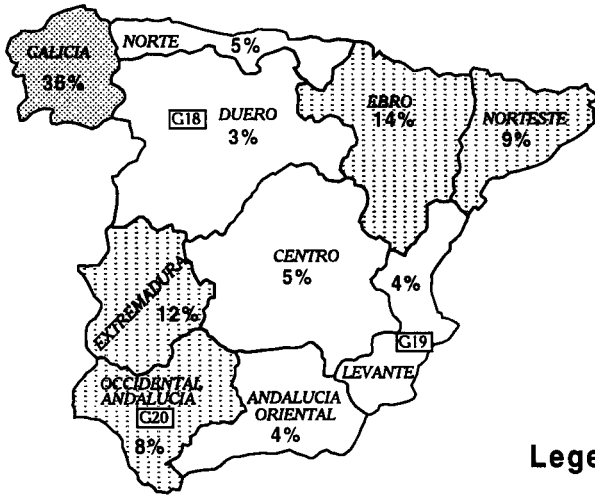
Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1975/76	3,262	2.06	6,728
1976/77	3,240	1.69	5,473
1977/78	3,348	2.02	6,766
1978/79	3,389	2.38	8,068
1979/80	3,477	1.80	6,252
1980/81	3,575	2.43	8,705
1981/82	3,507	1.36	4,758
1982/83	3,615	1.46	5,269
1983/84	3,735	1.78	6,662
1984/85	4,023	2.68	10,789
1985/86	4,246	2.52	10,698
1986/87	4,340	1.71	7,431
1987/88	4,352	2.13	9,282
1988/89	4,175	2.89	12,070
1989/90	4,260	2.14	9,100
1990/91	4,359	2.16	9,414
1991/92	4,371	2.09	9,141
1992/93	4,012	1.52	6,105
1988/89-1992/93 average	4,235	2.16	9,166

Spain: Historical wheat statistics

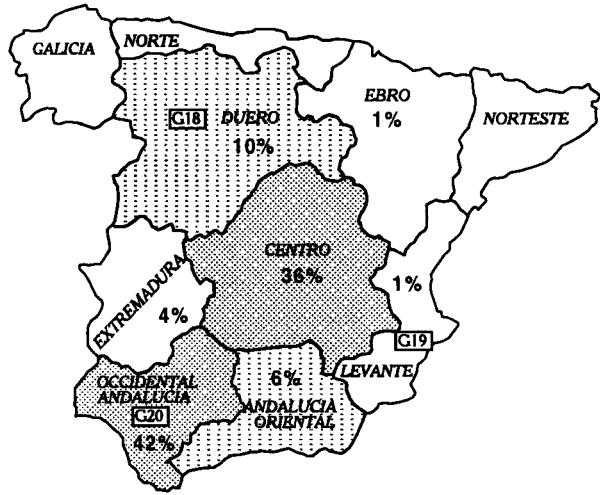
Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1975/76	2,661	1.62	4,302
1976/77	2,772	1.60	4,436
1977/78	2,715	1.50	4,064
1978/79	2,752	1.75	4,806
1979/80	2,551	1.60	4,082
1980/81	2,698	2.24	6,039
1981/82	2,635	1.29	3,408
1982/83	2,662	1.66	4,410
1983/84	2,603	1.64	4,268
1984/85	2,306	2.62	6,052
1985/86	2,043	2.61	5,329
1986/87	2,114	2.08	4,392
1987/88	2,223	2.59	5,768
1988/89	2,333	2.65	6,173
1989/90	2,295	2.27	5,200
1990/91	2,006	2.37	4,759
1991/92	2,257	2.22	5,000
1992/93	2,293	1.90	4,356
1988/89-1992/93 average	2,237	2.28	5,098

Spain: Corn and sunflowerseed

Percent of corn area by region



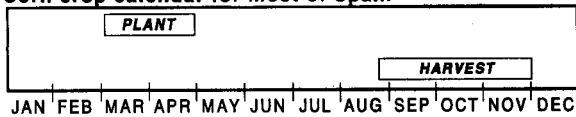
Percent of sunflowerseed area by region



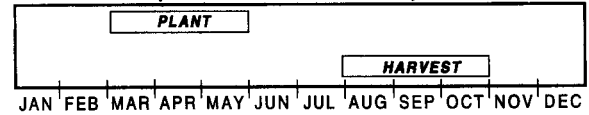
Legend



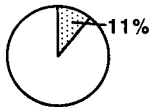
Corn crop calendar for most of Spain



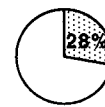
Sunflower crop calendar for most of Spain



Percent of European Union corn production (1988/89-1992/93 average)



Percent of European Union sunflowerseed production (1988/89-1992/93 average)



Spain: Historical corn statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1975/76	485	3.70	1,794
1976/77	432	3.58	1,545
1977/78	442	4.28	1,892
1978/79	443	4.44	1,969
1979/80	467	4.74	2,212
1980/81	454	5.10	2,314
1981/82	429	5.03	2,157
1982/83	418	5.57	2,330
1983/84	354	5.09	1,803
1984/85	440	5.75	2,529
1985/86	526	6.49	3,414
1986/87	524	6.53	3,424
1987/88	540	6.53	3,526
1988/89	556	6.40	3,557
1989/90	510	6.08	3,100
1990/91	450	6.22	2,800
1991/92	490	6.33	3,100
1992/93	390	6.41	2,500
1988/89-1992/93 average	479	6.29	3,011

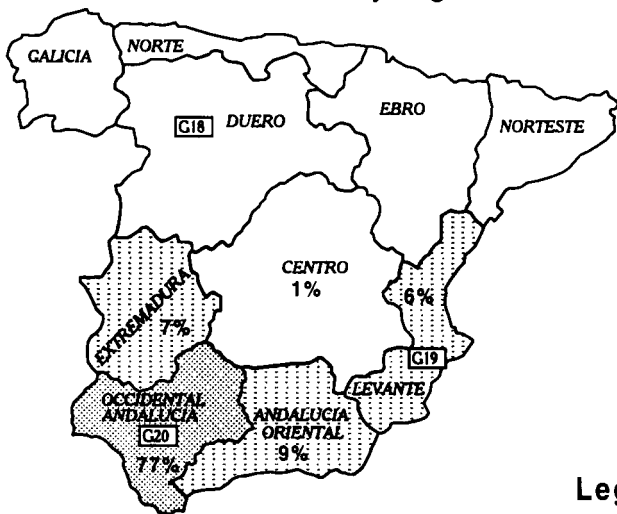
Spain: Historical sunflowerseed statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1975/76	792	0.53	416
1976/77	507	0.62	312
1977/78	545	0.71	388
1978/79	584	0.80	470
1979/80	638	0.79	504
1980/81	668	0.74	495
1981/82	750	0.54	405
1982/83	870	0.86	750
1983/84	950	0.79	750
1984/85	1,007	1.09	1,100
1985/86	1,215	0.81	990
1986/87	1,070	0.86	920
1987/88	994	1.01	1,006
1988/89	921	1.22	1,123
1989/90	977	0.95	929
1990/91	1,201	1.08	1,300
1991/92	1,070	0.84	900
1992/93	1,366	0.98	1,343
1988/89-1992/93 average	1,107	1.01	1,119

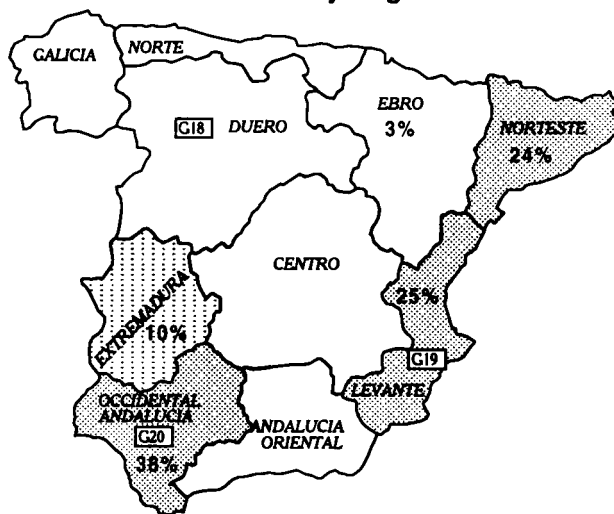
JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Spain: Cotton and rice

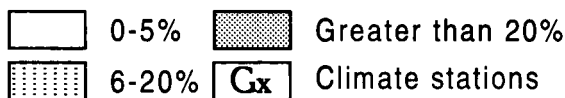
Percent of cotton area by region



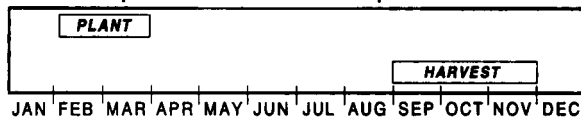
Percent of rice area by region



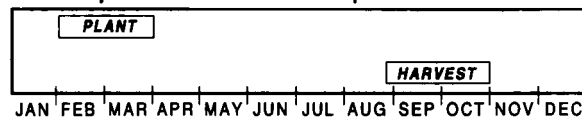
Legend



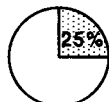
Cotton crop calendar for most of Spain



Rice crop calendar for most of Spain



Percent of European Union cotton production (1988/89-1992/93 average)



Percent of European Union rice production (1988/89-1992/93 average)



Spain: Historical cotton statistics

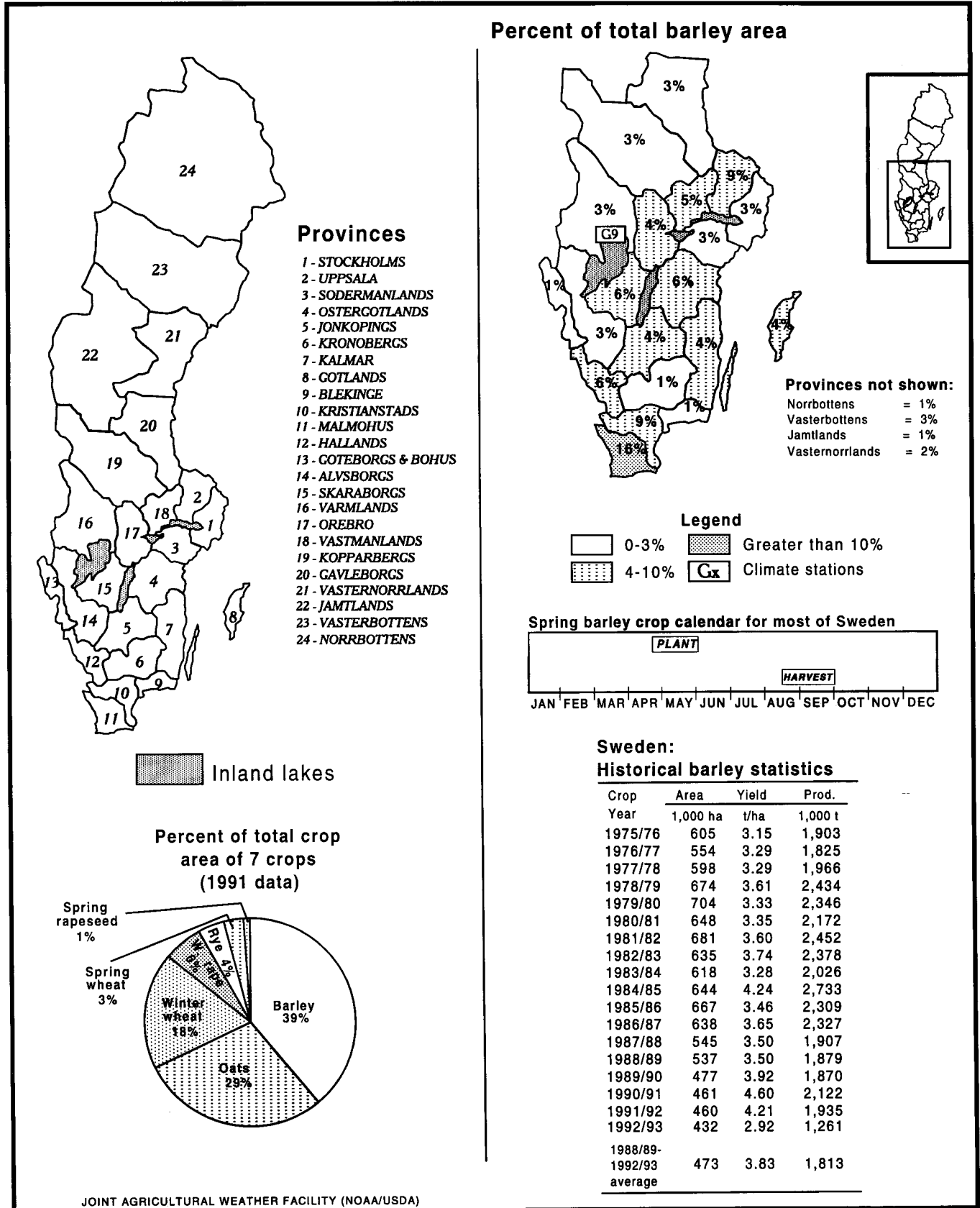
Crop Year	Area 1,000 ha	Yield kg/ha	Prod. 1,000 480 lbs. bales
1975/76	62	694	197
1976/77	56	696	179
1977/78	78	603	216
1978/79	43	744	147
1979/80	50	820	188
1980/81	63	937	271
1981/82	72	972	322
1982/83	49	1,122	253
1983/84	40	1,000	184
1984/85	60	917	253
1985/86	64	1,078	317
1986/87	79	1,089	395
1987/88	79	1,051	381
1988/89	137	810	510
1989/90	68	897	280
1990/91	84	940	363
1991/92	79	1,051	381
1992/93	75	930	322
1988/89-1992/93 average	89	926	371

Spain: Historical rice statistics

Crop Year	Area 1,000 ha	Yield (Rough) t/ha	Prod. (Milled) 1,000 t
1975/76	62	6.10	261
1976/77	64	6.34	280
1977/78	68	5.59	262
1978/79	68	5.90	277
1979/80	69	6.20	295
1980/81	68	6.37	303
1981/82	69	6.43	311
1982/83	68	5.90	281
1983/84	41	5.46	157
1984/85	73	5.99	306
1985/86	74	6.20	321
1986/87	79	6.25	346
1987/88	76	6.36	338
1988/89	80	6.24	349
1989/90	59	5.76	238
1990/91	90	6.34	400
1991/92	94	6.23	410
1992/93	86	6.55	394
1988/89-1992/93 average	81	6.22	358

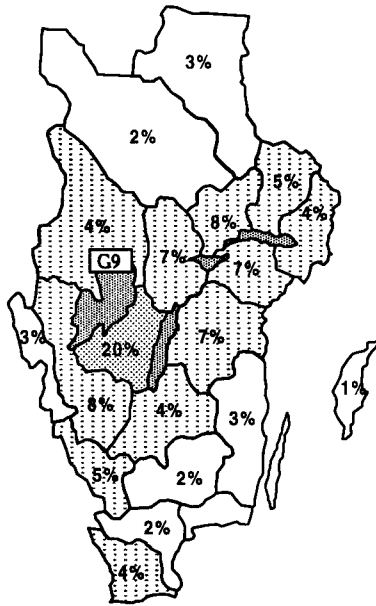
JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Sweden: Crop areas and barley

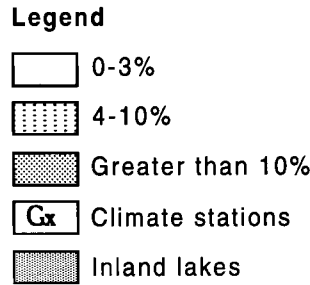
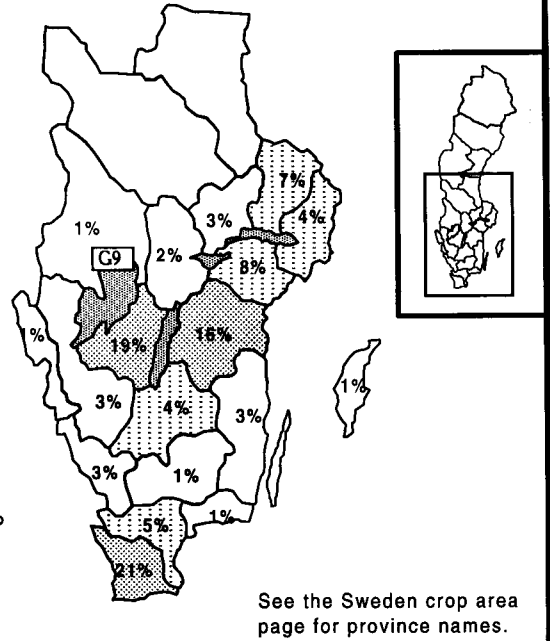


Sweden: Oats and winter wheat

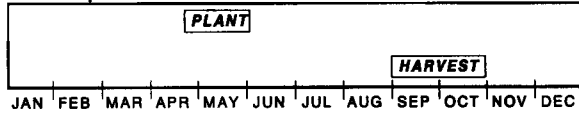
Percent of oat area by province



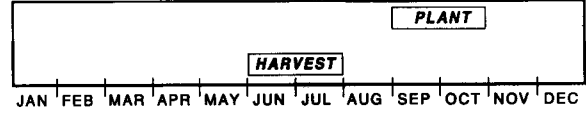
Percent of winter wheat area by province



Oat crop calendar for most of Sweden



Winter wheat crop calendar for most of Sweden



**Sweden:
Historical oat statistics**

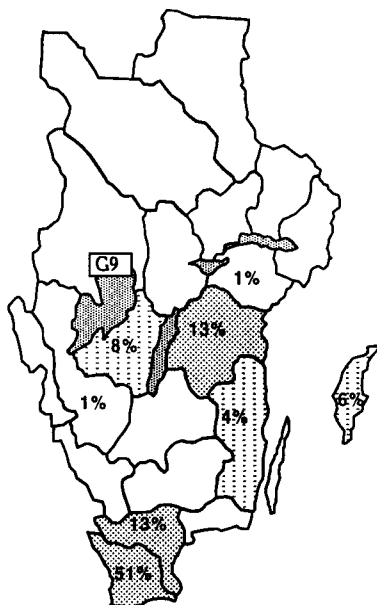
Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1975/76	464	2.85	1,321
1976/77	450	2.78	1,251
1977/78	458	3.09	1,416
1978/79	453	3.42	1,550
1979/80	457	3.33	1,524
1980/81	452	3.47	1,567
1981/82	474	3.83	1,816
1982/83	477	3.49	1,663
1983/84	404	3.14	1,268
1984/85	428	4.45	1,904
1985/86	445	3.75	1,668
1986/87	456	3.26	1,486
1987/88	397	3.63	1,440
1988/89	424	3.14	1,330
1989/90	411	3.54	1,455
1990/91	358	4.42	1,584
1991/92	345	4.13	1,426
1992/93	342	2.36	807
1988/89-1992/93 average	376	3.52	1,320

**Sweden: Historical
winter wheat statistics**

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1975/76	301	4.83	1,455
1976/77	395	4.46	1,763
1977/78	374	4.07	1,522
1978/79	287	4.49	1,290
1979/80	243	4.24	1,030
1980/81	288	4.14	1,193
1981/82	224	4.76	1,066
1982/83	283	5.27	1,490
1983/84	336	5.13	1,722
1984/85	315	5.64	1,776
1985/86	277	4.83	1,338
1986/87	311	5.56	1,730
1987/88	325	4.79	1,558
1988/89	251	5.16	1,295
1989/90	285	6.14	1,750
1990/91	335	6.70	2,243
1991/92	255	5.81	1,481
1992/93	264	5.33	1,406
1988/89-1992/93 average	278	5.83	1,635

Sweden: Rapeseed and rye

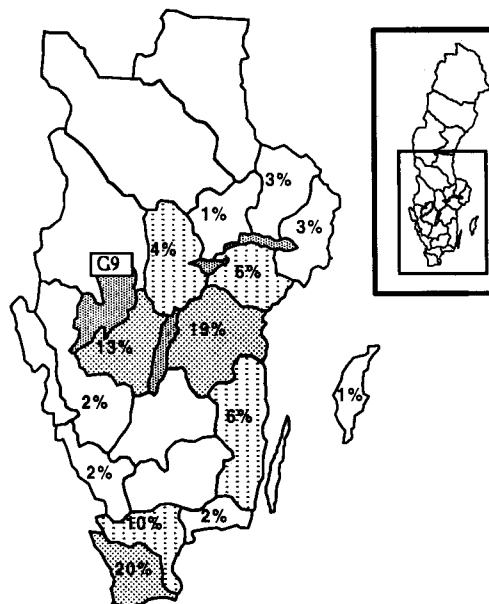
Percent of winter rapeseed area by province



Legend

- 0-3%
- 4-10%
- Greater than 10%
- Climate stations
- Inland lakes

Percent of winter rye area by province



See the Sweden crop area page for province names.

Winter rapeseed crop calendar for most of Sweden



Winter rye crop calendar for most of Sweden



Sweden: Historical rapeseed statistics

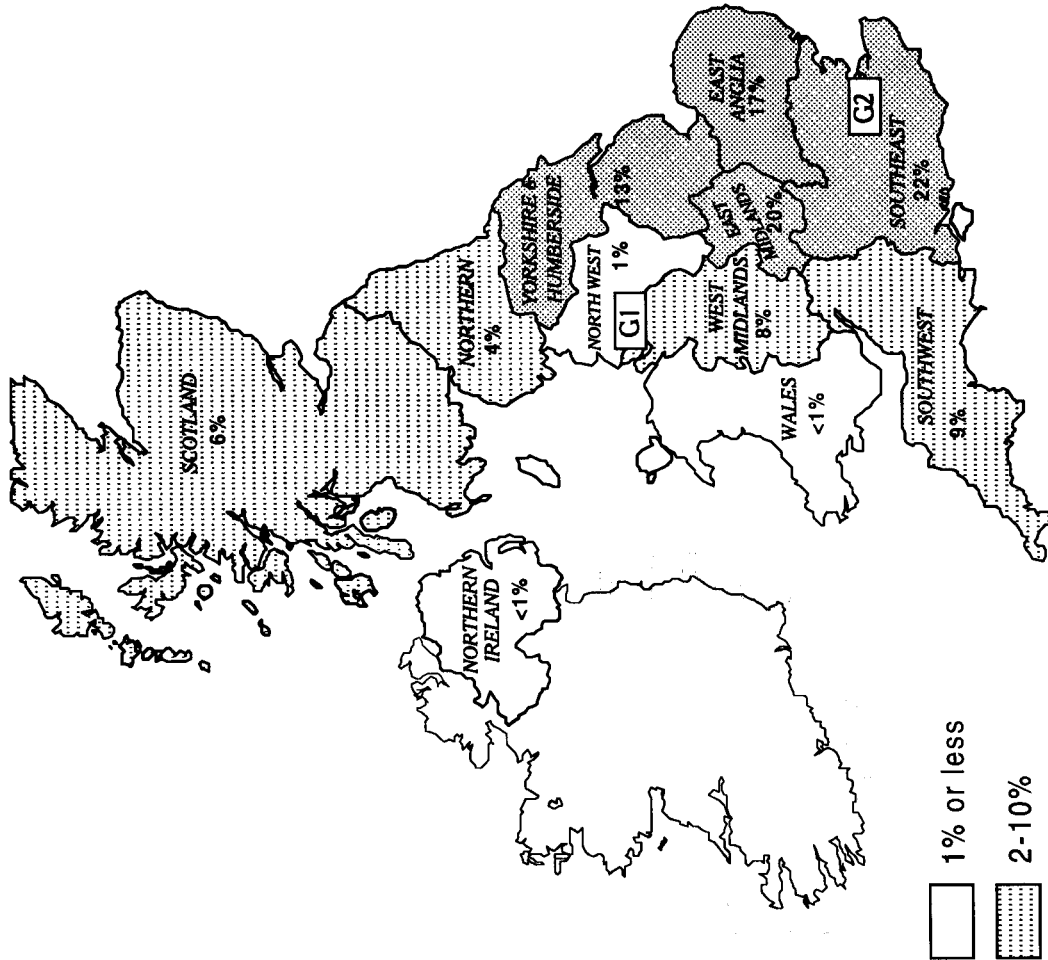
Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1975/76	164	1.77	290
1976/77	140	1.76	247
1977/78	120	1.97	236
1978/79	151	1.91	289
1979/80	155	1.70	264
1980/81	172	1.66	285
1981/82	165	1.71	282
1982/83	166	1.93	320
1983/84	161	1.98	318
1984/85	164	1.99	327
1985/86	168	1.90	320
1986/87	171	1.88	321
1987/88	164	1.52	250
1988/89	146	1.71	249
1989/90	175	2.11	370
1990/91	163	2.25	367
1991/92	145	1.74	252
1992/93	127	1.94	247
1988/89- 1992/93 average	151	1.95	297

Sweden: Historical rye statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1975/76	95	3.44	327
1976/77	122	3.50	427
1977/78	111	3.05	339
1978/79	81	3.68	298
1979/80	59	3.31	195
1980/81	66	3.41	225
1981/82	51	3.51	179
1982/83	54	3.91	211
1983/84	62	3.82	237
1984/85	62	3.98	247
1985/86	46	3.43	158
1986/87	39	3.95	154
1987/88	40	3.43	137
1988/89	36	3.56	128
1989/90	68	4.69	319
1990/91	71	4.72	335
1991/92	42	3.93	165
1992/93	33	4.12	136
1988/89- 1992/93 average	50	4.20	217

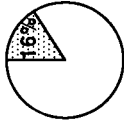
United Kingdom: Wheat

Percent of total wheat area by region



JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

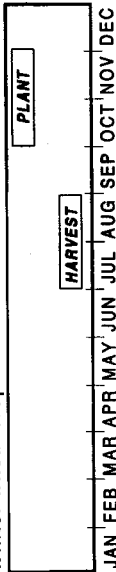
Percent of European Union wheat production (1988/89-1992/93 average)



United Kingdom: Historical wheat statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1970/71	1,010	4.19	4,236
1971/72	1,097	4.39	4,815
1972/73	1,127	4.24	4,779
1973/74	1,146	4.36	5,002
1974/75	1,233	4.97	6,130
1975/76	1,034	4.34	4,489
1976/77	1,231	3.85	4,740
1977/78	1,076	4.90	5,274
1978/79	1,257	5.26	6,613
1979/80	1,371	5.23	7,175
1980/81	1,441	5.88	8,470
1981/82	1,491	5.84	8,710
1982/83	1,663	6.21	10,320
1983/84	1,695	6.37	10,802
1984/85	1,939	7.71	14,957
1985/86	1,902	6.33	12,045
1986/87	1,997	6.97	13,910
1987/88	1,994	5.99	11,940
1988/89	1,886	6.23	11,750
1989/90	2,106	6.66	14,030
1990/91	2,050	6.83	14,000
1991/92	1,981	7.27	14,400
1992/93	2,060	6.80	14,000
1988/89-1992/93 average	2,017	6.76	13,636

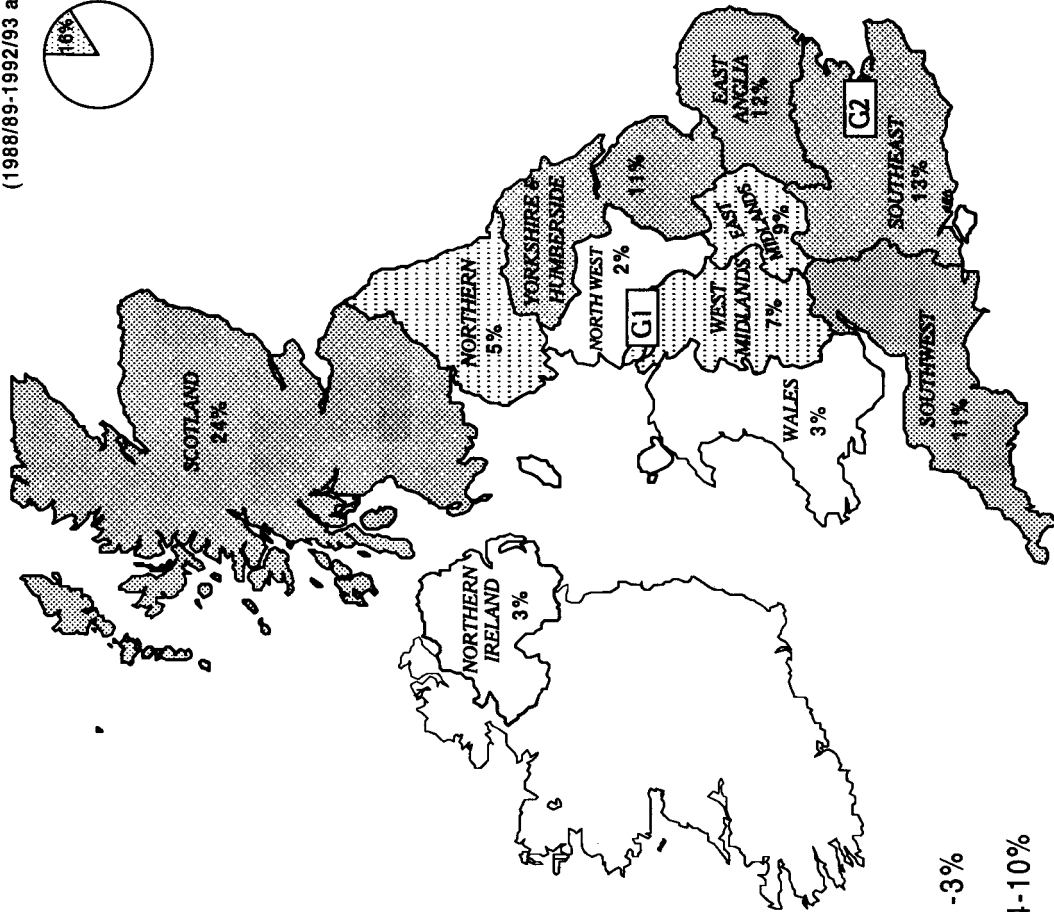
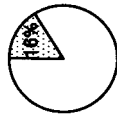
Winter wheat crop calendar for most of the U.K.



United Kingdom: Barley

Percent of total barley area by region

Percent of European Union
barley production
(1988/89-1992/93 average)



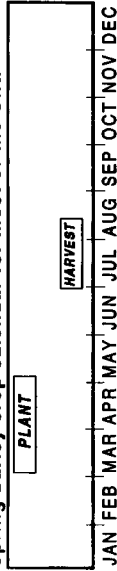
- 1-3%
- 4-10%
- Greater than 10%
- Climate stations

JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

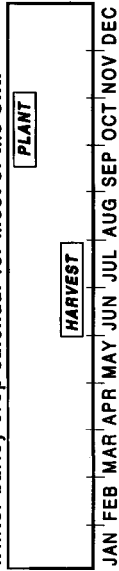
United Kingdom: Historical barley statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1970/71	2,243	3.36	7,529
1971/72	2,289	3.74	8,558
1972/73	2,288	4.04	9,244
1973/74	2,268	3.97	9,007
1974/75	2,214	4.13	9,133
1975/76	2,345	3.63	8,513
1976/77	2,182	3.51	7,648
1977/78	2,400	4.39	10,531
1978/79	2,348	4.20	9,850
1979/80	2,343	4.10	9,613
1980/81	2,330	4.43	10,320
1981/82	2,327	4.40	10,230
1982/83	2,222	4.93	10,960
1983/84	2,143	4.66	9,980
1984/85	1,978	5.59	11,055
1985/86	1,965	4.96	9,740
1986/87	1,917	5.22	10,015
1987/88	1,831	5.04	9,225
1988/89	1,913	4.55	8,705
1989/90	1,662	4.86	8,070
1990/91	1,529	5.17	7,900
1991/92	1,390	5.54	7,700
1992/93	1,309	5.61	7,350
1988/89-1992/93 average	1,561	5.15	7,945

Spring barley crop calendar for most of the U.K.

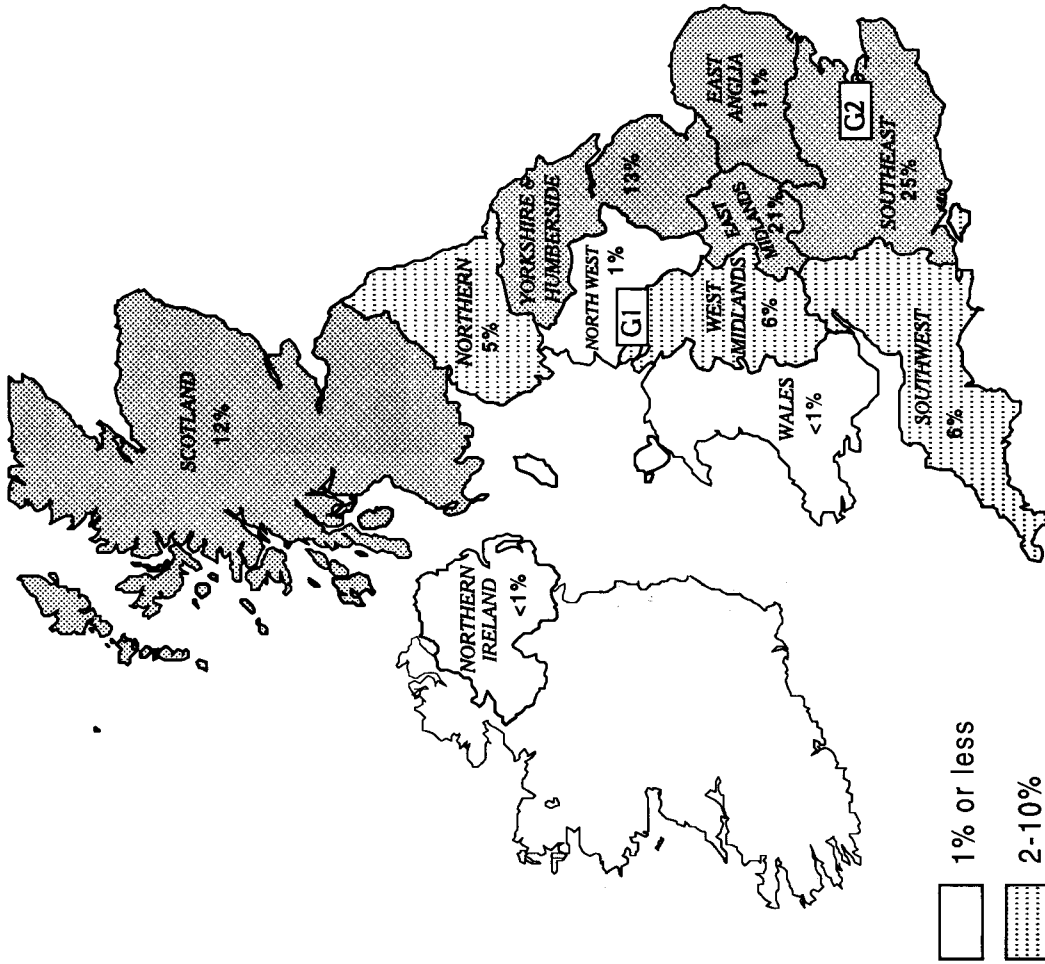


Winter barley crop calendar for most of the U.K.

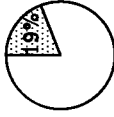


United Kingdom: Rapeseed

Percent of total rapeseed area by region



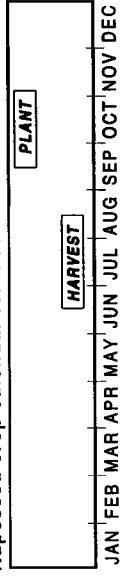
Percent of European Union rapeseed production (1988/89-1992/93 average)



United Kingdom: Historical rapeseed statistics

Crop Year	Area		Yield		Prod. 1,000 t
	1,000 ha	1/ha	t/ha	1,000 t	
1975/76	39	1.56			61
1976/77	48	2.31			111
1977/78	55	2.58			142
1978/79	64	2.42			155
1979/80	74	2.68			198
1980/81	92	3.26			300
1981/82	125	2.60			325
1982/83	174	3.33			580
1983/84	222	2.55			565
1984/85	269	3.44			925
1985/86	296	3.02			895
1986/87	299	3.14			940
1987/88	388	3.49			1,353
1988/89	340	3.06			1,040
1989/90	323	2.95			953
1990/91	390	3.08			1,200
1991/92	439	2.96			1,300
1992/93	422	2.73			1,150
1988/89-1992/93 average	383	2.96			1,129

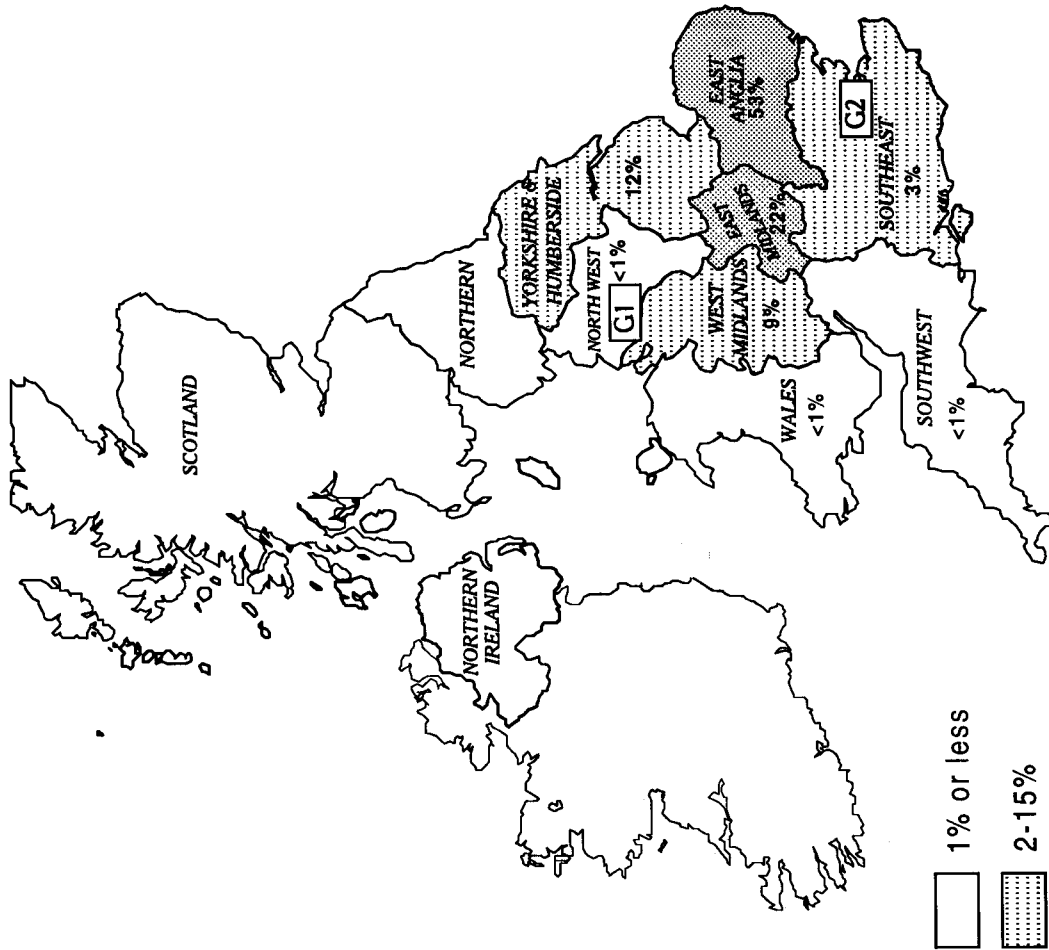
Rapeseed crop calendar for most of the U.K.



JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

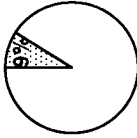
United Kingdom: Sugarbeets

Percent of total sugarbeet area by region



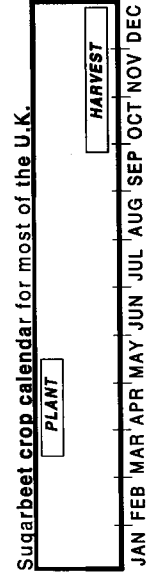
- 1% or less
- 2-15%
- Greater than 15%
- Climate stations

Percent of European Union
sugarbeet production
(1988/89-1992/93 average)



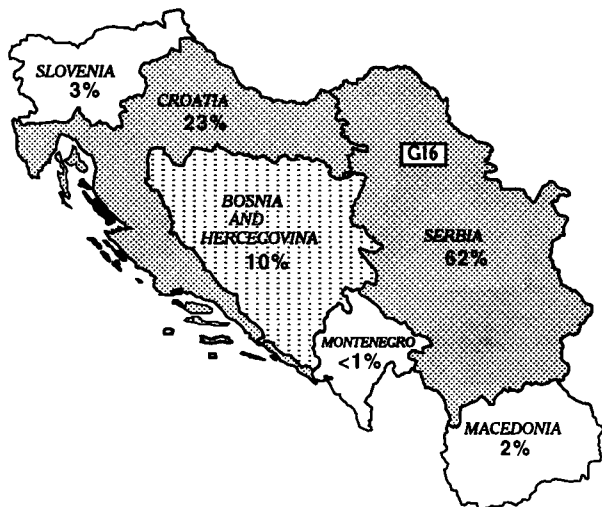
United Kingdom: Historical sugarbeet statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t	Raw sugar 1,000 t
1980/81	210	35.1	7,380	1,202
1981/82	209	35.4	7,395	1,187
1982/83	202	49.5	10,007	1,541
1983/84	196	40.8	8,000	1,155
1984/85	196	43.4	8,500	1,430
1985/86	202	38.0	7,676	1,315
1986/87	202	40.2	8,120	1,433
1987/88	201	39.8	7,990	1,335
1988/89	198	41.2	8,152	1,417
1989/90	194	41.2	8,000	1,322
1990/91	192	41.7	8,000	1,360
1991/92	170	45.1	7,672	1,330
1992/93	170	54.0	9,180	1,600
1988/89-1992/93 average	185	44.6	8,201	1,406

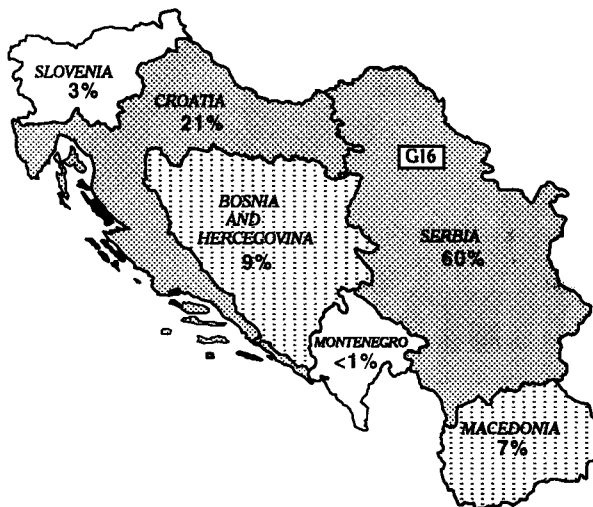


Former Yugoslavia: Corn and wheat

Percent of total corn area by republic



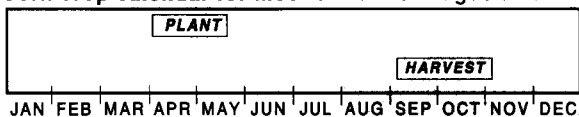
Percent of total wheat area by republic



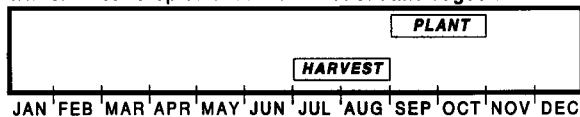
Legend

- Less than 5%
- 5-20%
- Greater than 20%
- Climate stations

Corn crop calendar for most of Former Yugoslavia



Winter wheat crop calendar for most of Fmr. Yugoslavia



Former Yugoslavia: Historical corn statistics

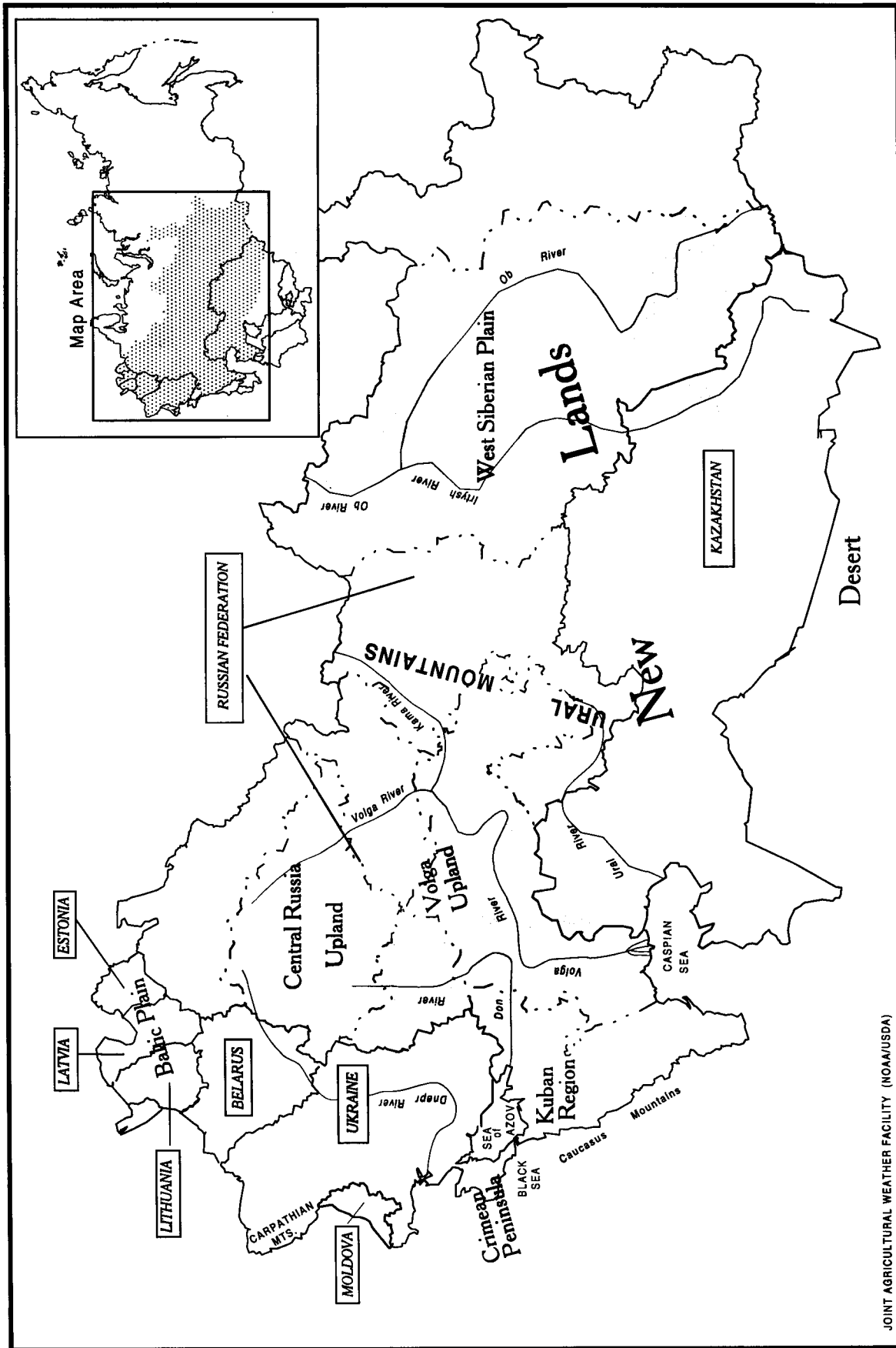
Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1975/76	2,363	3.97	9,389
1976/77	2,374	3.84	9,106
1977/78	2,321	4.25	9,870
1978/79	2,130	3.56	7,585
1979/80	2,251	4.48	10,084
1980/81	2,202	4.23	9,317
1981/82	2,297	4.27	9,807
1982/83	2,246	4.95	11,126
1983/84	2,264	4.73	10,719
1984/85	2,331	4.84	11,293
1985/86	2,400	4.12	9,896
1986/87	2,369	5.29	12,526
1987/88	2,218	4.00	8,863
1988/89	2,269	3.39	7,697
1989/90	2,268	4.15	9,415
1990/91	2,229	3.02	6,724
1991/92	2,100	5.48	11,500
1992/93	2,263	2.94	6,650
1988/89-1992/93 average	2,226	3.80	8,397

Former Yugoslavia: Historical wheat statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1975/76	1,615	2.73	4,404
1976/77	1,723	3.47	5,979
1977/78	1,604	3.49	5,595
1978/79	1,712	3.13	5,355
1979/80	1,524	2.96	4,512
1980/81	1,516	3.36	5,091
1981/82	1,386	3.08	4,270
1982/83	1,558	3.35	5,218
1983/84	1,609	3.43	5,524
1984/85	1,458	3.84	5,595
1985/86	1,348	3.59	4,839
1986/87	1,346	3.55	4,776
1987/88	1,455	3.62	5,272
1988/89	1,506	4.18	6,300
1989/90	1,479	3.79	5,599
1990/91	1,495	4.25	6,359
1991/92	1,547	4.35	6,725
1992/93	1,100	3.36	3,700
1988/89-1992/93 average	1,425	3.99	5,737

JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

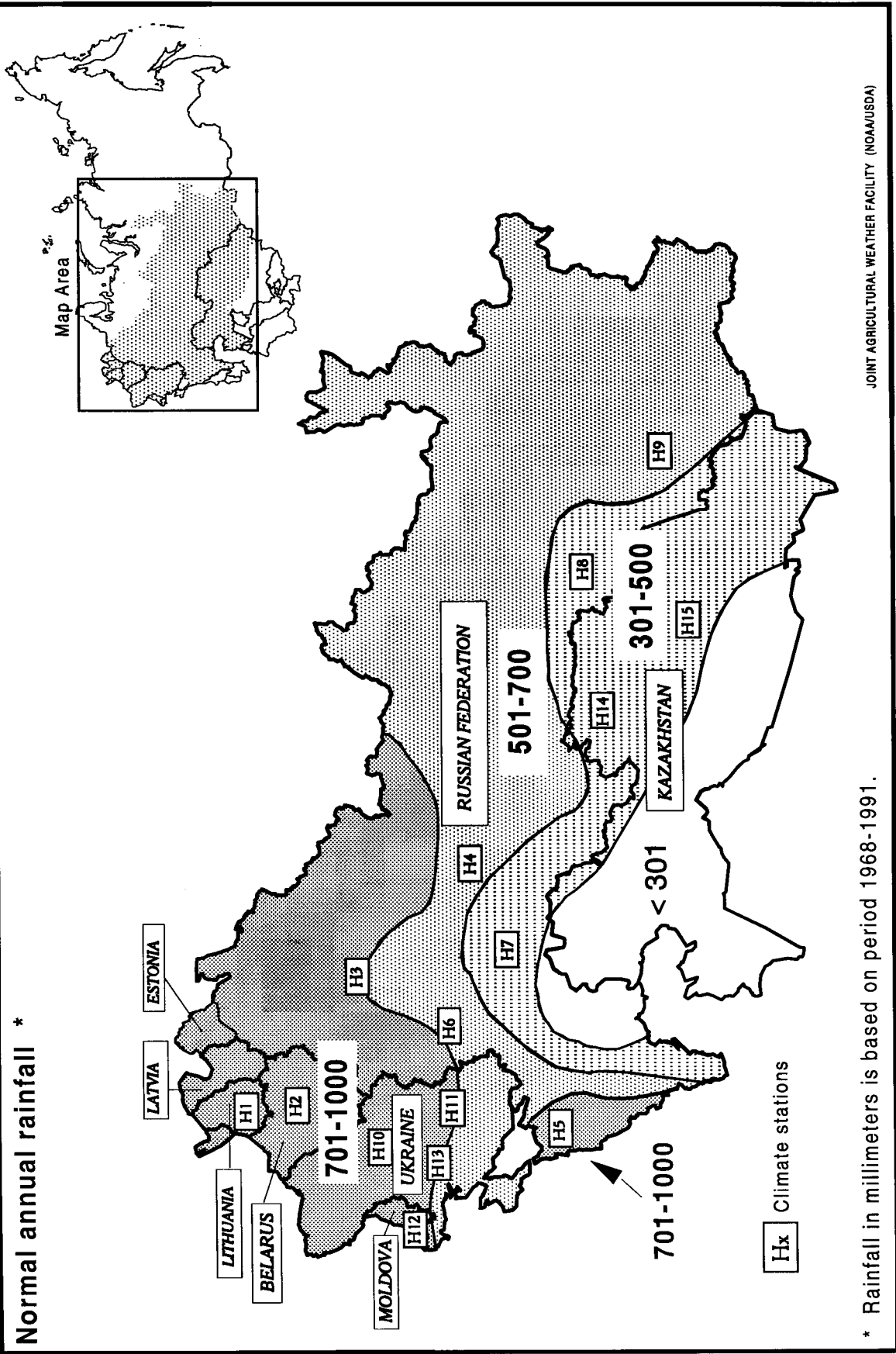
Former Soviet Union: Landforms



JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

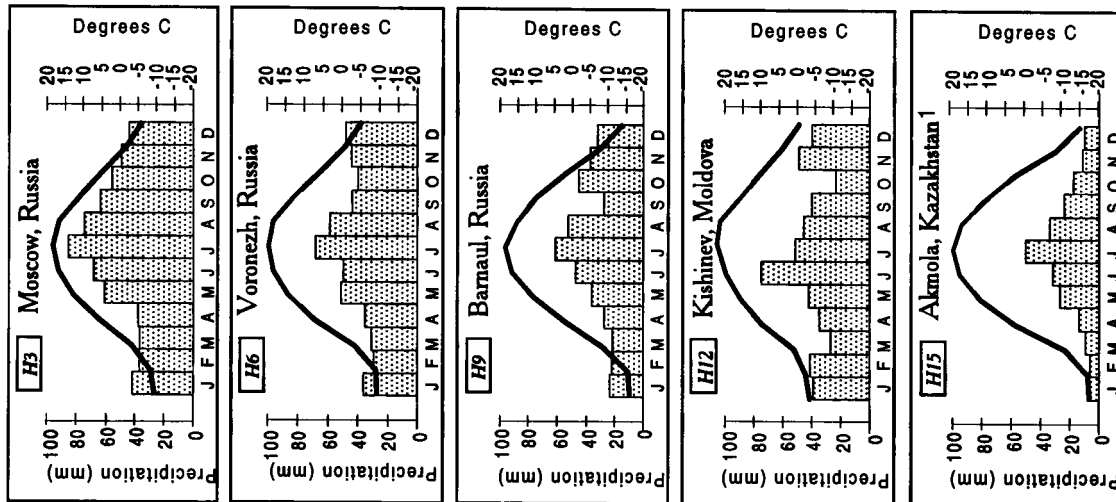
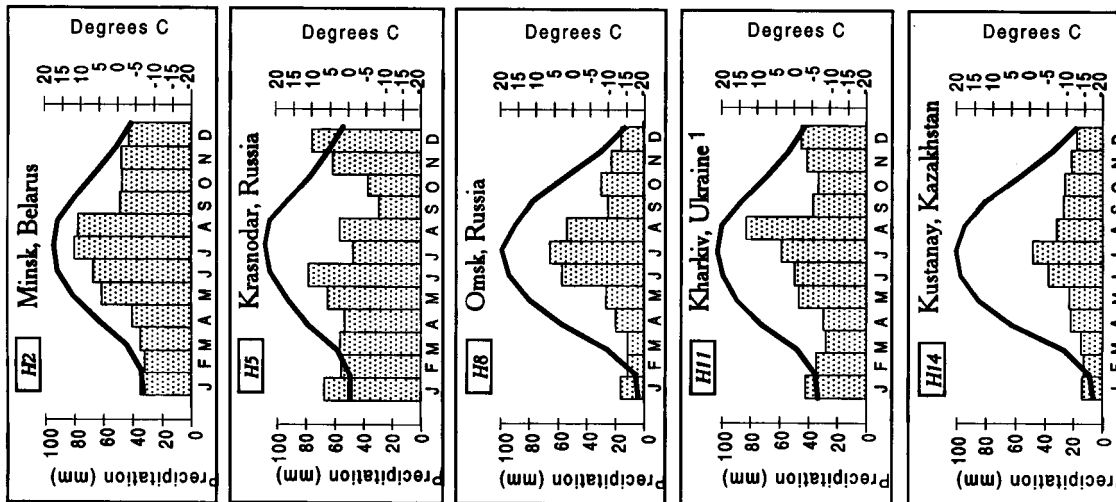
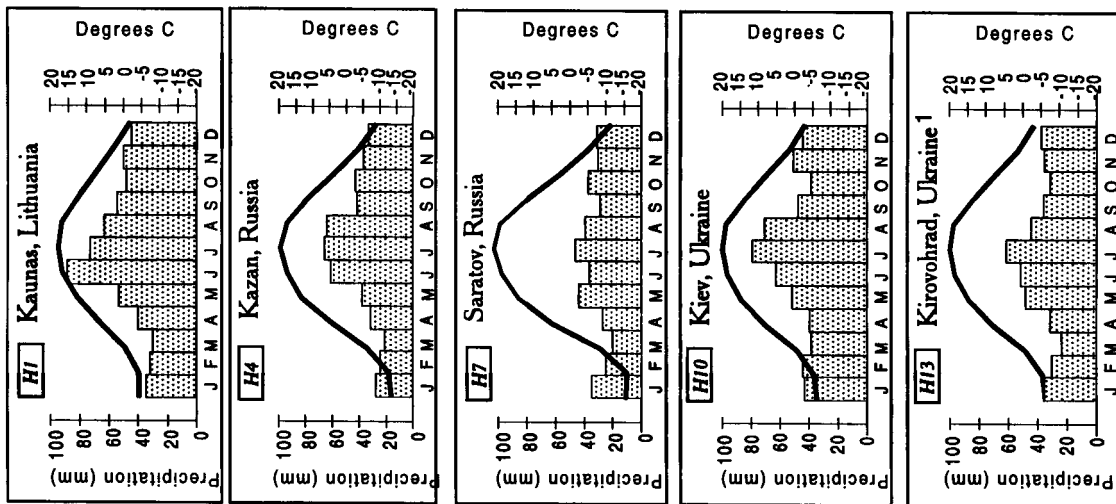
Former Soviet Union: Annual rainfall (mm)

Normal annual rainfall *



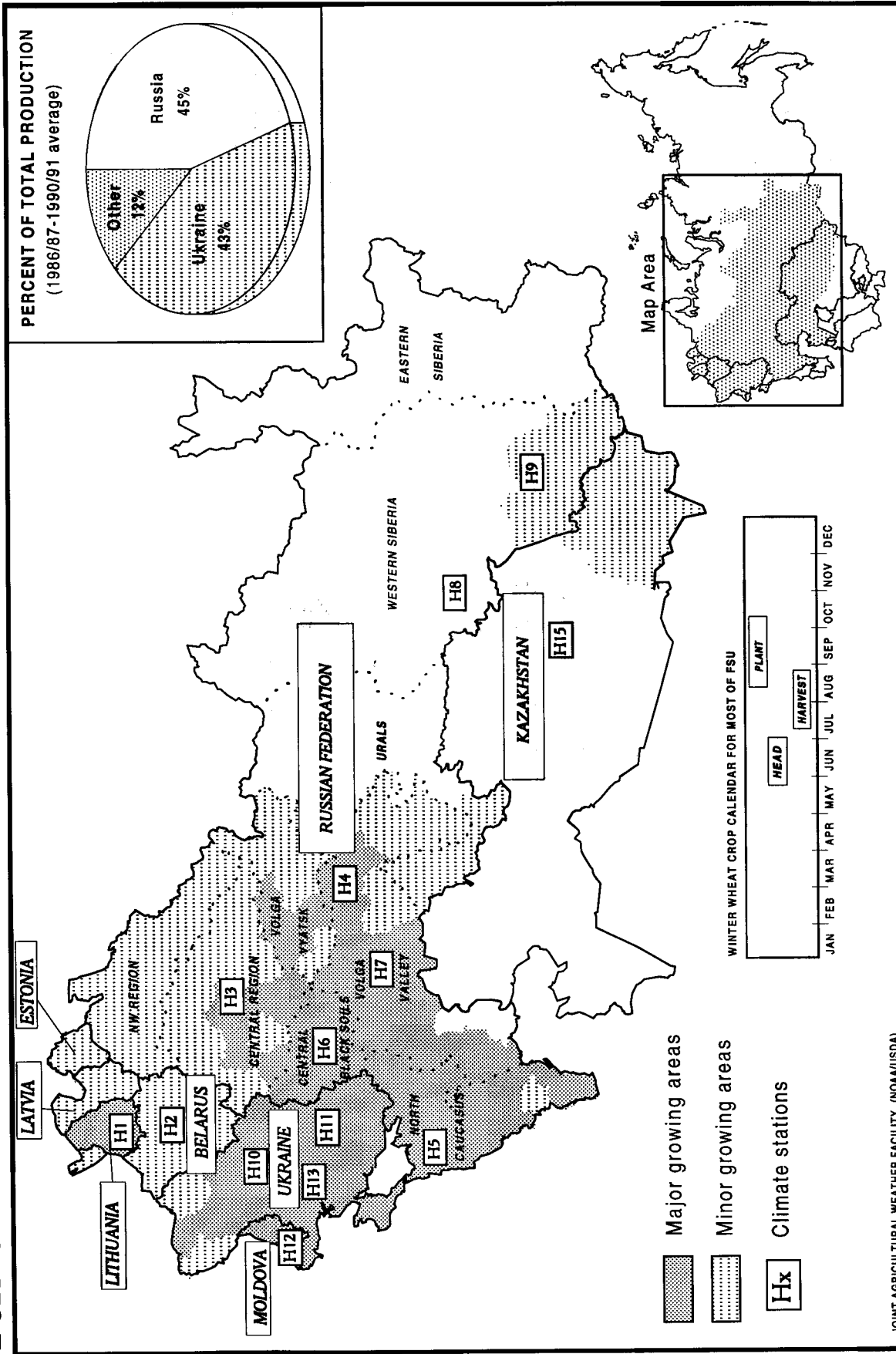
* Rainfall in millimeters is based on period 1968-1991.

Former Soviet Union: Climate stations



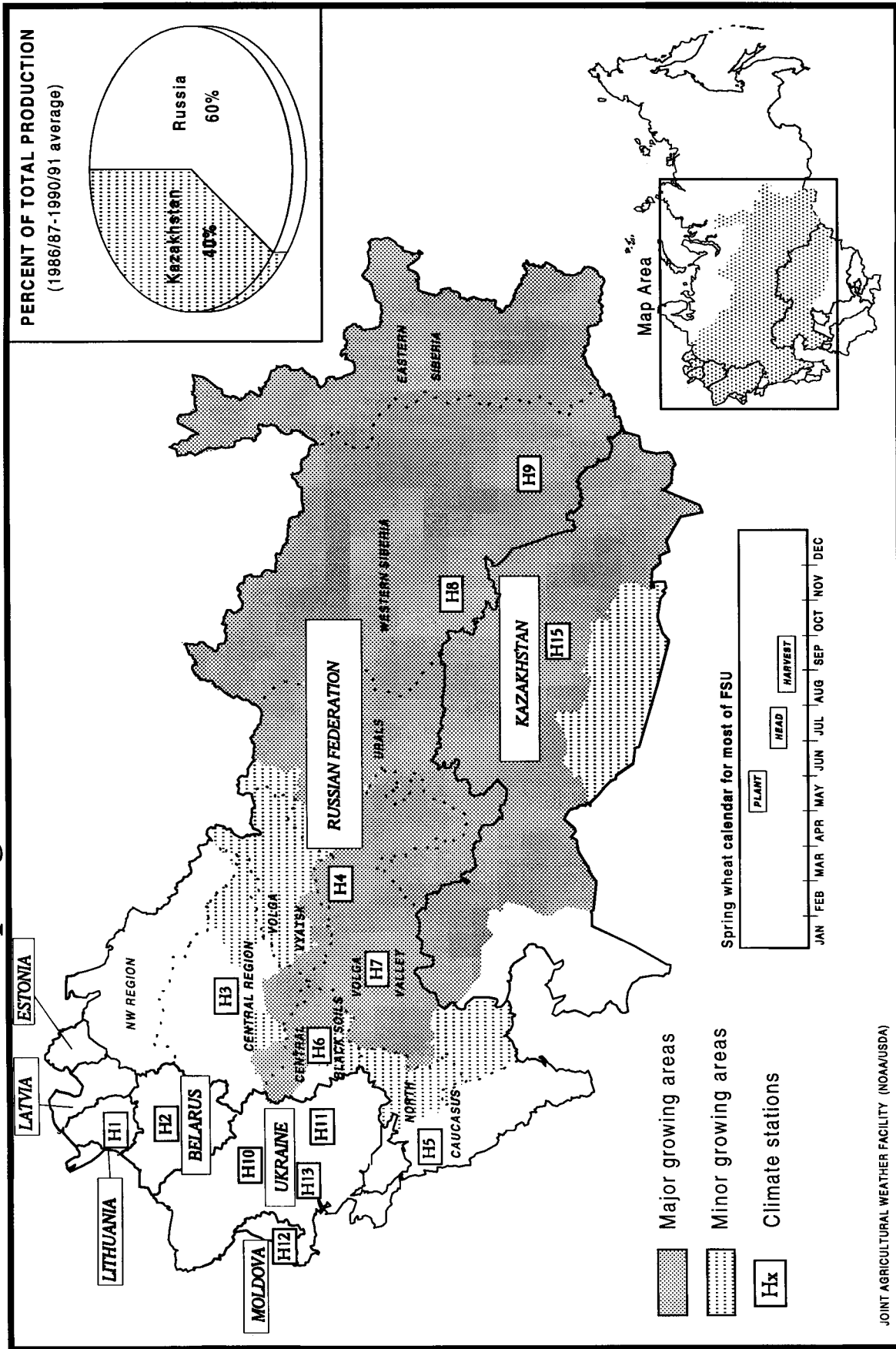
¹ In the former Soviet Union, these cities were named Kharkov, Kirovograd, and Tselinograd, respectively.

Former Soviet Union: Winter wheat



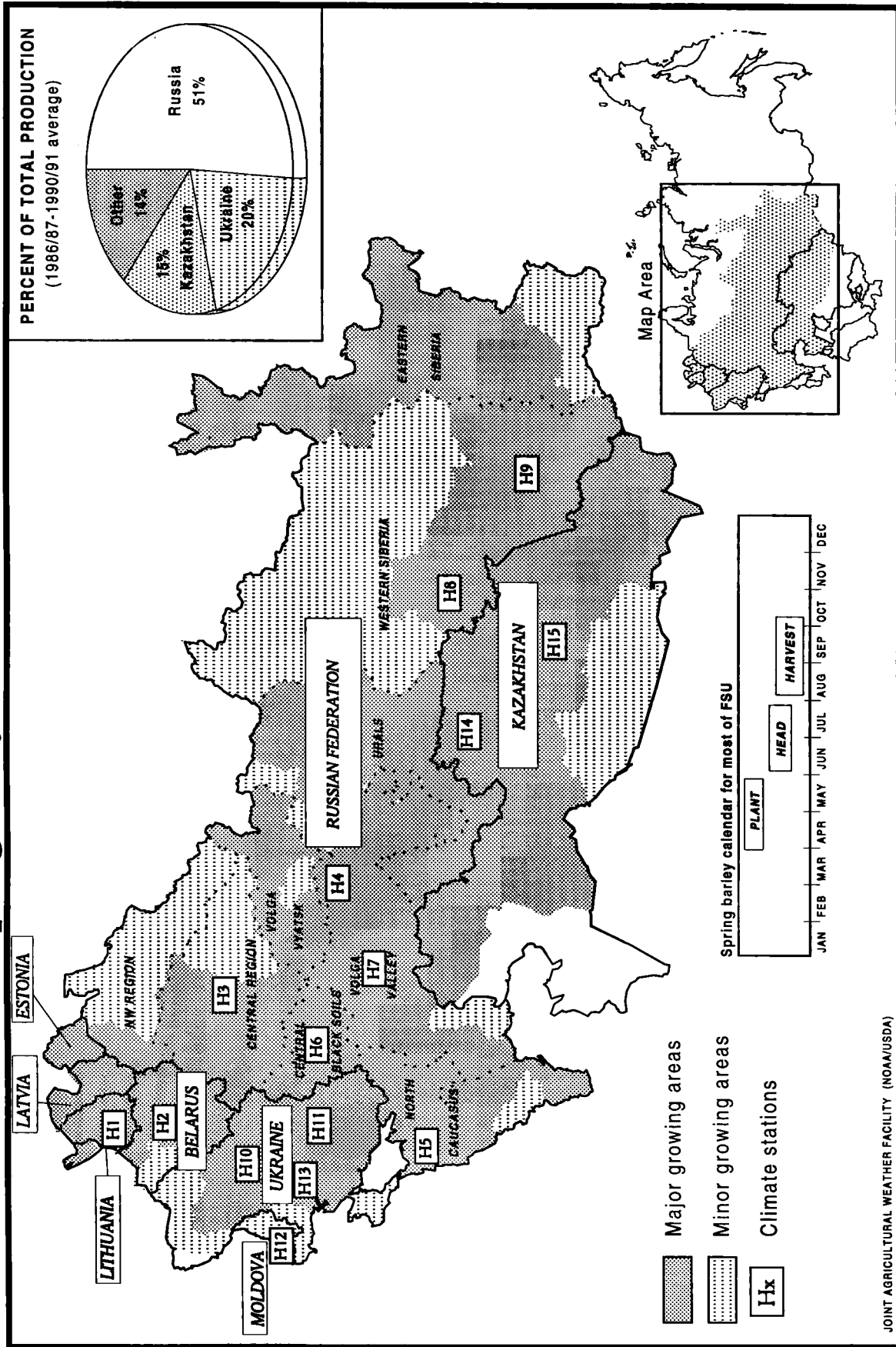
JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Former Soviet Union: Spring wheat



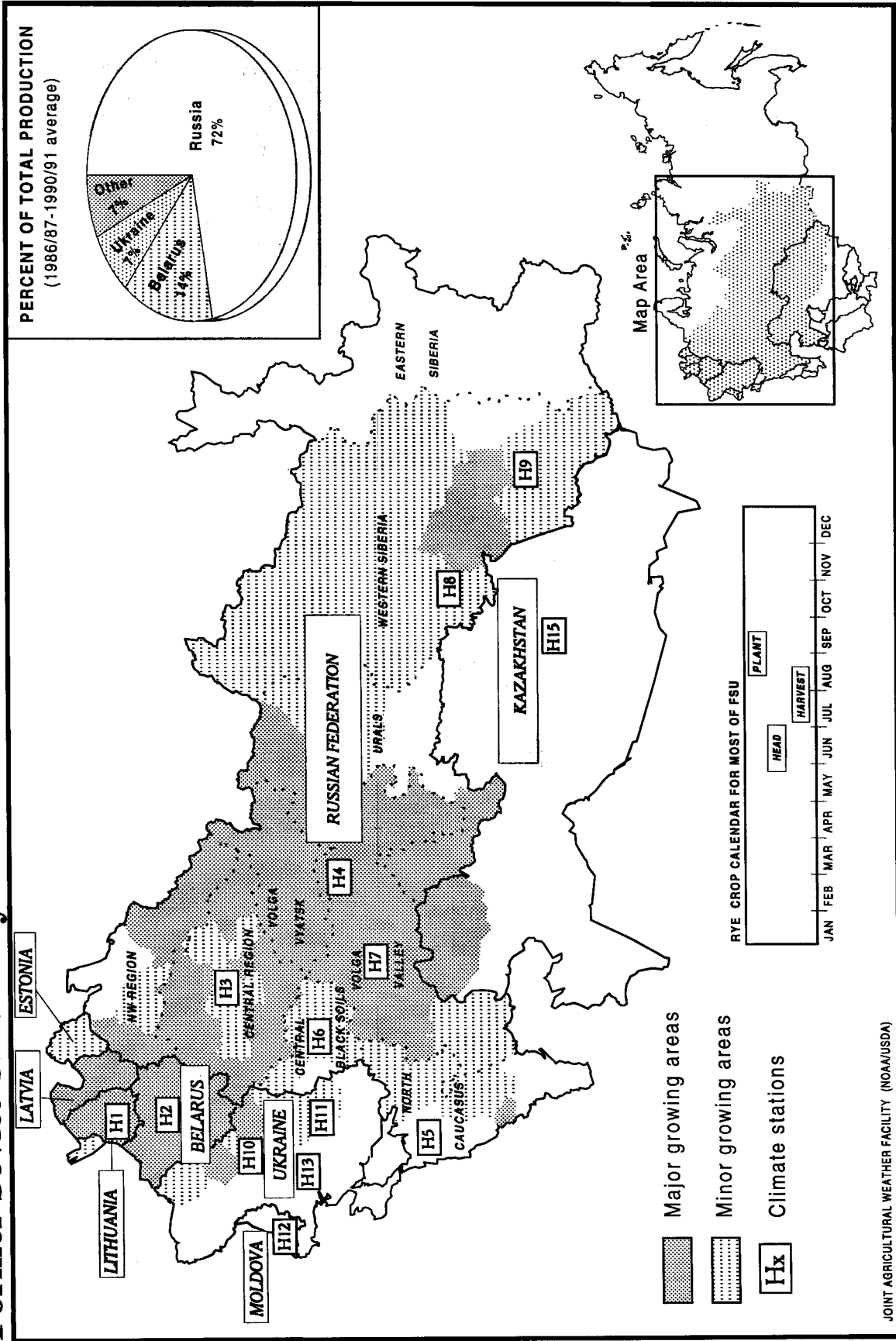
JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Former Soviet Union: Spring barley



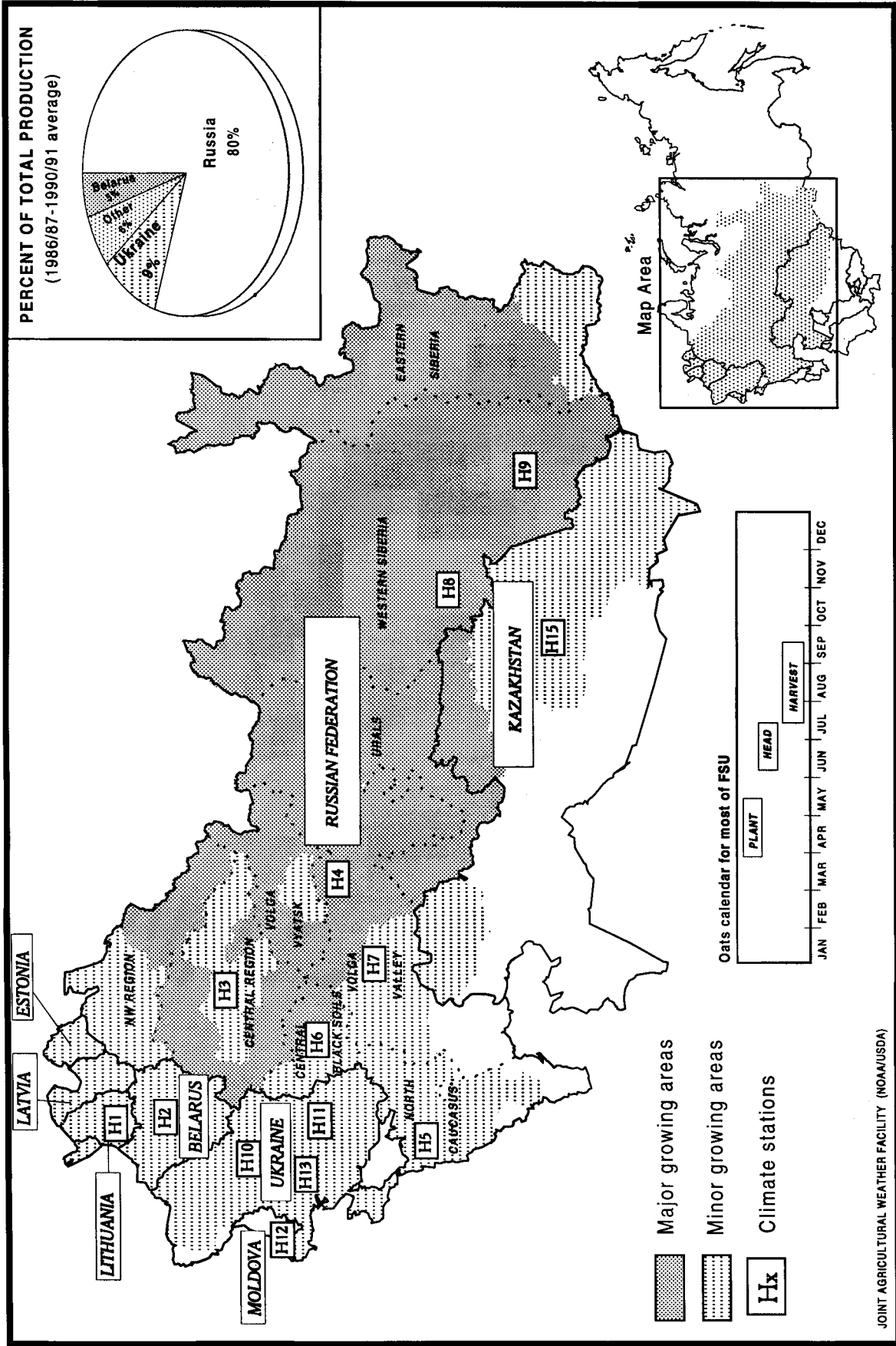
JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Former Soviet Union: Rye



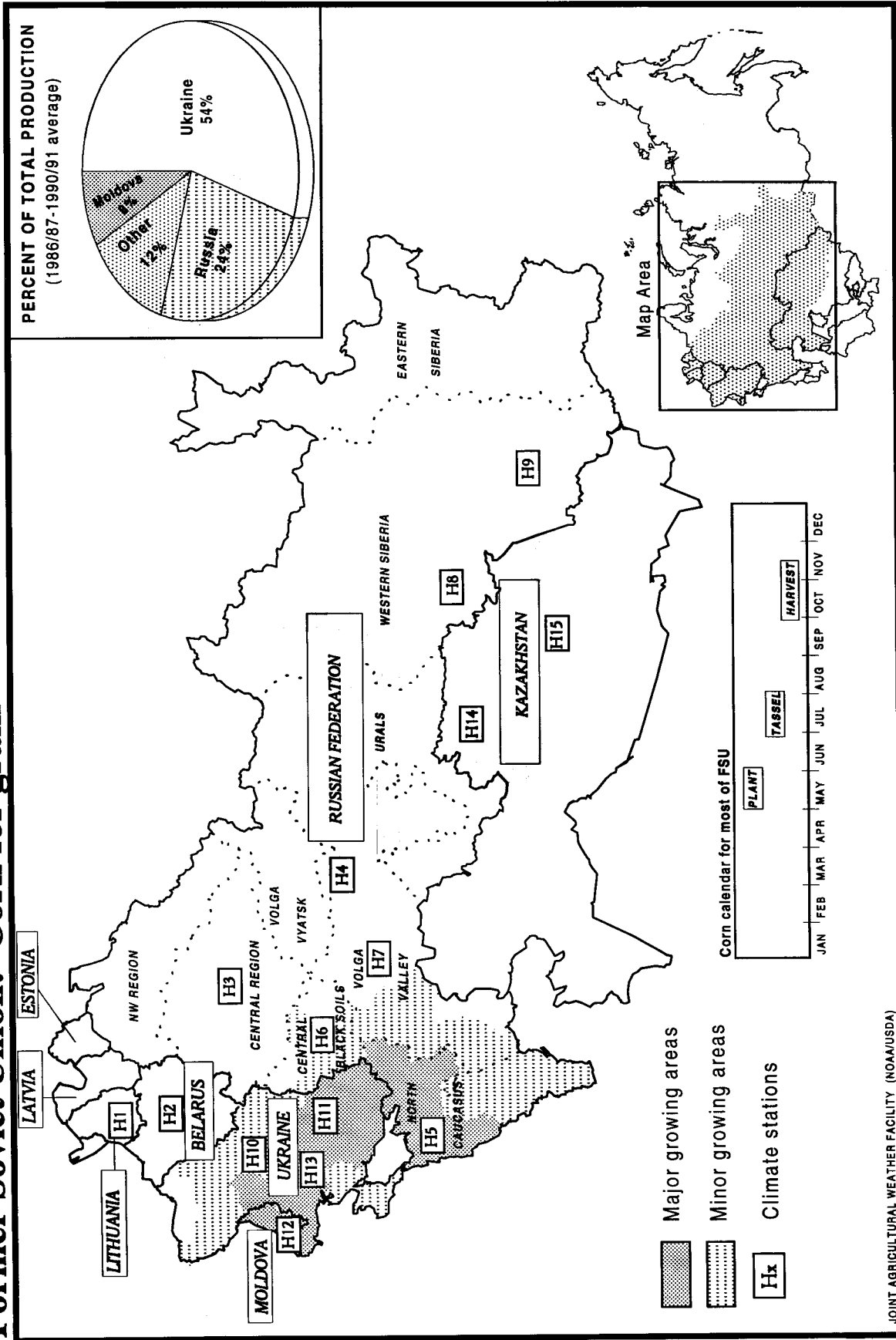
JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Former Soviet Union: Oats



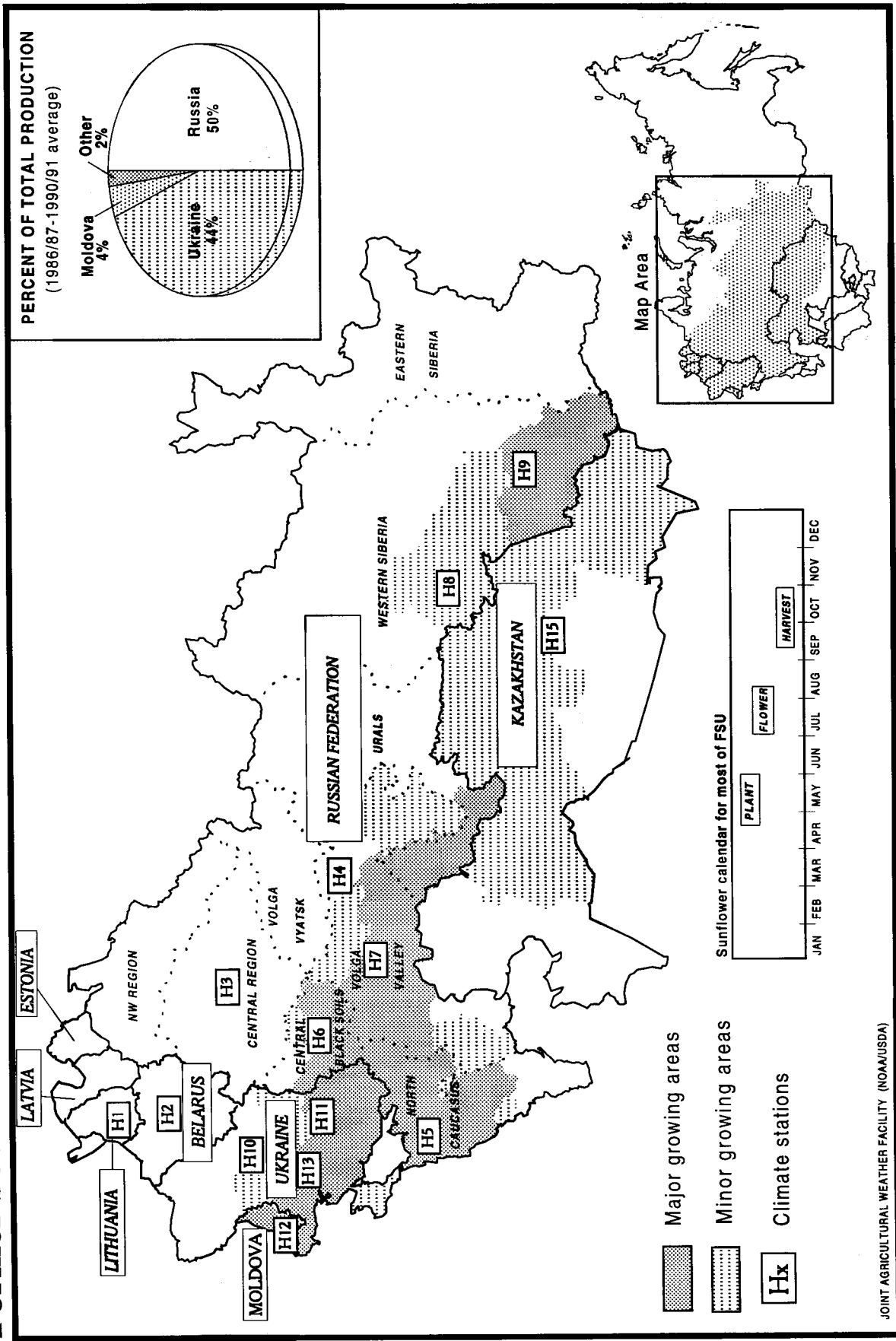
JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Former Soviet Union: Corn for grain

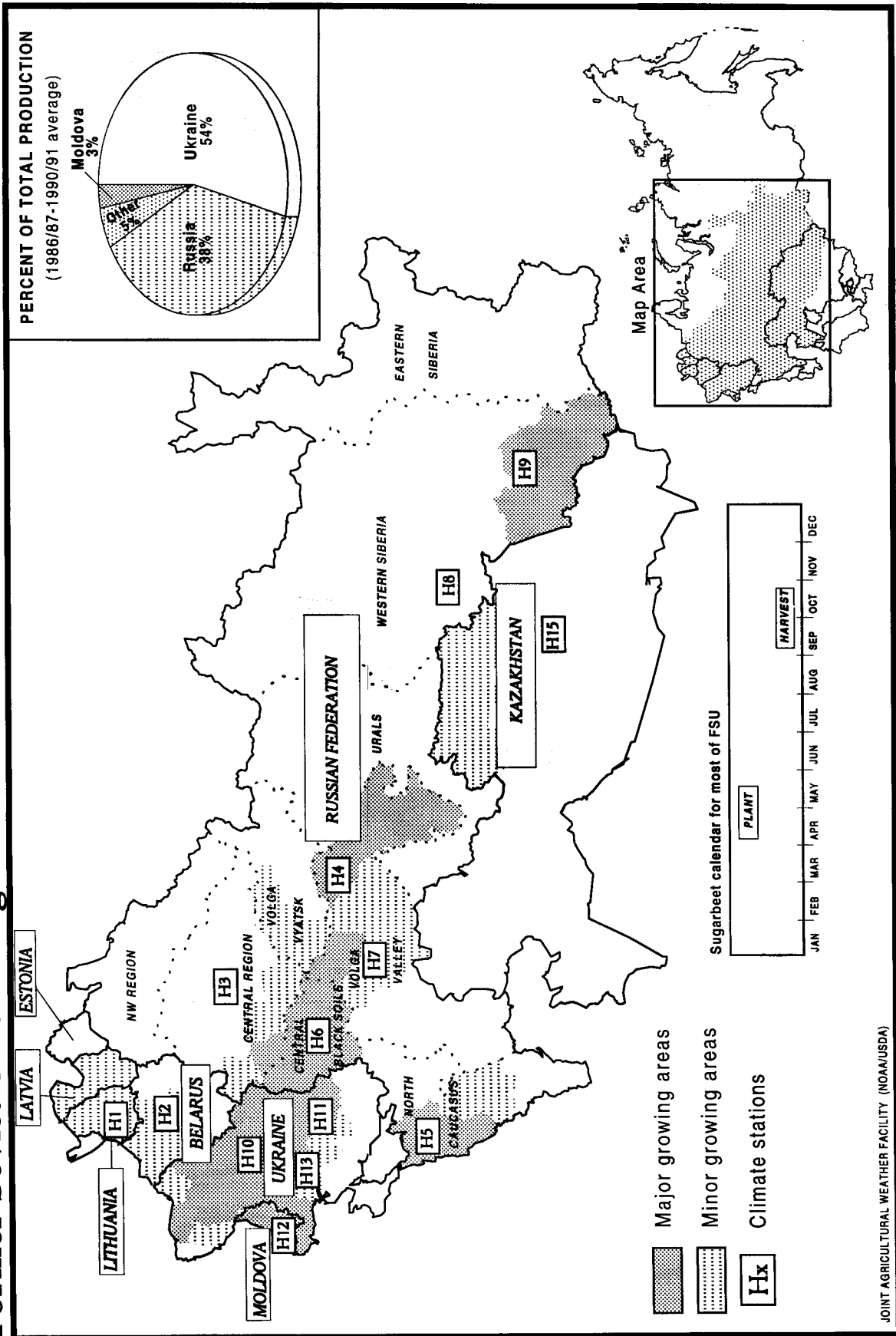


JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Former Soviet Union: Sunflowerseed



Former Soviet Union: Sugarbeets



JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Russian Federation: Area yield, and production of selected grain crops (cleanweight), sunflowerseed and sugarbeets

Year	Wheat		Barley		Total	Rye	Oats	Millet	Corn	Buck-wheat	Rice	Pulses	Total Sunflower-grain seed	Sugar-beets
	Winter	Spring	Winter	Spring										
Area														
1,000 hectares														
1981-85 avg.	8,750	19,550	28,300	16,548	17,241	6,850	10,575	1,640	940	1,145	336	3,802	70,910	2,328
1986-90 avg.	8,554	16,001	24,555	14,837	15,405	7,522	9,834	1,710	1,131	1,124	301	3,960	65,644	2,446
1988-92 avg.	9,541	14,585	24,126	14,137	14,819	7,583	9,058	1,839	1,020	1,374	285	3,372	63,550	2,641
1986/87	8,174	17,432	25,606	15,601	16,157	6,431	11,389	1,495	672	1,033	306	4,298	67,501	2,112
1987/88	6,880	17,094	23,974	16,148	16,621	7,300	10,063	1,733	1,424	1,070	306	4,071	66,886	2,377
1988/89	8,878	15,697	24,575	15,302	15,866	7,892	9,407	1,638	1,260	1,111	306	4,080	66,025	2,438
1989/90	9,106	15,270	24,376	14,101	14,659	8,200	9,210	1,749	1,428	1,127	301	3,793	64,938	2,565
1990/91	9,731	14,513	24,244	13,032	13,723	7,889	9,100	1,936	869	1,278	287	3,556	63,068	2,739
1991/92	9,191	13,961	23,152	14,503	15,281	6,461	9,032	1,997	733	1,646	267	3,163	61,783	2,576
1992/93	10,799	13,485	24,284	13,746	14,564	7,574	8,540	1,875	810	1,709	265	2,266	61,939	2,889
1993/94	10,604	12,914	23,518	14,747	15,477	5,987	8,387	1,459	805	1,785	260	3,150	60,856	2,903
Yield														
tons per hectare														
1981-85 avg.	2.01	1.10	1.37	1.22	1.26	1.30	1.23	0.81	2.90	0.41	3.37	0.99	1.30	1.00
1986-90 avg.	2.82	1.19	1.77	1.49	1.58	1.64	1.28	1.19	2.87	0.56	3.49	1.13	1.59	1.26
1988-92 avg.	2.89	1.11	1.81	1.51	1.60	1.73	1.25	1.01	2.88	0.54	3.18	1.15	1.61	1.22
1986/87	2.55	1.52	1.85	1.51	1.59	1.50	1.38	0.91	2.54	0.50	3.82	0.99	1.59	1.12
1987/88	2.51	1.15	1.54	1.52	1.57	1.52	1.22	1.37	2.70	0.59	3.49	1.04	1.48	1.27
1988/89	2.68	1.03	1.62	1.15	1.23	1.62	1.13	1.07	3.02	0.42	3.75	1.00	1.42	1.21
1989/90	2.97	1.11	1.81	1.43	1.51	1.53	1.30	1.62	3.26	0.66	3.28	1.24	1.61	1.47
1990/91	3.37	1.16	2.05	1.85	1.98	2.05	1.35	1.00	2.82	0.62	3.13	1.38	1.85	1.25
1991/92	2.81	0.94	1.68	1.34	1.45	1.64	1.15	0.52	2.68	0.41	2.90	0.79	1.44	1.12
1992/93	2.62	1.33	1.90	1.77	1.85	1.83	1.32	0.82	2.64	0.61	2.85	1.35	1.72	1.06
1993/94	2.69	1.08	1.81	1.64	1.72	1.53	1.38	0.77	3.04	0.45	2.64	1.3	0.69	0.96
Production														
1,000 tons														
1981-85 avg.	17,548	21,106	38,654	20,188	21,732	9,025	12,981	1,331	2,757	474	1,132	3,774	91,961	2,323
1986-90 avg.	24,335	19,206	43,553	22,024	24,109	12,448	12,576	2,059	3,296	643	1,054	4,433	104,266	3,121
1988-92 avg.	27,522	16,173	43,707	21,139	23,603	13,203	11,304	1,824	3,006	754	911	3,851	102,24	3,228
1986/87	20,863	26,571	47,434	23,552	25,599	9,677	15,684	1,362	1,708	525	1,169	4,246	107,46	2,363
1987/88	17,272	19,596	36,868	1,500	24,601	11,057	12,289	2,385	3,844	644	1,072	4,224	98,588	3,067
1988/89	23,740	16,124	39,864	1,783	17,635	19,418	12,507	10,604	3,814	479	1,146	4,051	93,729	2,958
1989/90	27,090	16,914	44,004	1,967	20,234	22,201	11,977	2,846	4,663	758	986	4,720	104,84	3,789
1990/91	32,711	16,825	49,596	3,137	24,098	16,416	12,326	1,946	2,451	809	896	4,923	116,67	3,427
1991/92	25,800	13,100	38,899	2,735	19,439	22,174	10,372	1,040	1,969	688	773	2,506	89,094	2,895
1992/93	28,270	17,900	46,170	2,700	24,289	13,887	11,241	1,535	2,135	1,038	754	3,055	106,855	3,073
1993/94	28,500	13,980	42,480	2,500	24,128	9,151	11,539	1,124	2,447	800	686	4,105	99,000	2,800

Sources: USDA; Goskomstat Rossii.

JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Ukraine: Area, yield, and production of selected grain crops (cleanweight), sunflowerseed and sugarbeets

Year	Wheat			Barley		Rye	Oats	Millet	Corn	Buck-wheat	Rice	Pulses	Total grain seed	Sunflower-seeds	Sugar-beets
	Winter	Spring	Total	Winter	Spring										
Area	1,000 hectares														
1981-85 avg.	6,824	21	6,844	325	3,171	3,496	705	657	2,161	345	35	1,543	16,172	1,560	1,698
1986-90 avg.	6,407	11	6,419	363	3,185	3,548	572	596	1,981	343	33	1,567	15,525	1,572	1,645
1988-92 avg.	6,861	11	6,871	501	2,752	3,252	530	525	1,464	377	29	1,437	14,883	1,614	1,590
1986/87	5,715	13	5,728	334	3,710	4,044	577	691	2,781	335	35	1,681	16,214	1,498	1,652
1987/88	5,346	13	5,359	228	3,849	4,077	623	653	2,423	341	35	1,616	15,571	1,536	1,667
1988/89	6,451	12	6,463	338	3,320	3,658	597	595	2,328	347	35	1,617	15,962	1,577	1,661
1989/90	6,957	10	6,966	387	2,847	3,233	542	549	1,856	342	33	1,496	15,294	1,615	1,640
1990/91	7,568	9	7,577	527	2,201	2,728	519	492	1,234	350	28	1,424	14,583	1,636	1,607
1991/92	7,013	10	7,023	633	2,557	3,190	491	496	1,462	399	23	1,376	14,671	1,601	1,558
1992/93	6,315	14	6,328	618	2,833	3,451	499	495	1,160	449	25	1,271	13,903	1,641	1,483
1993/94	na	na	5,752	na	na	3,965	498	508	1,330	446	23	na	14,213	1,627	1,500
Yield	tons per hectare														
1981-85 avg.	2.64	1.93	2.64	2.54	2.13	2.17	1.59	1.75	1.33	0.83	4.24	1.60	2.34	1.46	25.9
1986-90 avg.	3.64	2.73	3.64	3.25	2.81	2.87	1.99	2.34	1.78	0.95	4.72	1.85	3.06	1.74	28.8
1988-92 avg.	3.48	2.53	3.48	3.32	2.79	2.86	2.06	2.33	1.66	0.91	4.31	1.97	3.02	1.63	22.5
1986/87	3.21	2.61	3.21	2.89	2.43	2.47	1.74	1.93	1.51	0.77	5.30	1.07	2.55	1.70	26.0
1987/88	3.67	3.02	3.67	2.92	2.99	2.99	2.21	2.54	1.94	1.11	4.88	2.10	3.08	1.76	29.9
1988/89	3.36	2.05	3.36	3.17	2.31	2.39	1.17	2.07	2.06	0.81	4.64	1.78	2.84	1.75	29.9
1989/90	3.93	2.98	3.93	3.56	3.06	3.12	2.39	2.53	1.78	0.91	4.61	2.04	3.35	1.77	31.7
1990/91	4.01	2.97	4.01	3.70	3.28	3.36	2.43	2.65	1.63	1.16	4.19	2.28	3.49	1.69	27.5
1991/92	3.01	2.16	3.01	3.18	2.36	2.52	2.00	1.90	1.76	0.90	4.38	1.42	2.63	1.55	23.2
1992/93	3.08	2.50	3.08	2.99	2.92	2.93	2.32	2.52	1.09	0.78	3.72	2.35	2.77	1.39	19.4
1993/94	na	na	3.79	na	na	3.18	2.41	2.95	na	na	na	na	3.21	1.35	22.4
Production	1,000 tons														
1981-85 avg.	18,056	39	18,095	825	6,737	7,562	1,119	1,139	443	288	148	2,505	34,881	2,287	42,837
1986-90 avg.	23,479	31	23,510	1,206	8,828	10,035	1,197	1,384	498	335	158	2,895	47,415	2,732	43,619
1988-92 avg.	24,002	27	24,029	1,652	7,580	9,233	1,150	1,223	382	350	125	2,837	44,960	2,622	40,426
1986/87	18,377	34	18,411	964	9,009	9,973	1,000	1,336	454	260	185	1,819	41,506	2,561	42,920
1987/88	19,615	40	19,655	666	11,524	12,190	1,373	1,658	688	386	171	3,423	47,978	2,716	49,743
1988/89	21,684	25	21,709	1,071	7,680	8,751	1,055	1,236	576	291	163	2,894	45,369	2,775	48,205
1989/90	27,371	29	27,400	1,377	8,713	10,090	1,297	1,387	434	317	153	3,072	51,212	2,885	51,917
1990/91	30,348	26	30,374	1,953	7,215	9,169	1,259	1,303	338	420	117	3,266	51,009	2,725	44,265
1991/92	21,133	22	21,155	2,015	6,032	8,047	982	945	338	473	102	1,965	38,674	2,448	36,168
1992/93	19,473	35	19,507	1,846	8,260	10,106	1,156	1,246	226	351	93	2,986	38,537	2,277	28,800
1993/94	na	na	21,800	na	na	12,600	1,200	1,500	na	na	na	na	45,600	2,200	33,600

na = not available.

Sources: USDA; Minstat Ukraine.

JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Kazakhstan: Area, yield, and production of selected grain crops (cleanweight), sunflowerseed and sugarbeets

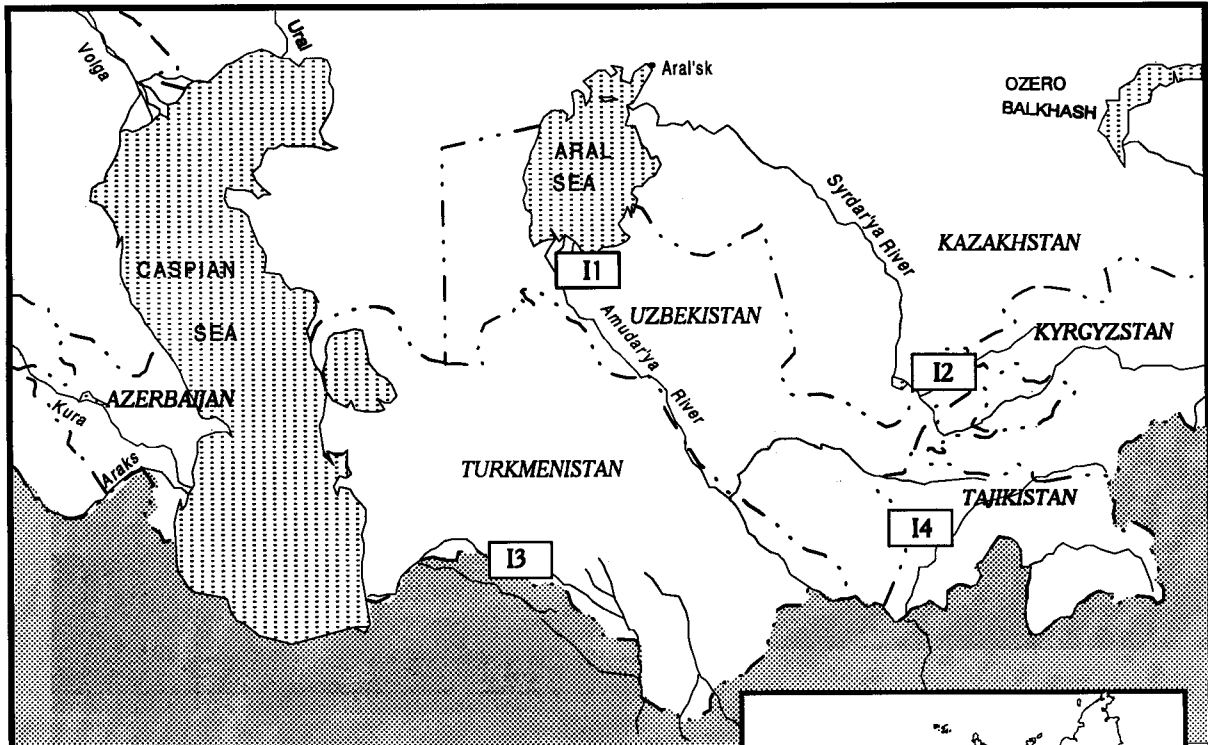
Year	Wheat			Barley		Total	Rye	Oats	Millet	Corn	Buck-wheat	Rice	Pulses	Total grain	sunflower-seed	sugar-beets
	Winter	Spring	Total	Winter	Spring											
Area	1,000 hectares															
1981-85 avg.	1,089	15,246	16,335	na	na	6,737	354	446	802	123	198	137	169	25,352	101	68
1986-90 avg.	1,086	13,764	14,849	38	6,774	6,819	598	415	725	128	193	131	172	24,109	118	50
1988-92 avg.	1,127	13,006	14,134	47	6,519	6,566	651	422	821	129	275	126	161	23,361	176	49
1986/87	1,062	14,538	15,600	46	6,643	6,727	432	450	692	119	177	129	164	24,563	96	62
1987/88	1,155	14,156	15,311	30	6,841	6,871	489	483	677	119	179	133	184	24,525	104	56
1988/89	915	13,961	14,876	30	7,033	7,063	577	350	699	137	177	135	183	24,290	122	42
1989/90	1,097	13,293	14,390	29	6,744	6,773	723	408	774	134	215	133	172	23,812	131	45
1990/91	1,199	12,871	14,070	53	6,607	6,660	789	382	781	129	218	124	159	23,356	137	44
1991/92	1,206	12,250	13,456	60	6,554	6,614	562	512	847	121	318	118	152	22,753	190	45
1992/93	1,220	12,657	13,877	61	5,657	5,718	623	456	1,003	126	447	121	140	22,596	298	68
1993/94	1,313	11,437	12,750	63	6,938	7,001	na	549	527	117	409	112	119	22,250	271	65
Yield	tons per hectare															
1981-85 avg.	0.92	0.75	0.75	0.99	0.79	0.79	0.60	0.97	0.47	4.14	0.40	4.38	0.62	0.79	0.94	25.6
1986-90 avg.	1.53	0.92	0.97	1.78	0.99	0.99	0.92	1.10	0.80	3.88	0.51	4.51	0.80	1.00	0.99	28.9
1988-92 avg.	1.38	0.87	0.91	1.86	0.96	0.97	0.95	1.05	0.67	3.35	0.53	4.34	0.72	0.94	0.79	20.2
1986/87	1.25	1.06	1.07	1.08	1.06	1.06	0.85	1.37	0.56	4.25	0.42	4.55	0.91	1.08	0.87	27.9
1987/88	1.95	0.98	1.05	1.96	1.00	1.00	0.69	0.95	0.82	4.03	0.40	4.54	0.79	1.05	1.12	32.0
1988/89	1.48	0.77	0.82	2.00	0.83	0.83	0.95	0.98	0.82	4.09	0.66	4.65	0.72	0.86	1.14	31.8
1989/90	1.32	0.70	0.75	1.72	0.78	0.78	1.03	0.61	0.59	3.58	0.25	4.16	0.62	0.79	0.80	26.7
1990/91	1.64	1.11	1.15	2.12	1.27	1.28	1.09	1.60	1.20	3.44	0.80	4.65	0.97	1.22	1.03	26.0
1991/92	1.02	0.46	0.51	1.52	0.46	0.47	0.85	0.45	0.28	2.72	0.43	4.40	0.43	0.53	0.57	16.1
1992/93	1.43	1.31	1.32	1.95	1.48	1.49	0.85	1.59	0.45	2.91	0.51	3.86	0.88	1.32	0.41	17.2
1993/94	1.47	0.84	0.91	1.78	1.01	1.02	na	1.46	0.44	3.03	0.32	3.61	0.79	0.97	0.40	13.8
Production	1,000 tons															
1981-85 avg.	1,018	11,380	12,398	103	5,261	5,364	217	420	374	503	80	597	105	20,082	94	1,785
1986-90 avg.	1,671	12,728	14,399	92	6,645	6,737	568	456	583	493	98	590	138	24,108	117	1,434
1988-92 avg.	1,562	11,301	12,863	93	6,159	6,251	627	433	532	436	142	550	116	22,004	123	1,108
1986/87	1,328	15,415	16,743	91	7,004	7,095	369	616	391	505	74	586	150	26,562	83	1,724
1987/88	2,255	13,853	16,108	122	6,807	6,929	338	459	549	477	72	606	145	25,721	117	1,804
1988/89	1,354	10,808	12,162	84	5,766	5,850	548	345	577	561	117	626	132	20,970	139	1,321
1989/90	1,451	9,332	10,783	50	5,260	5,310	745	251	459	479	53	555	107	18,797	105	1,188
1990/91	1,966	14,231	16,197	112	6,369	6,500	839	610	940	442	174	579	154	28,488	141	1,134
1991/92	1,298	5,591	6,889	100	2,985	3,085	480	231	330	330	136	521	66	11,992	108	726
1992/93	1,743	16,542	18,285	118	8,393	8,511	525	727	447	368	230	467	123	29,772	122	1,170
1993/94	1,934	9,651	11,585	112	7,037	7,149	na	802	232	355	130	403	94	21,631	107	900

na = not available.

Sources: USDA; Goskomstat Kazakhstan.

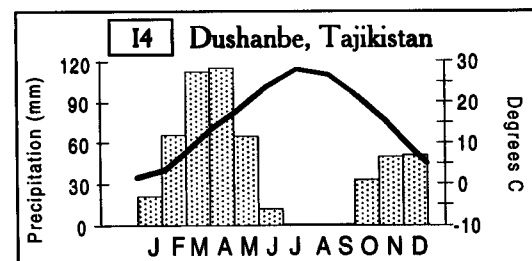
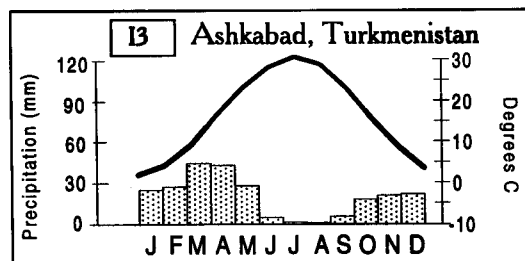
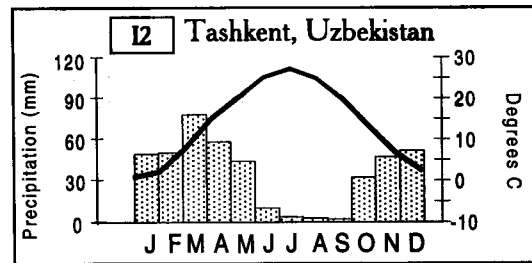
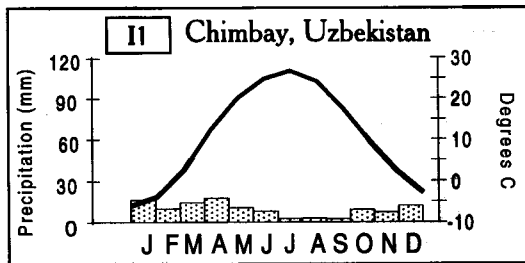
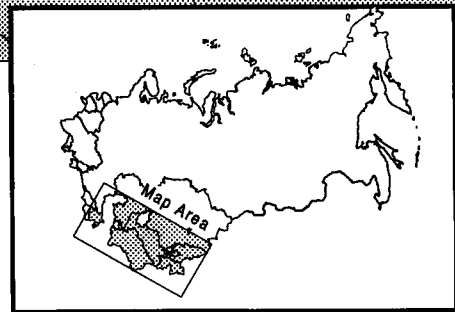
JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Former Soviet Union (Central Asia): Landforms and climate stations

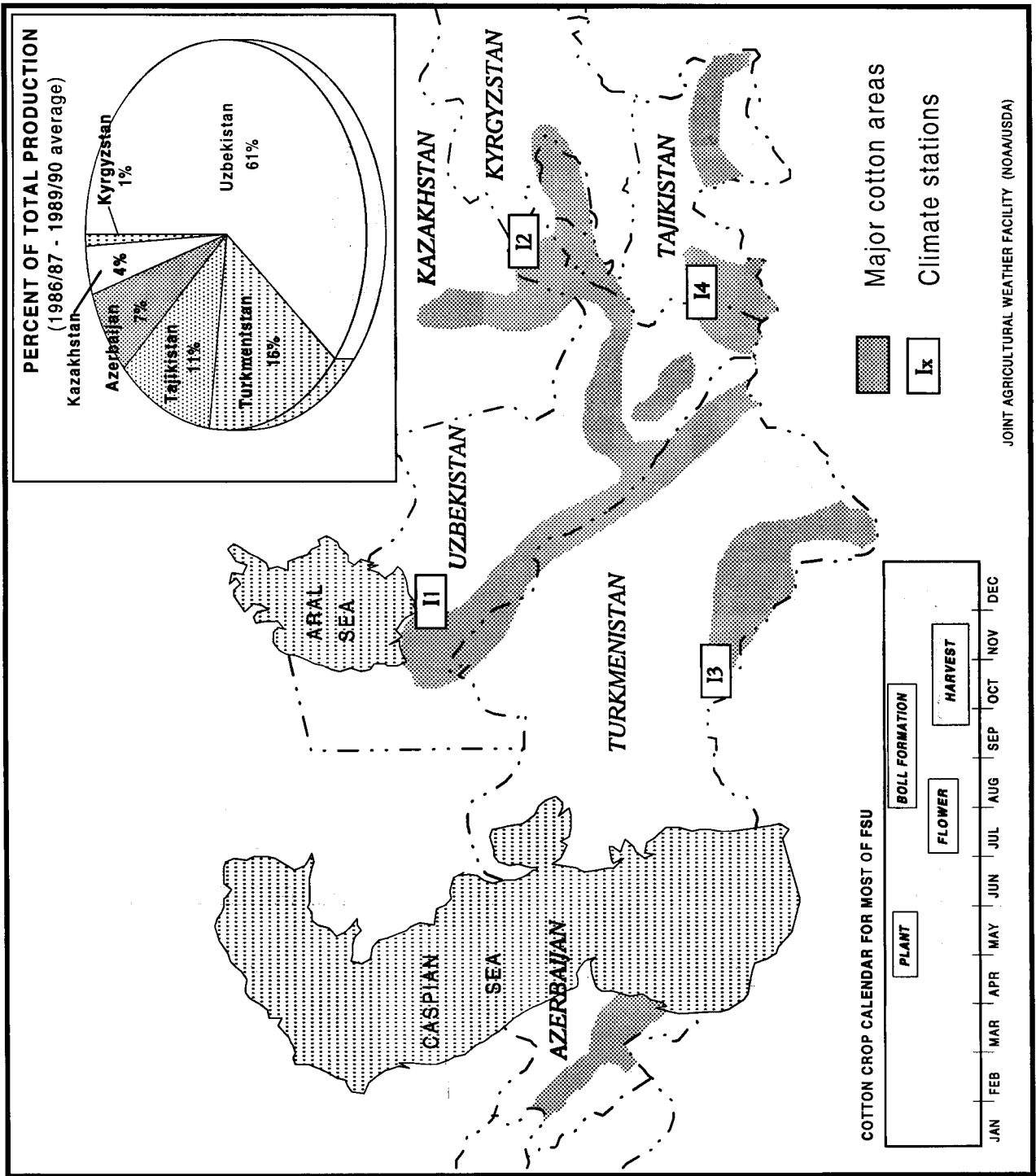


JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Ix Climate Stations



Former Soviet Union: Cotton



JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

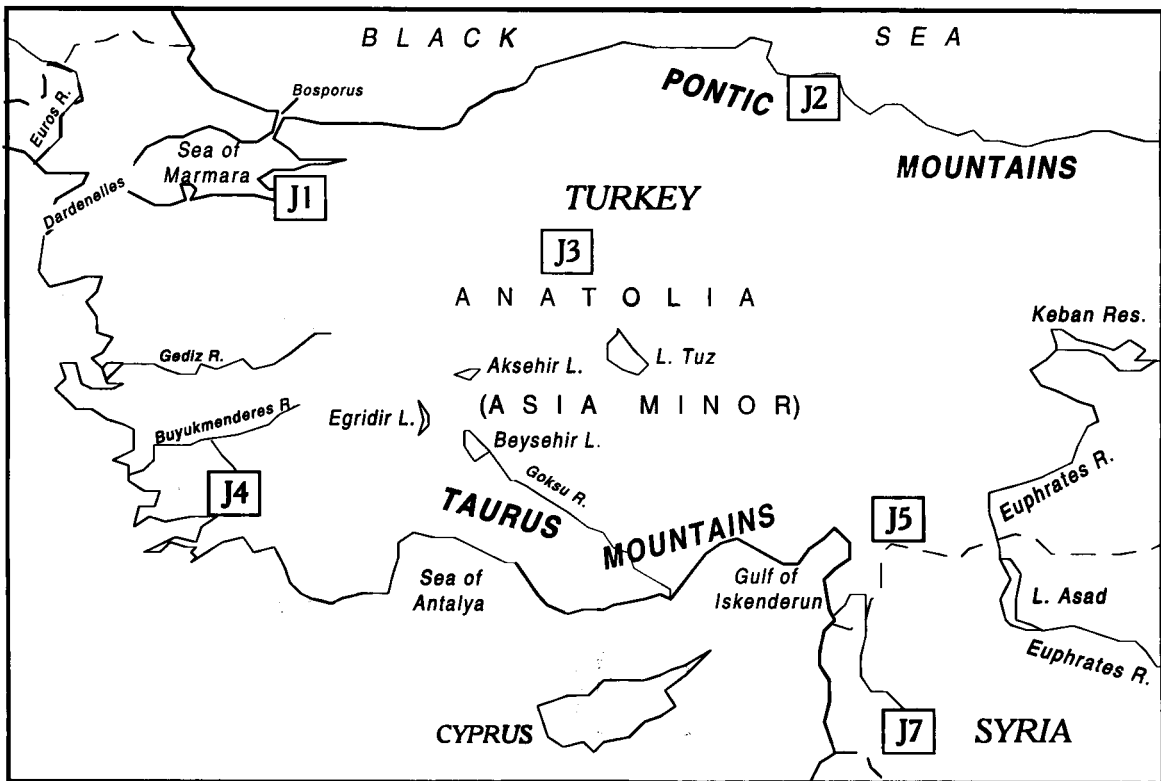
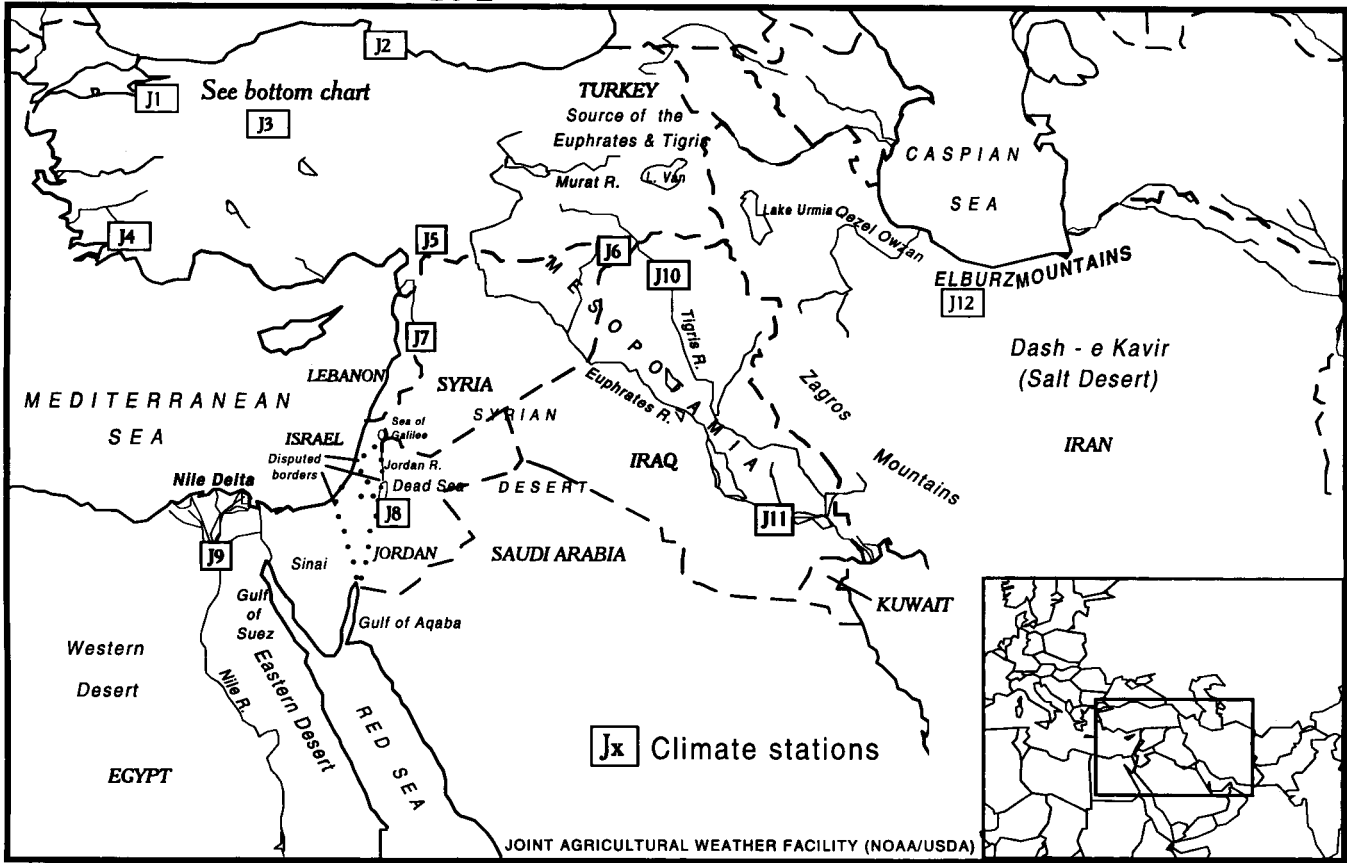
Former Soviet Union: Area, yield, and production of cotton for selected countries

Country	1981-85	1986-90	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94	1986-90
Area	1,000 hectares										
Uzbekistan	1,931	1,994	2,044	2,112	2,014	1,969	1,830	1,720	1,667	1,627	59
Turkmenistan	533	636	653	630	640	634	623	604	570	574	19
Tajikistan	308	313	310	324	319	309	304	298	286	260	9
Azerbaijan	297	291	310	303	298	280	264	245	233	225	8
Kazakhstan	130	125	128	127	129	119	120	117	110	110	4
Kirgyzstan	44	30	30	31	32	27	30	26	22	19	1
Total FSU	3,242	3,389	3,475	3,527	3,432	3,338	3,171	3,010	2,888	2,815	100
Raw Yield	tons per hectare										
Uzbekistan	2.97	2.57	2.44	2.30	2.66	2.69	2.76	2.70	2.48	2.60	-
Turkmenistan	2.27	2.08	1.74	2.02	2.10	2.18	2.34	2.36	2.28	2.32	-
Tajikistan	2.98	2.89	2.97	2.69	3.02	2.98	2.77	2.74	1.43	2.00	-
Azerbaijan	2.91	2.21	2.53	2.30	2.07	2.08	2.06	2.20	1.42	1.25	-
Kazakhstan	2.33	2.51	2.60	2.46	2.52	2.65	2.70	2.48	2.24	1.88	-
Kirgyzstan	1.91	2.59	2.27	2.35	2.47	2.74	2.70	2.38	2.38	2.61	-
Total FSU	2.56	2.48	2.37	2.29	2.53	2.57	2.62	2.58	2.24	2.35	-
Raw Production	1,000 tons										
Uzbekistan	5,723	5,112	4,989	4,858	5,365	5,292	5,058	4,645	4,128	4,234	61
Turkmenistan	1,210	1,318	1,138	1,272	1,341	1,382	1,457	1,428	1,301	1,330	16
Tajikistan	917	904	922	872	964	921	842	816	410	520	11
Azerbaijan	861	644	784	697	616	582	543	539	330	282	7
Kazakhstan	302	322	333	312	325	315	324	290	246	207	4
Kirgyzstan	87	75	68	73	79	74	81	62	52	50	1
Total FSU	8,314	8,376	8,234	8,084	8,690	8,566	8,305	7,780	6,467	6,623	100

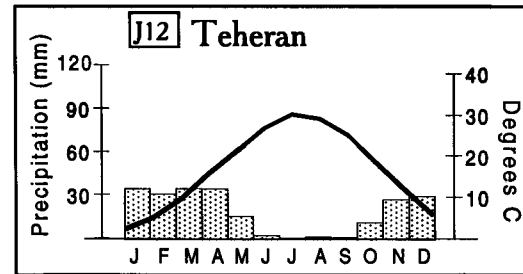
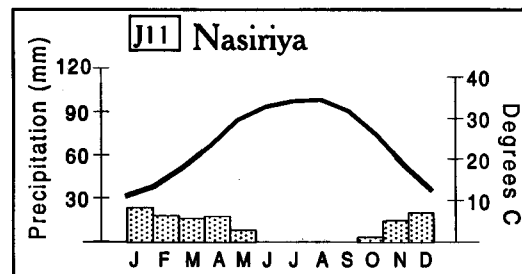
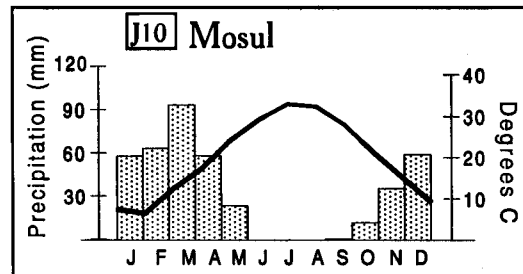
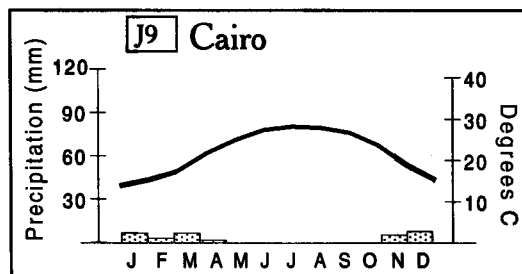
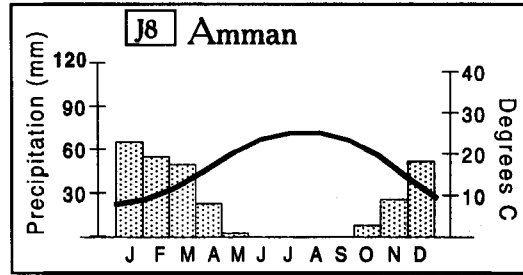
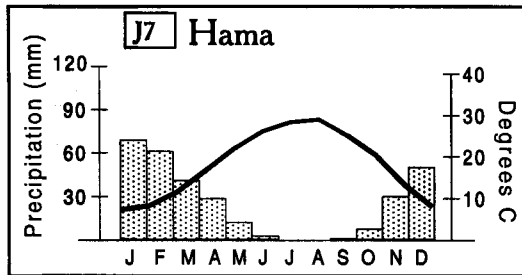
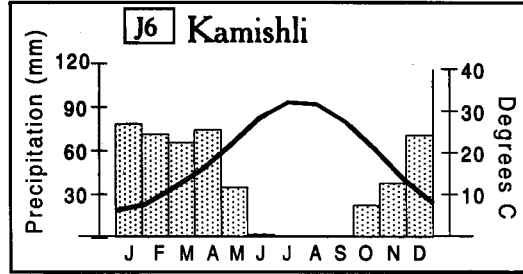
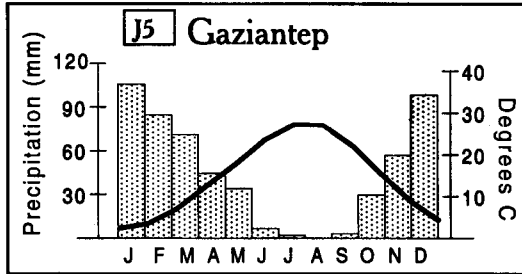
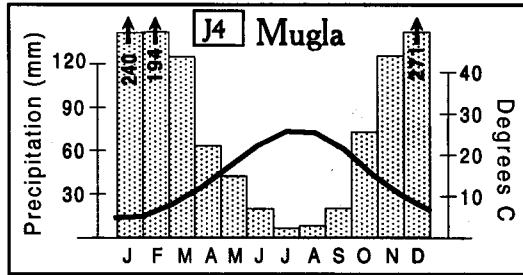
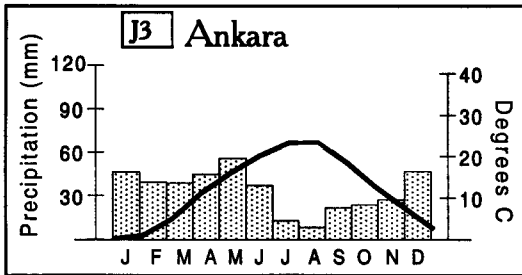
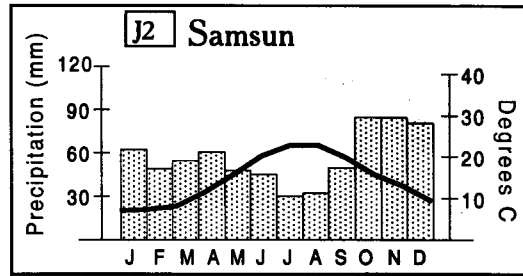
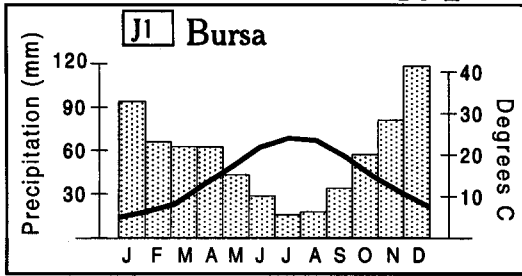
Sources: USDA; Statkom SNG; Goskomstat.

JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Middle East and Egypt: Landforms

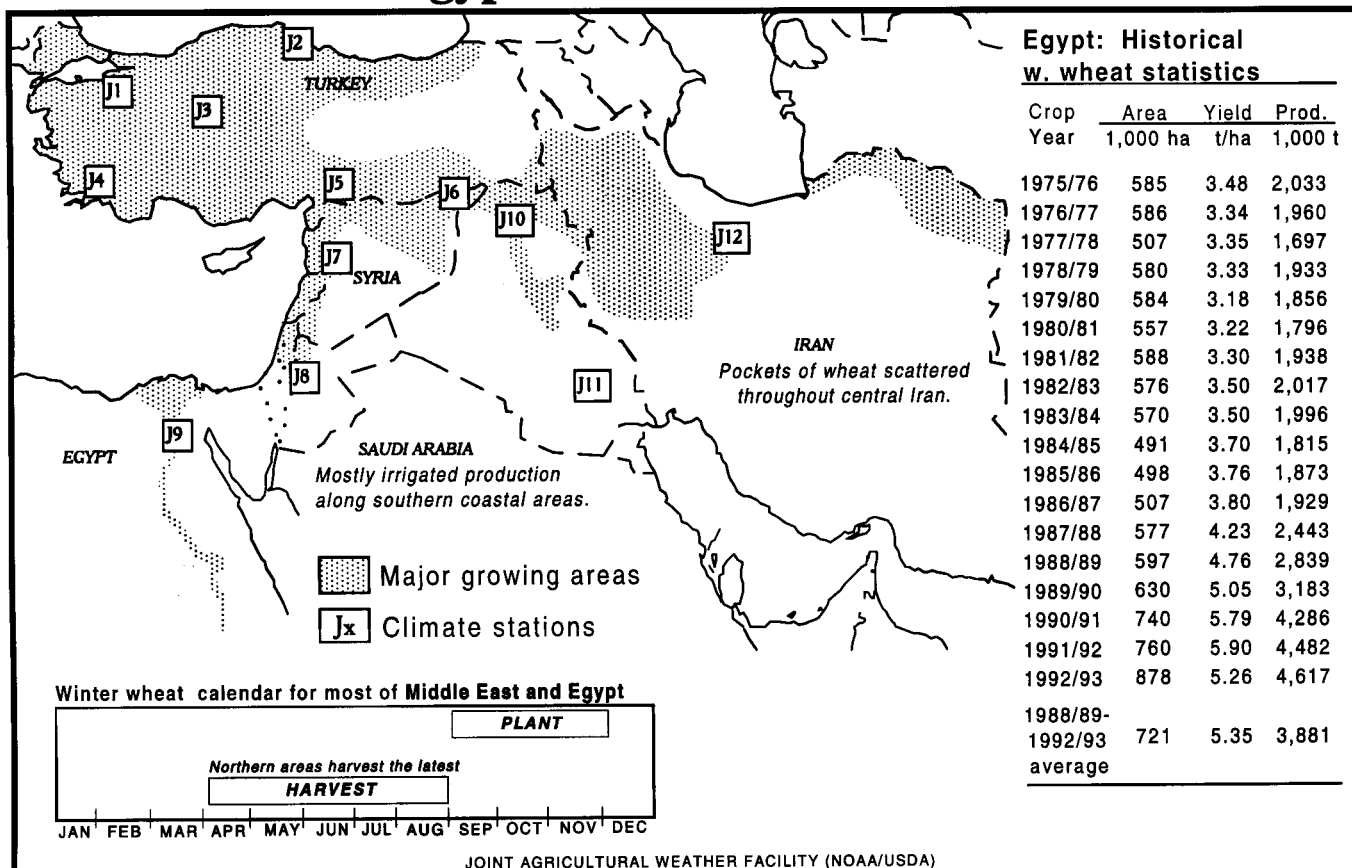


Middle East and Egypt: Climate stations



JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Middle East and Egypt: Winter wheat

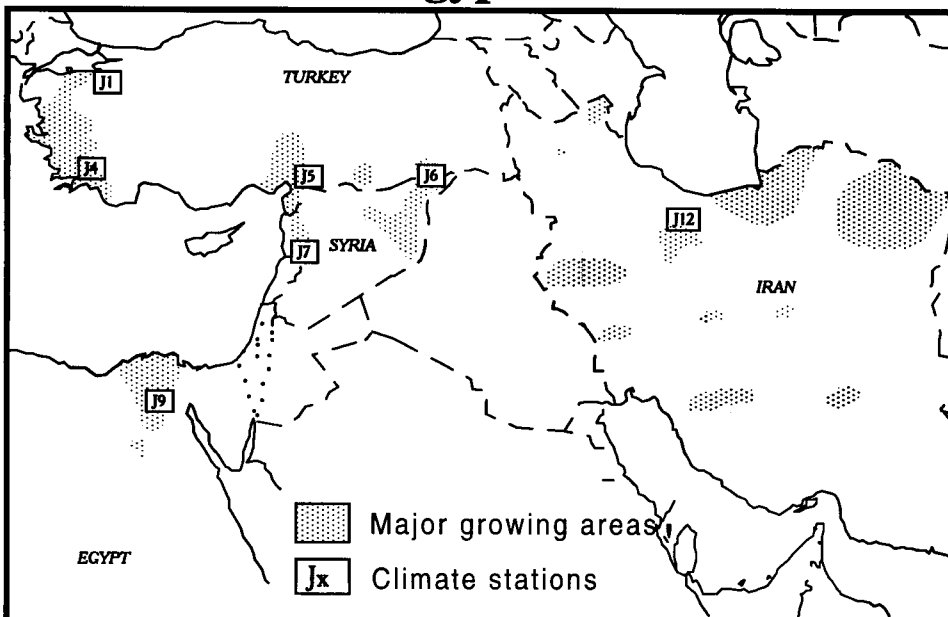


Middle East *: Historical winter wheat statistics				Turkey: Historical w. wheat statistics			Iran: Historical w. wheat statistics			Syria: Historical w. wheat statistics			S. Arabia: Historical w. wheat statistics		
Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t	Area 1,000 ha	Yield t/ha	Prod. 1,000 t	Area 1,000 ha	Yield t/ha	Prod. 1,000 t	Area 1,000 ha	Yield t/ha	Prod. 1,000 t	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1975/76	17,196	1.17	20,082	8,500	1.35	11,500	5,200	1.07	5,575	1,692	0.92	1,550	53	3.64	193
1976/77	17,423	1.28	22,257	8,600	1.51	13,000	5,000	1.10	5,500	1,590	1.13	1,790	57	3.60	205
1977/78	16,325	1.29	21,042	8,500	1.59	13,500	5,000	1.01	5,025	1,528	0.80	1,217	58	2.59	150
1978/79	17,092	1.29	21,965	8,600	1.55	13,300	5,000	1.11	5,525	1,555	1.06	1,651	58	3.02	175
1979/80	17,476	1.28	22,310	8,600	1.51	13,000	5,275	1.15	6,050	1,445	0.91	1,320	85	1.76	150
1980/81	17,870	1.29	23,125	8,600	1.51	13,000	5,925	1.00	5,925	1,449	1.54	2,238	67	2.10	141
1981/82	17,543	1.34	23,443	8,500	1.55	13,200	6,250	1.07	6,675	1,255	1.66	2,087	60	3.12	187
1982/83	16,928	1.40	23,723	8,600	1.60	13,800	6,200	1.08	6,675	1,222	1.27	1,556	137	3.01	412
1983/84	16,940	1.35	22,878	8,700	1.53	13,300	5,925	0.99	5,875	1,290	1.25	1,612	264	2.69	710
1984/85	16,833	1.35	22,710	8,600	1.55	13,300	5,960	1.04	6,200	1,107	0.96	1,068	470	2.98	1,402
1985/86	18,341	1.35	24,794	8,600	1.48	12,700	6,200	1.07	6,625	1,265	1.35	1,714	500	4.09	2,047
1986/87	18,380	1.47	27,042	8,700	1.61	14,000	6,300	1.20	7,550	1,350	1.37	1,850	556	4.12	2,290
1987/88	18,247	1.43	26,150	8,700	1.49	13,000	6,591	1.15	7,600	1,183	1.40	1,656	602	4.40	2,649
1988/89	18,083	1.66	30,038	8,750	1.83	16,000	6,150	1.18	7,265	1,100	1.88	2,067	726	4.50	3,267
1989/90	17,349	1.37	23,754	8,700	1.44	12,500	6,260	0.96	6,010	744	1.21	900	780	4.43	3,452
1990/91	18,572	1.67	30,977	8,750	1.83	16,000	6,500	1.23	8,000	1,100	1.57	1,726	771	4.64	3,580
1991/92	19,618	1.70	33,344	8,800	1.88	16,500	6,650	1.34	8,900	1,269	1.69	2,140	864	4.55	3,934
1992/93	20,334	1.70	34,507	8,800	1.76	15,500	7,200	1.42	10,200	1,380	2.03	2,800	907	4.49	4,070
1988/89-1992/93 average	18,791	1.62	30,524	8,760	1.75	15,300	6,552	1.23	8,075	1,119	1.68	1,927	810	4.52	3,661

Turkey historically produces 44% of Middle East total.
 Iran historically produces 31% of Middle East total.
 Syria historically produces 12% of Middle East total.
 Saudi Arabia hist. produces 7% of Middle East total.

* For statistical purposes, the Middle East is comprised of the following countries: Bahrain, Cyprus, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, Turkey, United Arab Emirates, and Yemen (North and South).

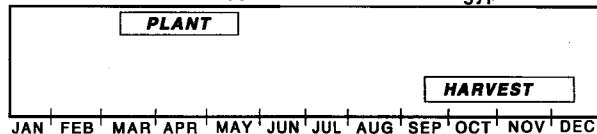
Middle East and Egypt: Cotton



Egypt: Historical cotton statistics

Crop Year	Area	Yield	Prod.
	1,000 ha	kg/ha	1,000 480 lb. bales
1975/76	565	680	1,754
1976/77	524	760	1,819
1977/78	598	670	1,833
1978/79	499	880	2,012
1979/80	502	960	2,223
1980/81	523	1,010	2,430
1981/82	495	1,010	2,292
1982/83	447	1,030	2,117
1983/84	425	990	1,934
1984/85	415	970	1,842
1985/86	454	960	1,998
1986/87	443	910	1,851
1987/88	416	840	1,612
1988/89	426	720	1,405
1989/90	422	680	1,323
1990/91	417	720	1,378
1991/92	358	810	1,337
1992/93	357	990	1,621
1988/89-1992/93 average	396	784	1,413

Cotton calendar for most of Middle East and Egypt



JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Middle East *: Historical cotton statistics

Crop Year	Area	Yield	Prod.
	1,000 ha	kg/ha	1,000 480 lb. bales
1975/76	1,312	650	3,913
1976/77	1,207	720	3,996
1977/78	1,444	690	4,579
1978/79	1,278	670	3,955
1979/80	1,151	700	3,706
1980/81	1,126	690	3,592
1981/82	1,162	700	3,748
1982/83	1,122	760	3,932
1983/84	1,135	820	4,267
1984/85	1,303	740	4,414
1985/86	1,190	770	4,198
1986/87	1,074	790	3,913
1987/88	1,058	780	3,798
1988/89	1,254	770	4,460
1989/90	1,248	750	4,290
1990/91	1,164	860	4,584
1991/92	1,095	830	4,189
1992/93	1,172	820	4,441
1988/89-1992/93 average	1,187	806	4,393

Turkey: Historical cotton statistics

Area	Yield	Prod.
670	720	2,205
581	820	2,186
778	740	2,641
653	730	2,182
612	780	2,186
673	740	2,296
654	750	2,241
595	820	2,246
614	850	2,398
743	780	2,664
660	780	2,379
589	880	2,379
586	920	2,466
737	880	2,985
725	850	2,834
641	1,020	3,008
599	940	2,577
637	900	2,636
668	918	2,808

Turkey historically produces 64% of Middle East total.

Syria: Historical cotton statistics

Area	Yield	Prod.
208	760	726
182	860	716
187	810	694
169	850	661
154	830	588
139	850	542
143	910	597
159	990	726
173	1,120	891
178	860	703
170	950	744
144	870	579
129	740	441
171	670	524
158	810	588
156	930	666
170	1,070	836
212	1,090	1,079
173	914	739

Syria historically produces 17% of Middle East total.

Iran: Historical cotton statistics

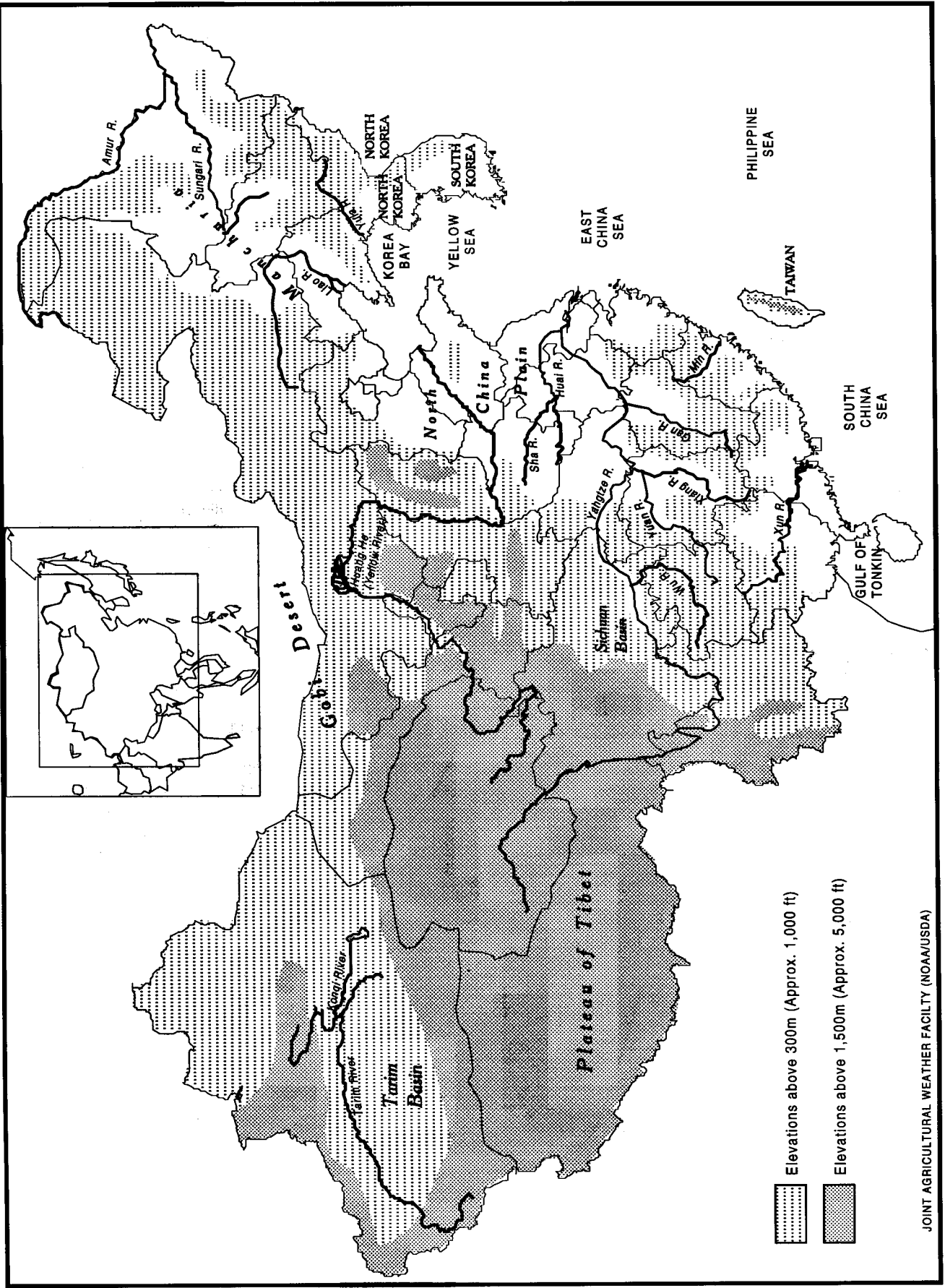
Area	Yield	Prod.
291	470	634
295	530	712
316	560	818
280	480	611
215	460	455
145	390	262
194	400	358
205	460	432
184	500	418
212	530	510
188	560	487
188	590	510
196	540	487
191	610	533
228	500	524
229	520	547
207	570	542
200	510	464
211	542	522



Iran historically produces 12% of Middle East total.

* For statistical purposes, the Middle East is comprised of the following countries:

Bahrain, Cyprus, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, Turkey, United Arab Emirates, and Yemen (North and South).

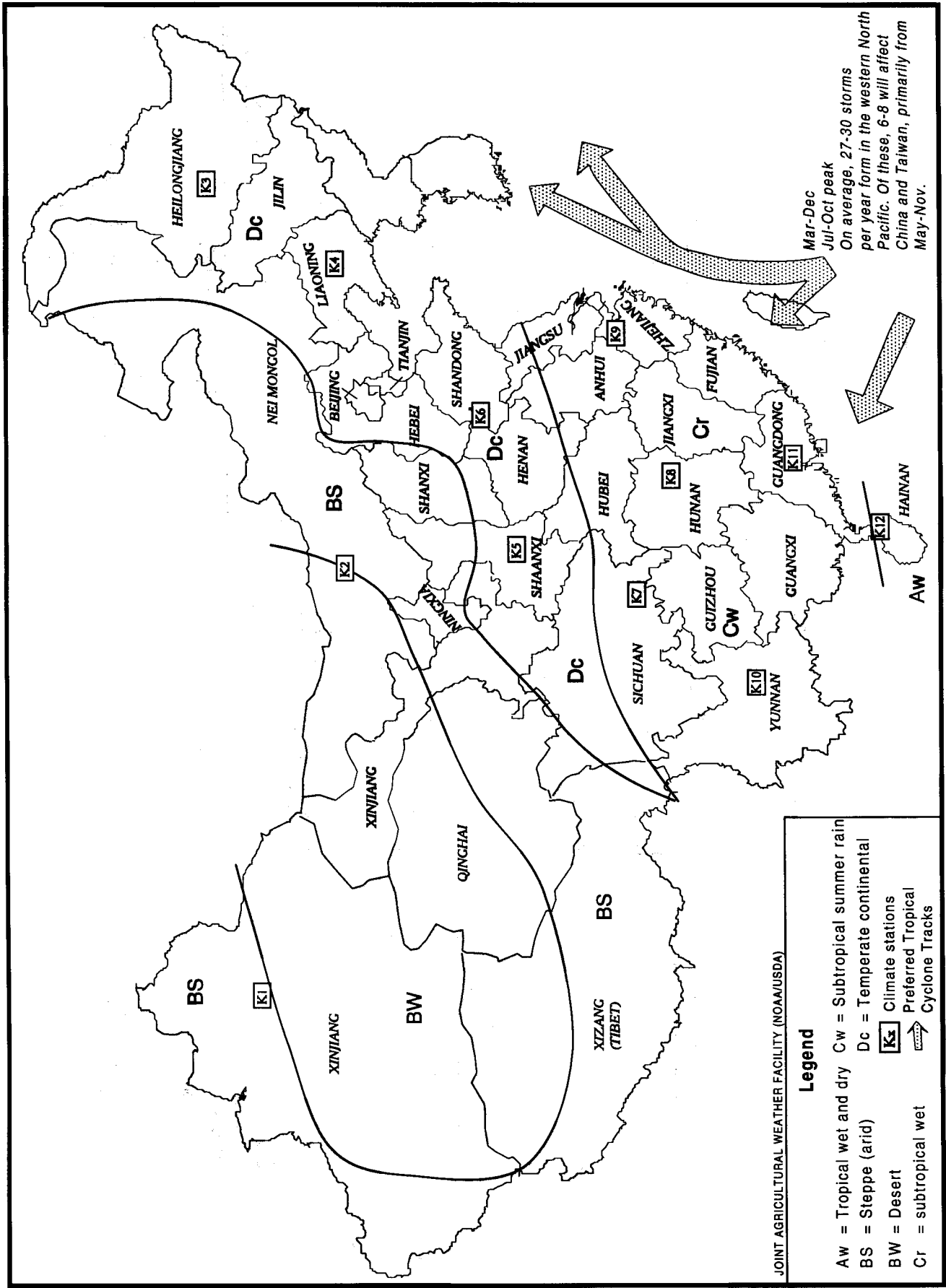
China: Landforms



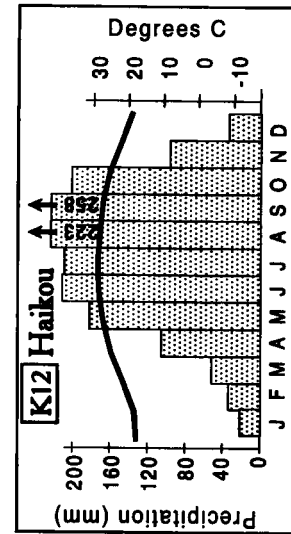
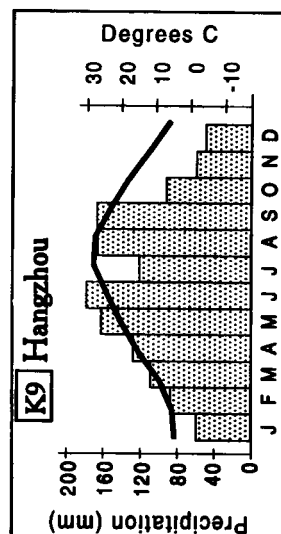
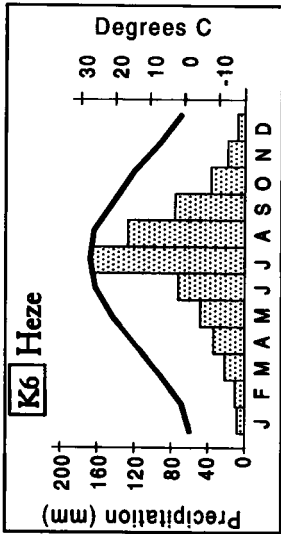
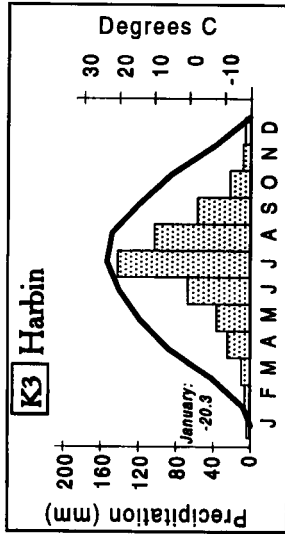
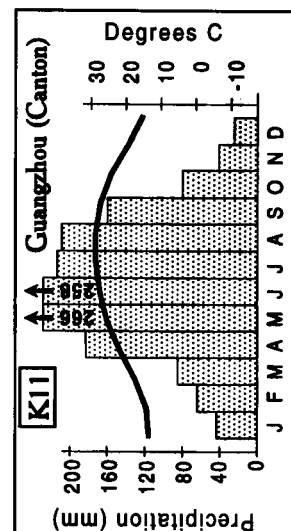
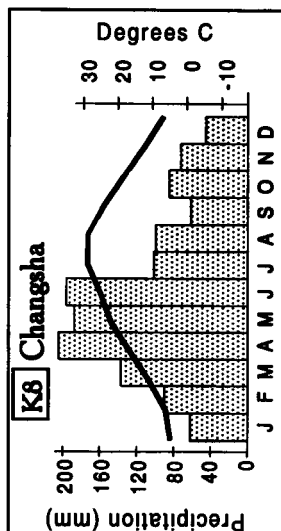
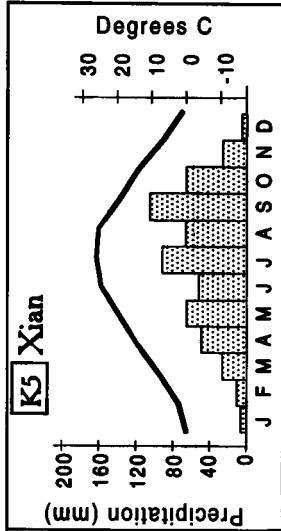
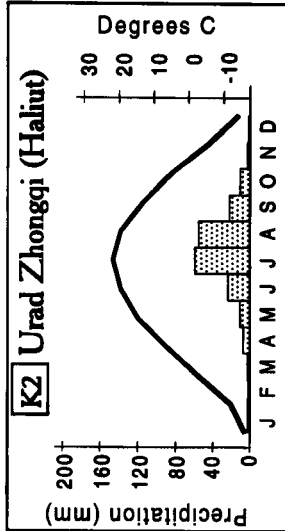
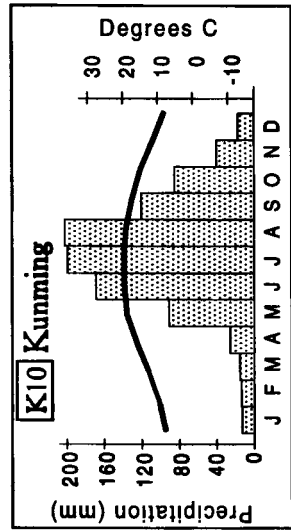
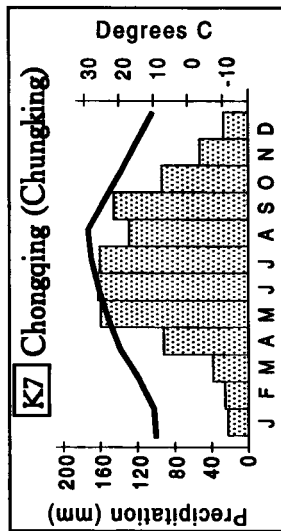
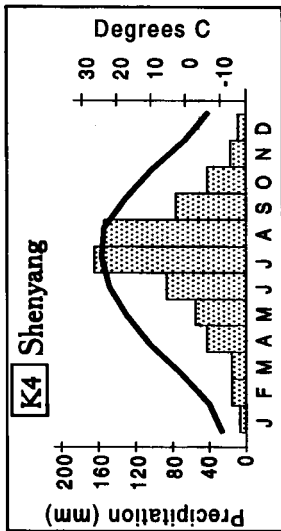
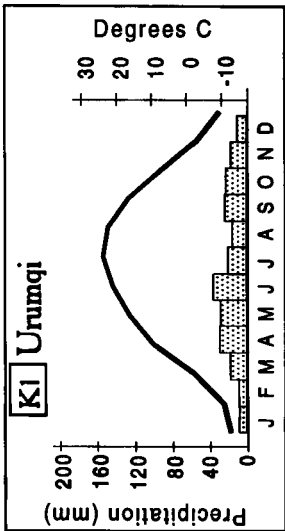
-  Elevations above 300m (Approx. 1,000 ft)
-  Elevations above 1,500m (Approx. 5,000 ft)

JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

China: Climate

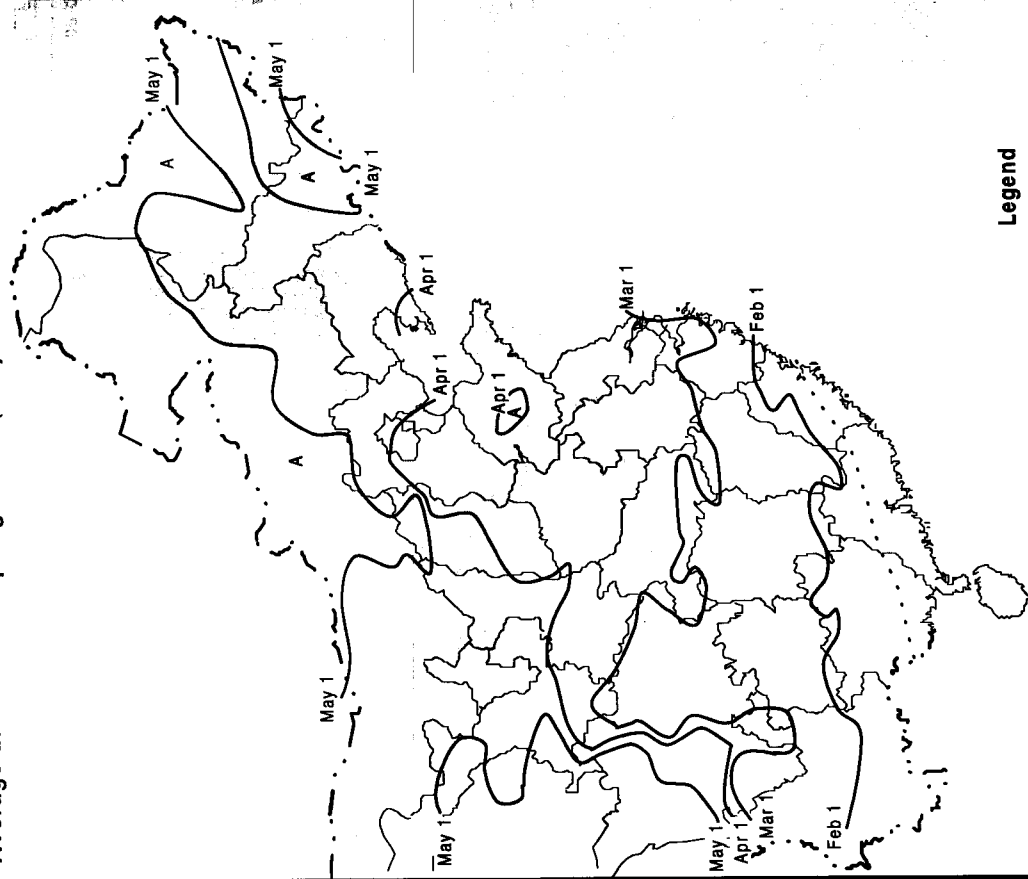


China: Climate stations



China: Average freeze dates

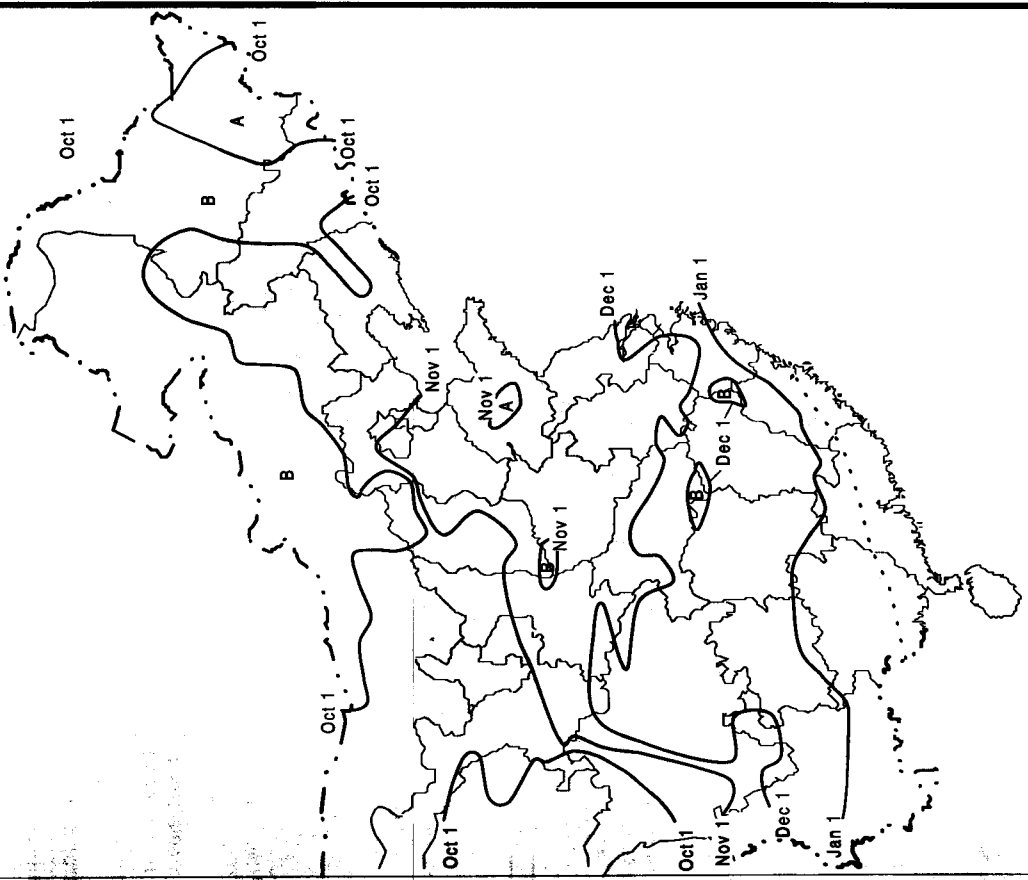
Average dates of last spring freeze (0 °C)



Legend

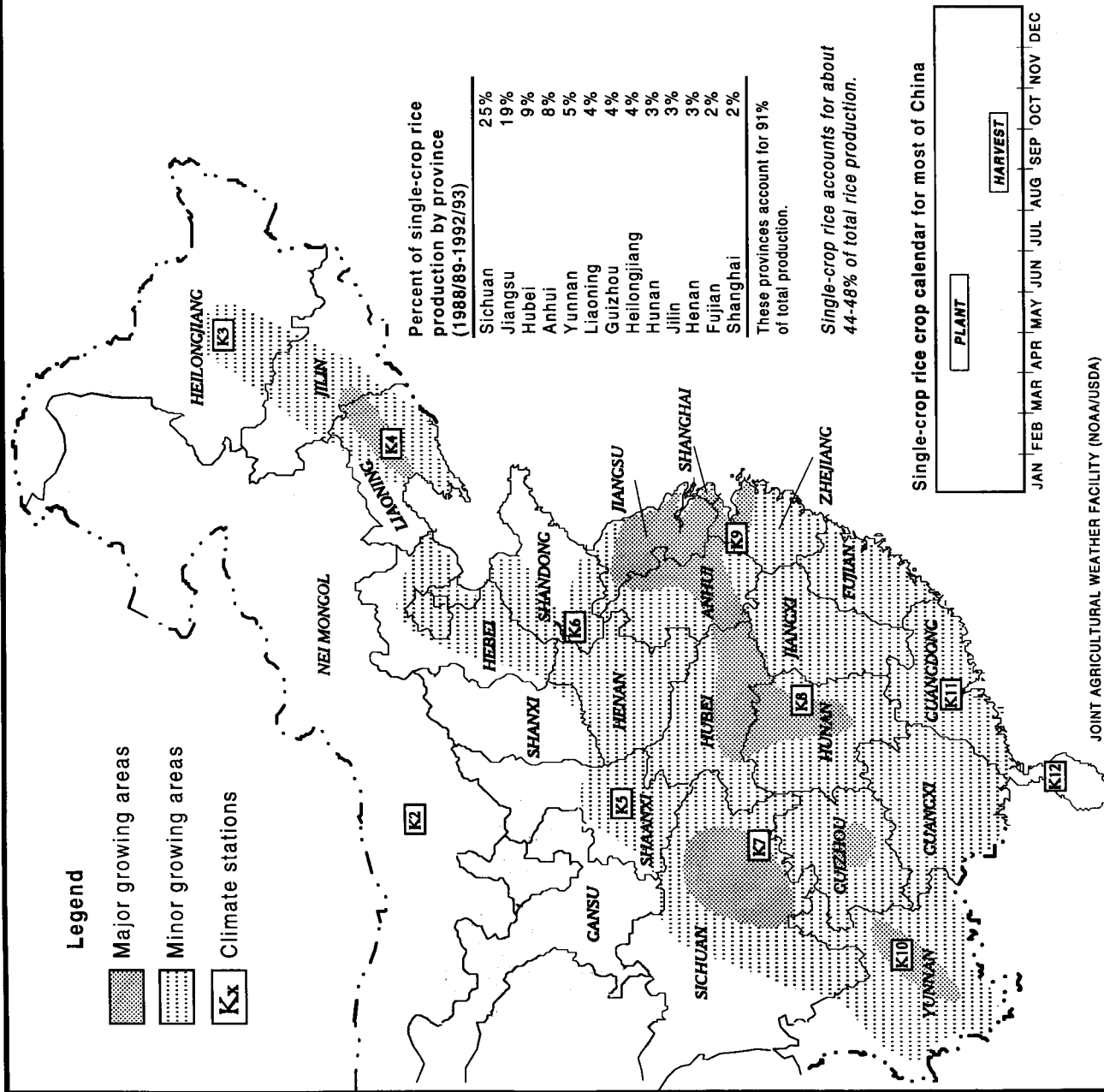
- A = Freezes occur after specified date
- B = Freezes occur before specified date
- Freezes occur south of this line in less than half the years

Average dates of first autumn freeze (0 °C)






Note: Period of record is from 1977-1991. Due to the short period of record and local climate variations, these maps should be considered as a general representation.

China: Single-crop rice



Legend

-  Major growing areas
-  Minor growing areas
-  Climate stations

China: Historical total rice statistics

Crop Year	Area 1,000 ha	Yield (Rough) t/ha	Prod. (Milled) 1,000 t
1970/71	32,358	3.40	76,993
1971/72	34,918	3.30	80,643
1972/73	35,143	3.23	79,348
1973/74	35,090	3.47	85,215
1974/75	35,512	3.49	86,733
1975/76	35,729	3.51	87,892
1976/77	36,217	3.47	88,063
1977/78	35,526	3.62	89,996
1978/79	34,421	3.98	95,850
1979/80	33,344	4.31	100,625
1980/81	33,878	4.13	97,934
1981/82	33,293	4.32	100,768
1982/83	33,056	4.89	113,117
1983/84	33,136	5.10	118,206
1984/85	33,178	5.37	124,779
1985/86	32,070	5.26	117,999
1986/87	32,266	5.34	120,557
1987/88	32,139	5.41	121,716
1988/89	31,914	5.30	118,377
1989/90	32,700	5.51	126,091
1990/91	33,064	5.73	132,532
1991/92	32,590	5.64	128,667
1992/93	32,090	5.80	130,354
1988/89- 1992/93 average	32,472	5.60	127,204

Percent of total rice production by province (1988/89-1992/93)

Hunan	13%
Sichuan	12%
Jiangsu	9%
Hubei	9%
Guangdong	9%
Jiangxi	8%
Zhejiang	7%
Anhui	7%
Guangxi	6%
Fujian	4%
Yunnan	3%
Liaoning	2%
Guizhou	2%
Heilongjiang	2%

These provinces account for 93% of total rice production.

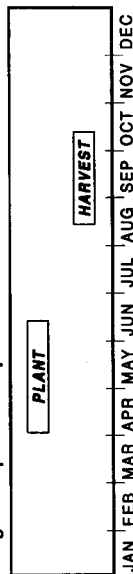
Percent of single-crop rice production by province (1988/89-1992/93)

Sichuan	25%
Jiangsu	19%
Hubei	9%
Anhui	8%
Yunnan	5%
Liaoning	4%
Guizhou	4%
Heilongjiang	4%
Hunan	3%
Jilin	3%
Henan	3%
Fujian	2%
Shanghai	2%

These provinces account for 91% of total production.

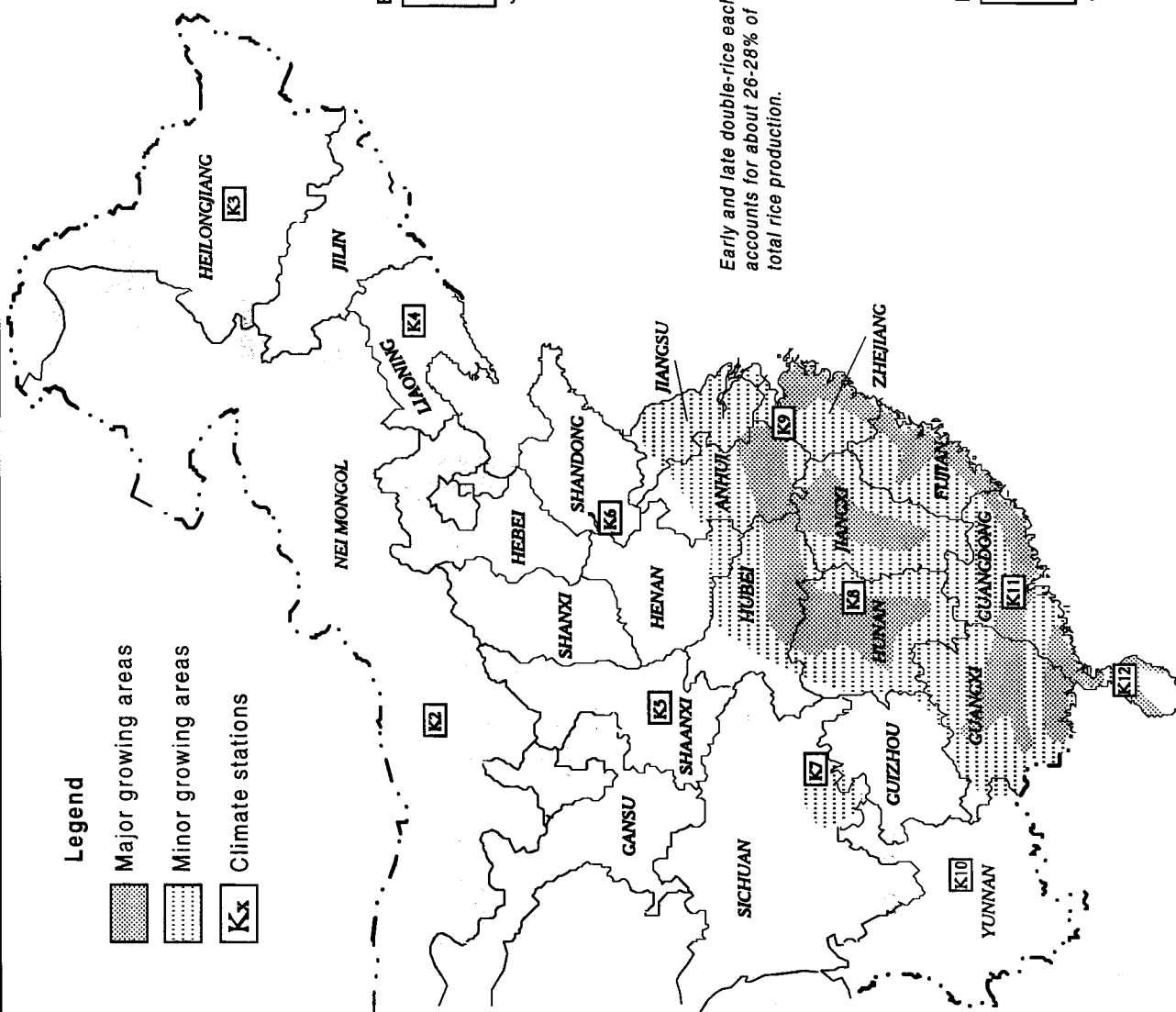
Single-crop rice accounts for about 44-48% of total rice production.




Single-crop rice crop calendar for most of China



JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

China: Double-crop rice

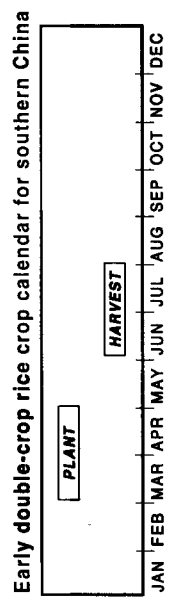


- Legend**
-  Major growing areas
 -  Minor growing areas
 -  Climate stations

Percent of early double-crop rice production by province (1988/89-1992/93)

Hunan	21%
Guangdong	17%
Jiangxi	14%
Guangxi	13%
Zhejiang	12%
Hubei	9%
Fujian	6%
Anhui	5%
Hainan	2%

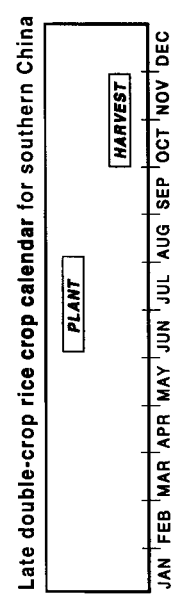
These provinces account for 98% of total production.



Percent of late double-crop rice production by province (1988/89-1992/93)

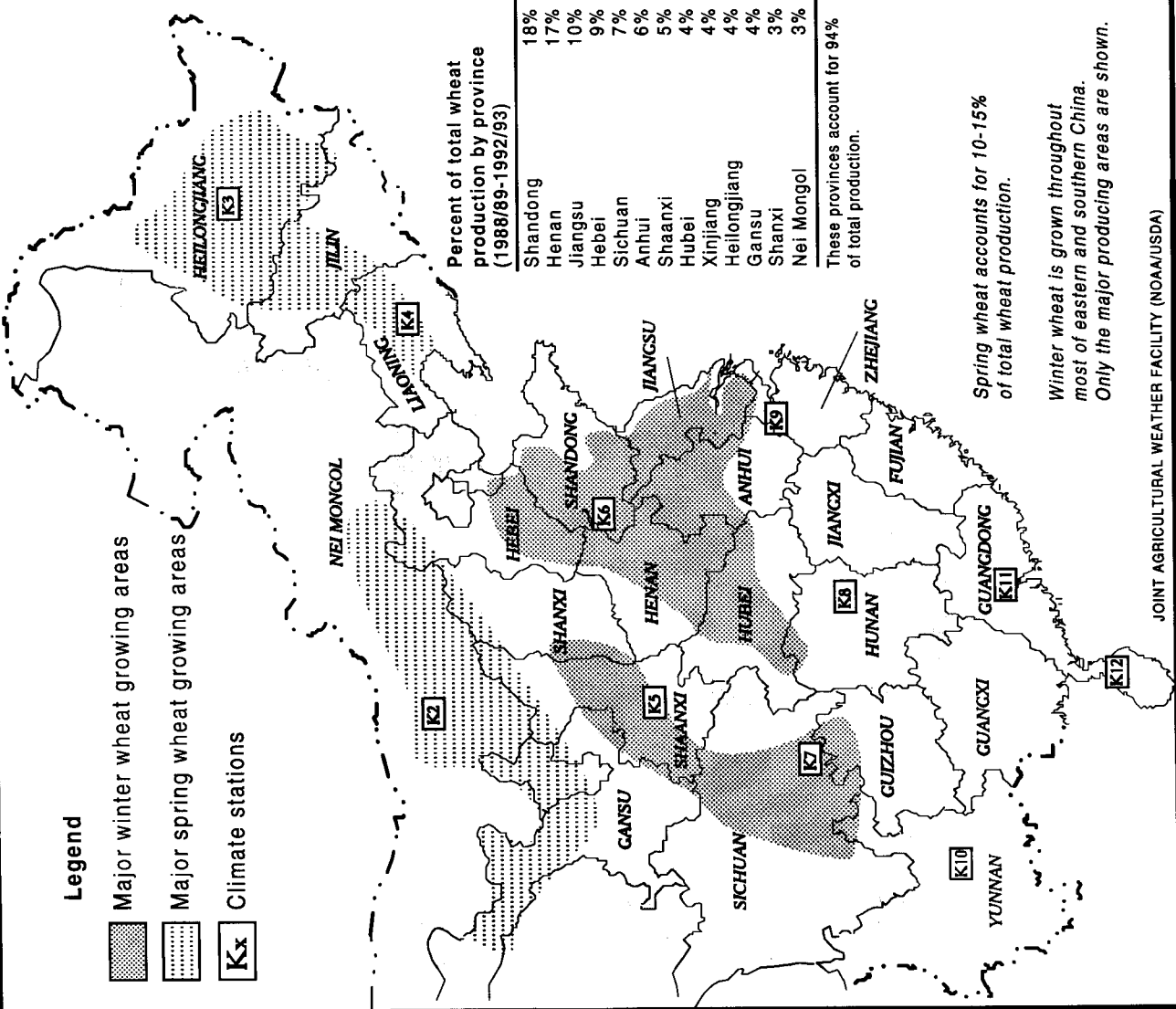
Hunan	24%
Guangdong	16%
Jiangxi	14%
Zhejiang	13%
Hubei	10%
Guangxi	9%
Fujian	6%
Anhui	5%
Hainan	1%

These provinces account for 98% of total production.



Early and late double-crop rice each accounts for about 26-28% of total rice production.

China: Wheat



Percent of total wheat production by province (1988/89-1992/93)

Shandong	18%
Henan	17%
Jiangsu	10%
Hebei	9%
Sichuan	7%
Anhui	6%
Shaanxi	5%
Hubei	4%
Xinjiang	4%
Heilongjiang	4%
Gansu	4%
Shanxi	3%
Nei Mongol	3%

These provinces account for 94% of total production.

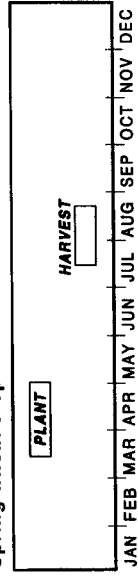
Spring wheat accounts for 10-15% of total wheat production.

Winter wheat is grown throughout most of eastern and southern China. Only the major producing areas are shown.

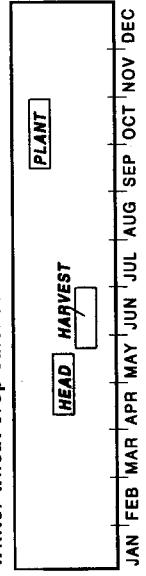
China: Historical total wheat statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1970/71	25,458	1.15	29,185
1971/72	25,639	1.27	32,575
1972/73	26,302	1.37	35,985
1973/74	26,439	1.33	35,225
1974/75	27,061	1.51	40,865
1975/76	27,661	1.64	45,310
1976/77	28,417	1.77	50,385
1977/78	28,065	1.46	41,075
1978/79	29,193	1.84	53,840
1979/80	29,357	2.14	62,730
1980/81	29,228	1.89	55,210
1981/82	28,307	2.11	59,640
1982/83	27,955	2.45	68,470
1983/84	29,050	2.80	81,390
1984/85	29,576	2.97	87,815
1985/86	29,218	2.94	85,810
1986/87	29,616	3.04	90,040
1987/88	28,798	2.98	85,840
1988/89	28,785	2.97	85,432
1989/90	29,841	3.04	90,807
1990/91	30,753	3.19	98,229
1991/92	30,948	3.10	96,000
1992/93	30,500	3.33	101,590
1988/89-1992/93 average	30,165	3.13	94,412

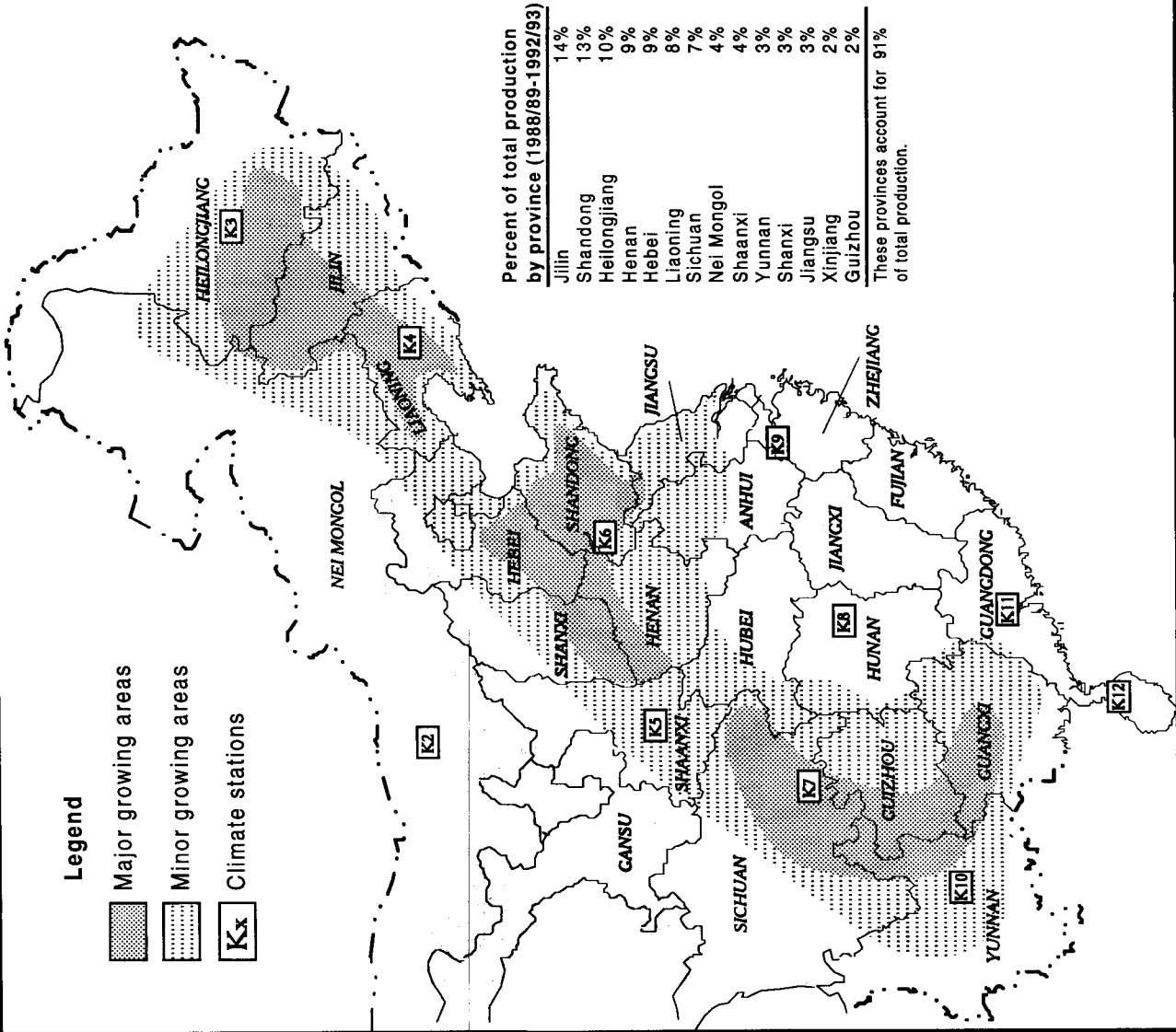
Spring wheat crop calendar for northern China



Winter wheat crop calendar for most of China



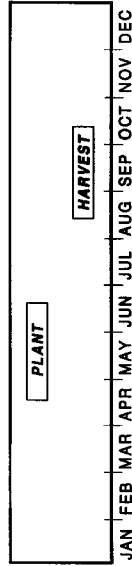
China: Corn



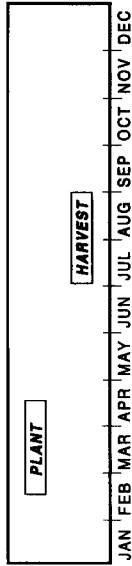
China: Historical corn statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1970/71	15,831	2.09	33,030
1971/72	16,726	2.14	35,850
1972/73	16,703	1.92	32,100
1973/74	16,571	2.33	38,630
1974/75	17,410	2.47	42,920
1975/76	18,598	2.54	47,220
1976/77	19,230	2.50	48,160
1977/78	19,657	2.51	49,390
1978/79	19,961	2.80	55,945
1979/80	20,133	2.98	60,035
1980/81	20,353	3.08	62,600
1981/82	19,425	3.05	59,205
1982/83	18,543	3.27	60,560
1983/84	18,824	3.62	68,205
1984/85	18,537	3.96	73,410
1985/86	17,694	3.61	63,826
1986/87	19,124	3.71	70,856
1987/88	20,212	3.92	79,240
1988/89	19,692	3.93	77,351
1989/90	20,353	3.88	78,928
1990/91	21,402	4.52	96,820
1991/92	21,574	4.58	98,770
1992/93	21,040	4.53	95,380
1988/89-1992/93 average	20,812	4.29	89,450

Corn crop calendar for North China Plain and Manchuria



Corn crop calendar for most of southern China

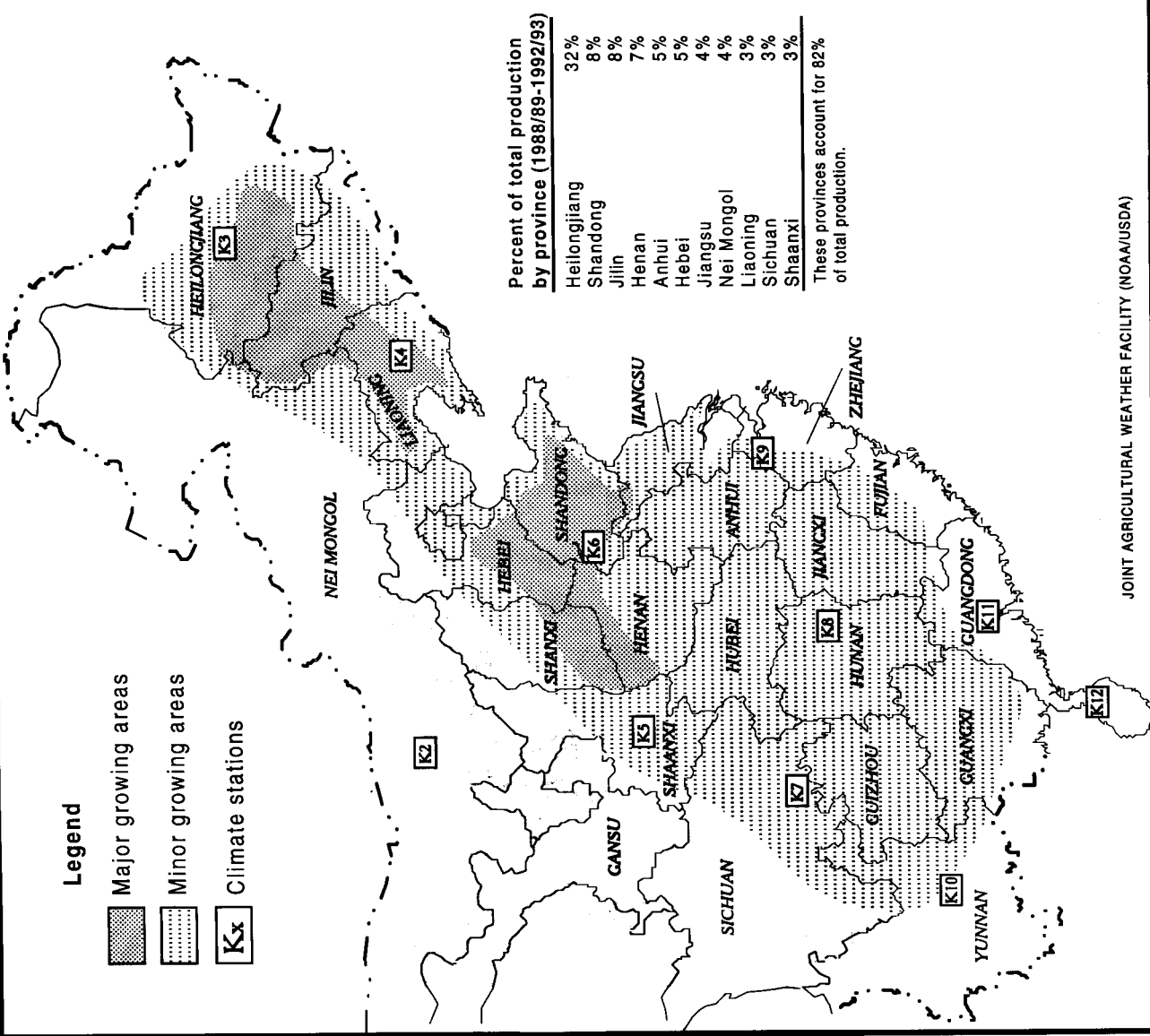


JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

China: Soybeans

China: Historical soybean statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1970/71	7,985	1.09	8,710
1971/72	7,791	1.11	8,610
1972/73	7,583	0.85	6,450
1973/74	7,408	1.13	8,370
1974/75	7,261	1.03	7,470
1975/76	6,999	1.03	7,240
1976/77	6,691	0.99	6,640
1977/78	6,850	1.06	7,260
1978/79	7,144	1.06	7,565
1979/80	7,247	1.03	7,460
1980/81	7,226	1.10	7,940
1981/82	8,024	1.16	9,325
1982/83	8,419	1.07	9,030
1983/84	7,567	1.29	9,760
1984/85	7,286	1.33	9,695
1985/86	7,718	1.36	10,509
1986/87	8,295	1.40	11,614
1987/88	8,445	1.44	12,184
1988/89	8,120	1.43	11,645
1989/90	8,034	1.27	10,227
1990/91	7,560	1.46	11,000
1991/92	7,041	1.38	9,710
1992/93	7,221	1.43	10,300
1988/89- 1992/93 average	7,595	1.39	10,576

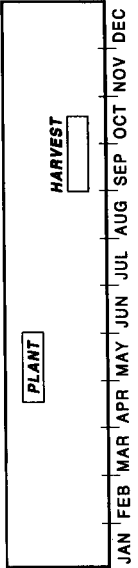


Percent of total production by province (1988/89-1992/93)

Heilongjiang	32%
Shandong	8%
Jilin	8%
Henan	7%
Anhui	5%
Hebei	5%
Jiangsu	4%
Nei Mongol	4%
Liaoning	3%
Sichuan	3%
Shaanxi	3%

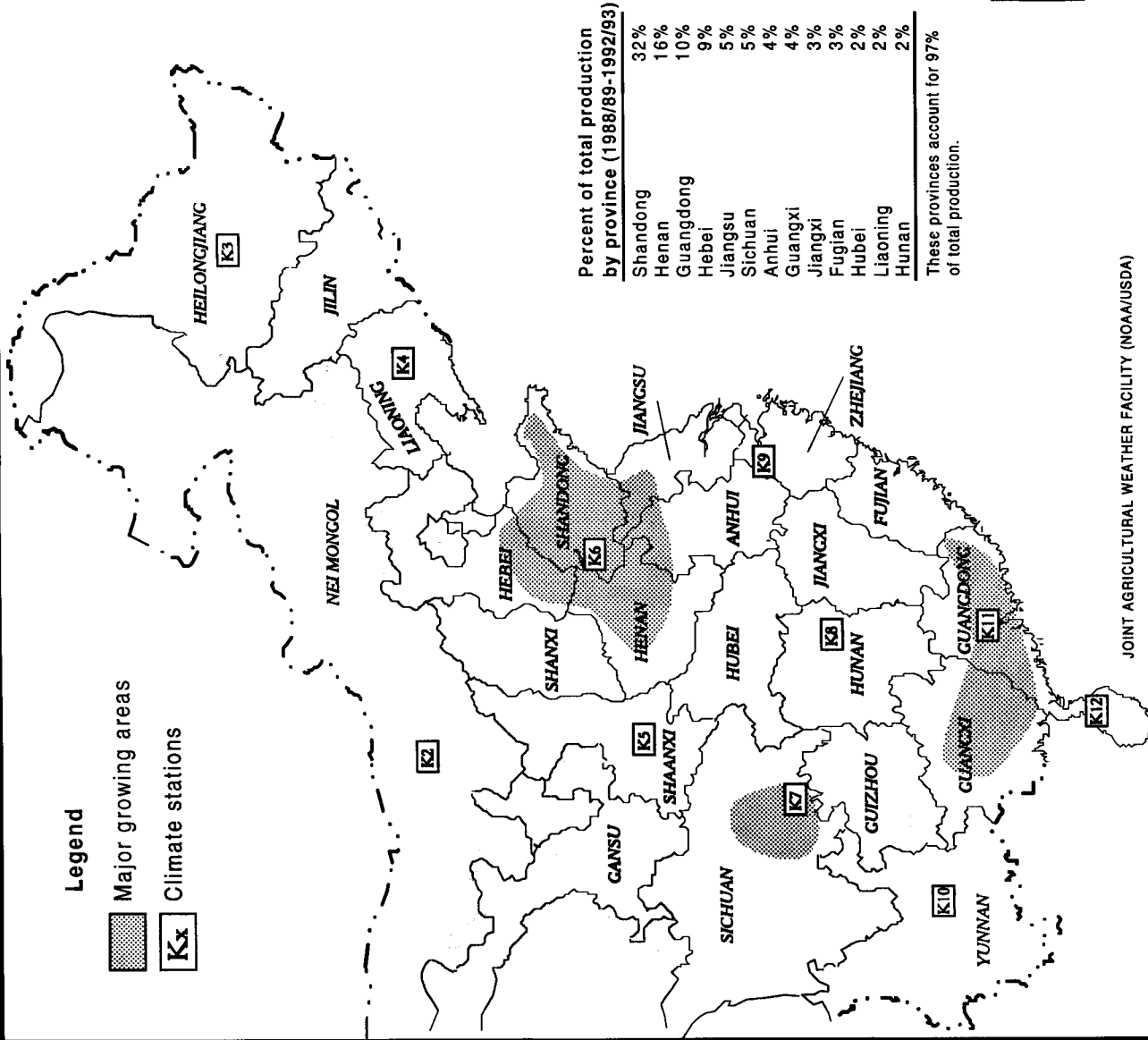
These provinces account for 82% of total production.

Soybean crop calendar for North China Plain & Manchuria



Across southern China, soybeans are planted and harvested 1-2 months earlier than depicted above.

China: Groundnuts



Percent of total production by province (1988/89-1992/93)

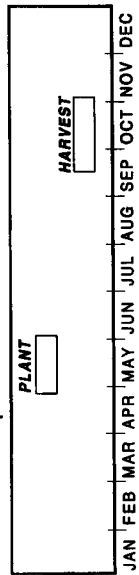
Shandong	32%
Henan	16%
Guangdong	10%
Hebei	9%
Jiangsu	5%
Sichuan	5%
Anhui	4%
Guangxi	4%
Jiangxi	3%
Fujian	3%
Hubei	2%
Liaoning	2%
Hunan	2%

These provinces account for 97% of total production.

China: Historical groundnut statistics

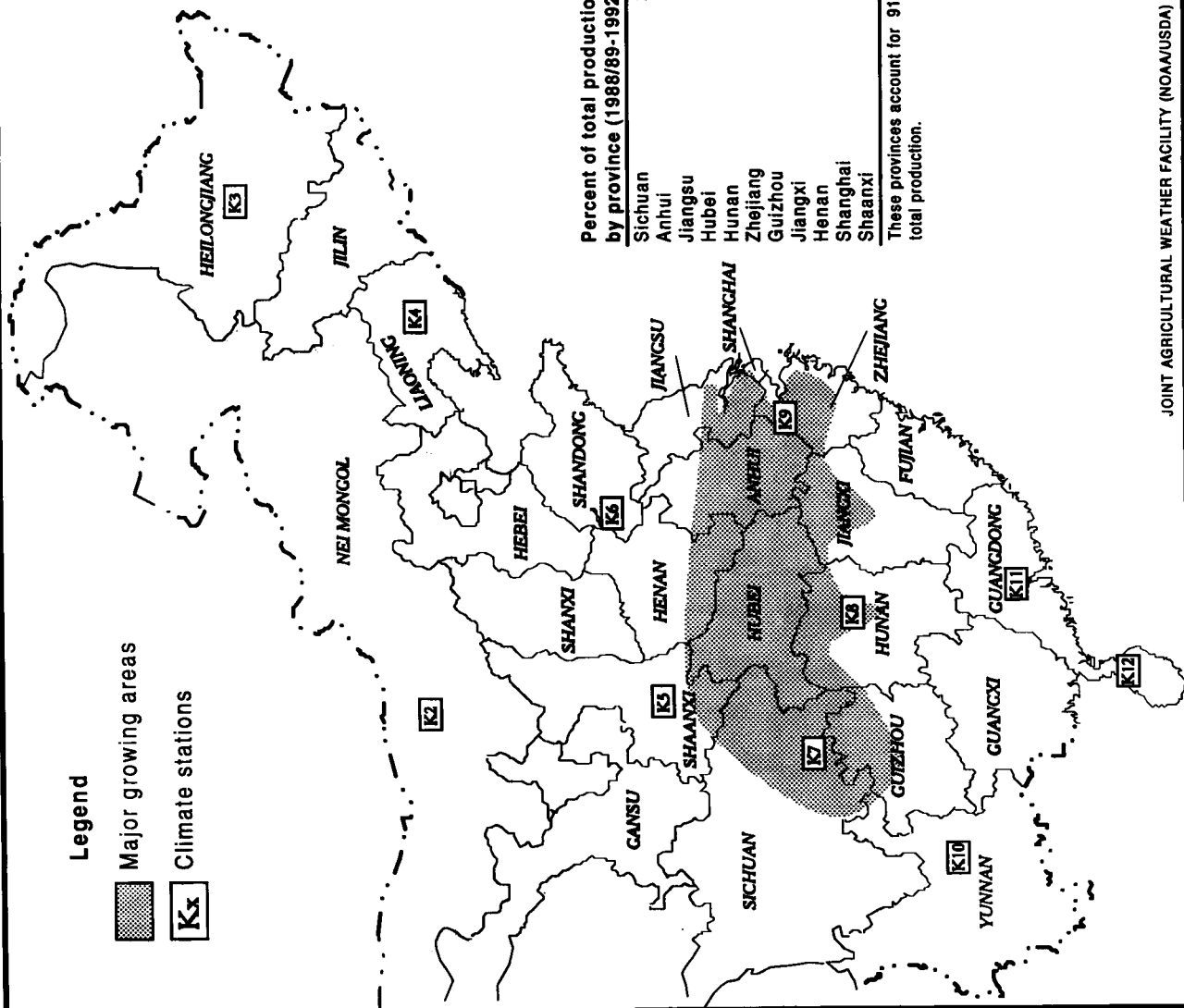
Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1975/76	1,877	1.21	2,270
1976/77	1,841	1.02	1,873
1977/78	1,687	1.17	1,978
1978/79	1,768	1.34	2,377
1979/80	2,075	1.36	2,822
1980/81	2,339	1.54	3,600
1981/82	2,472	1.55	3,826
1982/83	2,416	1.62	3,916
1983/84	2,201	1.80	3,951
1984/85	2,421	1.99	4,815
1985/86	3,318	2.01	6,664
1986/87	3,253	1.81	5,882
1987/88	3,022	2.04	6,170
1988/89	2,977	1.85	5,493
1989/90	2,946	1.82	5,365
1990/91	2,907	2.19	6,368
1991/92	2,880	2.19	6,300
1992/93	2,986	1.99	5,953
1988/89-1992/93 average	2,939	2.01	5,896

Groundnut crop calendar for most of China



JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

China: Rapeseed



China: Historical rapeseed statistics

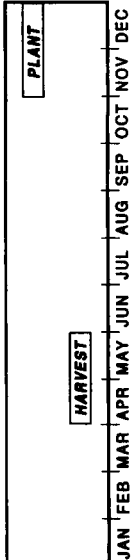
Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1970/71	1,453	0.66	965
1971/72	1,616	0.76	1,233
1972/73	1,967	0.71	1,397
1973/74	2,096	0.65	1,353
1974/75	2,063	0.67	1,382
1975/76	2,313	0.66	1,535
1976/77	2,346	0.57	1,348
1977/78	2,218	0.53	1,170
1978/79	2,600	0.72	1,868
1979/80	2,761	0.87	2,402
1980/81	2,844	0.84	2,384
1981/82	3,801	1.07	4,065
1982/83	4,122	1.37	5,656
1983/84	3,669	1.17	4,287
1984/85	3,413	1.23	4,205
1985/86	4,494	1.25	5,607
1986/87	4,916	1.20	5,881
1987/88	5,267	1.25	6,605
1988/89	4,936	1.02	5,044
1989/90	4,993	1.09	5,435
1990/91	5,504	1.26	6,958
1991/92	6,133	1.21	7,436
1992/93	5,976	1.28	7,653
1988/89-1992/93 average	5,508	1.17	6,505

Percent of total production by province (1988/89-1992/93)

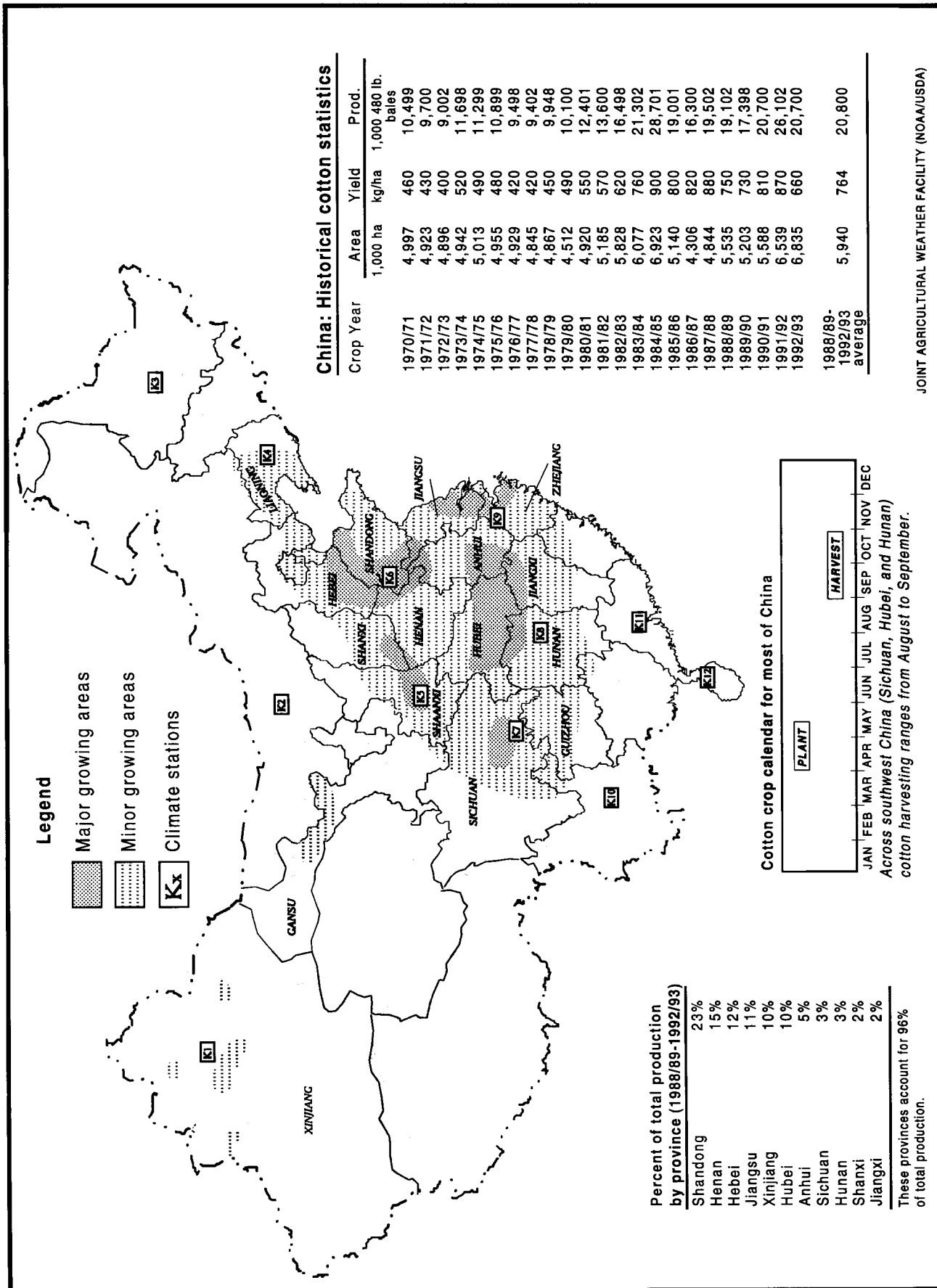
Sichuan	20%
Anhui	12%
Jiangsu	12%
Hubei	10%
Hunan	9%
Zhejiang	7%
Guizhou	7%
Jiangxi	5%
Henan	3%
Shanghai	3%
Shaanxi	3%

These provinces account for 91% of total production.




Winter rapeseed crop calendar for most of China



China: Cotton



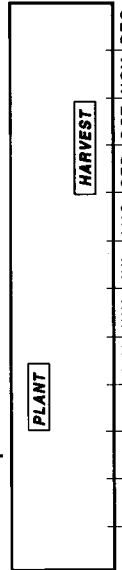
Legend

-  Major growing areas
-  Minor growing areas
-  Climate stations

China: Historical cotton statistics

Crop Year	Area 1,000 ha	Yield kg/ha	Prod. 1,000 480 lb. bales
1970/71	4,997	460	10,499
1971/72	4,923	430	9,700
1972/73	4,896	400	9,002
1973/74	4,942	520	11,698
1974/75	5,013	490	11,299
1975/76	4,955	480	10,899
1976/77	4,929	420	9,498
1977/78	4,845	420	9,402
1978/79	4,867	450	9,948
1979/80	4,512	490	10,100
1980/81	4,920	550	12,401
1981/82	5,185	570	13,600
1982/83	5,828	620	16,498
1983/84	6,077	760	21,302
1984/85	6,923	900	28,701
1985/86	5,140	800	19,001
1986/87	4,306	820	16,300
1987/88	4,844	880	19,502
1988/89	5,535	750	19,102
1989/90	5,203	730	17,398
1990/91	5,588	810	20,700
1991/92	6,539	870	26,102
1992/93	6,835	660	20,700
1988/89- 1992/93 average	5,940	764	20,800

Cotton crop calendar for most of China



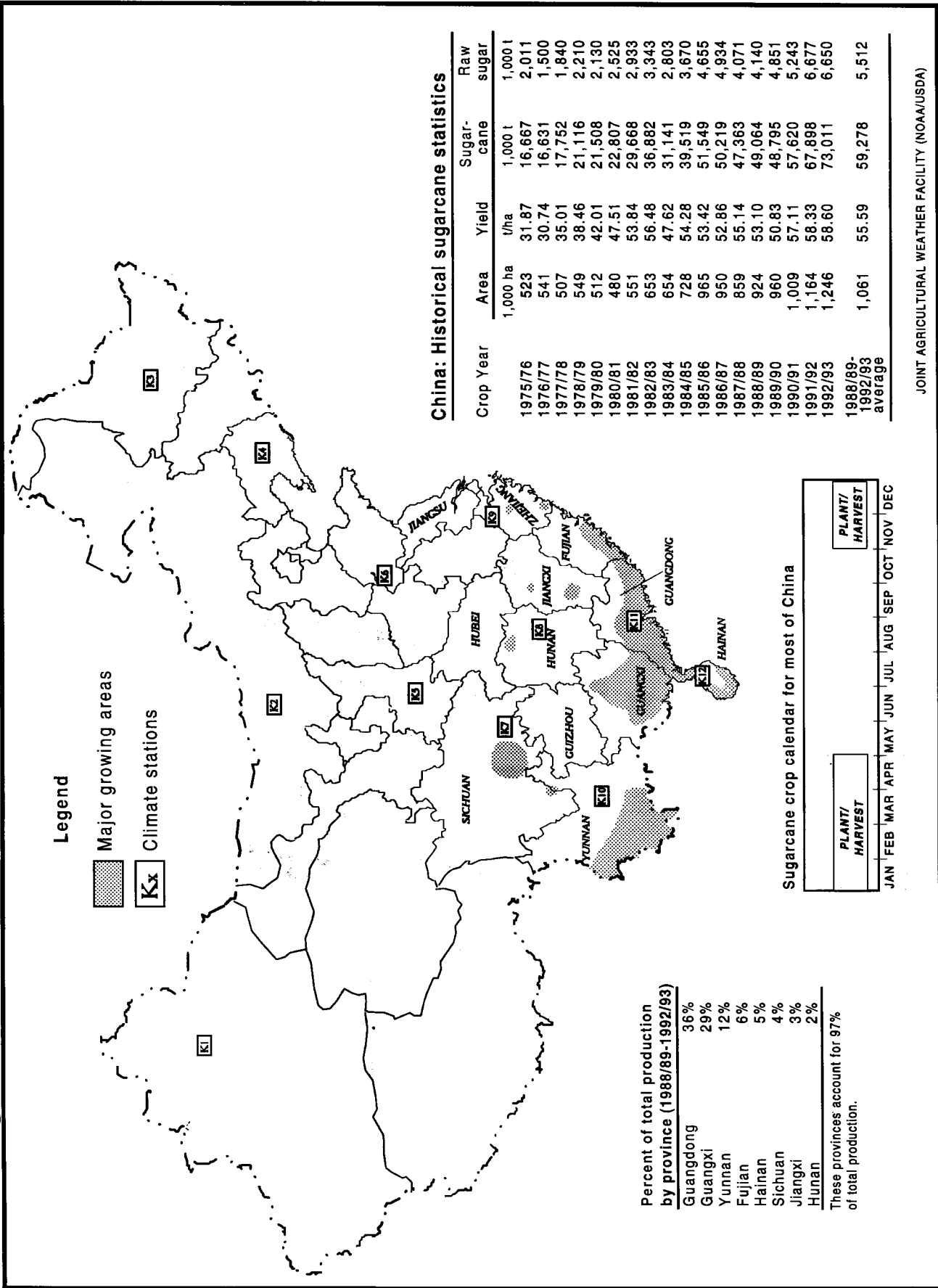
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
 Across southwest China (Sichuan, Hubei, and Hunan)
 cotton harvesting ranges from August to September.

Percent of total production by province (1988/89-1992/93)

Shandong	23%
Henan	15%
Hebei	12%
Jiangsu	11%
Xinjiang	10%
Hubei	10%
Anhui	5%
Sichuan	3%
Hunan	3%
Shanxi	2%
Jiangxi	2%

These provinces account for 96%
of total production.

China: Sugarcane

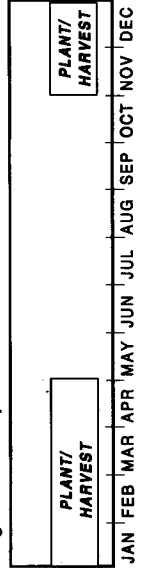


Percent of total production by province (1988/89-1992/93)

Guangdong	36%
Guangxi	29%
Yunnan	12%
Fujian	6%
Hainan	5%
Sichuan	4%
Jiangxi	3%
Hunan	2%

These provinces account for 97% of total production.

Sugarcane crop calendar for most of China

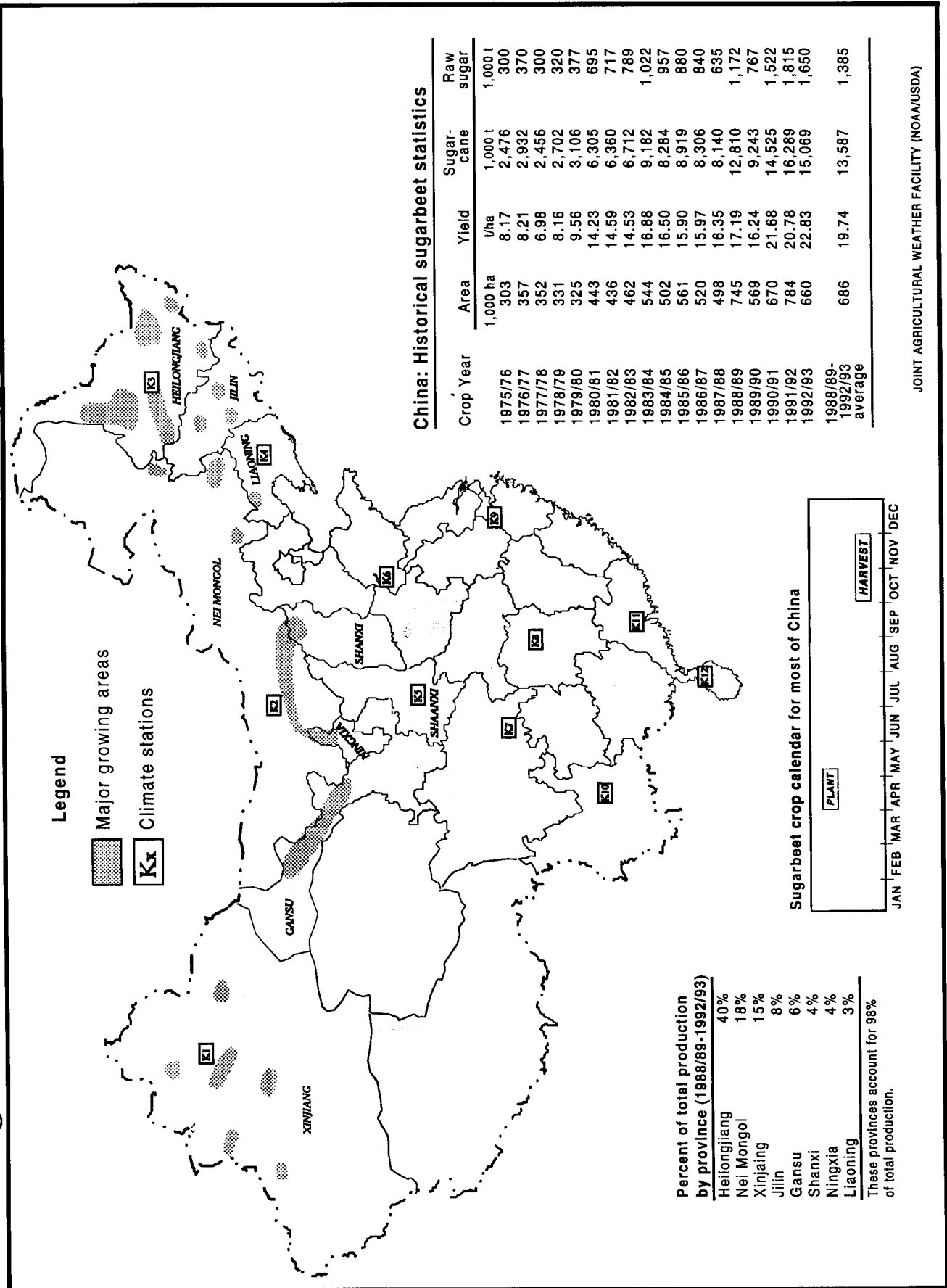


China: Historical sugarcane statistics

Crop Year	Area 1,000 ha	Yield t/ha	Sugar-cane 1,000 t	Raw sugar 1,000 t
1975/76	523	31.87	16,667	2,011
1976/77	541	30.74	16,631	1,500
1977/78	507	35.01	17,752	1,840
1978/79	549	38.46	21,116	2,210
1979/80	512	42.01	21,508	2,130
1980/81	480	47.51	22,807	2,525
1981/82	551	53.84	29,668	2,933
1982/83	653	56.48	36,882	3,343
1983/84	654	47.62	31,141	2,803
1984/85	728	54.28	39,519	3,670
1985/86	965	53.42	51,549	4,655
1986/87	950	52.86	50,219	4,934
1987/88	859	55.14	47,363	4,071
1988/89	924	53.10	49,064	4,140
1989/90	960	50.83	48,795	4,851
1990/91	1,009	57.11	57,620	5,243
1991/92	1,164	58.33	67,898	6,677
1992/93	1,246	58.60	73,011	6,650
1988/89-1992/93 average	1,061	55.59	59,278	5,512

JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

China: Sugarbeets

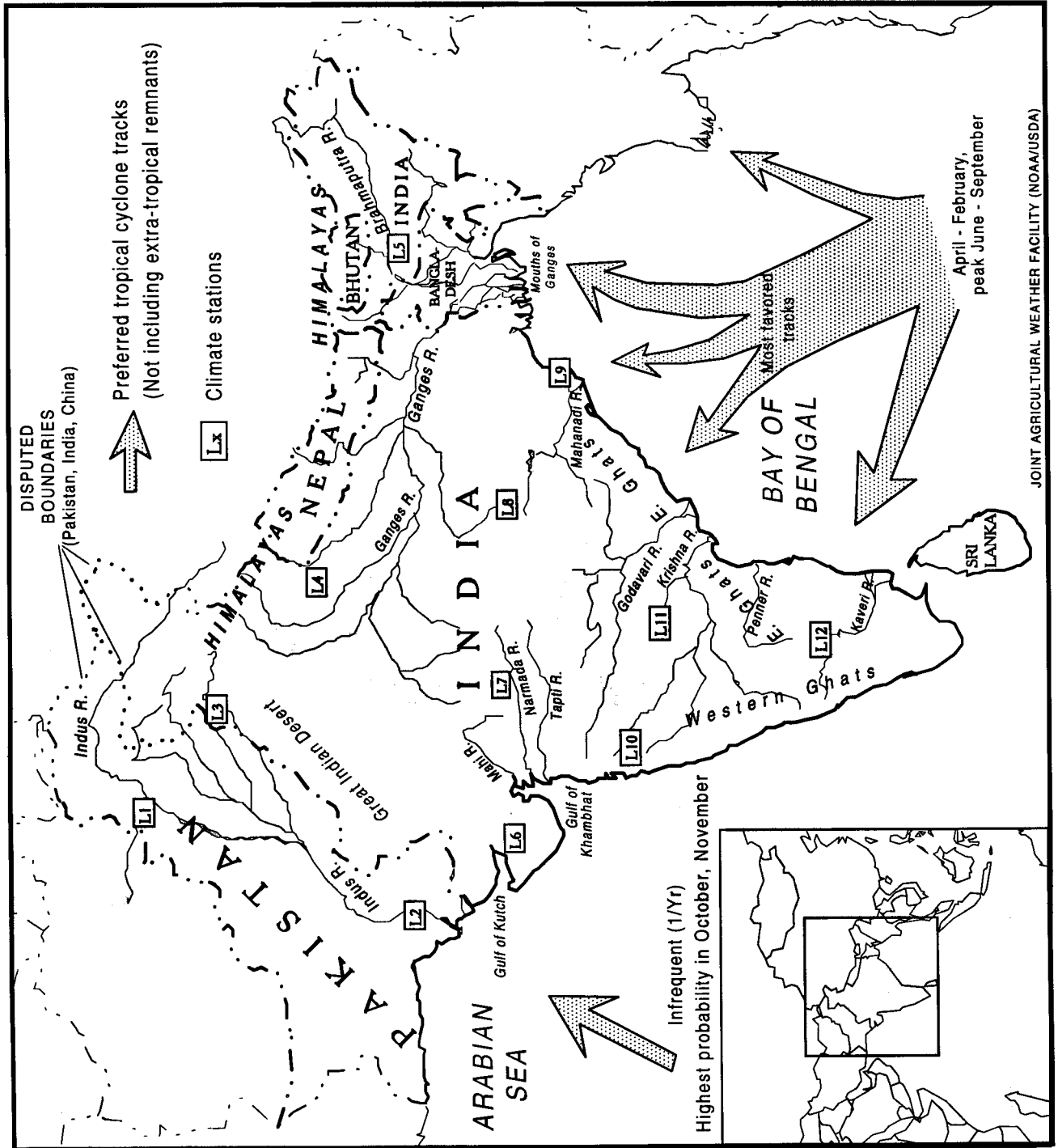


China: Historical sugarbeet statistics

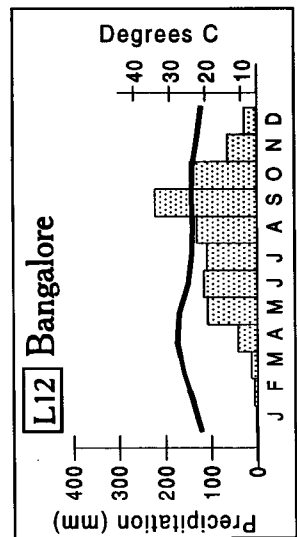
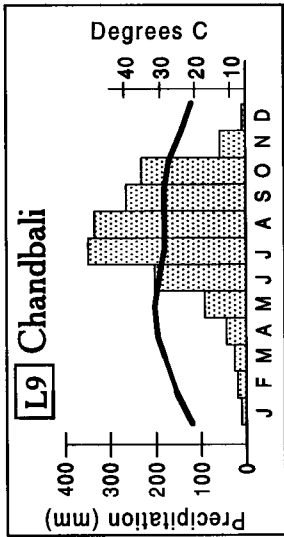
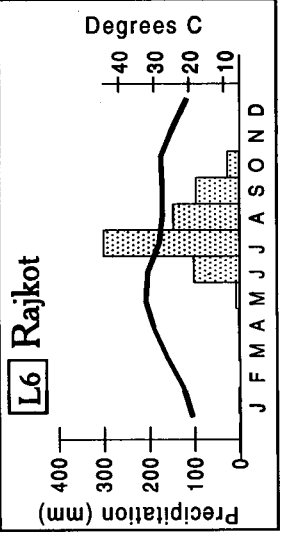
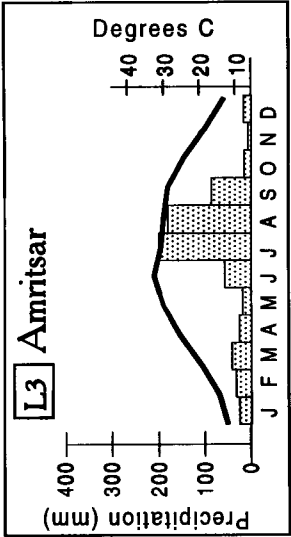
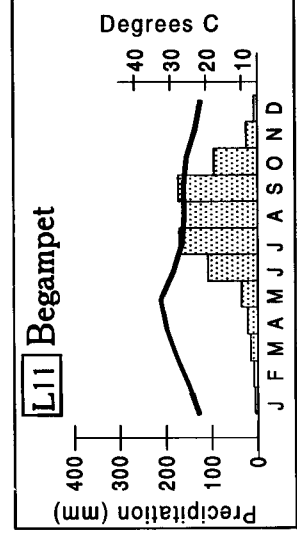
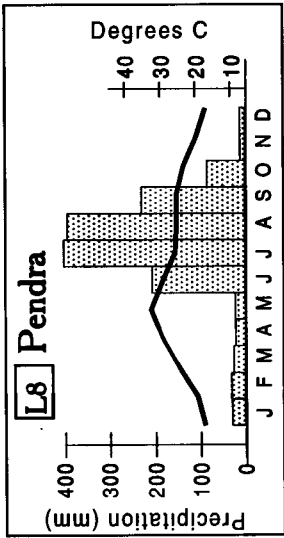
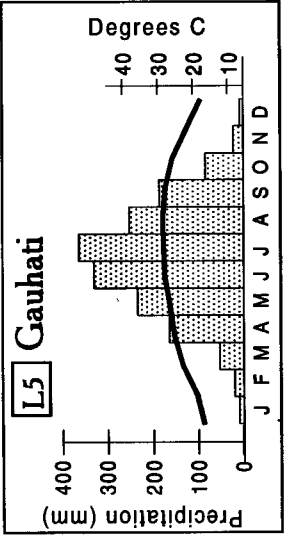
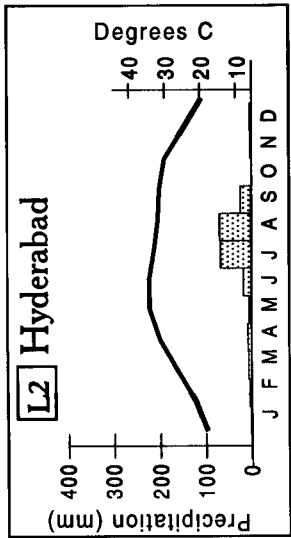
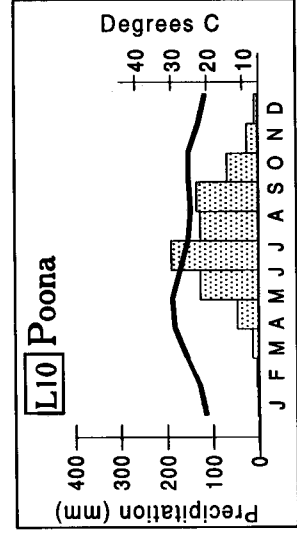
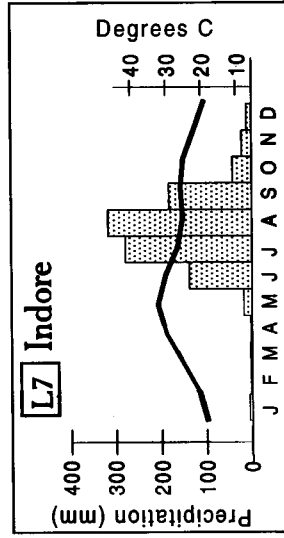
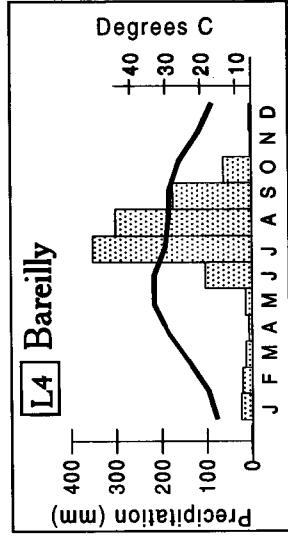
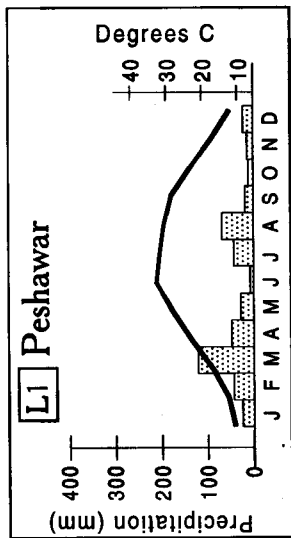
Crop Year	Area 1,000 ha	Yield t/ha	Sugar- cane	Raw sugar
1975/76	303	8.17	1,000 t	1,000 t
1976/77	357	8.21	2,932	300
1977/78	352	6.98	2,456	300
1978/79	331	8.16	2,702	320
1979/80	325	9.56	3,106	377
1980/81	443	14.23	6,305	695
1981/82	436	14.59	6,360	717
1982/83	462	14.53	6,712	789
1983/84	544	16.88	9,182	1,022
1984/85	502	16.50	8,284	957
1985/86	561	15.90	8,919	880
1986/87	520	15.97	8,306	840
1987/88	498	16.35	8,140	635
1988/89	745	17.19	12,810	1,172
1989/90	569	16.24	9,243	767
1990/91	670	21.68	14,525	1,522
1991/92	784	20.78	16,289	1,815
1992/93	660	22.83	15,069	1,650
1988/89- 1992/93 average	686	19.74	13,587	1,385

JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

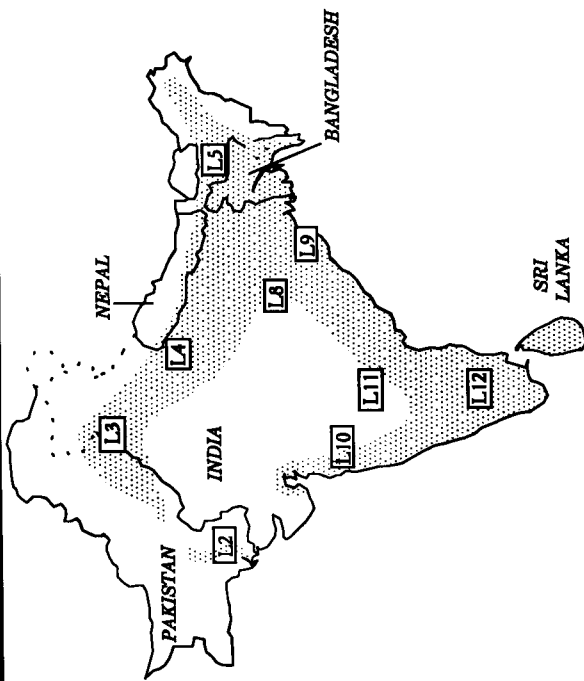
South Asia: Landforms and climate



South Asia: Climate stations

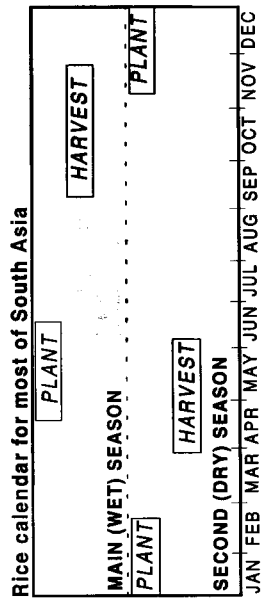


South Asia: Rice



Major growing areas

Climate stations



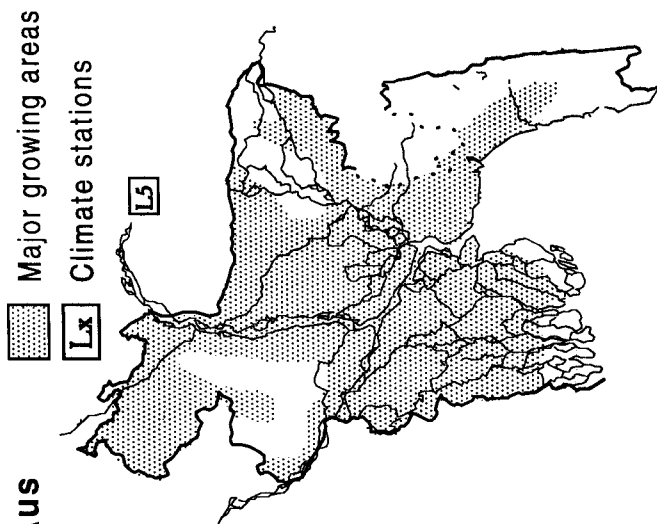
Areas depict both
rainfed and irrigated
cropping patterns
in major producing
countries.

Crop Year	Bangladesh: Historical rice statistics			India: Historical rice statistics			Nepal: Historical rice statistics			Pakistan: Historical rice statistics			Sri Lanka: Historical rice statistics		
	Area (1,000 ha)	Yield (Rough) (t/ha)	Prod. (Milled) (1,000 t)	Area (1,000 ha)	Yield (Rough) (t/ha)	Prod. (Milled) (1,000 t)	Area (1,000 ha)	Yield (Rough) (t/ha)	Prod. (Milled) (1,000 t)	Area (1,000 ha)	Yield (Rough) (t/ha)	Prod. (Milled) (1,000 t)	Area (1,000 ha)	Yield (Rough) (t/ha)	Prod. (Milled) (1,000 t)
1980/81	10,309	2.01	13,882	40,152	2.00	53,631	1,276	1.93	1,641	1,933	2.42	3,123	819	2.60	1,450
1981/82	10,459	1.94	13,631	40,708	1.96	53,248	1,297	1.97	1,706	1,976	2.60	3,430	819	2.63	1,469
1982/83	10,587	2.00	14,216	38,262	1.84	47,116	1,265	1.43	1,220	1,978	2.60	3,445	747	2.88	1,466
1983/84	10,546	2.04	14,500	41,244	2.18	60,097	1,334	2.06	1,838	1,998	2.49	3,339	777	3.19	1,688
1984/85	10,140	2.15	14,620	41,159	2.12	58,337	1,377	1.96	1,804	1,998	2.48	3,315	886	2.72	1,640
1985/86	10,403	2.16	15,040	41,137	2.31	63,825	1,391	2.00	1,867	1,863	2.34	2,919	864	3.07	1,809
1986/87	10,609	2.16	15,406	40,774	2.21	60,416	1,333	2.09	1,865	2,066	2.52	3,486	837	3.10	1,765
1987/88	10,322	2.22	15,413	38,806	2.19	56,862	1,423	2.09	1,986	1,963	2.46	3,241	680	3.13	1,445
1988/89	10,220	2.27	15,550	41,736	2.52	70,489	1,450	2.25	2,186	2,042	2.34	3,200	820	3.01	1,685
1989/90	10,478	2.54	17,860	42,167	2.60	73,573	1,433	2.36	2,258	2,107	2.28	3,220	690	2.99	1,403
1990/91	10,435	2.55	17,852	42,687	2.60	74,291	1,431	2.43	2,331	2,114	2.30	3,265	828	3.06	1,726
1991/92	10,240	2.66	18,250	42,307	2.60	73,660	1,350	2.37	2,145	2,097	2.31	3,243	791	3.01	1,622
1992/93	10,160	2.70	18,340	41,400	2.61	72,610	1,300	2.07	1,812	1,974	2.36	3,116	683	3.43	1,591
1988/89-1992/93 average	10,307	2.54	17,570	42,059	2.59	72,925	1,393	2.30	2,146	2,067	2.32	3,209	762	3.10	1,605

JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Bangladesh: Rice

Aus



Aus rice calendar for most of Bangladesh

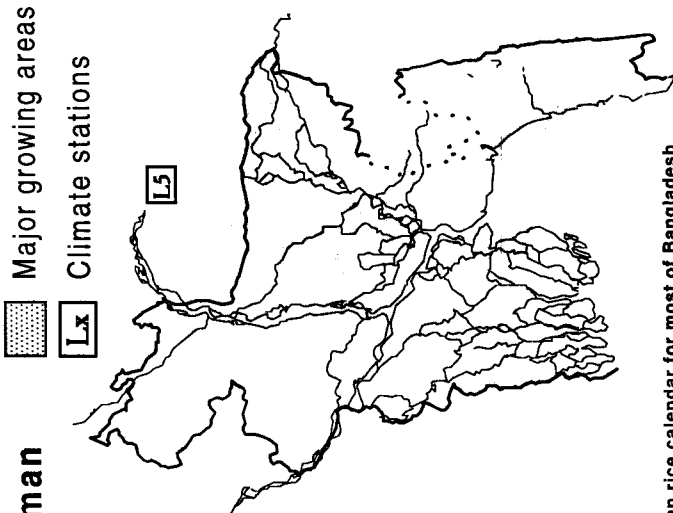


Bangladesh: Historical Aus rice statistics

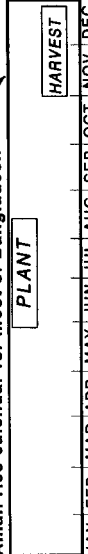
Crop Year	Area 1,000 ha	Yield		Prod. (Milled) 1,000 t
		(Rough) t/ha	(Milled)	
1983/84	3,140	1.54	3,222	3,222
1984/85	2,953	1.41	2,783	2,783
1985/86	2,842	1.48	2,827	2,827
1986/87	2,900	1.62	3,130	3,130
1987/88	2,790	1.60	2,990	2,990
1988/89	2,680	1.60	2,860	2,860
1989/90	2,260	1.66	2,500	2,500
1990/91	2,110	1.65	2,330	2,330
1991/92	1,920	1.71	2,180	2,180
1992/93	1,730	1.80	2,070	2,070
1988/89- 1992/93 average	2,140	1.69	2,388	2,388

JOINT AGRICULTURAL WEATHER FACILITY (INAM/USDA)

Aman



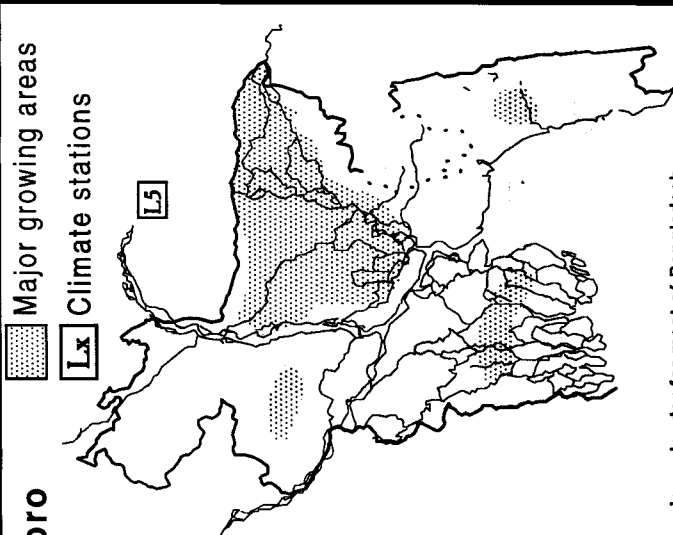
Aman rice calendar for most of Bangladesh



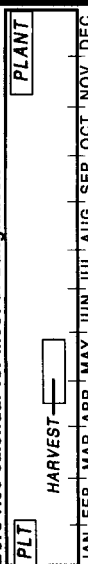
Bangladesh: Historical Aman rice statistics

Crop Year	Area 1,000 ha	Yield		Prod. (Milled) 1,000 t
		(Rough) t/ha	(Milled)	
1983/84	5,978	1.99	7,934	7,934
1984/85	5,754	2.07	7,935	7,935
1985/86	6,022	2.13	8,562	8,562
1986/87	6,050	2.05	8,270	8,270
1987/88	5,590	2.07	7,690	7,690
1988/89	5,100	2.02	6,860	6,860
1989/90	5,700	2.41	9,200	9,200
1990/91	5,780	2.38	9,170	9,170
1991/92	5,690	2.44	9,270	9,270
1992/93	5,840	2.49	9,680	9,680
1988/89- 1992/93 average	5,622	2.35	8,836	8,836

Boro






Boro rice calendar for most of Bangladesh

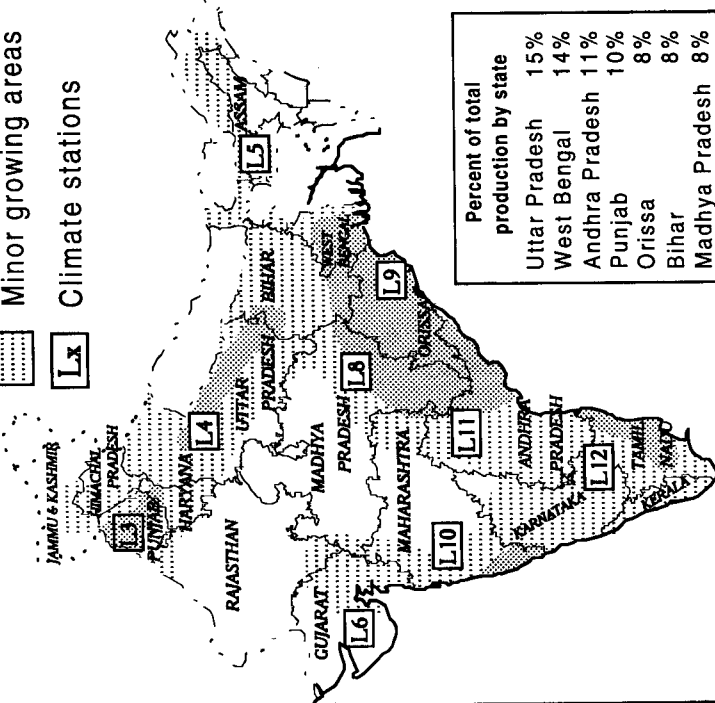


Bangladesh: Historical Boro rice statistics

Crop Year	Area 1,000 ha	Yield		Prod. (Milled) 1,000 t
		(Rough) t/ha	(Milled)	
1983/84	1,402	3.61	3,373	3,373
1984/85	1,575	3.78	3,975	3,975
1985/86	1,534	3.61	3,703	3,703
1986/87	1,650	3.64	4,010	4,010
1987/88	1,940	3.66	4,730	4,730
1988/89	2,440	3.58	5,830	5,830
1989/90	2,530	3.73	6,300	6,300
1990/91	2,550	3.73	6,360	6,360
1991/92	2,630	3.88	6,800	6,800
1992/93	2,590	3.81	6,590	6,590
1988/89- 1992/93 average	2,548	3.75	6,376	6,376

India: Kharif rice

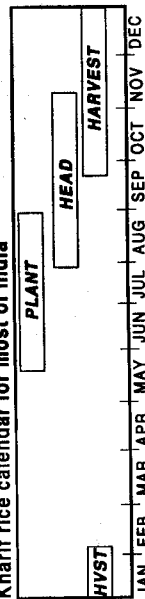
-  Major growing areas
-  Minor growing areas
-  Climate stations



Percent of total production by state	
Uttar Pradesh	15%
West Bengal	14%
Andhra Pradesh	11%
Punjab	10%
Orissa	8%
Bihar	8%
Madhya Pradesh	8%
Tamil Nadu	7%
Assam	4%
Total	85%

* States Producing 4% or More

Kharif rice calendar for most of India






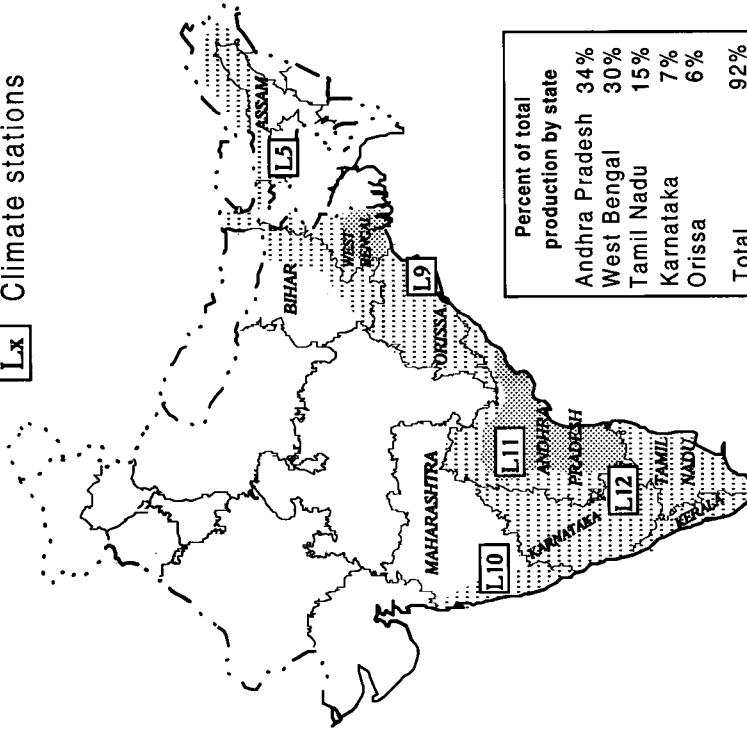
JOINT AGRICULTURAL WEATHER FACILITY (USDA/NOAA)

India: Historical kharif rice statistics

	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1988/89-1992/93 average
Andhra Pradesh											
Area (1,000 ha)	3,048	2,593	2,660	2,625	2,234	3,061	3,134	3,047	3,029	2,559	2,966
Yield (t/ha, rough)	3.10	2.80	3.20	2.60	3.10	3.60	3.40	3.40	3.40	3.70	3.50
Prod. (1,000 t, milled)	6,210	4,858	5,704	4,587	4,669	7,443	7,115	6,985	6,956	6,276	6,955
Assam											
Area (1,000 ha)	2,269	2,277	2,420	2,239	2,283	2,241	2,358	2,373	2,399	2,414	2,357
Yield (t/ha, rough)	1.60	1.60	1.70	1.60	1.70	1.60	1.70	2.00	1.90	1.90	1.82
Prod. (1,000 t, milled)	2,479	2,383	2,801	2,323	2,646	2,355	2,687	3,088	2,981	3,105	2,843
Bihar											
Area (1,000 ha)	4,844	5,113	5,279	5,316	5,028	5,234	5,205	5,310	4,701	4,239	4,938
Yield (t/ha, rough)	1.50	1.60	1.70	1.70	1.40	1.80	1.80	1.80	1.40	1.10	1.58
Prod. (1,000 t, milled)	4,908	5,302	5,949	5,974	4,551	6,255	6,242	6,454	4,317	3,100	5,273
Madhya Pradesh											
Area (1,000 ha)	4,947	4,957	5,032	5,041	4,896	5,009	5,005	5,118	5,098	5,071	5,060
Yield (t/ha, rough)	1.50	1.10	1.60	1.20	1.30	1.40	1.30	1.70	1.60	1.60	1.52
Prod. (1,000 t, milled)	4,799	3,761	5,418	4,178	4,266	4,667	4,493	5,738	5,428	5,432	5,152
Orissa											
Area (1,000 ha)	4,148	4,130	4,196	4,203	3,855	4,088	4,187	4,189	4,258	4,231	4,191
Yield (t/ha, rough)	1.70	1.40	1.70	1.60	1.20	1.80	2.10	1.70	2.10	1.80	1.90
Prod. (1,000 t, milled)	4,763	3,850	4,880	4,456	3,103	4,896	5,840	4,842	6,030	4,976	5,317
Punjab											
Area (1,000 ha)	1,481	1,644	1,714	1,809	1,720	1,778	1,908	2,024	2,074	2,069	1,971
Yield (t/ha, rough)	4.60	4.60	4.80	5.00	4.70	4.20	5.30	4.80	4.90	5.10	4.86
Prod. (1,000 t, milled)	4,536	5,052	5,449	6,022	5,442	4,925	6,697	6,535	6,755	7,025	6,387
Tamil Nadu											
Area (1,000 ha)	2,337	2,484	2,239	1,955	1,894	1,671	1,630	1,520	1,735	1,730	1,657
Yield (t/ha, rough)	2.80	3.20	3.60	4.00	4.10	4.50	4.60	4.60	3.70	4.50	4.38
Prod. (1,000 t, milled)	4,433	5,310	5,306	3,640	3,825	5,024	4,966	4,700	4,252	5,200	4,829
Uttar Pradesh											
Area (1,000 ha)	5,349	5,503	5,584	5,538	4,779	5,378	5,426	5,615	5,296	5,477	5,438
Yield (t/ha, rough)	1.90	1.90	2.20	2.00	2.00	2.60	2.60	2.70	2.60	2.60	2.62
Prod. (1,000 t, milled)	6,773	7,153	8,311	7,506	6,471	9,288	9,477	10,256	9,100	9,614	9,547
West Bengal											
Area (1,000 ha)	4,852	4,728	4,566	4,697	4,683	4,902	4,857	4,917	4,785	4,800	4,852
Yield (t/ha, rough)	2.00	2.20	2.20	2.00	2.20	2.60	2.70	2.40	2.90	2.80	2.68
Prod. (1,000 t, milled)	6,610	6,823	6,564	6,404	6,783	8,609	8,662	7,772	9,092	9,010	8,829
All-India (100%)											
Area (1,000 ha)	38,954	39,169	39,234	38,437	35,847	38,944	39,293	39,702	39,037	38,232	39,042
Yield (t/ha, rough)	2.10	2.10	2.30	2.10	2.10	2.40	2.50	2.50	2.50	2.50	2.48
Prod. (1,000 t, milled)	55,052	53,782	59,392	53,561	49,049	63,376	65,878	66,317	64,819	64,042	64,866

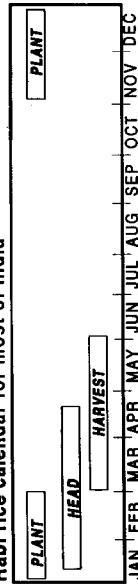
India: Rabi rice

-  Major growing areas
-  Minor growing areas
-  Climate stations



Percent of total production by state	
Andhra Pradesh	34%
West Bengal	30%
Tamil Nadu	15%
Karnataka	7%
Orissa	6%
Total	92%




Rabi rice calendar for most of India



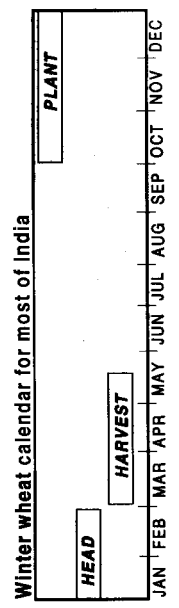
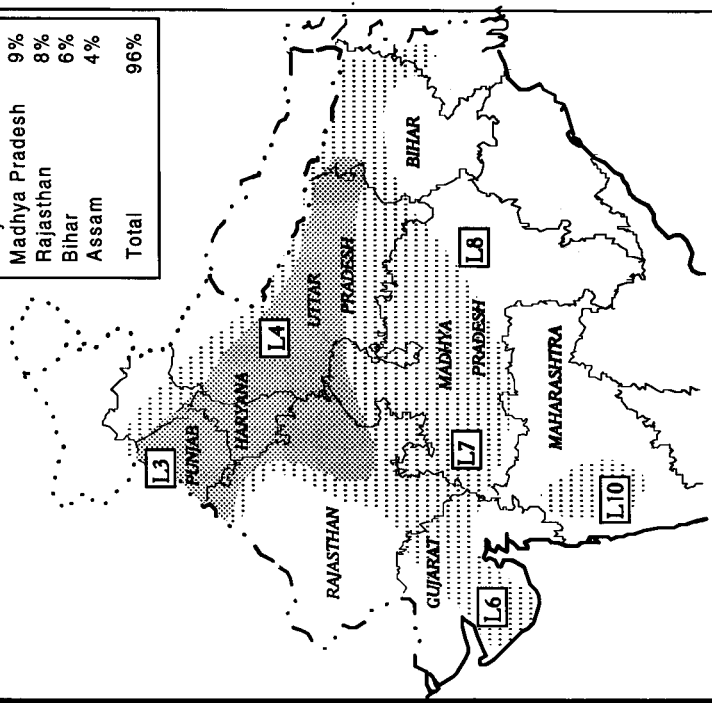
India: Historical rabi rice statistics

	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1988/89-1992/93 average
Andhra Pradesh											
Area (1,000 ha)	1,116	905	793	835	973	1,157	1,073	989	891	830	988
Yield (t/ha, rough)	3.50	3.40	3.60	3.60	3.70	4.10	4.00	4.00	4.20	4.20	4.10
Prod. (1,000 t, milled)	2,580	2,052	1,909	2,004	2,418	3,178	2,845	2,669	2,509	2,313	2,703
Karnataka											
Area (1,000 ha)	157	156	111	173	109	213	205	197	260	215	218
Yield (t/ha, rough)	3.40	4.20	3.70	3.70	3.80	3.70	3.80	3.90	4.00	3.90	3.86
Prod. (1,000 t, milled)	359	435	275	433	274	520	524	509	691	566	582
Orissa											
Area (1,000 ha)	208	174	206	191	198	194	205	215	289	199	220
Yield (t/ha, rough)	2.60	2.80	2.50	3.00	2.80	3.10	3.30	3.00	3.30	3.30	3.20
Prod. (1,000 t, milled)	358	322	346	378	368	401	444	433	630	440	470
Tamil Nadu											
Area (1,000 ha)	16	23	25	600	617	216	333	336	557	570	403
Yield (t/ha, rough)	3.20	3.30	3.80	4.20	4.30	3.90	4.90	4.80	4.50	4.20	4.46
Prod. (1,000 t, milled)	33	52	65	1,683	1,779	566	1,098	1,082	1,675	1,600	1,204
West Bengal											
Area (1,000 ha)	520	471	512	679	792	721	757	896	896	750	804
Yield (t/ha, rough)	3.80	4.00	4.20	4.50	4.70	4.10	4.50	4.50	4.50	4.50	4.42
Prod. (1,000 t, milled)	1,330	1,270	1,427	2,059	2,489	1,951	2,261	2,664	2,664	2,260	2,360
All-India (100%)											
Area (1,000 ha)	2,290	1,990	1,903	2,729	2,960	2,792	2,874	2,985	3,270	2,974	2,979
Yield (t/ha, rough)	3.30	3.40	3.50	3.80	4.00	3.80	4.00	4.00	4.10	4.00	3.98
Prod. (1,000 t, milled)	5,045	4,555	4,433	6,996	7,813	7,112	7,695	7,974	8,845	7,868	7,899

India: Winter wheat

-  Major growing areas
-  Minor growing areas
-  Climate stations

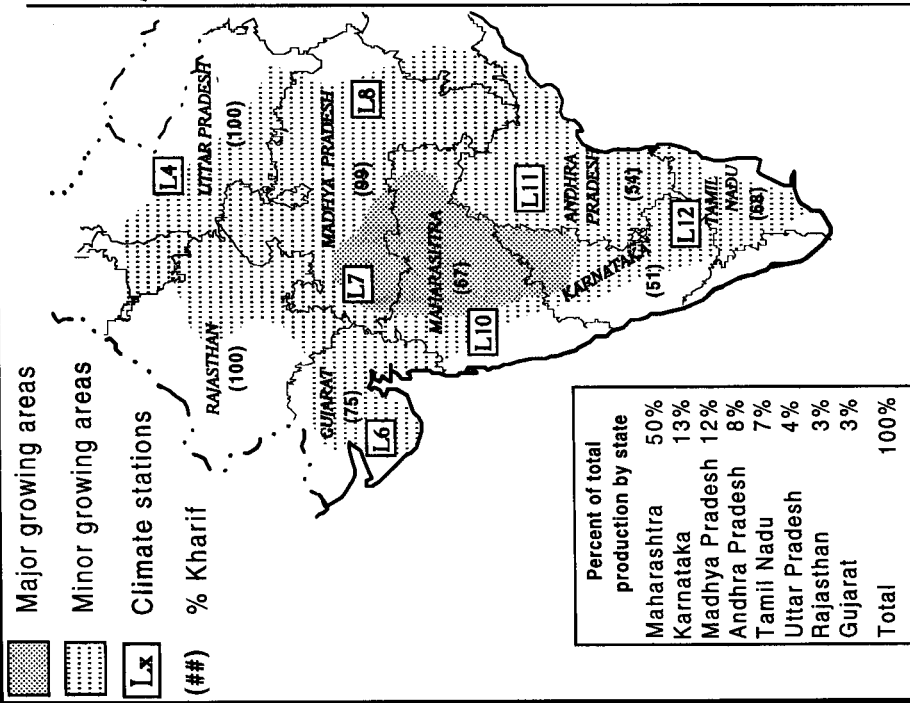
Percent of total production by state	
Uttar Pradesh	35%
Punjab	22%
Haryana	12%
Madhya Pradesh	9%
Rajasthan	8%
Bihar	6%
Assam	4%
Total	96%



India: Historical winter wheat statistics

	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1992/93 average
Bihar											
Area (1,000 ha)	1,891	1,876	1,835	1,840	1,935	2,112	1,988	1,965	1,963	1,975	2,001
Yield (t/ha)	1.55	1.62	1.60	1.56	1.44	1.68	1.64	1.81	1.82	1.75	1.74
Prod. (1,000 t)	2,935	3,032	2,936	2,861	2,777	3,557	3,270	3,560	3,566	3,452	3,481
Gujarat											
Area (1,000 ha)	741	637	431	315	192	649	619	717	409	611	601
Yield (t/ha)	2.20	2.09	1.81	2.10	1.83	2.33	1.78	2.01	2.21	2.23	2.11
Prod. (1,000 t)	1,627	1,329	783	662	351	1,513	1,102	1,444	906	1,360	1,265
Haryana											
Area (1,000 ha)	1,784	1,705	1,699	1,782	1,731	1,827	1,859	1,850	1,808	1,956	1,860
Yield (t/ha)	2.50	2.59	3.09	2.84	2.81	3.41	3.18	3.48	3.60	3.62	3.46
Prod. (1,000 t)	4,458	4,421	5,257	5,055	4,861	6,225	5,913	6,440	6,502	7,083	6,433
Madhya Pradesh											
Area (1,000 ha)	3,780	3,598	3,705	3,502	3,549	3,667	3,284	3,834	3,267	3,461	3,503
Yield (t/ha)	1.16	1.09	1.13	1.22	1.22	1.31	1.25	1.52	1.43	1.36	1.37
Prod. (1,000 t)	4,374	3,935	4,202	4,264	4,329	4,797	4,120	5,833	4,673	4,709	4,826
Punjab											
Area (1,000 ha)	3,125	3,095	3,112	3,189	3,126	3,158	3,251	3,272	3,233	3,281	3,239
Yield (t/ha)	3.02	3.29	3.53	2.97	3.60	3.67	3.59	3.71	3.80	3.77	3.71
Prod. (1,000 t)	9,422	10,176	10,988	9,458	11,266	11,580	11,681	12,155	12,295	12,369	12,016
Rajasthan											
Area (1,000 ha)	2,159	1,718	1,677	1,843	1,534	1,770	1,650	1,814	1,779	2,252	1,853
Yield (t/ha)	1.59	1.63	2.22	1.85	1.90	2.24	2.06	2.38	2.52	2.29	2.30
Prod. (1,000 t)	3,442	2,792	3,721	3,402	2,910	3,964	3,400	4,309	4,478	5,150	4,260
Uttar Pradesh											
Area (1,000 ha)	8,528	8,389	8,281	8,405	8,340	8,702	8,638	8,568	8,626	8,924	8,691
Yield (t/ha)	1.89	1.87	2.00	1.93	1.97	2.25	2.05	2.17	2.34	2.23	2.21
Prod. (1,000 t)	16,121	15,675	16,559	16,236	16,463	19,611	17,684	18,600	20,156	19,907	19,192
All-India (100%)											
Area (1,000 ha)	24,672	23,565	22,997	23,131	22,604	24,109	23,502	24,167	22,980	24,431	23,838
Yield (t/ha)	1.84	1.87	2.05	1.92	2.00	2.24	2.12	2.28	2.40	2.32	2.27
Prod. (1,000 t)	45,476	44,069	47,052	44,323	45,096	54,110	49,850	55,135	55,087	56,762	54,189

India: Sorghum

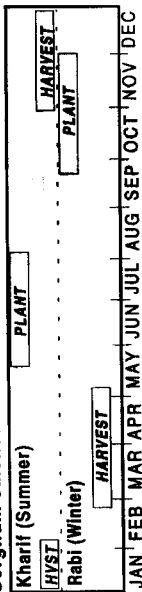


India: Historical Sorghum Statistics

	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1988/89 1992/93 average
Andhra Pradesh											
Area (1,000 ha)	1,976	1,862	1,788	1,656	1,730	1,314	1,311	1,190	1,075	1,153	1,209
Yield (t/ha)	0.57	0.65	0.85	0.60	0.66	0.47	0.69	0.72	0.63	0.84	0.67
Prod. (1,000 t)	1,125	1,216	1,162	994	1,146	613	902	851	673	971	802
Gujarat											
Area (1,000 ha)	948	874	894	882	526	781	873	853	509	582	719
Yield (t/ha)	0.61	0.57	0.40	0.28	0.24	0.54	0.50	0.44	0.39	0.58	0.49
Prod. (1,000 t)	582	500	355	245	125	425	433	379	199	336	355
Karnataka											
Area (1,000 ha)	2,251	2,344	2,319	2,640	2,465	2,106	2,339	2,155	2,090	2,335	2,205
Yield (t/ha)	0.79	0.74	0.64	0.80	0.64	0.73	0.70	0.63	0.81	0.71	0.71
Prod. (1,000 t)	1,788	1,745	1,474	2,108	1,571	1,538	1,627	1,353	1,692	1,647	1,571
Madhya Pradesh											
Area (1,000 ha)	2,128	1,909	1,960	1,912	2,093	1,811	1,748	1,648	1,479	1,370	1,611
Yield (t/ha)	0.93	0.80	0.90	0.68	0.92	0.90	0.99	0.90	0.74	1.09	0.93
Prod. (1,000 t)	1,983	1,520	1,773	1,301	1,931	1,635	1,737	1,490	1,091	1,491	1,489
Maharashtra											
Area (1,000 ha)	6,541	6,562	6,626	6,335	6,663	6,185	6,428	6,331	5,485	5,921	6,070
Yield (t/ha)	0.72	0.73	0.59	0.49	0.89	0.69	1.03	0.94	0.62	1.11	0.88
Prod. (1,000 t)	4,678	4,802	3,923	3,092	5,952	4,278	6,635	5,948	3,390	6,556	5,361
Rajasthan											
Area (1,000 ha)	986	838	983	1,006	981	1,043	827	931	707	812	864
Yield (t/ha)	0.6	0.49	0.38	0.24	0.22	0.52	0.4	0.56	0.22	0.48	0.43
Prod. (1,000 t)	591	415	375	239	217	539	328	518	157	387	386
Tamil Nadu											
Area (1,000 ha)	747	687	729	730	764	593	584	541	578	650	589
Yield (t/ha)	0.74	0.82	0.88	0.9	1.01	0.95	0.96	1.01	1.22	1.33	1.09
Prod. (1,000 t)	556	565	642	659	769	561	563	549	703	865	648
Uttar Pradesh											
Area (1,000 ha)	645	659	630	579	588	555	571	527	516	501	534
Yield (t/ha)	0.85	0.86	0.67	0.81	0.75	0.91	1.08	0.94	0.75	0.88	0.91
Prod. (1,000 t)	545	566	420	468	438	503	615	493	384	443	488
All-India (100%)											
Area (1,000 ha)	16,432	15,939	16,097	15,948	15,999	14,599	14,838	14,357	12,592	13,499	13,977
Yield (t/ha)	0.73	0.72	0.63	0.58	0.76	0.70	0.87	0.81	0.66	0.95	0.80
Prod. (1,000 t)	11,919	11,402	10,197	9,185	12,196	10,170	12,898	11,681	8,357	12,778	11,177



o About 70% of crop grown in the summer (Kharif).

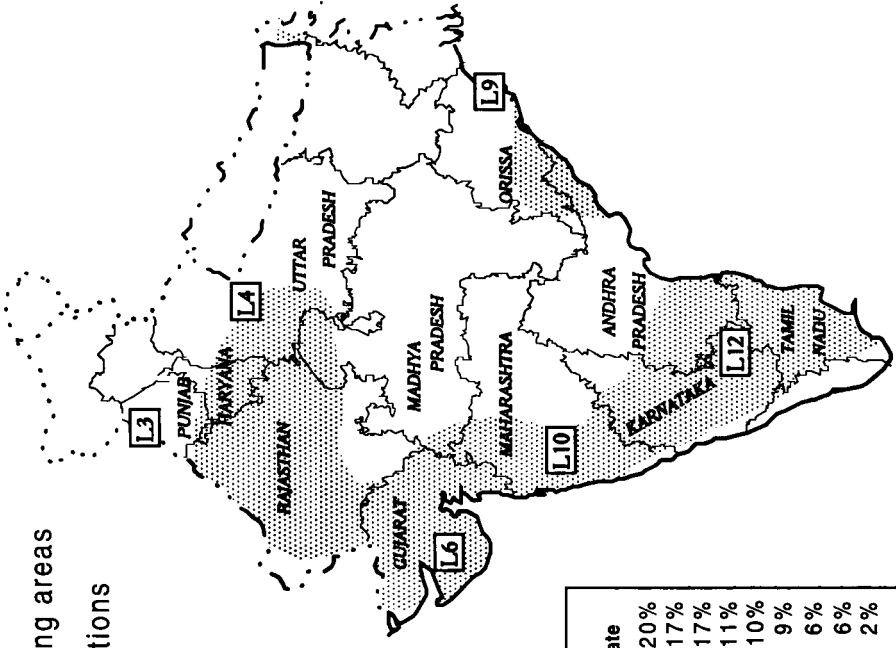
Sorghum calendar for most of India



JOINT AGRICULTURAL WEATHER FACILITY (USDA/NOAA)

India: Millet

-  Major growing areas
-  Climate stations

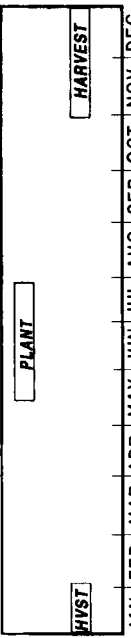


State	Percent of total production by state
Rajasthan	20%
Uttar Pradesh	17%
Gujarat	17%
Maharashtra	11%
Tamil Nadu	10%
Haryana	9%
Karnataka	6%
Andhra Pradesh	6%
Madhya Pradesh	2%
Total	98%

India: Historical millet statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1980/81	17,866	0.53	9,461
1981/82	17,932	0.57	10,136
1982/83	16,853	0.51	8,583
1983/84	18,028	0.68	12,232
1984/85	16,220	0.60	9,770
1985/86	16,207	0.46	7,400
1986/87	16,702	0.50	8,288
1987/88	13,851	0.50	6,865
1988/89	17,106	0.66	11,353
1989/90	15,855	0.66	10,514
1990/91	15,095	0.69	10,424
1991/92	14,437	0.57	8,272
1992/93	14,740	0.84	12,370
1988/89-1992/93 average	15,447	0.68	10,587

Millet calendar for most of India

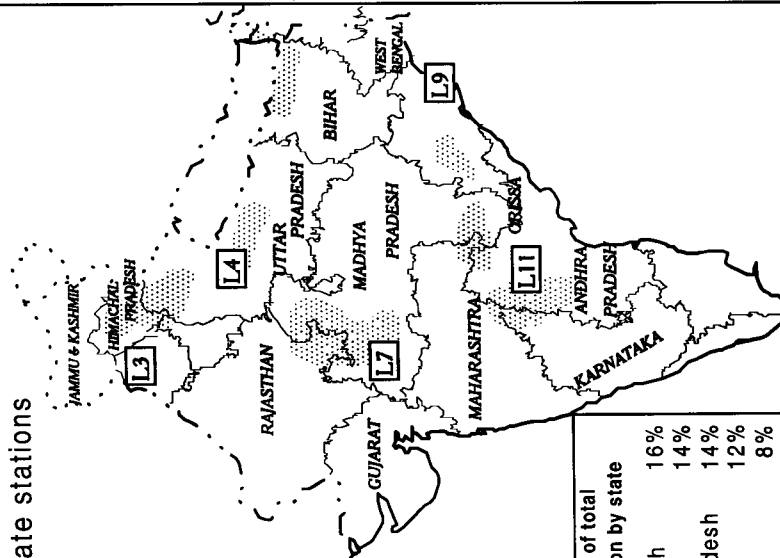


JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
 JOINT AGRICULTURAL WEATHER FACILITY (USDAN/OAA)

India: Corn

Major growing areas

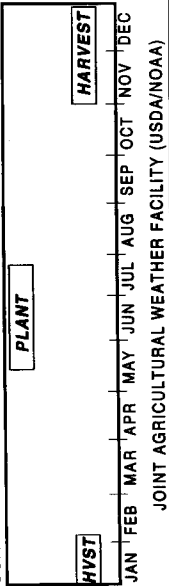
Climate stations



Percent of total production by state	
Uttar Pradesh	16%
Bihar	14%
Madhya Pradesh	14%
Rajasthan	12%
Karnataka	8%
Andhra Pradesh	7%
Himachal Pradesh	7%
Gujarat	5%
Jammu & Kashmir	5%
Total	88%

* States Producing 5% or More

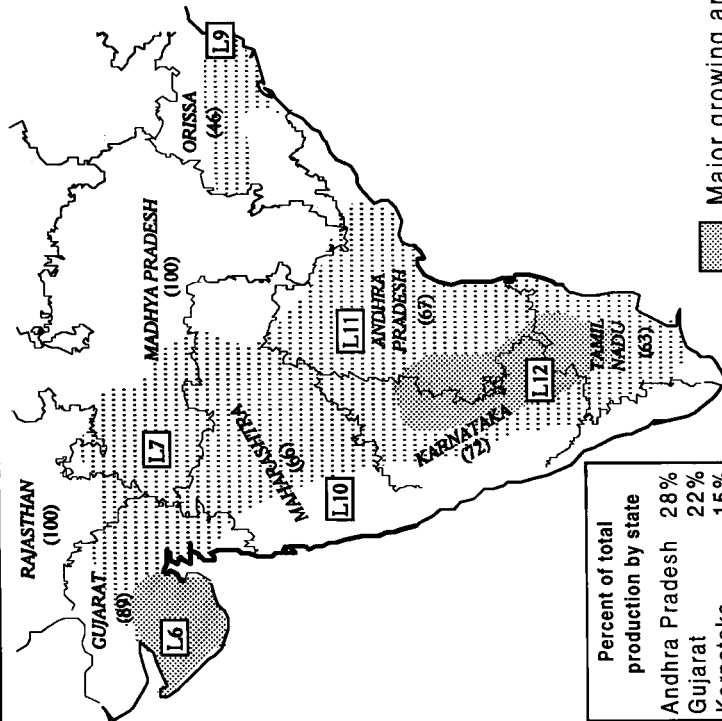
Corn calendar for most of India



India: Historical corn statistics

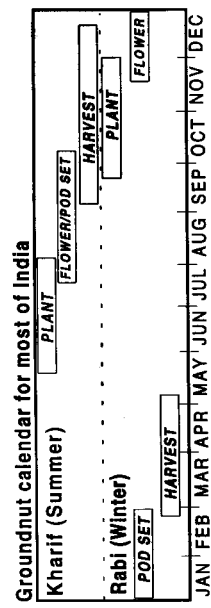
	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1988/89-1992/93 average
Andhra Pradesh											
Area (1,000 ha)	341	313	289	307	304	297	298	309	315	329	310
Yield (t/ha)	1.53	1.38	1.43	1.49	1.76	1.65	2.24	2.09	2.03	2.46	2.10
Prod. (1,000 t)	522	433	414	459	533	491	670	646	639	808	651
Bihar											
Area (1,000 ha)	779	682	670	647	659	693	701	665	664	859	716
Yield (t/ha)	1.13	1.29	1.31	1.43	1.14	1.56	1.72	1.56	1.84	1.86	1.72
Prod. (1,000 t)	884	881	877	924	753	1,082	1,203	1,038	1,224	1,600	1,229
Gujarat											
Area (1,000 ha)	319	310	317	314	275	337	323	369	344	368	348
Yield (t/ha)	1.49	1.24	0.36	1.39	0.34	1.35	1.49	1.44	1.02	1.51	1.36
Prod. (1,000 t)	476	384	114	435	93	456	480	530	351	557	475
Himachal Pradesh											
Area (1,000 ha)	295	308	300	303	293	315	314	319	315	320	317
Yield (t/ha)	1.99	1.86	1.74	1.86	1.38	1.53	2.13	2.05	1.90	2.09	1.94
Prod. (1,000 t)	589	572	521	563	406	483	669	655	598	670	615
Jammu & Kashmir											
Area (1,000 ha)	276	282	287	289	293	292	297	298	298	300	297
Yield (t/ha)	1.03	1.62	1.72	1.80	1.02	1.51	1.51	1.50	1.50	1.42	1.49
Prod. (1,000 t)	285	455	494	519	298	442	447	446	446	427	441
Karnataka											
Area (1,000 ha)	166	188	167	226	205	255	253	252	280	316	271
Yield (t/ha)	2.72	2.45	2.19	2.59	2.44	2.65	2.80	2.53	3.03	2.85	2.78
Prod. (1,000 t)	450	460	365	585	500	677	708	637	846	902	754
Madhya Pradesh											
Area (1,000 ha)	831	850	839	850	849	860	879	877	855	850	864
Yield (t/ha)	1.39	1.37	0.84	0.89	1.03	1.39	1.66	1.41	1.00	1.60	1.41
Prod. (1,000 t)	1,156	1,161	709	761	873	1,194	1,458	1,237	857	1,357	1,220
Rajasthan											
Area (1,000 ha)	894	912	975	973	802	892	944	984	945	875	928
Yield (t/ha)	1.38	1.23	0.66	0.67	0.38	1.37	1.39	1.33	0.81	1.10	1.20
Prod. (1,000 t)	1,230	1,123	644	648	302	1,222	1,315	1,303	764	966	1,114
Uttar Pradesh											
Area (1,000 ha)	1,106	1,164	1,200	1,206	1,135	1,154	1,150	1,085	1,035	1,085	1,102
Yield (t/ha)	1.00	1.52	1.22	1.23	0.88	1.04	1.38	1.32	1.10	1.58	1.29
Prod. (1,000 t)	1,111	1,765	1,462	1,481	997	1,202	1,587	1,432	1,141	1,718	1,416
All-India (100%)											
Area (1,000 ha)	5,859	5,800	5,797	5,923	5,561	5,997	5,915	5,904	5,781	6,072	5,914
Yield (t/ha)	1.35	1.46	1.15	1.28	1.03	1.40	1.63	1.52	1.38	1.70	1.53
Prod. (1,000 t)	7,922	8,442	6,644	7,593	5,721	8,229	9,651	8,962	7,983	10,316	9,028

India: Groundnuts



State	Percent of total production
Andhra Pradesh	28%
Gujarat	22%
Karnataka	15%
Tamil Nadu	12%
Maharashtra	9%
Madhya Pradesh	4%
Orissa	4%
Rajasthan	3%
Total	97%




o About 70% of the total crop is kharif (grown during summer rainy season).
 o Gujarat is highly susceptible to drought stemming from weak monsoon.

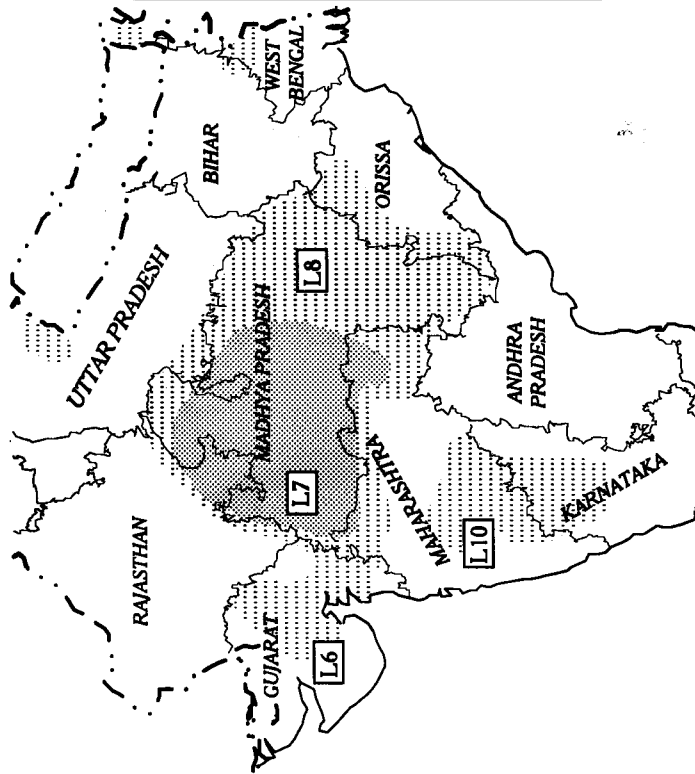


India: Historical groundnut statistics

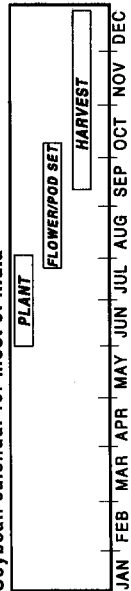
	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1988/89-1992/93 average
Andhra Pradesh											
Area (1,000 ha)	1,665	1,676	1,666	1,571	1,911	2,291	2,282	2,394	2,496	2,431	2,379
Yield (t/ha)	1.03	0.75	0.80	0.83	1.00	0.96	0.91	0.95	0.90	0.87	0.92
Prod. (1,000 t)	1,716	1,258	1,325	1,308	1,906	2,201	2,087	2,267	2,236	2,123	2,183
Gujarat											
Area (1,000 ha)	2,150	2,061	1,794	1,825	1,051	1,823	2,072	1,702	1,942	1,835	1,875
Yield (t/ha)	0.84	0.76	0.25	0.71	0.13	1.58	0.82	0.62	0.36	1.07	0.89
Prod. (1,000 t)	1,810	1,572	448	1,292	140	2,875	1,694	1,053	700	1,962	1,657
Karnataka											
Area (1,000 ha)	878	595	1,013	1,034	1,056	1,264	1,187	1,212	1,326	1,280	1,254
Yield (t/ha)	0.84	1.51	0.70	0.71	0.86	0.80	0.79	0.68	0.83	0.86	0.79
Prod. (1,000 t)	739	897	707	738	911	1,010	936	828	1,101	1,106	996
Madhya Pradesh											
Area (1,000 ha)	312	302	257	244	264	303	366	321	307	274	314
Yield (t/ha)	0.74	0.53	0.66	0.77	0.93	1.11	0.74	0.78	0.70	1.12	0.89
Prod. (1,000 t)	232	160	170	189	246	336	272	250	213	307	276
Maharashtra											
Area (1,000 ha)	810	737	664	654	655	900	854	881	742	632	802
Yield (t/ha)	1.00	0.99	0.71	0.67	0.94	1.12	1.15	1.13	0.74	1.18	1.06
Prod. (1,000 t)	807	731	469	435	618	1,006	979	991	546	744	853
Orissa											
Area (1,000 ha)	259	313	348	348	387	377	371	396	397	380	384
Yield (t/ha)	1.55	1.55	1.42	1.42	1.27	1.49	1.24	1.41	1.49	1.38	1.40
Prod. (1,000 t)	399	485	494	496	490	563	461	558	592	525	540
Rajasthan											
Area (1,000 ha)	183	253	245	202	227	235	276	232	246	235	245
Yield (t/ha)	0.95	0.68	0.61	0.65	0.61	1.11	0.77	0.94	0.79	1.07	0.94
Prod. (1,000 t)	174	173	150	131	138	260	214	218	196	252	228
Tamil Nadu											
Area (1,000 ha)	956	960	932	897	1,100	1,044	1,081	963	1,031	1,128	1,049
Yield (t/ha)	1.03	1.03	1.26	1.22	1.14	1.06	1.15	1.22	1.28	1.23	1.19
Prod. (1,000 t)	982	986	1,176	1,093	1,259	1,104	1,246	1,179	1,320	1,385	1,247
All-India (100%)											
Area (1,000 ha)	7,539	7,168	7,125	6,982	6,844	8,430	8,710	8,309	8,672	8,385	8,501
Yield (t/ha)	0.94	0.90	0.72	0.84	0.86	1.13	0.93	0.90	0.81	1.03	0.96
Prod. (1,000 t)	7,086	6,436	5,121	5,875	5,854	9,544	8,101	7,515	7,066	8,619	8,169

India: Soybeans

-  Major growing areas
-  Minor growing areas
-  Climate stations

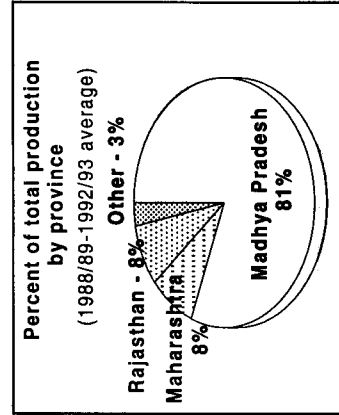


Soybean calendar for most of India






India: Historical soybean statistics

	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1988/89-1992/93 average
Gujarat											
Area (1,000 ha)	11	11	1	22	10	17	23	13	23	17	18
Yield (t/ha)	0.41	0.41	0.83	0.27	0.30	0.75	0.83	1.14	0.67	0.82	0.84
Prod. (1,000 t)	5	5	1	6	3	12	19	15	15	14	15
Madhya Pradesh											
Area (1,000 ha)	614	987	1,097	1,210	1,329	1,476	1,878	2,149	2,296	2,899	2,140
Yield (t/ha)	0.75	0.78	0.76	0.56	0.58	0.89	0.80	1.02	0.82	0.80	0.87
Prod. (1,000 t)	462	770	829	677	767	1,313	1,497	2,184	1,887	2,322	1,841
Maharashtra											
Area (1,000 ha)											
Yield (t/ha)											
Prod. (1,000 t)											
Rajasthan											
Area (1,000 ha)	23	31	43	52	84	107	169	144	172	278	174
Yield (t/ha)	0.69	0.86	0.74	0.75	0.73	1.15	0.80	1.11	0.76	1.17	1.00
Prod. (1,000 t)	16	26	32	39	62	123	135	160	130	325	175
Uttar Pradesh											
Area (1,000 ha)	182	207	192	167	18	16	21	24	25	22	22
Yield (t/ha)	0.70	0.71	0.80	0.81	1.03	1.31	1.29	1.33	1.20	1.50	1.33
Prod. (1,000 t)	127	148	154	136	19	21	28	32	30	33	29
All-India (100%)											
Area (1,000 ha)	836	1,243	1,340	1,527	1,543	1,734	2,253	2,564	2,821	3,670	2,609
Yield (t/ha)	0.73	0.77	0.76	0.58	0.58	0.89	0.80	1.01	0.81	0.85	0.87
Prod. (1,000 t)	614	955	1,024	891	898	1,547	1,806	2,602	2,275	3,109	2,268

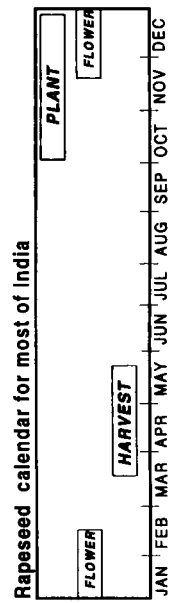
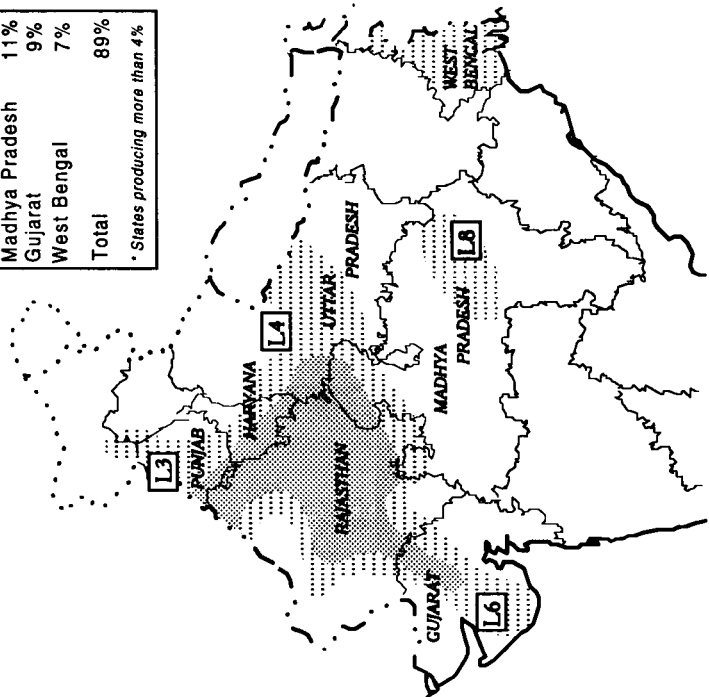


India: Rapeseed

-  Major growing areas
-  Minor growing areas
-  Climate stations

Percent of total production by state*	
Rajasthan	32%
Uttar Pradesh	17%
Haryana	13%
Madhya Pradesh	11%
Gujarat	9%
West Bengal	7%
Total	89%

* States producing more than 4%



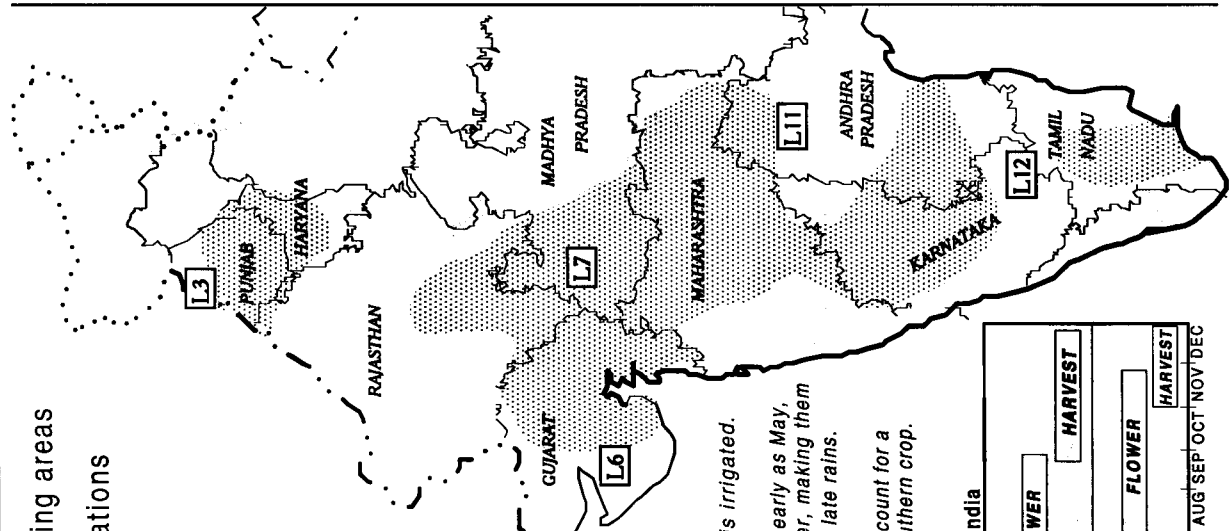
India: Historical rapeseed statistics

	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1988/89-1992/93 average
Gujarat											
Area (1,000 ha)	174	195	192	182	183	242	306	417	393	382	348
Yield (t/ha)	1.36	1.23	1.09	1.29	1.01	1.36	1.16	1.01	1.17	1.32	1.20
Prod. (1,000 t)	236	239	209	235	184	329	356	420	458	503	413
Haryana											
Area (1,000 ha)	195	311	342	276	328	383	429	474	637	700	525
Yield (t/ha)	0.81	0.95	0.80	0.78	1.00	1.25	0.99	1.34	1.04	1.00	1.12
Prod. (1,000 t)	157	296	274	216	329	480	424	634	660	700	580
Madhya Pradesh											
Area (1,000 ha)	312	355	338	331	440	478	450	571	536	648	537
Yield (t/ha)	0.74	0.68	0.54	0.63	0.75	0.90	0.76	0.92	0.83	0.93	0.87
Prod. (1,000 t)	232	243	182	208	329	430	343	527	446	600	469
Punjab											
Area (1,000 ha)	83	138	146	128	208	114	93	73	92	127	100
Yield (t/ha)	0.88	1.08	1.01	0.92	1.00	1.05	0.90	1.00	1.02	1.06	1.01
Prod. (1,000 t)	73	148	148	118	209	120	84	73	94	135	101
Rajasthan											
Area (1,000 ha)	820	1,081	1,015	852	1,373	1,527	1,578	2,042	2,387	2,324	1,972
Yield (t/ha)	0.79	0.81	0.66	0.81	0.75	0.94	0.85	0.85	0.93	0.77	0.87
Prod. (1,000 t)	648	874	665	691	1,030	1,440	1,336	1,738	2,230	1,785	1,706
Uttar Pradesh											
Area (1,000 ha)	1,519	1,028	1,069	974	1,029	1,045	1,054	1,116	1,326	967	1,104
Yield (t/ha)	0.54	0.76	0.62	0.61	0.66	0.86	0.83	0.98	0.87	0.98	0.91
Prod. (1,000 t)	814	785	659	595	680	903	881	1,089	1,161	950	999
West Bengal											
Area (1,000 ha)	189	245	232	295	380	379	363	378	378	415	383
Yield (t/ha)	0.60	0.67	0.71	0.60	0.88	0.86	0.89	0.89	0.89	0.87	0.88
Prod. (1,000 t)	113	164	163	177	334	327	325	336	336	360	337
All-India (100%)											
Area (1,000 ha)	3,874	3,987	3,980	3,719	4,619	4,832	4,967	5,782	6,470	6,293	5,669
Yield (t/ha)	0.67	0.77	0.67	0.70	0.75	0.91	0.83	0.90	0.90	0.88	0.88
Prod. (1,000 t)	2,608	3,073	2,681	2,605	3,455	4,377	4,125	5,229	5,841	5,516	5,018

India: Cotton

-  Major growing areas
-  Climate stations

State	Percent of total production by state
Punjab	18%
Andhra Pradesh	14%
Gujarat	14%
Maharashtra	13%
Haryana	10%
Madhya Pradesh	10%
Rajasthan	8%
Karnataka	8%
Tamil Nadu	4%
Total	99%



- o About 30% of total crop is irrigated.
- o Northern crops, planted as early as May, begin opening by September, making them susceptible to damage from late rains.
- o Rabi crops (fall planted) account for a small percentage of the southern crop.

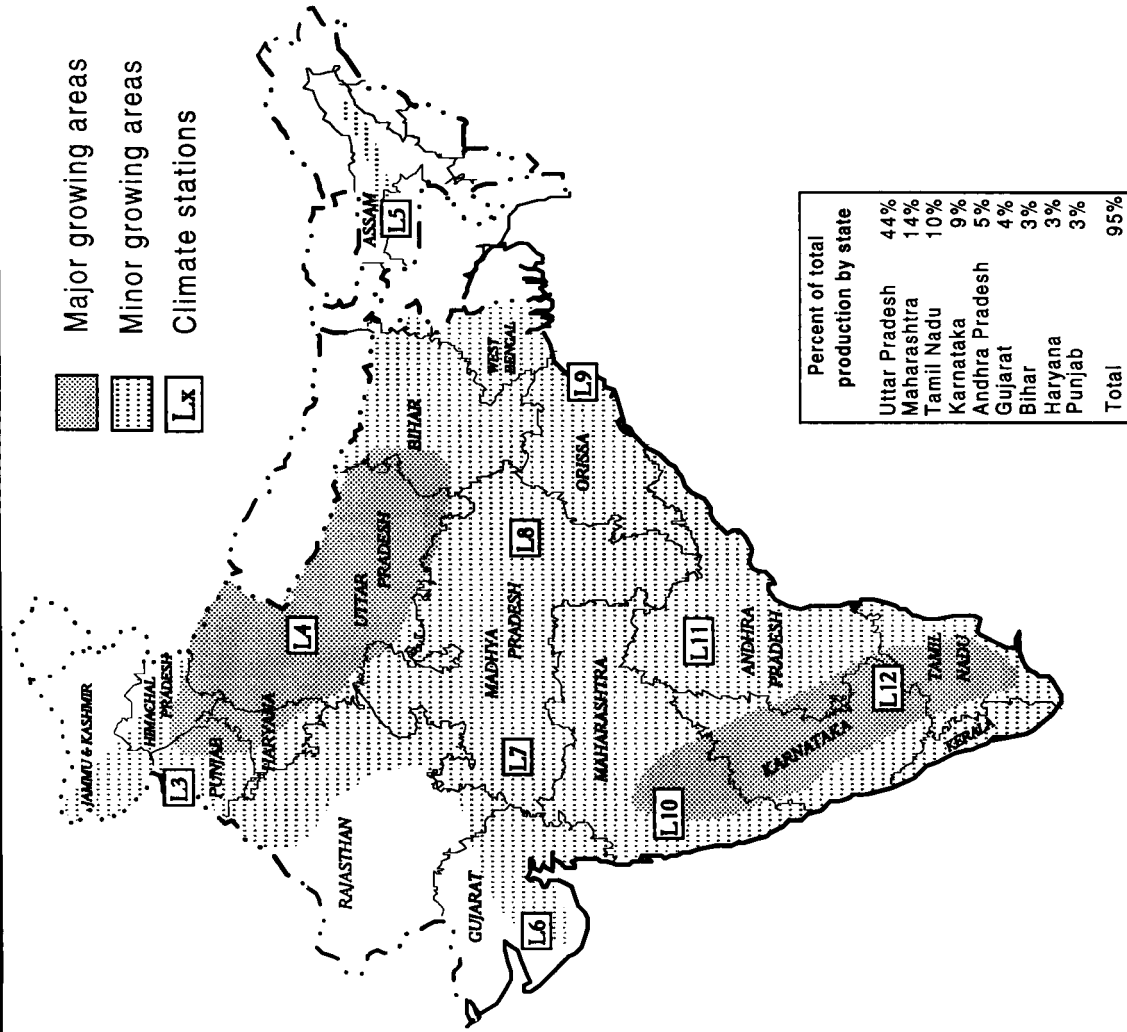
Cotton calendar for most of India

Region	PLANT	FLOWER	HARVEST
North (Mostly Irrigated)			
Central & south (Mostly Rainfed)			
HVST			
JAN ' FEB ' MAR ' APR ' MAY ' JUN ' JUL ' AUG ' SEP ' OCT ' NOV ' DEC			

India: Historical cotton statistics

	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1988/89-1992/93 average
Andhra Pradesh									
Area (1,000 ha)	620	411	574	628	657	655	707	806	691
Yield (kg/ha)	430	480	440	360	400	490	470	470	440
Prod. (1,000 480 lb bales)	1,234	898	1,159	1,031	1,210	1,464	1,523	1,733	1,392
Gujarat									
Area (1,000 ha)	1,404	1,366	719	1,091	837	921	1,135	1,151	1,027
Yield (kg/ha)	280	170	120	250	350	280	230	330	290
Prod. (1,000 480 lb bales)	1,804	1,035	383	1,249	1,351	1,171	1,171	1,741	1,337
Haryana									
Area (1,000 ha)	344	379	417	433	468	490	509	531	486
Yield (kg/ha)	340	450	360	360	500	400	500	450	440
Prod. (1,000 480 lb bales)	531	777	695	718	1,084	898	1,171	1,101	994
Karnataka									
Area (1,000 ha)	674	414	476	654	682	596	586	614	626
Yield (kg/ha)	190	220	240	250	260	230	230	300	250
Prod. (1,000 480 lb bales)	601	426	531	742	807	625	625	843	728
Madhya Pradesh									
Area (1,000 ha)	536	523	505	562	574	608	560	480	557
Yield (kg/ha)	240	290	370	360	400	450	270	350	370
Prod. (1,000 480 lb bales)	578	691	847	937	1,055	1,249	703	781	945
Maharashtra									
Area (1,000 ha)	2,753	2,693	2,518	2,628	2,636	2,730	2,724	2,480	2,640
Yield (kg/ha)	180	80	90	80	140	90	80	140	110
Prod. (1,000 480 lb bales)	2,256	1,007	1,023	976	1,640	1,171	976	1,585	1,270
Punjab									
Area (1,000 ha)	560	567	621	758	732	701	660	690	708
Yield (kg/ha)	390	510	570	440	590	420	620	540	520
Prod. (1,000 480 lb bales)	1,007	1,335	1,624	1,530	1,997	1,347	1,874	1,710	1,692
Rajasthan									
Area (1,000 ha)	333	365	344	299	434	455	475	476	428
Yield (kg/ha)	310	420	210	390	420	360	360	390	380
Prod. (1,000 480 lb bales)	472	703	324	531	841	742	781	851	749
Tamil Nadu									
Area (1,000 ha)	254	186	244	244	268	239	264	271	257
Yield (kg/ha)	410	380	450	450	450	360	390	410	410
Prod. (1,000 480 lb bales)	480	320	500	500	556	390	468	508	484
All-India (100%)									
Area (1,000 ha)	7,533	6,948	6,459	7,343	7,331	7,440	7,695	7,527	7,467
Yield (kg/ha)	260	230	240	240	310	270	270	320	280
Prod. (1,000 480 lb bales)	8,964	7,191	7,086	8,214	10,541	9,135	9,370	10,931	9,638

India: Sugarcane



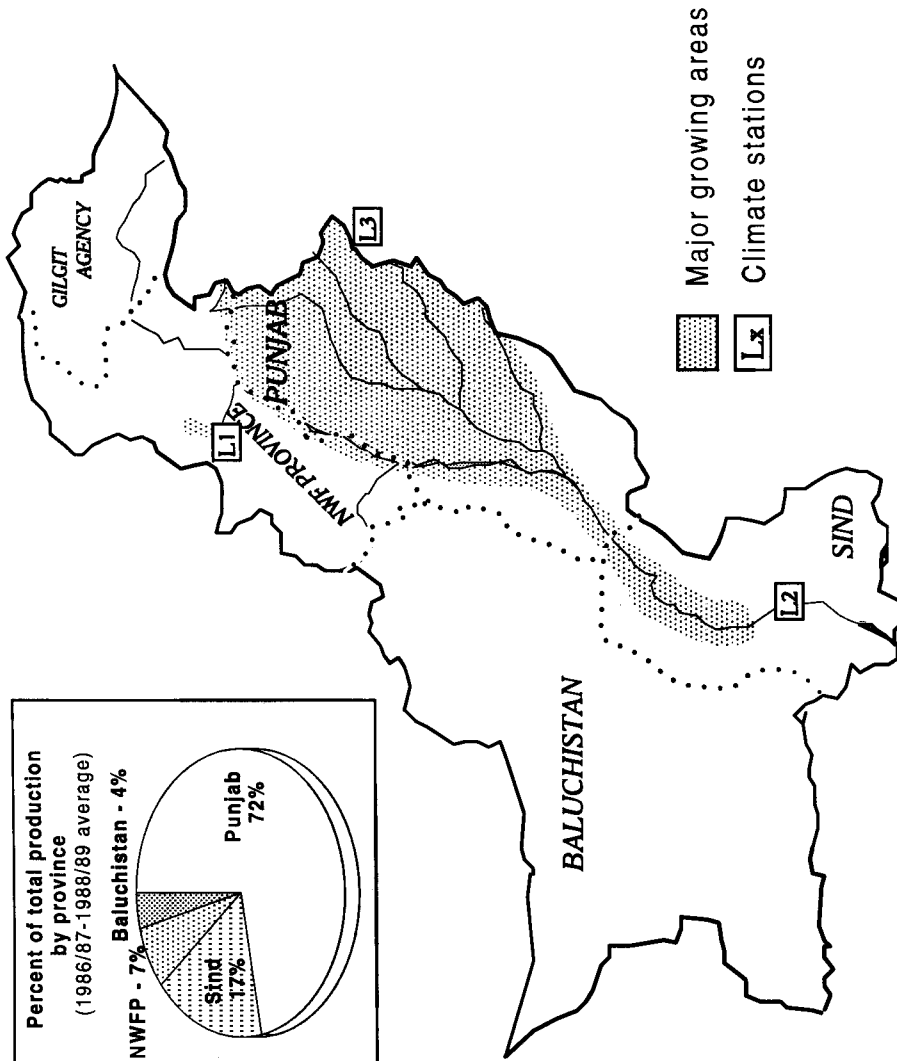
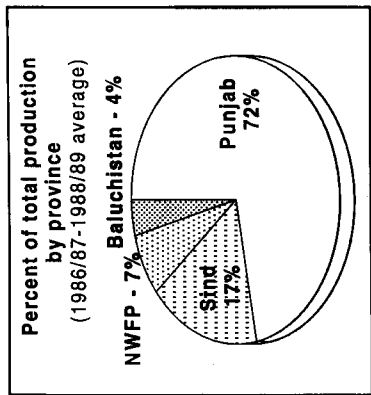
India: Historical sugarcane statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t	Raw sugar 1,000 t
1975/76	1,657	50.91	84,362	5,612
1976/77	1,720	53.38	91,805	6,430
1977/78	1,932	56.41	108,977	8,206
1978/79	1,782	48.00	85,536	7,071
1979/80	1,602	48.24	77,280	5,170
1980/81	1,600	57.83	92,520	6,542
1981/82	2,554	43.15	110,200	9,727
1982/83	3,364	56.18	189,000	9,508
1983/84	3,166	55.91	177,020	7,042
1984/85	2,992	58.01	173,569	7,071
1985/86	1,322	59.99	79,307	8,149
1986/87	1,693	60.38	102,229	10,153
1987/88	1,813	59.99	108,753	10,591
1988/89	1,620	61.00	98,825	10,177
1989/90	1,901	65.41	124,348	12,575
1990/91	2,117	64.30	136,119	13,748
1991/92	2,200	67.64	148,814	15,250
1992/93	2,250	64.44	145,000	14,750
1988/89- 1992/93 average	2,018	64.56	130,621	13,300

Sugarcane calendar for most of India

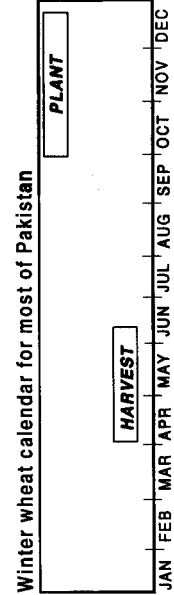
PLANT	HARVEST
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC	JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

Pakistan: Winter wheat

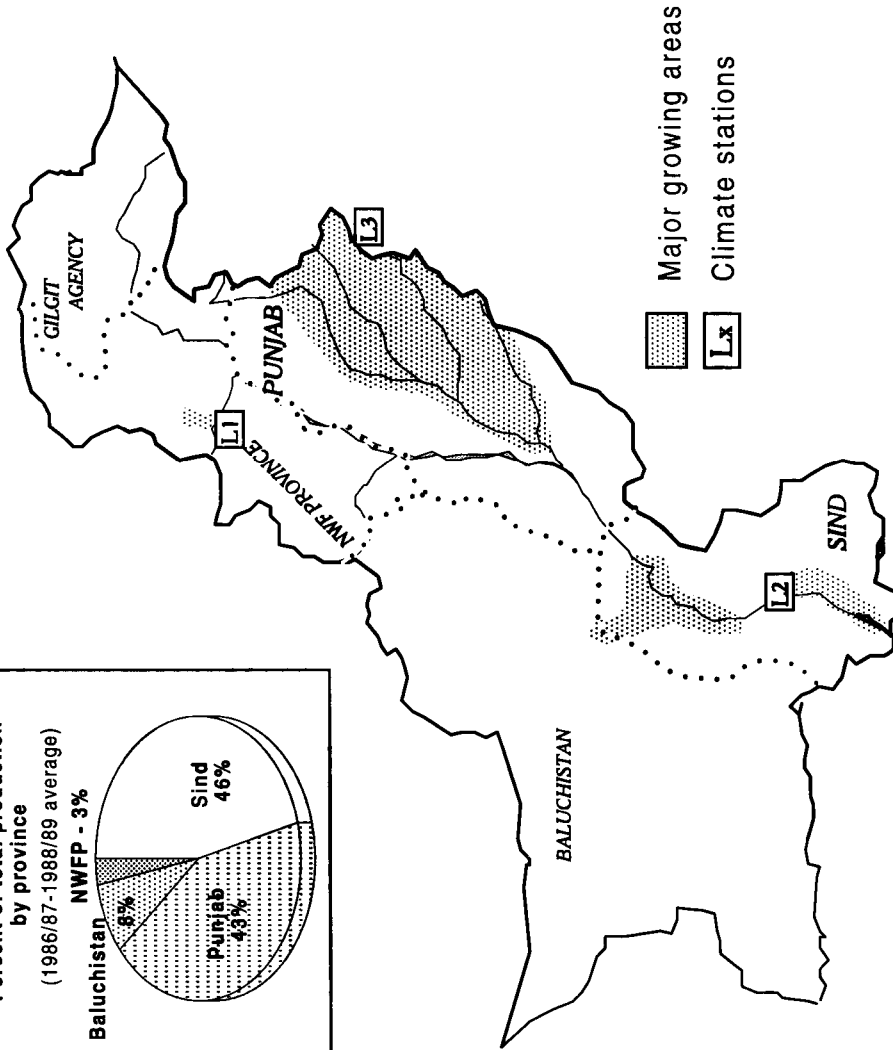
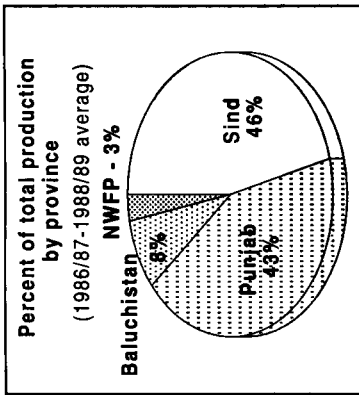


Pakistan: Historical winter wheat statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1975/76	5,813	1.32	7,674
1976/77	6,111	1.42	8,690
1977/78	6,390	1.43	9,143
1978/79	6,360	1.32	8,367
1979/80	6,687	1.49	9,950
1980/81	6,924	1.57	10,857
1981/82	6,982	1.64	11,473
1982/83	7,223	1.57	11,304
1983/84	7,398	1.68	12,414
1984/85	7,326	1.49	10,882
1985/86	7,403	1.58	11,703
1986/87	7,363	1.89	13,922
1987/88	7,706	1.56	12,020
1988/89	7,308	1.73	12,675
1989/90	7,730	1.87	14,419
1990/91	7,845	1.84	14,429
1991/92	7,911	1.84	14,565
1992/93	7,854	2.00	15,684
1988/89-1992/93 average	7,730	1.86	14,354

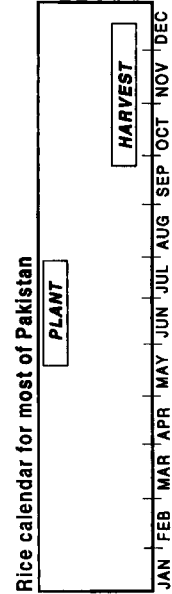


Pakistan: Rice

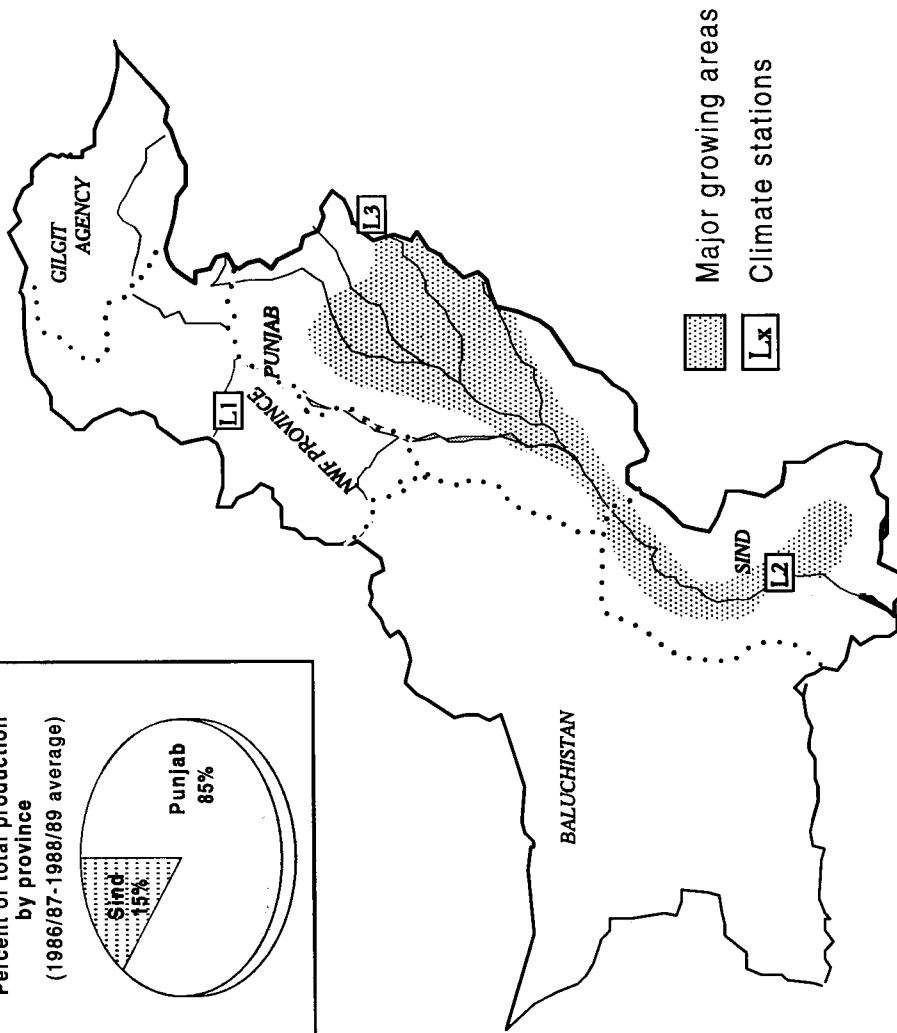
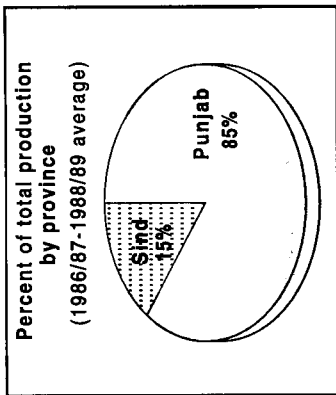


Pakistan:
Historical rice statistics

Crop Year	Yield		Prod. (Milled) 1,000 t
	Area 1,000 ha	(Rough) t/ha	
1975/76	1,710	2.30	2,617
1976/77	1,749	2.35	2,737
1977/78	1,899	2.33	2,950
1978/79	2,026	2.42	3,272
1979/80	2,034	2.37	3,216
1980/81	1,933	2.43	3,123
1981/82	1,976	2.61	3,430
1982/83	1,978	2.62	3,445
1983/84	1,998	2.51	3,339
1984/85	1,998	2.49	3,315
1985/86	1,863	2.35	2,919
1986/87	2,066	2.53	3,486
1987/88	1,963	2.48	3,241
1988/89	2,042	2.35	3,200
1989/90	2,107	2.29	3,220
1990/91	2,114	2.32	3,265
1991/92	2,097	2.32	3,243
1992/93	1,974	2.37	3,116
1988/89-1992/93 average	2,067	2.33	3,209



Pakistan: Cotton



Pakistan:

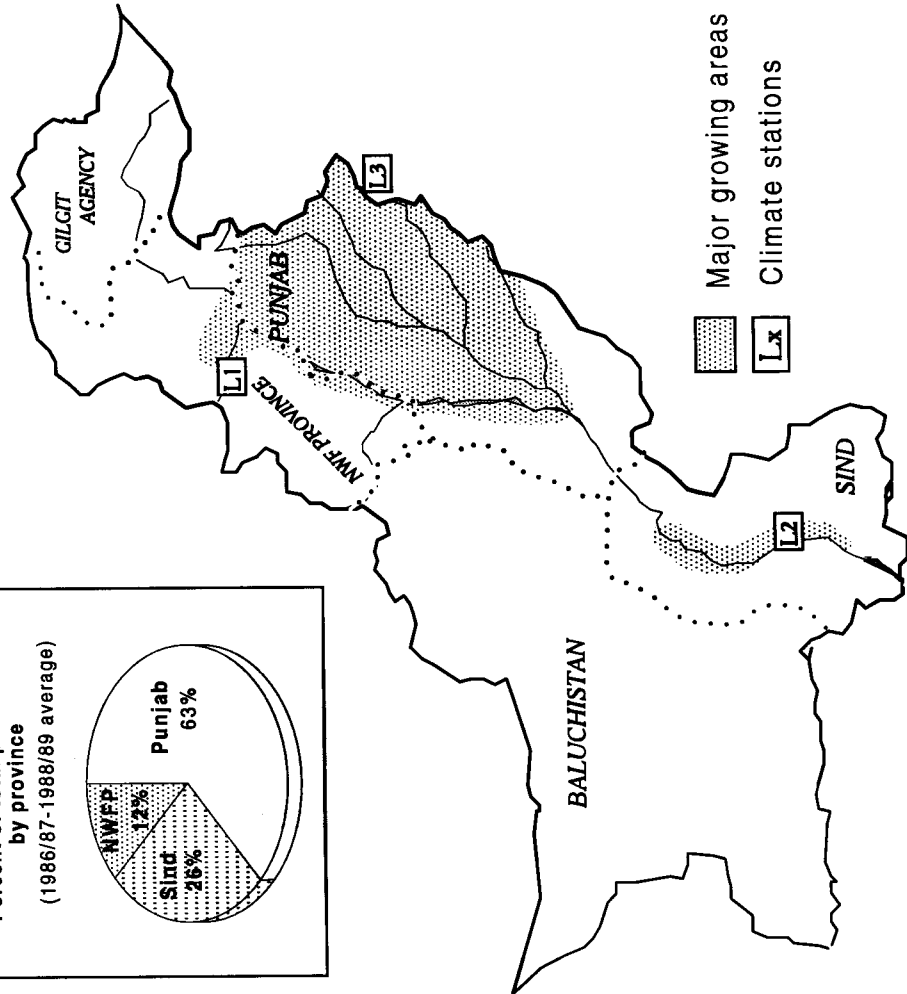
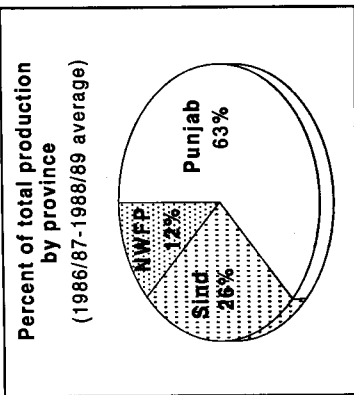
Historical cotton statistics

Crop Year	Area	Yield	Prod.
	1,000 ha	kg/ha	1,000 480 lb. bales
1975/76	1,851	270	2,269
1976/77	1,865	220	1,920
1977/78	1,843	300	2,540
1978/79	1,902	240	2,131
1979/80	2,023	370	3,417
1980/81	2,108	340	3,279
1981/82	2,215	340	3,436
1982/83	2,263	360	3,780
1983/84	2,221	220	2,269
1984/85	2,236	450	4,630
1985/86	2,366	510	5,585
1986/87	2,505	530	6,063
1987/88	2,568	570	6,742
1988/89	2,508	570	6,549
1989/90	2,599	560	6,687
1990/91	2,662	620	7,523
1991/92	2,836	770	9,999
1992/93	2,836	540	7,073
1988/89-1992/93 average	2,688	612	7,566

Cotton calendar for most of Pakistan



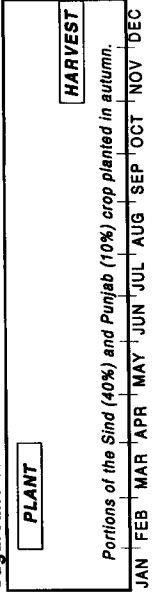
Pakistan: Sugarcane



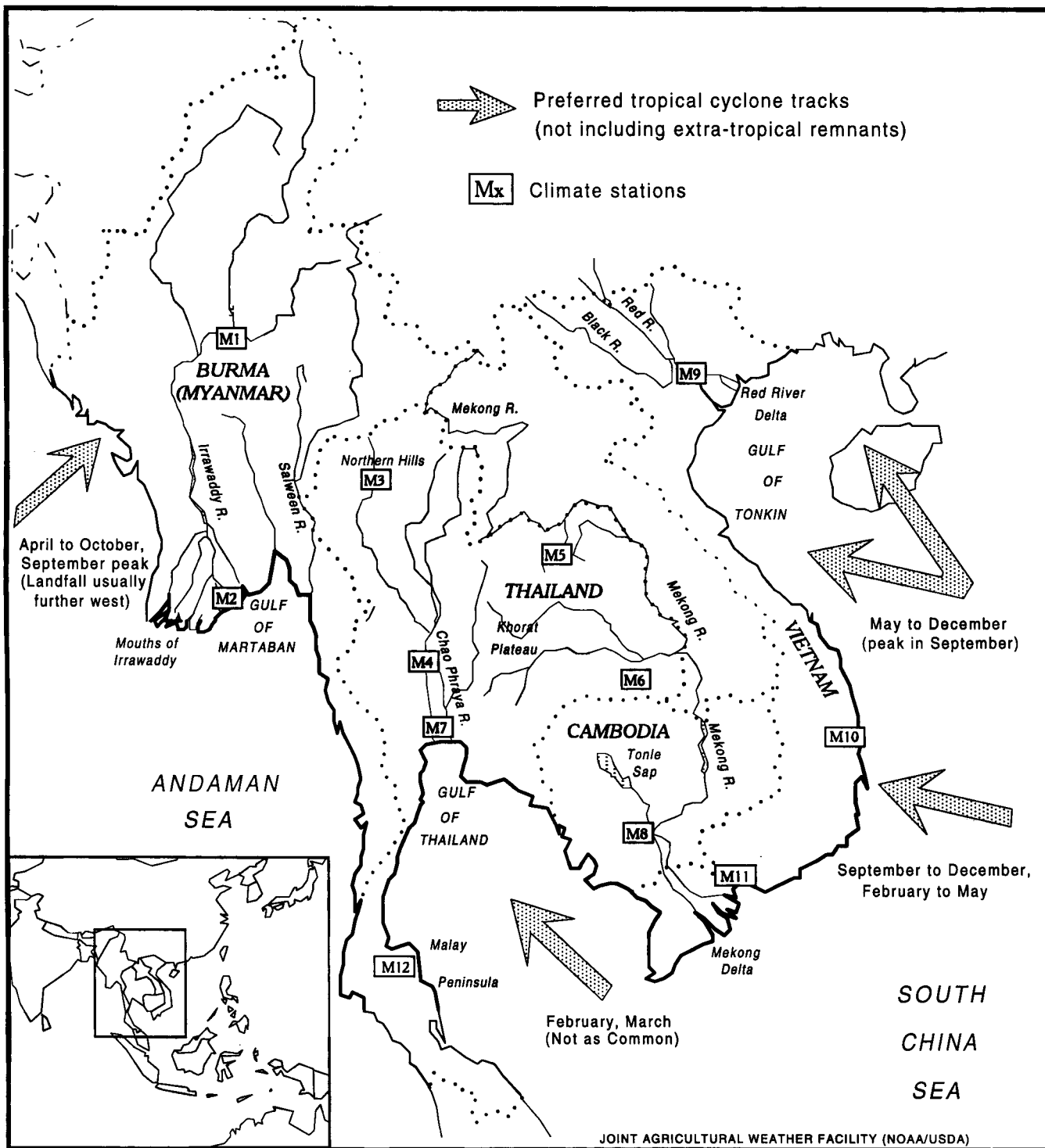
Pakistan: Historical sugarcane statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t	Raw sugar 1,000 t
1980/81	233	39.25	9,146	871
1981/82	378	38.50	14,552	1,352
1982/83	347	36.05	12,511	1,178
1983/84	353	38.20	13,486	1,203
1984/85	414	35.49	14,692	1,395
1985/86	348	34.66	12,060	1,205
1986/87	369	39.25	14,485	1,332
1987/88	518	39.19	20,300	1,866
1988/89	515	42.15	21,708	1,945
1989/90	496	41.33	20,500	1,957
1990/91	555	40.73	22,604	2,042
1991/92	572	43.33	24,786	2,457
1992/93	634	43.02	27,276	2,542
1988/89-1992/93 average	554	42.11	23,375	2,189

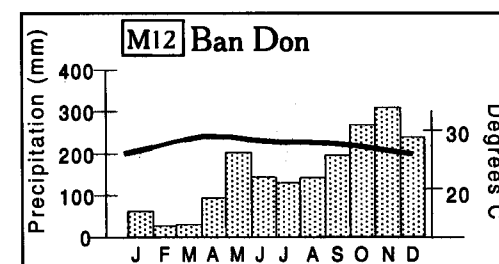
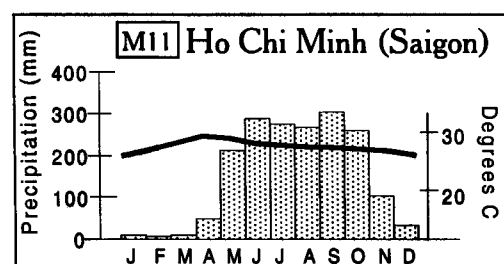
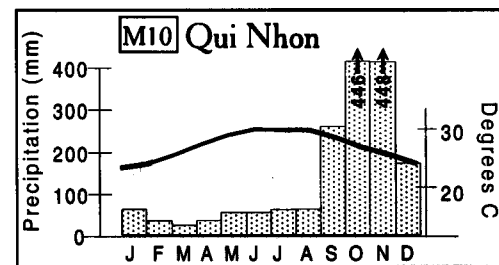
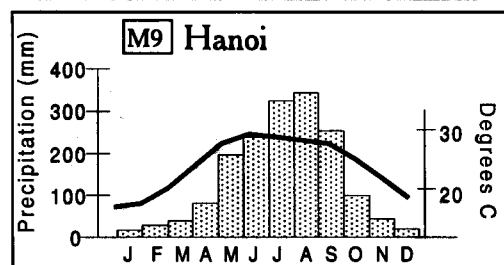
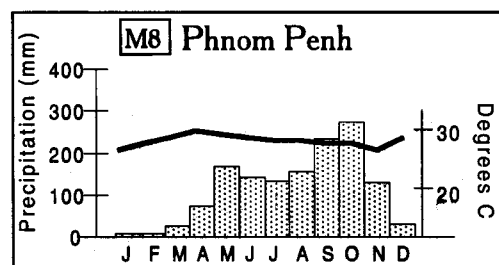
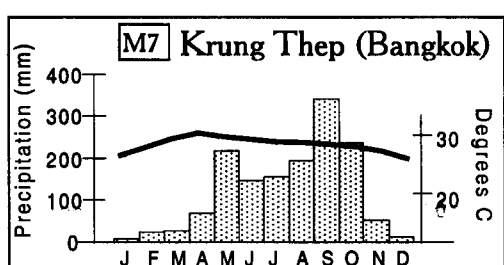
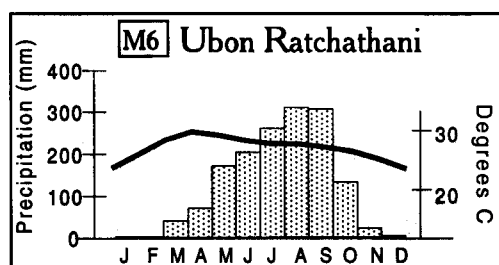
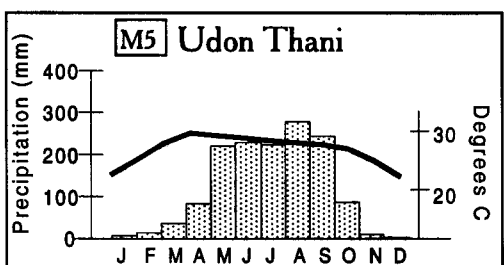
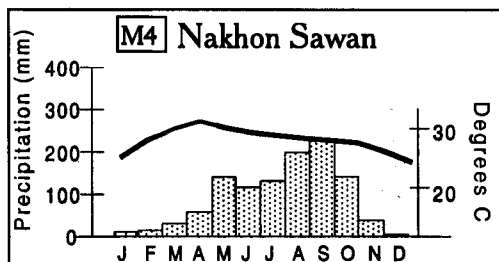
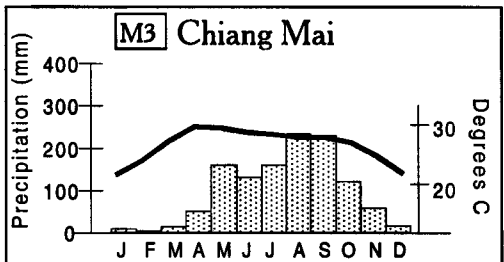
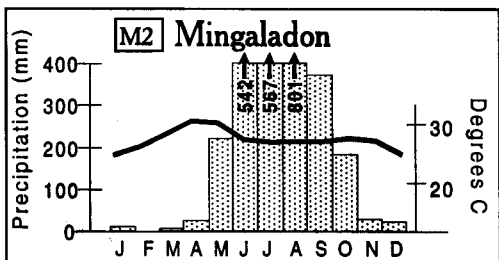
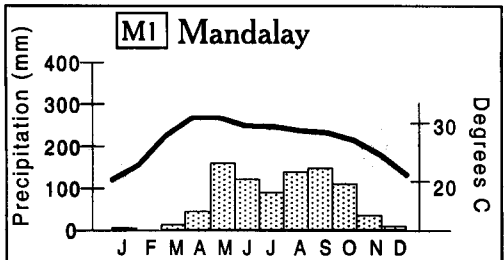
Sugarcane calendar for most of Pakistan



Southeast Asia: Landforms and climate



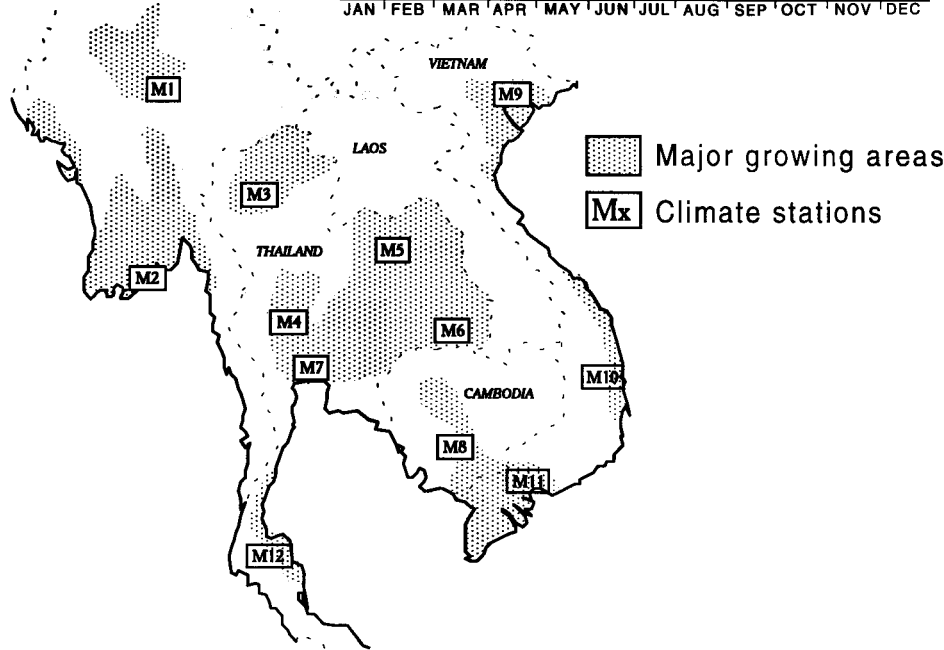
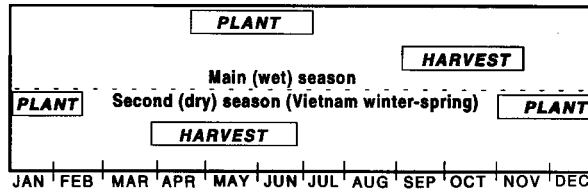
Southeast Asia: Climate stations



JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Indochina: Rice

Rice calendar for most of Indochina



Burma (Myanmar): Historical rice statistics

Crop Year	Yield (Rough)		Prod. (Milled)
	Area (1,000 ha)	t/ha	
1975/76	5,030	1.82	5,756
1976/77	4,912	1.90	5,825
1977/78	4,864	1.95	5,913
1978/79	5,011	2.10	6,581
1979/80	4,442	2.35	6,531
1980/81	4,801	2.22	6,675
1981/82	4,811	2.24	6,725
1982/83	4,560	2.40	6,850
1983/84	4,661	2.46	7,200
1984/85	4,603	2.46	7,075
1985/86	4,660	2.45	7,130
1986/87	4,666	2.53	7,080
1987/88	4,483	2.55	6,840
1988/89	4,527	2.77	7,500
1989/90	4,733	2.85	8,100
1990/91	4,797	2.86	7,943
1991/92	4,524	2.83	7,424
1992/93	4,855	2.76	7,772
1988/89-1992/93 average	4,687	2.81	7,748

JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Cambodia (Khmer): Historical rice statistics

Laos: Historical rice statistics

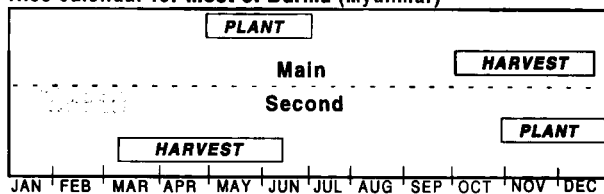
Thailand: Historical rice statistics

Vietnam: Historical rice statistics

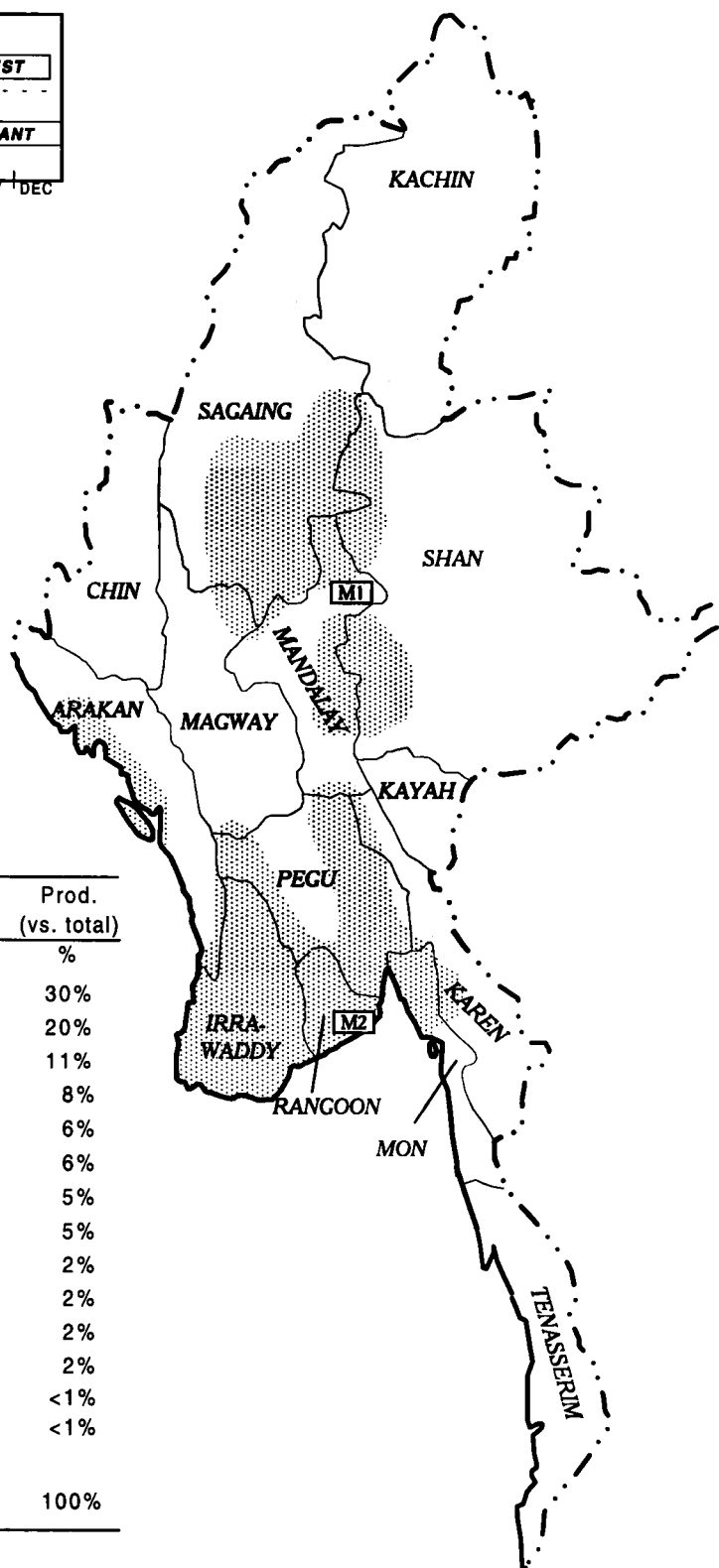
Crop Year	Cambodia (Khmer)			Laos			Thailand			Vietnam		
	Area (1,000 ha)	Yield (Rough) (t/ha)	Prod. (Milled) (1,000 t)	Area (1,000 ha)	Yield (Rough) (t/ha)	Prod. (Milled) (1,000 t)	Area (1,000 ha)	Yield (Rough) (t/ha)	Prod. (Milled) (1,000 t)	Area (1,000 ha)	Yield (Rough) (t/ha)	Prod. (Milled) (1,000 t)
1975/76	1,050	1.43	900	660	1.34	575	8,357	1.83	10,098	4,940	2.14	6,850
1976/77	1,400	1.28	1,080	680	1.26	558	8,167	1.85	9,944	5,314	2.28	7,849
1977/78	1,500	1.20	1,080	690	1.23	553	8,750	1.59	9,188	5,409	2.02	7,075
1978/79	1,400	1.07	900	665	1.20	517	8,935	1.95	11,530	5,142	1.95	6,526
1979/80	672	2.33	941	724	1.20	564	8,654	1.82	10,400	5,483	1.97	6,993
1980/81	1,417	1.21	1,080	739	1.55	684	9,200	1.89	11,463	5,468	2.17	7,697
1981/82	1,317	1.13	939	731	1.72	750	9,105	1.95	11,732	5,722	2.31	8,605
1982/83	1,615	1.27	1,290	664	1.77	703	8,940	1.89	11,139	5,708	2.66	9,901
1983/84	1,611	1.27	1,285	647	1.67	650	9,606	2.03	12,902	5,742	2.72	10,145
1984/85	1,063	1.19	793	680	1.92	780	9,629	2.06	13,137	5,842	2.80	10,633
1985/86	1,541	1.16	1,127	730	2.00	875	9,833	2.06	13,374	5,825	2.74	10,371
1986/87	1,532	1.37	1,314	730	2.03	894	9,659	1.95	12,453	5,679	2.63	9,688
1987/88	1,600	1.30	1,307	675	1.80	732	9,237	2.00	12,162	5,732	3.05	11,502
1988/89	1,670	1.48	1,556	650	1.67	651	9,917	2.15	14,034	5,982	3.05	12,044
1989/90	1,640	1.63	1,682	700	2.02	850	9,986	2.02	13,317	6,053	3.20	12,772
1990/91	1,740	1.21	1,323	860	1.75	900	8,792	1.95	11,347	6,268	3.00	12,420
1991/92	1,670	1.43	1,510	750	1.67	750	9,053	2.26	13,464	6,521	3.36	14,476
1992/93	1,600	1.29	1,300	800	1.88	900	9,177	2.17	13,145	6,525	3.30	14,210
1988/89-1992/93 average	1,664	1.41	1,200	752	1.80	810	9,385	2.11	13,061	6,270	3.18	13,184

Burma (Myanmar): Regional rice statistics

Rice calendar for most of Burma (Myanmar)



- Major growing areas
- Climate stations

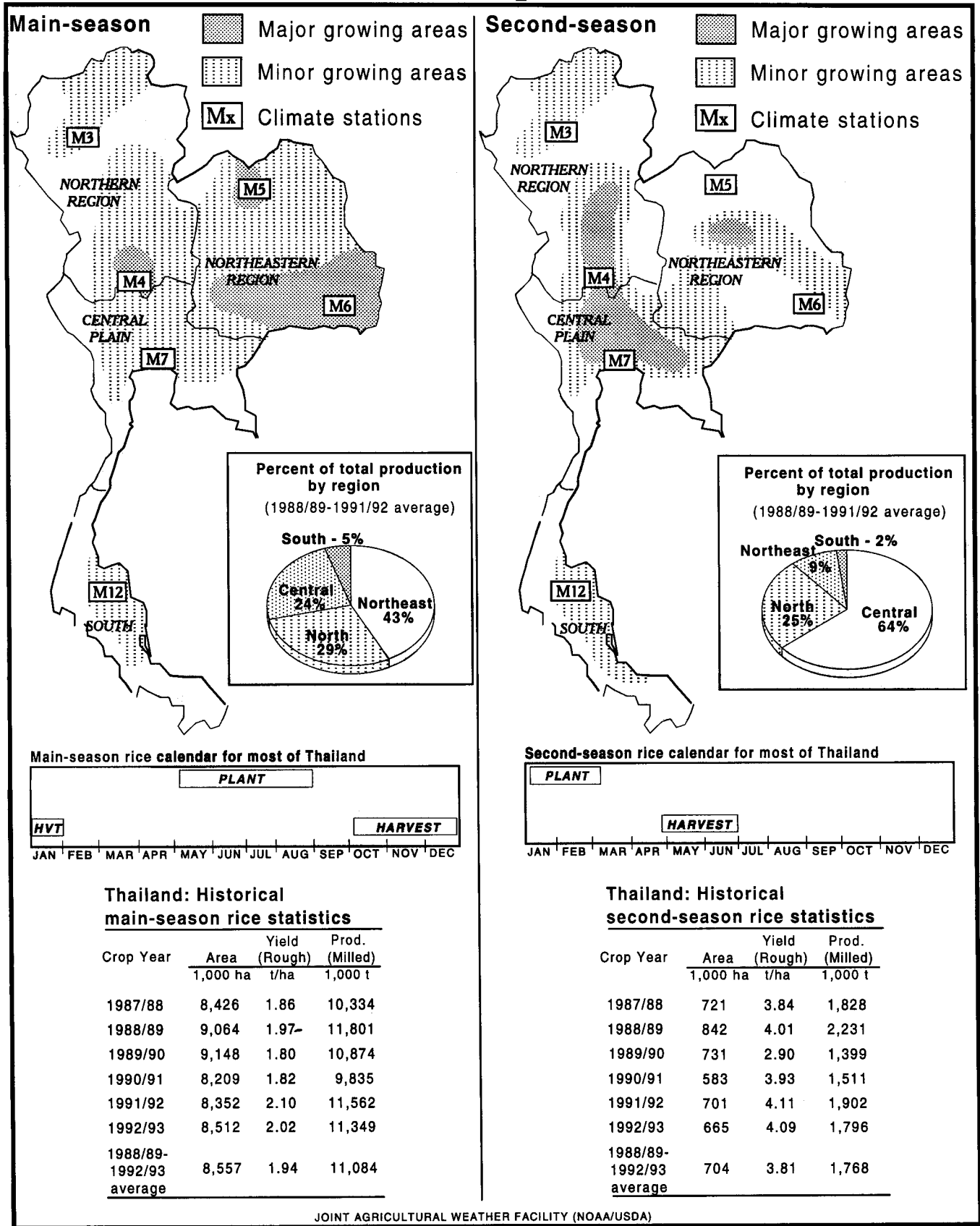


Burma (Myanmar):
Regional 1988/89 - 1992/93 rice statistics

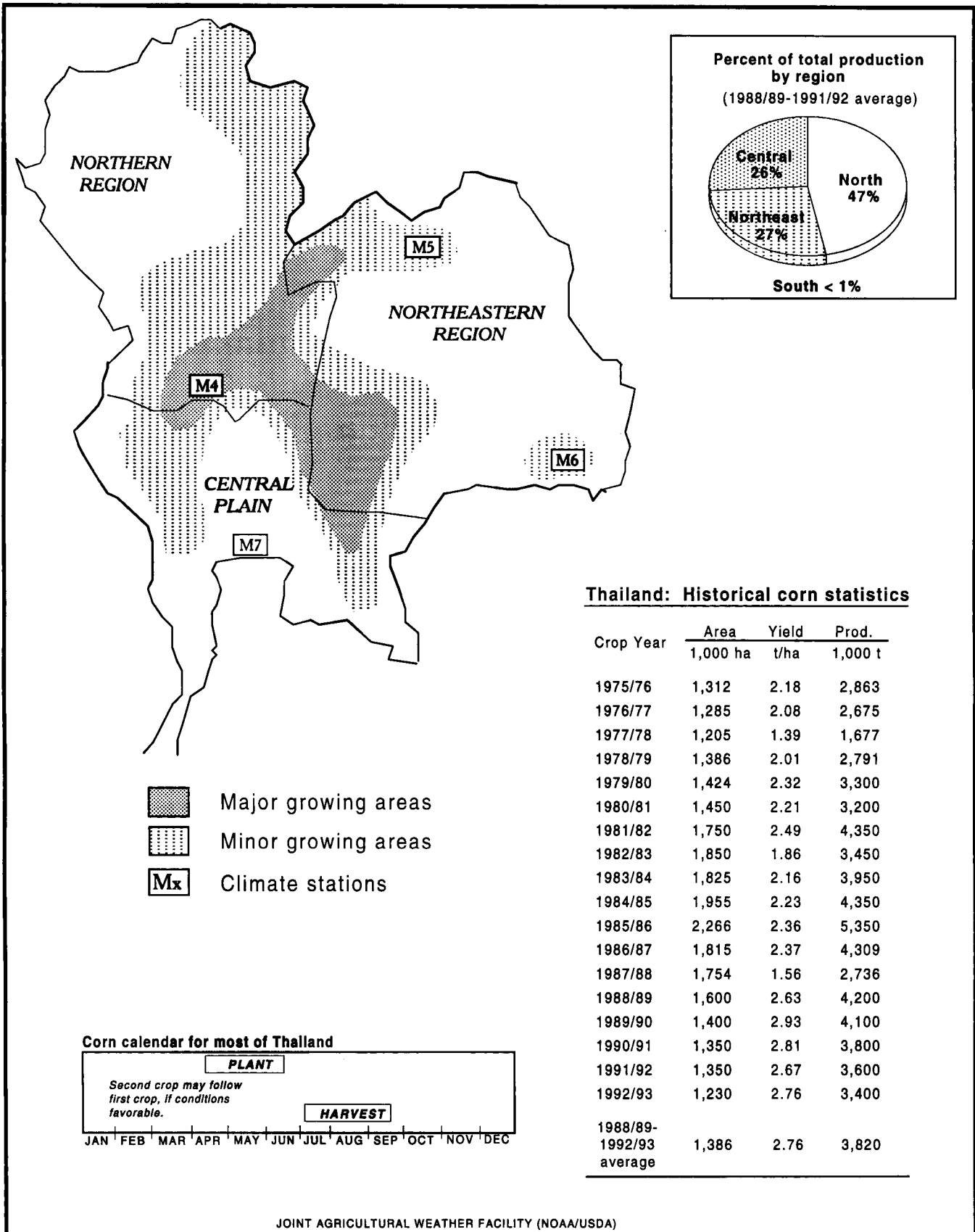
Division / State	Area 1,000 ha	Yield t/ha	Prod. (Milled) 1,000 t	Prod. (vs. total) %
Irrawaddy Div.	1,290	3.17	2,410	30%
Pegu Div..	849	3.24	1,622	20%
Rangoon Div.	479	3.17	896	11%
Sagaing Div.	439	2.61	677	8%
Arakan State	320	2.70	511	6%
Shan State	341	2.44	491	6%
Mon State	257	2.69	408	5%
Mandalay Div.	239	2.71	384	5%
Magway Div.	132	2.61	204	2%
Karen State	156	1.95	179	2%
Kachin State	100	2.29	134	2%
Tenasserim Div.	78	2.66	123	2%
Kayah State	25	2.25	33	<1%
Chin State	31	1.74	32	<1%
Total	4,737	2.90	8,103	100%

JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

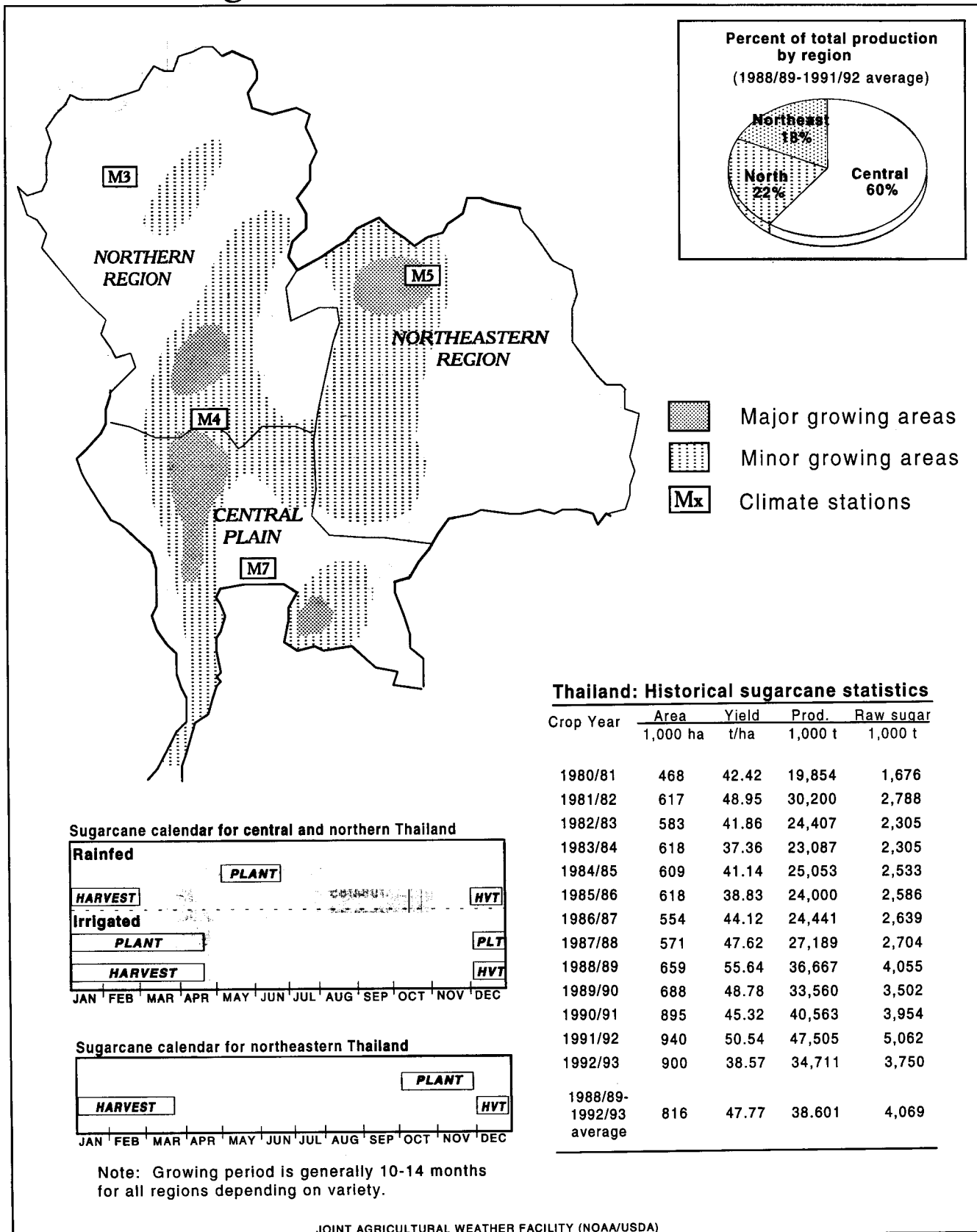
Thailand: Main and second-crop rice




Thailand: Corn




Thailand: Sugarcane



Vietnam: Rice

 Major growing areas

 Climate stations

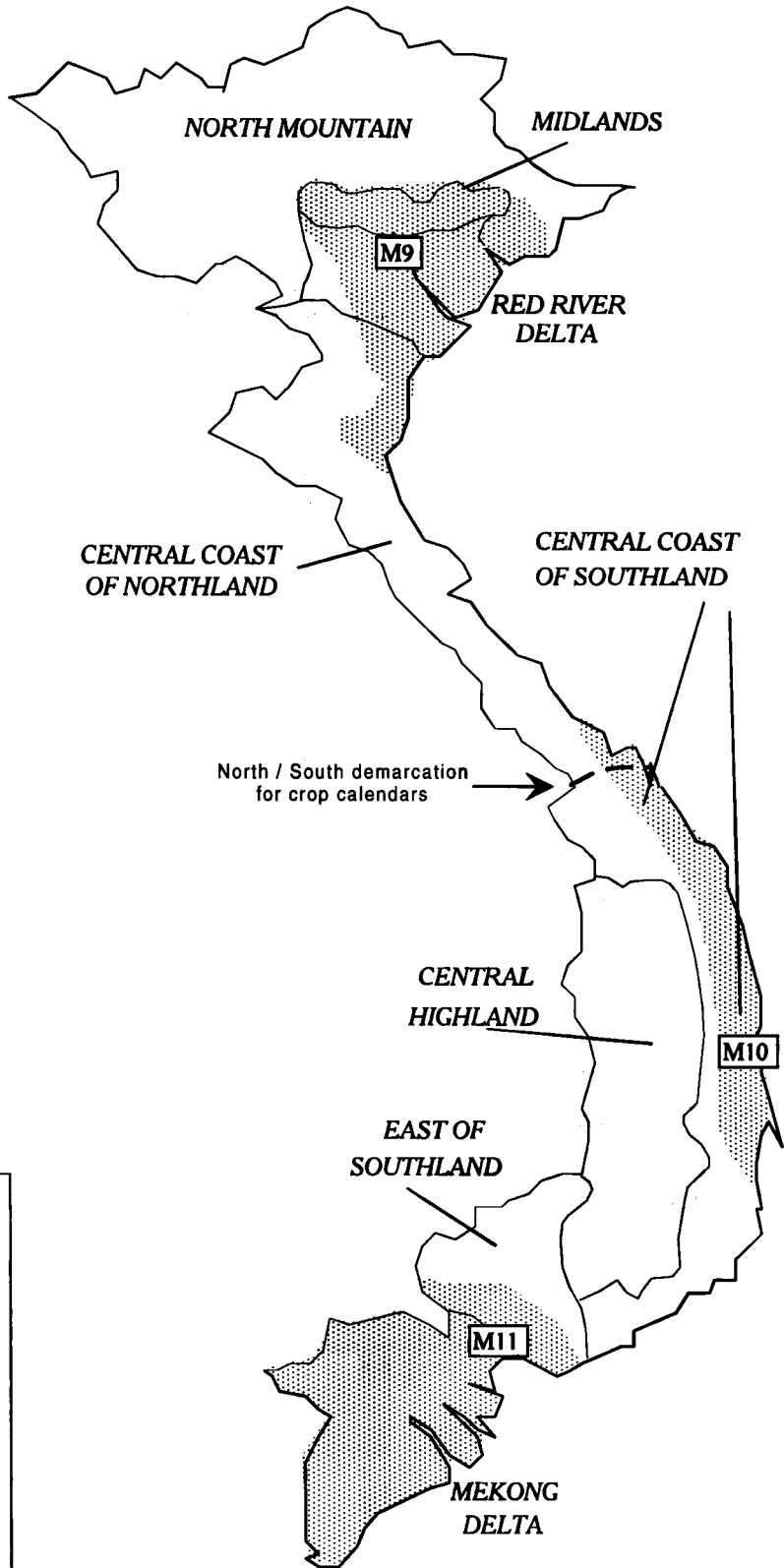
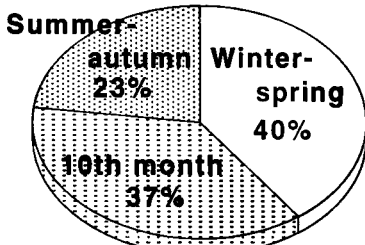
Vietnam: Regional rice production
1987/88 - 1991/92 % of total

North	
Red River Delta	19%
North Mountain	5%
Midlands	4%
North subtotal	28%

Central	
Northland	9%
Southland	9%
Highlands	2%
Central subtotal	20%

South	
Mekong Delta	48%
East of Southland	4%
South subtotal	52%

Percent of total production by crop
(1988/89-1992/93 average)

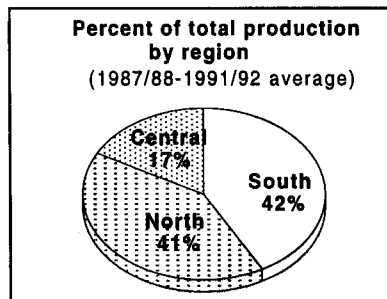


JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

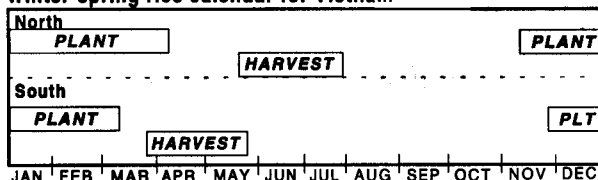
Vietnam: Rice statistics by crop

Winter-Spring

Crop Year	Area 1,000 ha	Yield (Rough) t/ha	Prod. (Milled) 1,000 t
80/81	1,640	2.54	2,711
81/82	1,620	2.80	2,945
82/83	1,650	3.11	3,335
83/84	1,660	3.35	3,614
84/85	1,770	3.50	4,024
85/86	1,830	3.34	3,978
86/87	1,840	2.99	3,575
87/88	1,880	3.71	4,600
88/89	1,990	3.79	4,976
89/90	2,070	3.79	5,181
90/91	2,160	3.14	4,481
91/92	2,200	4.18	6,072
92/93	2,250	3.91	5,808
1988/89- 1992/93 average	2,134	3.76	5,304

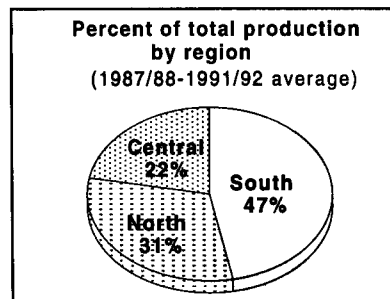


Winter-spring rice calendar for Vietnam

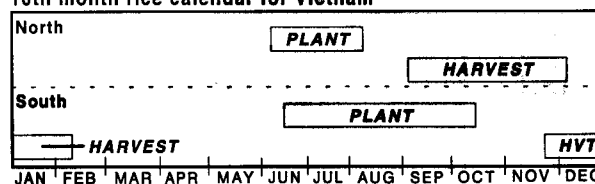


10th Month (Main-season)

Crop Year	Area 1,000 ha	Yield (Rough) t/ha	Prod. (Milled) 1,000 t
80/81	3,210	1.93	4,017
81/82	3,400	1.99	4,388
82/83	3,380	2.34	5,142
83/84	3,290	2.26	4,823
84/85	3,220	2.27	4,752
85/86	3,080	2.22	4,440
86/87	2,950	2.33	4,472
87/88	2,860	2.47	4,666
88/89	2,850	2.33	4,389
89/90	2,760	2.68	4,877
90/91	2,740	2.65	4,798
91/92	2,770	2.85	5,214
92/93	2,750	2.75	4,983
1988/89- 1992/93 average	2,774	2.65	4,852

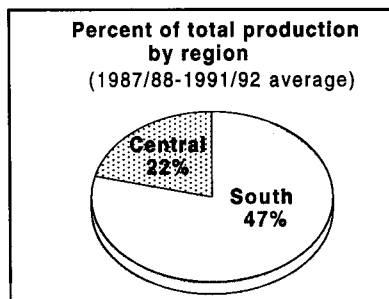


10th month rice calendar for Vietnam

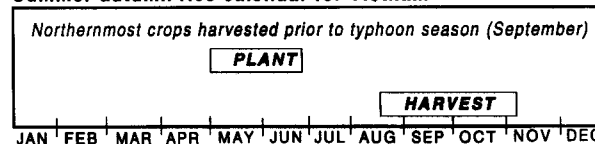


Summer - Autumn

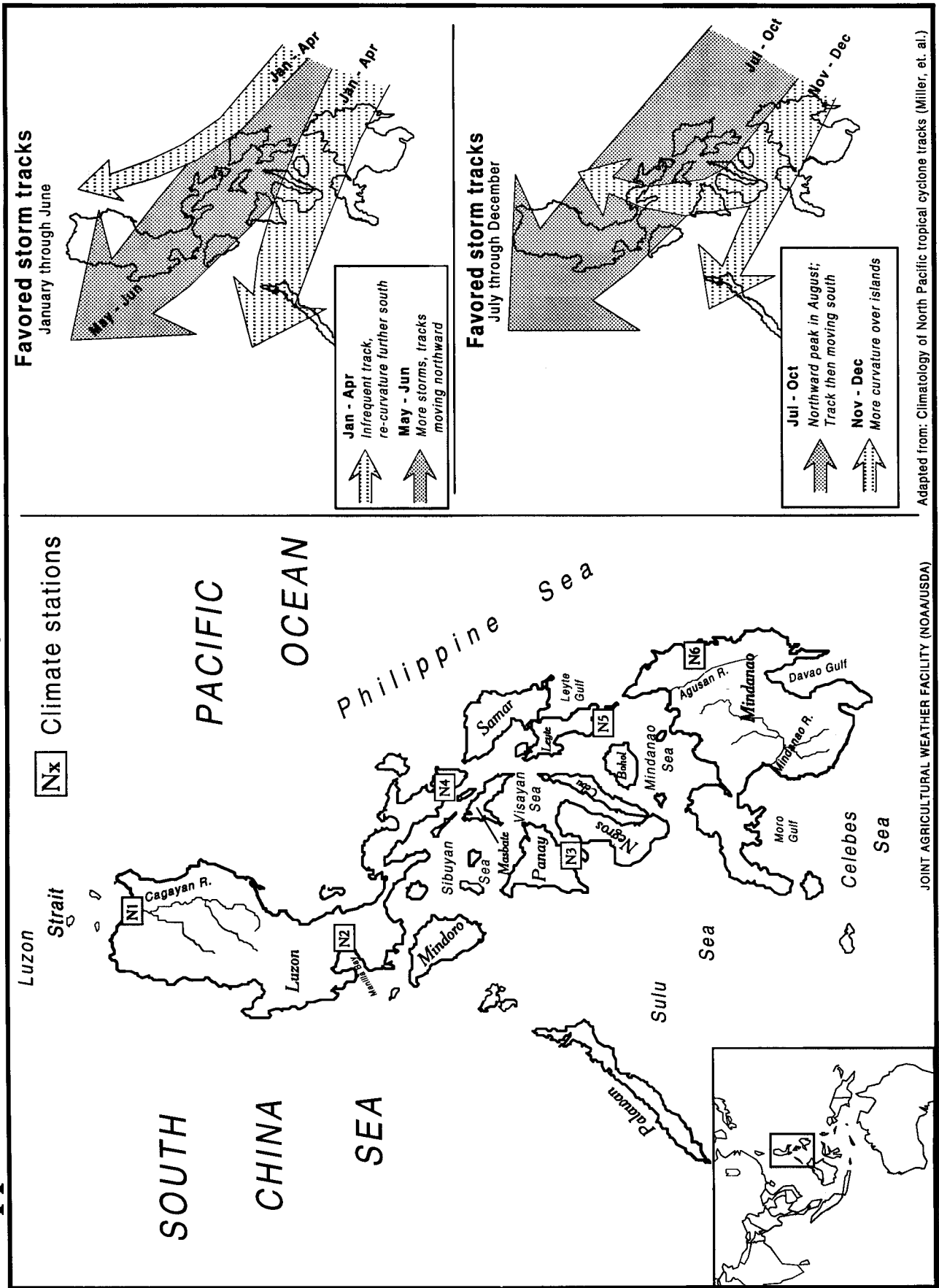
Crop Year	Area 1,000 ha	Yield (Rough) t/ha	Prod. (Milled) 1,000 t
80/81	620	2.40	969
81/82	700	2.80	1,274
82/83	670	3.27	1,424
83/84	800	3.29	1,710
84/85	860	3.33	1,859
85/86	920	3.27	1,957
86/87	890	2.84	1,645
87/88	990	3.41	2,231
88/89	1,140	3.56	2,680
89/90	1,220	3.37	2,713
90/91	1,370	3.48	3,148
91/92	1,300	3.69	3,168
92/93	1,300	3.58	3,069
1988/89- 1992/93 average	1,266	3.54	2,955



Summer-autumn rice calendar for Vietnam



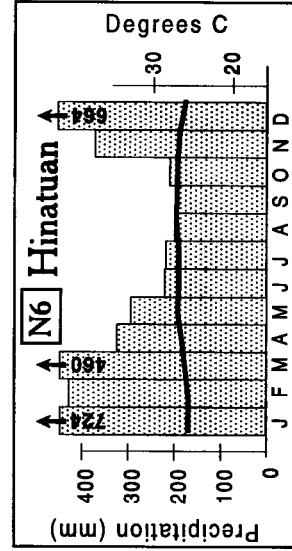
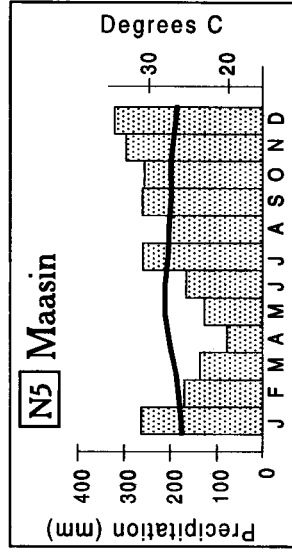
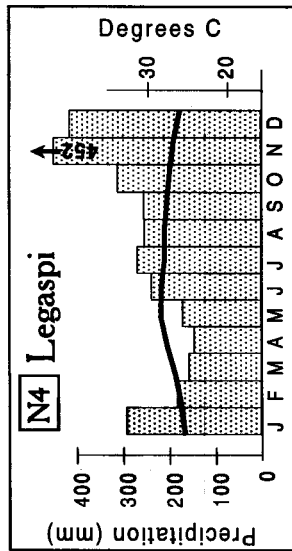
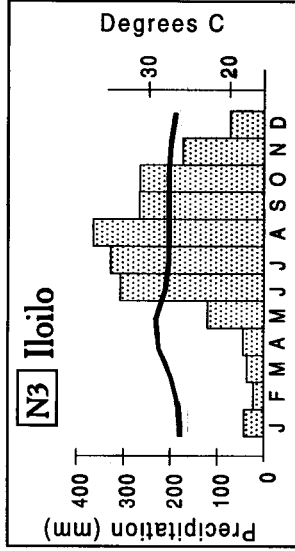
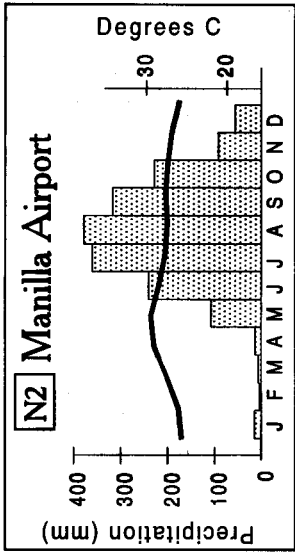
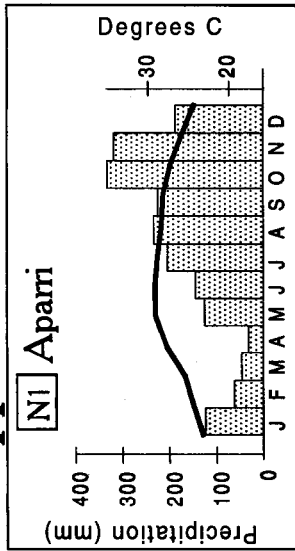
Philippines: Landforms and historical cyclone tracks



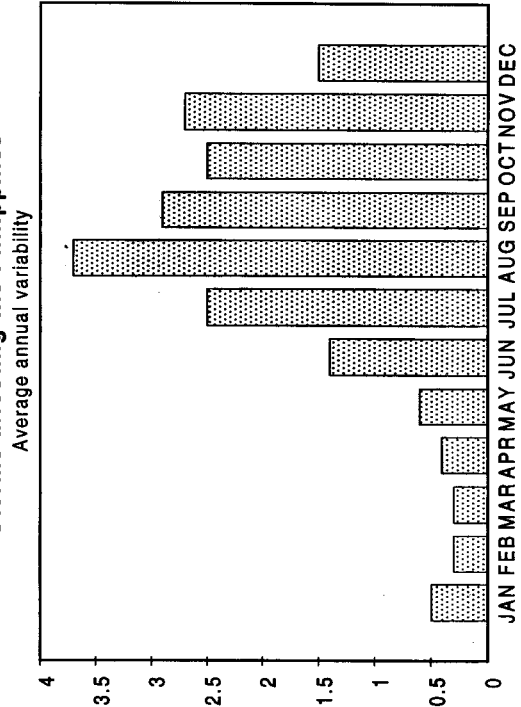
Adapted from: Climatology of North Pacific tropical cyclone tracks (Miller, et. al.)

JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Philippines: Climate stations



Storms affecting the Philippines

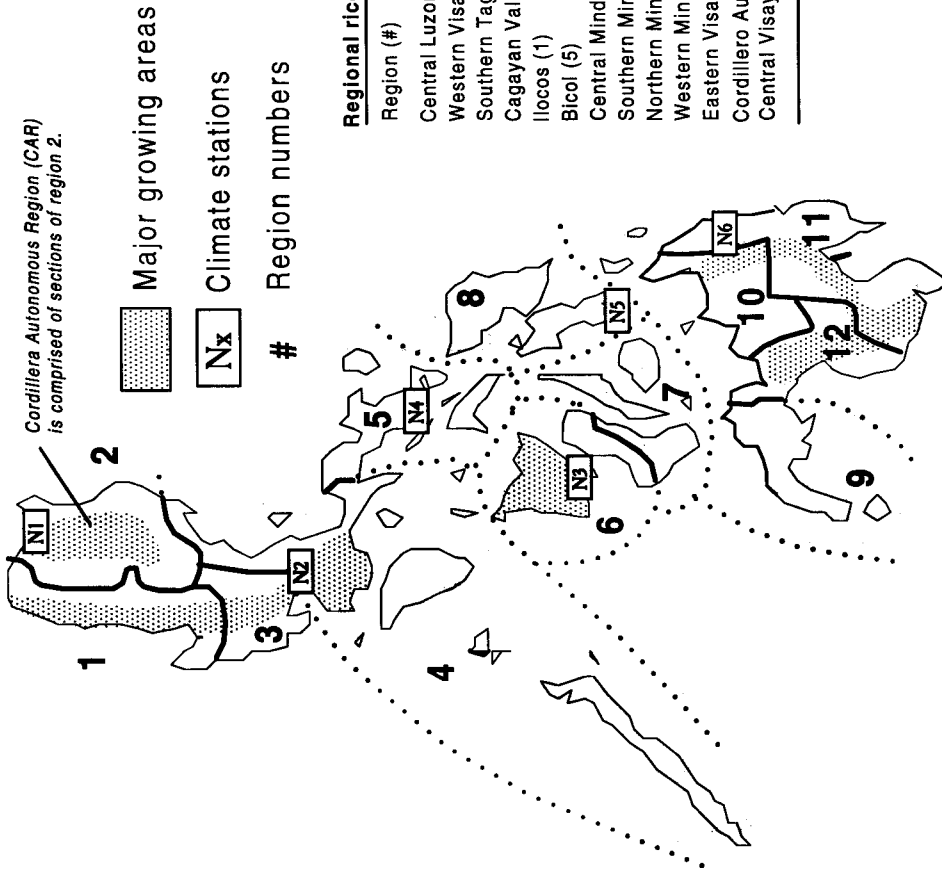


Source: WORLD SURVEY OF CLIMATOLOGY (Landsberg, 1969)

JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Philippines: Rice

Cordillera Autonomous Region (CAR) is comprised of sections of region 2.

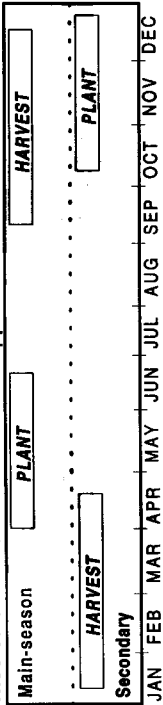


Region (#)	% of total
Central Luzon (3)	18%
Western Visayas (6)	13%
Southern Tagalog (4)	11%
Cagayan Valley (2)	11%
Ilocos (1)	9%
Bicol (5)	8%
Central Mindanao (12)	8%
Southern Mindanao (11)	7%
Northern Mindanao (10)	4%
Western Mindanao (9)	4%
Eastern Visayas (8)	4%
Cordillera Aut. Reg.	2%
Central Visayas (7)	2%

Philippines: Historical rice statistics

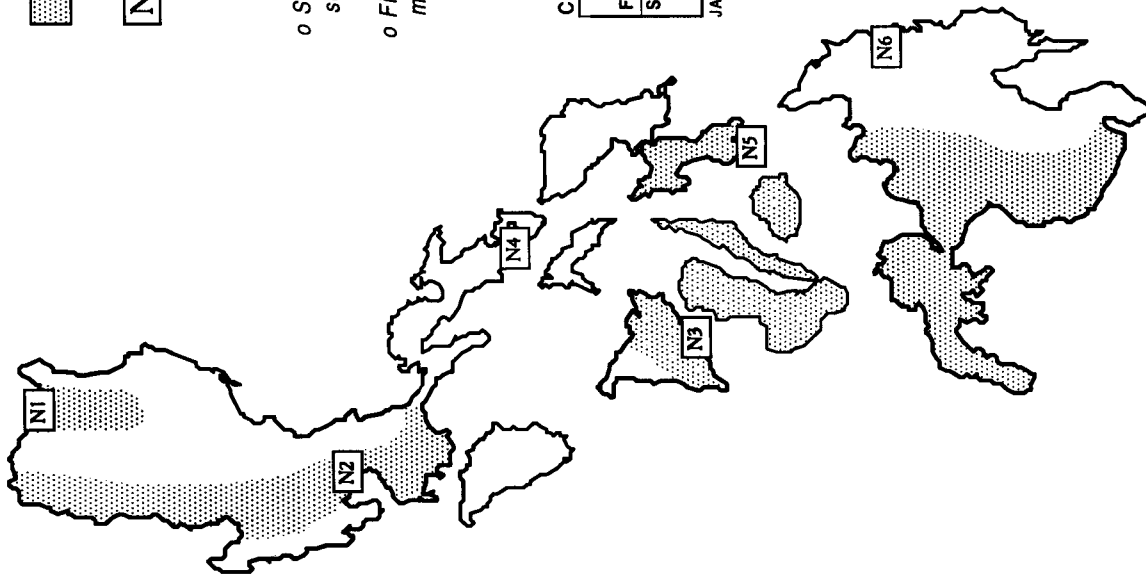
Crop Year	Area (Rough) (Milled)		Yield (t/ha)	Prod. (1,000 t)
	1,000 ha	t/ha		
1975/76	3,674	1.80	1.80	4,052
1976/77	3,641	1.93	1.93	4,280
1977/78	3,602	2.10	2.10	4,607
1978/79	3,561	2.11	2.11	4,846
1979/80	3,637	2.15	2.15	5,093
1980/81	3,459	2.23	2.23	5,020
1981/82	3,443	2.35	2.35	5,270
1982/83	3,240	2.38	2.38	5,025
1983/84	3,141	2.49	2.49	5,097
1984/85	3,222	2.54	2.54	5,330
1985/86	3,403	2.68	2.68	5,913
1986/87	3,402	2.63	2.63	5,831
1987/88	3,280	2.65	2.65	5,642
1988/89	3,485	2.65	2.65	5,996
1989/90	3,445	2.58	2.58	5,785
1990/91	3,433	2.88	2.88	6,425
1991/92	3,288	2.78	2.78	5,936
1992/93	3,237	2.94	2.94	6,183
1988/89-1992/93 average	3,378	2.77	2.77	6,065


Rice calendar for most of the Philippines




- o Planting corresponds to rainfall distribution and availability of irrigation.
- o West Coast wet season: May to September.
- o East Coast wet season: October to May (with secondary season during summer months).

Philippines: Corn

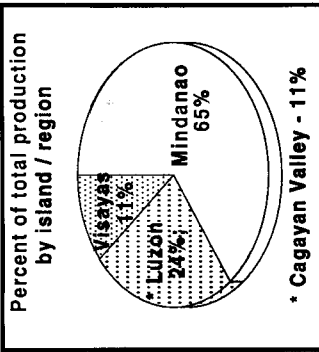
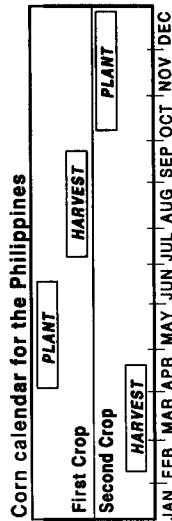


 Major growing areas

 Climate stations

o Second crop grown during winter rainy season along East Coast.

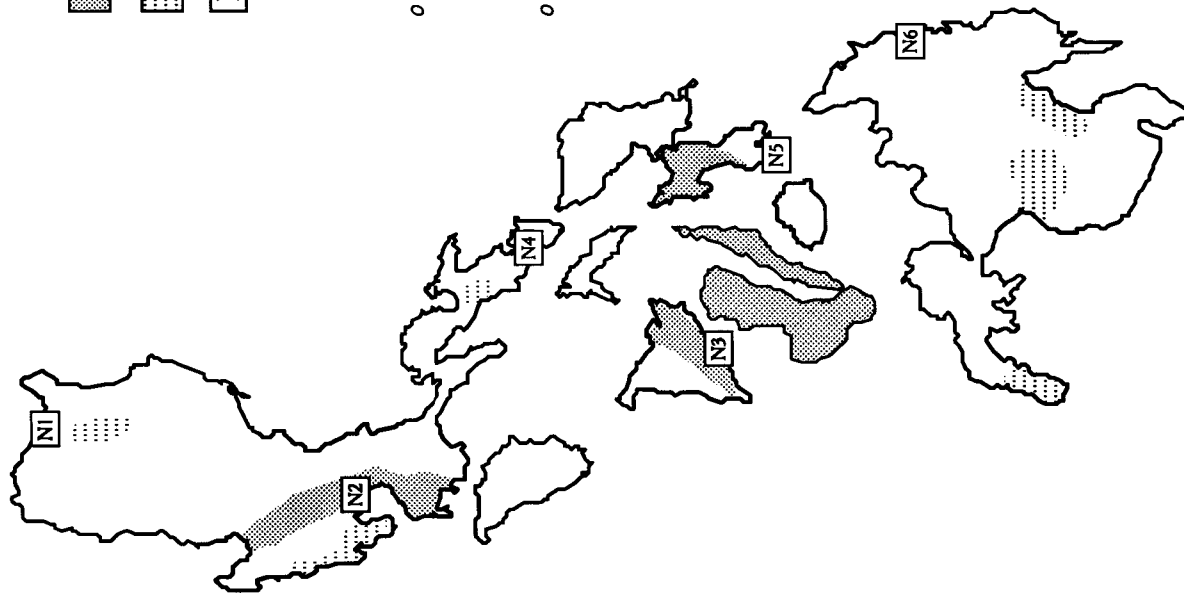
o First crop planted with advent of southwest monsoon (about 75% of total production).






Philippines: Historical corn statistics

Crop Year	Area		Yield t/ha	Prod. 1,000 t
	1,000 ha	1,000 t		
1975/76	5,030	1.14	1.14	5,756
1976/77	4,912	1.19	1.19	5,825
1977/78	4,864	1.22	1.22	5,913
1978/79	5,011	1.31	1.31	6,581
1979/80	4,442	1.47	1.47	6,531
1980/81	4,801	1.39	1.39	6,675
1981/82	4,811	1.40	1.40	6,725
1982/83	4,560	1.50	1.50	6,850
1983/84	4,661	1.54	1.54	7,200
1984/85	4,603	1.54	1.54	7,075
1985/86	4,660	1.53	1.53	7,130
1986/87	4,666	1.52	1.52	7,080
1987/88	4,483	1.53	1.53	6,840
1988/89	4,527	1.66	1.66	7,500
1989/90	4,733	1.71	1.71	8,100
1990/91	4,797	1.66	1.66	7,943
1991/92	4,524	1.64	1.64	7,424
1992/93	4,855	1.60	1.60	7,772
1988/89-1992/93 average	4,687	1.65	1.65	7,747

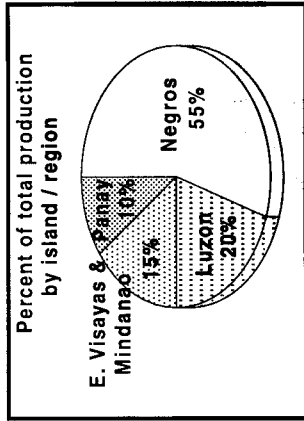
Philippines: Sugarcane



-  Major growing areas
-  Minor growing areas
-  Climate stations

o Harvest is mostly between October and May.

o Sugarcane is predominately rainfed, but irrigation may be applied when needed for planting and early development.



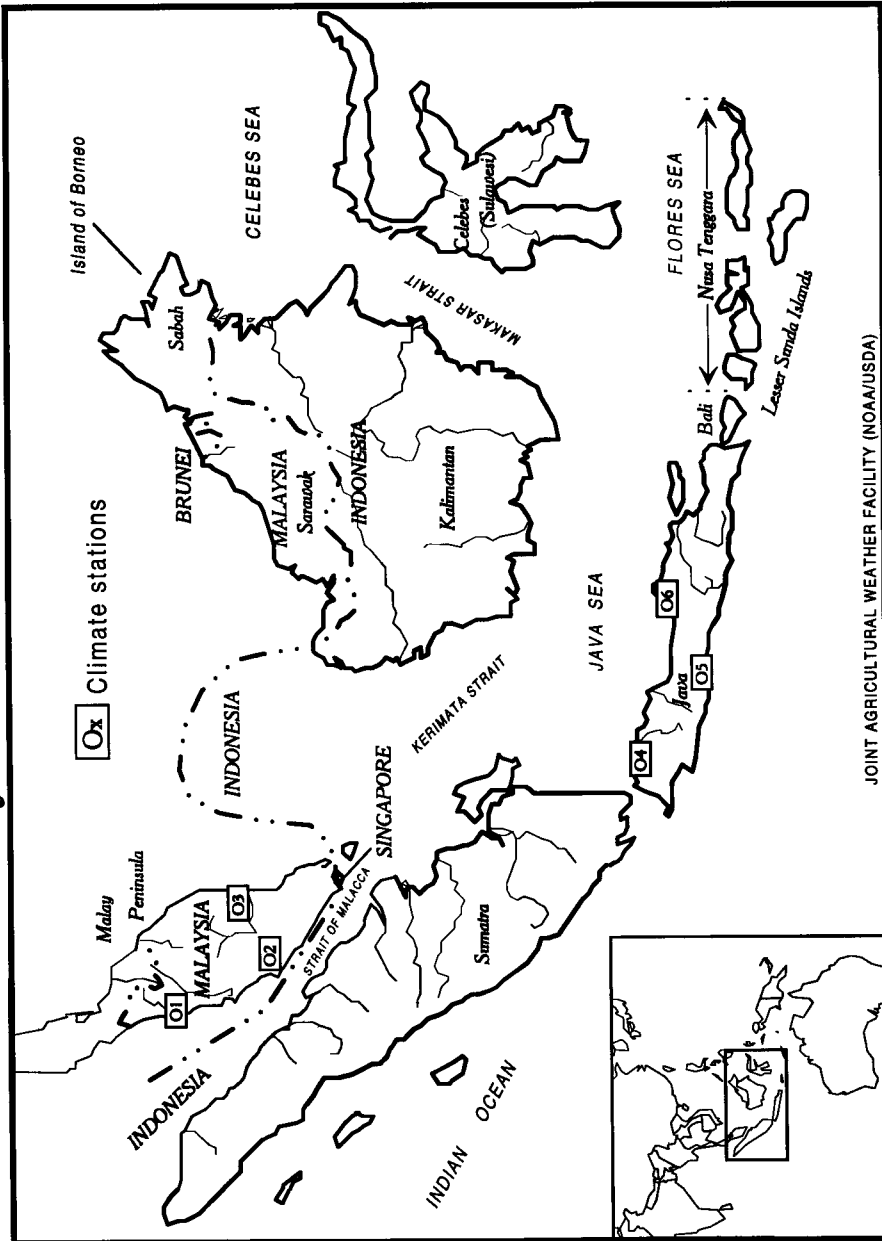
Philippines:

Historical sugarcane statistics

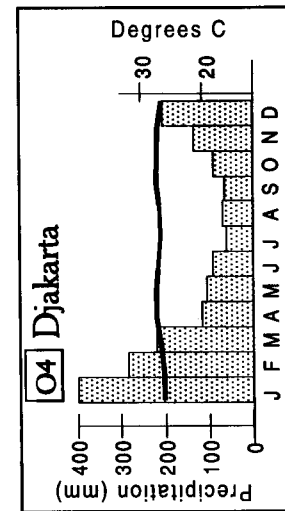
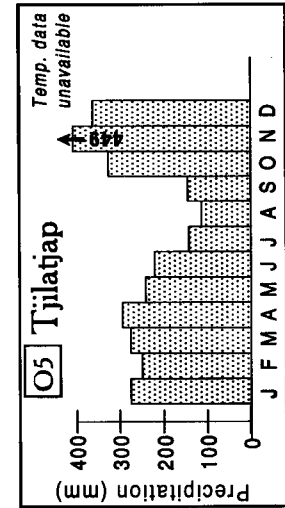
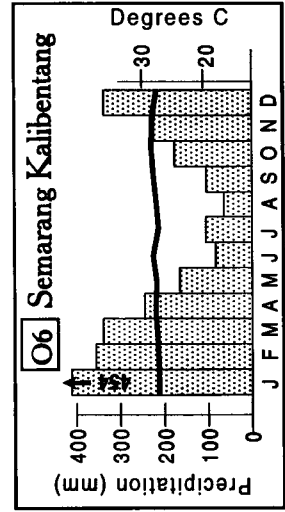
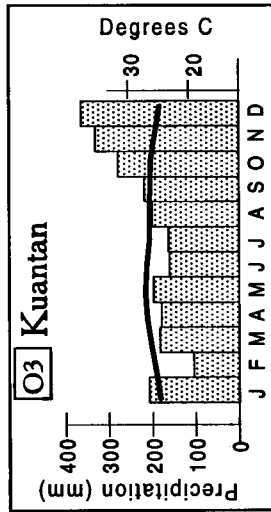
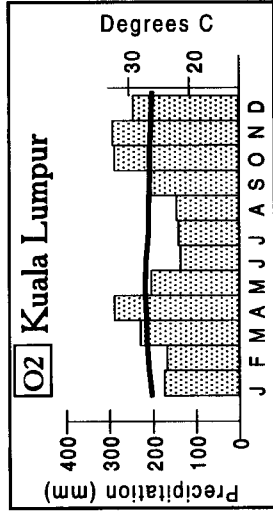
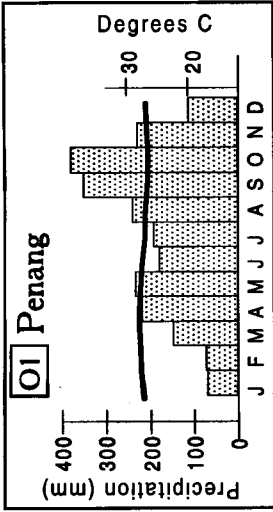
Crop Year	Area	Yield	Prod.	Raw sugar
	1,000 ha	t/ha	1,000 t	1,000 t
1980/81	395	56.08	22,150	2,373
1981/82	420	58.57	24,600	2,503
1982/83	410	57.68	23,650	2,521
1983/84	415	61.20	25,400	2,381
1984/85	390	46.41	18,100	1,767
1985/86	310	49.03	15,200	1,500
1986/87	270	49.26	13,300	1,350
1987/88	270	58.15	15,700	1,400
1988/89	295	64.41	19,000	1,600
1989/90	310	69.11	21,425	1,750
1990/91	341	54.55	18,600	1,718
1991/92	371	61.50	22,816	2,010
1992/93	377	63.26	23,850	2,060
1988/89-1992/93 average	338	62.57	21,138	1,828

JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

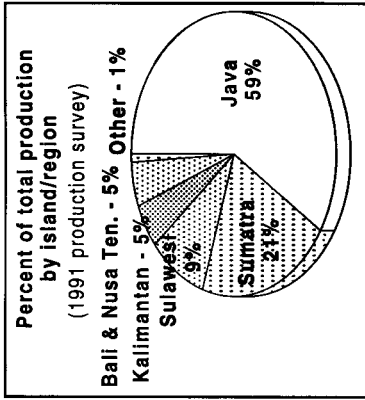
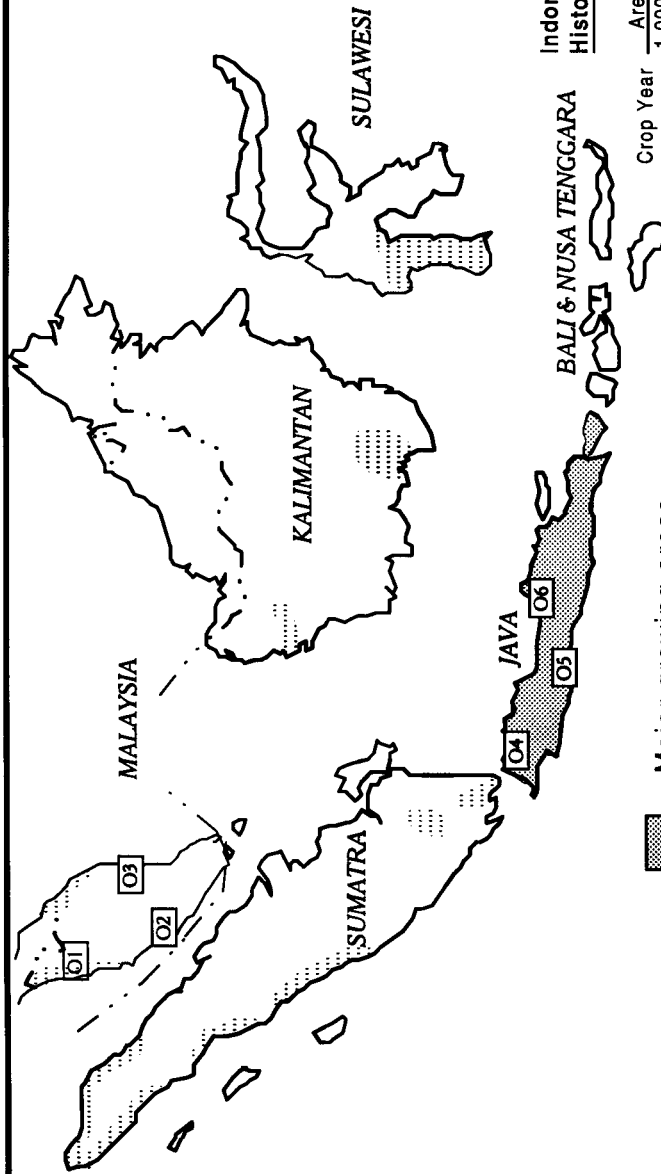
Indonesia and Malaysia: Landforms and climate



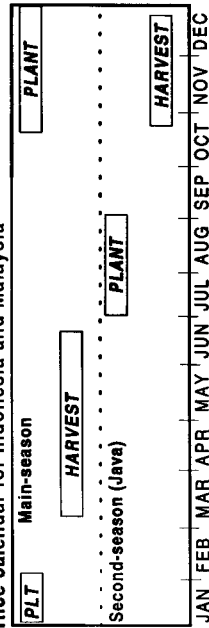
JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)



Indonesia and Malaysia: Rice



Rice calendar for Indonesia and Malaysia



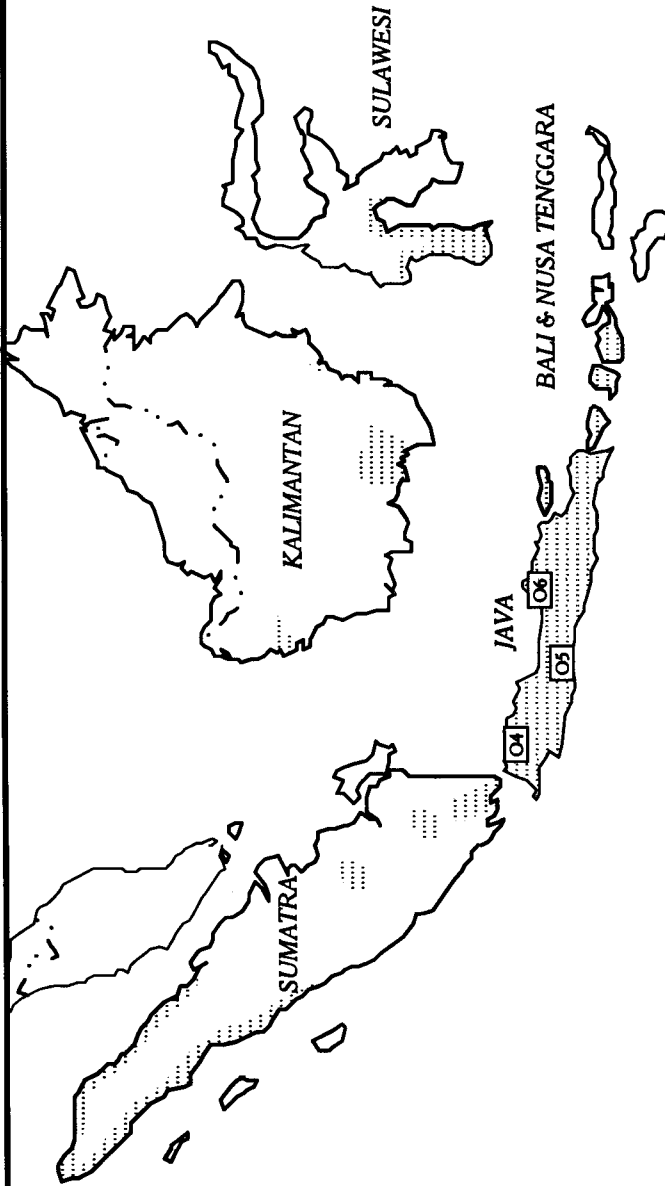
Indonesia: Historical rice statistics



Crop Year	Area (1,000 ha)	Yield (Rough) t/ha	Prod. (Milled) 1,000 t
1975/76	8,495	2.63	15,185
1976/77	8,369	2.78	15,845
1977/78	8,360	2.79	15,876
1978/79	8,929	2.88	17,525
1979/80	8,804	2.99	17,872
1980/81	9,005	3.29	20,163
1981/82	9,382	3.50	22,286
1982/83	8,988	3.74	22,837
1983/84	9,162	3.85	24,006
1984/85	9,764	3.91	25,933
1985/86	9,902	3.94	26,542
1986/87	9,896	3.94	26,500
1987/88	9,800	4.25	27,000
1988/89	9,800	4.32	27,500
1989/90	10,530	4.25	29,072
1990/91	10,502	4.31	29,366
1991/92	10,282	4.34	29,042
1992/93	11,103	4.34	31,350
1988/89-1992/93 average	10,443	4.31	29,266

Malaysia: Historical rice statistics

Area (1,000 ha)	Yield (Rough) t/ha	Prod. (Milled) 1,000 t
750	2.66	1,299
730	2.74	1,297
723	2.64	1,224
583	2.59	966
738	2.86	1,351
696	2.95	1,318
679	2.49	1,084
635	2.60	1,059
648	2.75	1,145
626	2.50	1,010
649	3.01	1,258
635	2.81	1,150
629	2.70	1,092
655	2.72	1,148
612	2.90	1,147
662	3.05	1,302
650	2.77	1,150
660	2.81	1,190
648	2.85	1,187

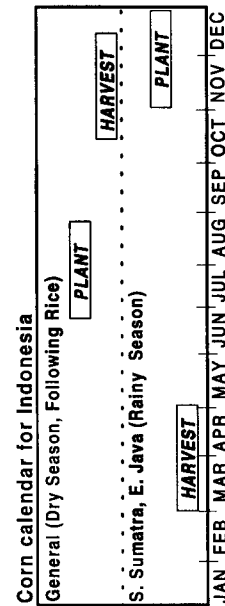
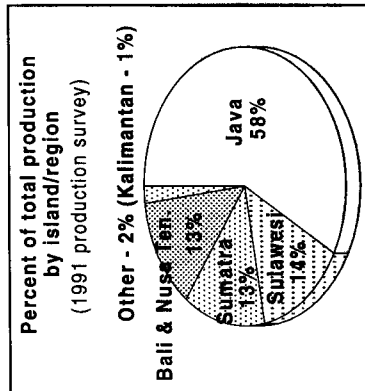
Indonesia: Corn



 Major growing areas
 Climate stations

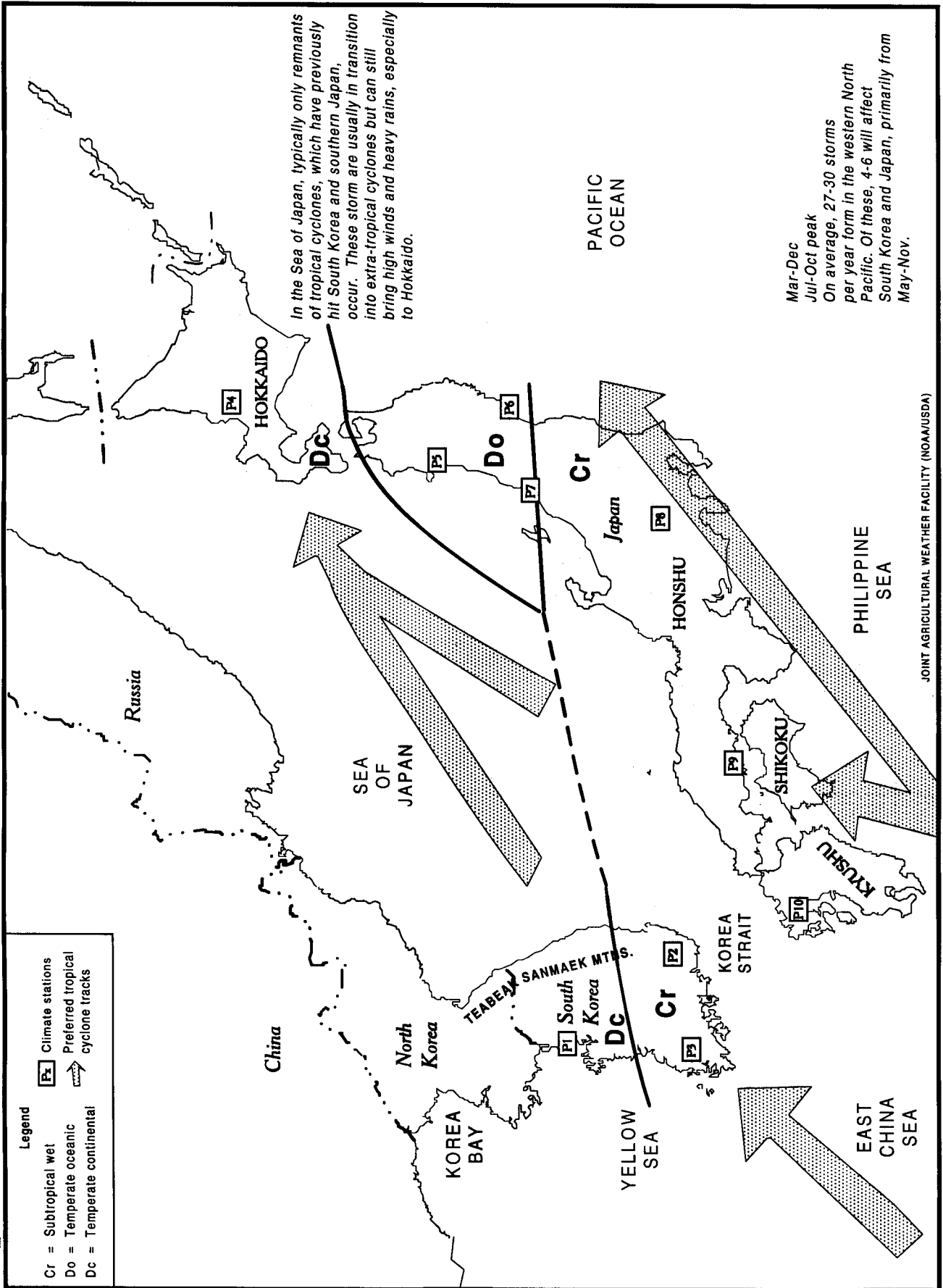
Indonesia: Historical corn statistics

Crop Year	Area		Yield t/ha	Prod. 1,000 t
	1,000 ha	1,000 t		
1975/76	2,445	1.19	2,903	2,903
1976/77	2,095	1.23	2,572	2,572
1977/78	2,567	1.22	3,143	3,143
1978/79	3,025	1.33	4,029	4,029
1979/80	2,594	1.39	3,606	3,606
1980/81	2,735	1.46	3,991	3,991
1981/82	2,955	1.53	4,509	4,509
1982/83	2,061	1.57	3,235	3,235
1983/84	3,002	1.69	5,087	5,087
1984/85	3,086	1.71	5,288	5,288
1985/86	2,440	1.77	4,330	4,330
1986/87	3,047	1.64	5,000	5,000
1987/88	2,675	1.79	4,800	4,800
1988/89	2,850	1.82	5,200	5,200
1989/90	2,700	1.85	5,000	5,000
1990/91	2,850	1.75	5,000	5,000
1991/92	2,900	1.86	5,400	5,400
1992/93	3,050	1.85	5,650	5,650
1988/89-1992/93 average	2,870	1.83	5,250	5,250

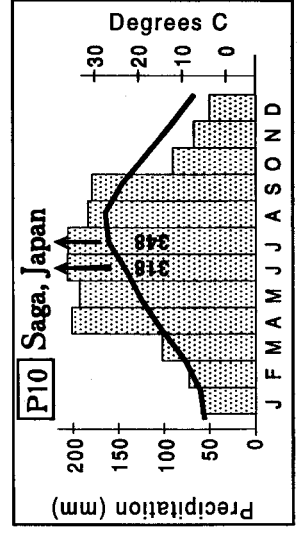
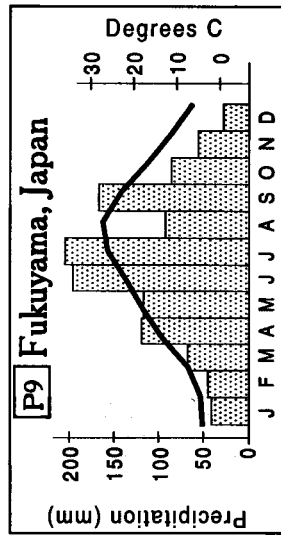
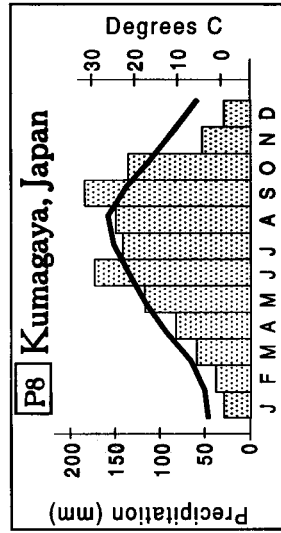
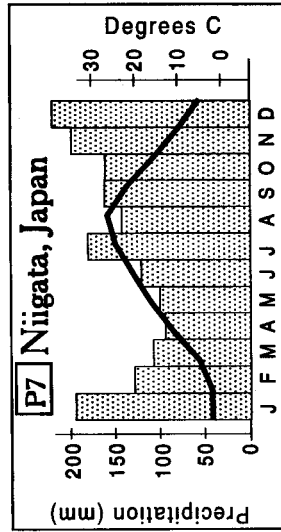
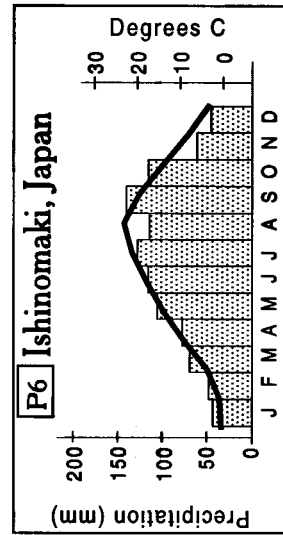
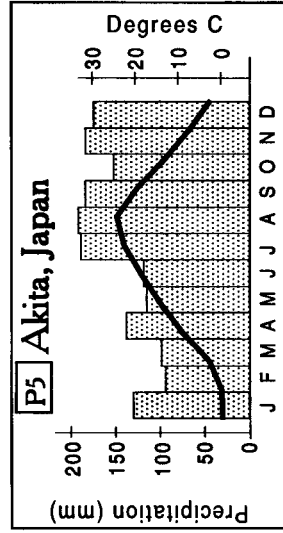
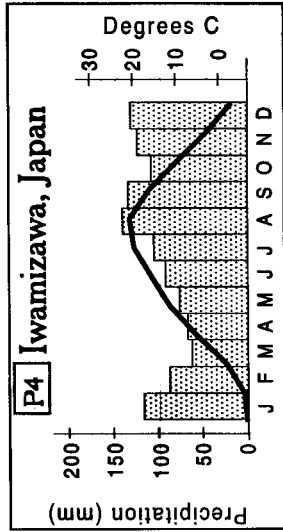
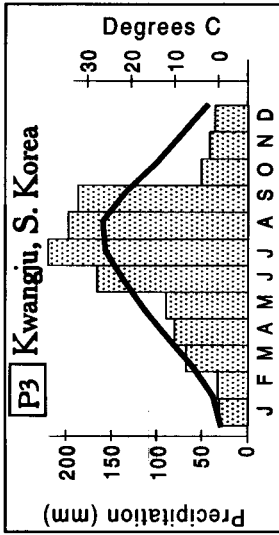
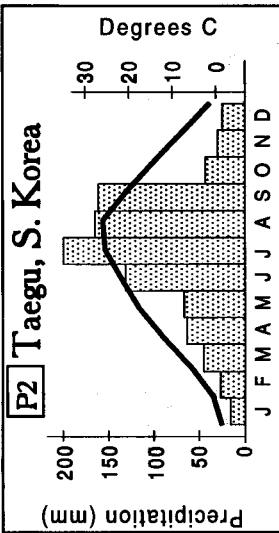
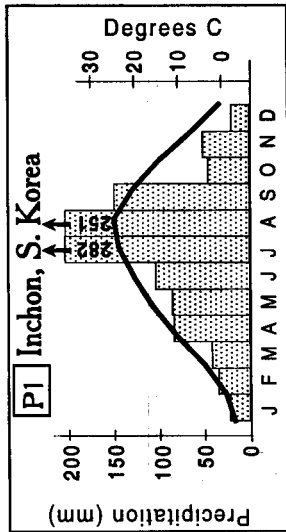


JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Japan and South Korea: Landforms and climate

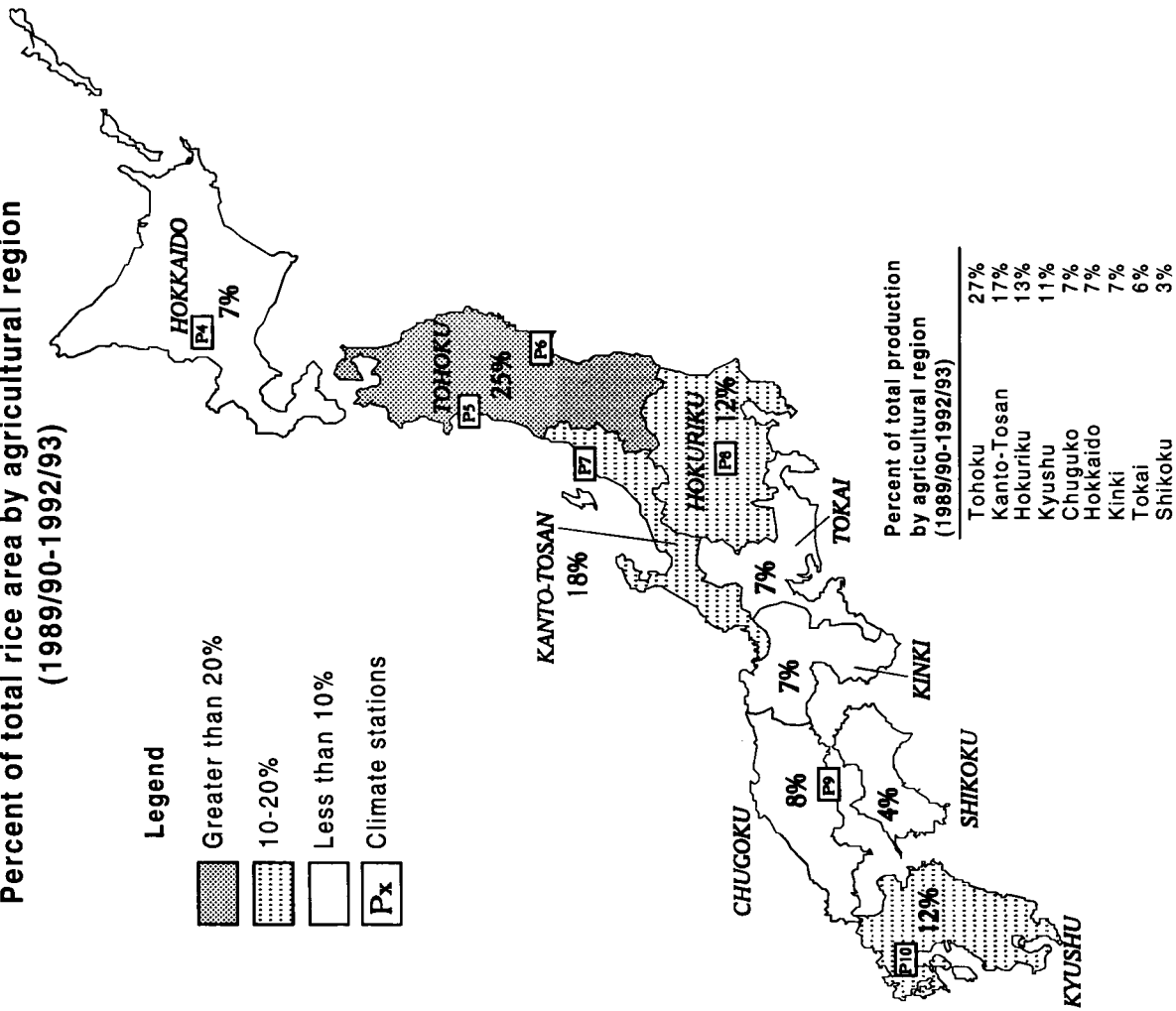
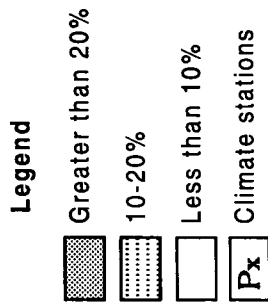


Japan and South Korea: Climate stations



Japan: Rice

Percent of total rice area by agricultural region
(1989/90-1992/93)



Percent of total production
by agricultural region
(1989/90-1992/93)

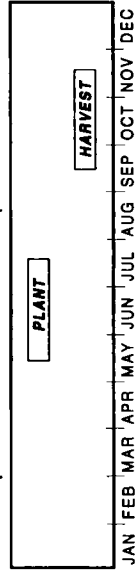
Tohoku	27%
Kanto-Tosan	17%
Hokuriku	13%
Kyushu	11%
Chugoku	7%
Hokkaido	7%
Kinki	7%
Tokai	6%
Shikoku	3%

These regions account for 98%
of total production.

Japan : Historical rice statistics

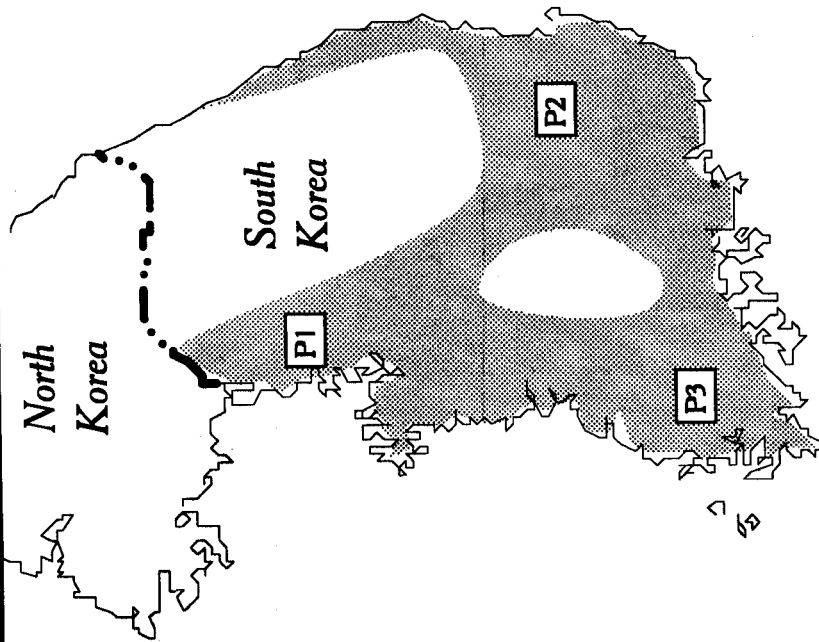
Crop Year	Yield		Prod. (Milled)
	Area (Rough)	1,000 t	
1970/71	2,923	5.43	11,547
1971/72	2,695	5.05	9,907
1972/73	2,640	5.63	10,819
1973/74	2,622	5.79	11,056
1974/75	2,724	5.64	11,186
1975/76	2,764	5.95	11,980
1976/77	2,779	5.30	10,713
1977/78	2,757	5.94	11,916
1978/79	2,584	6.09	11,456
1979/80	2,497	5.99	10,882
1980/81	2,377	5.13	8,873
1981/82	2,278	5.63	9,337
1982/83	2,257	5.69	9,346
1983/84	2,273	5.70	9,433
1984/85	2,315	6.41	10,809
1985/86	2,342	6.22	10,612
1986/87	2,303	6.32	10,599
1987/88	2,146	6.19	9,671
1988/89	2,100	5.91	9,041
1989/90	2,097	6.17	9,416
1990/91	2,074	6.33	9,554
1991/92	2,049	5.86	8,740
1992/93	2,106	6.28	9,621
1988/89- 1992/93 average	2,085	6.11	9,274

Rice crop calendar for most of Japan





JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

South Korea: Rice



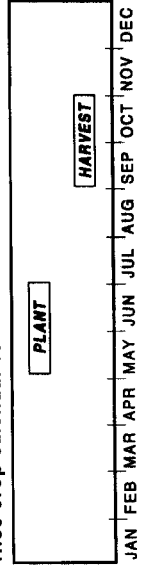
Legend

-  Major growing areas
-  Climate stations

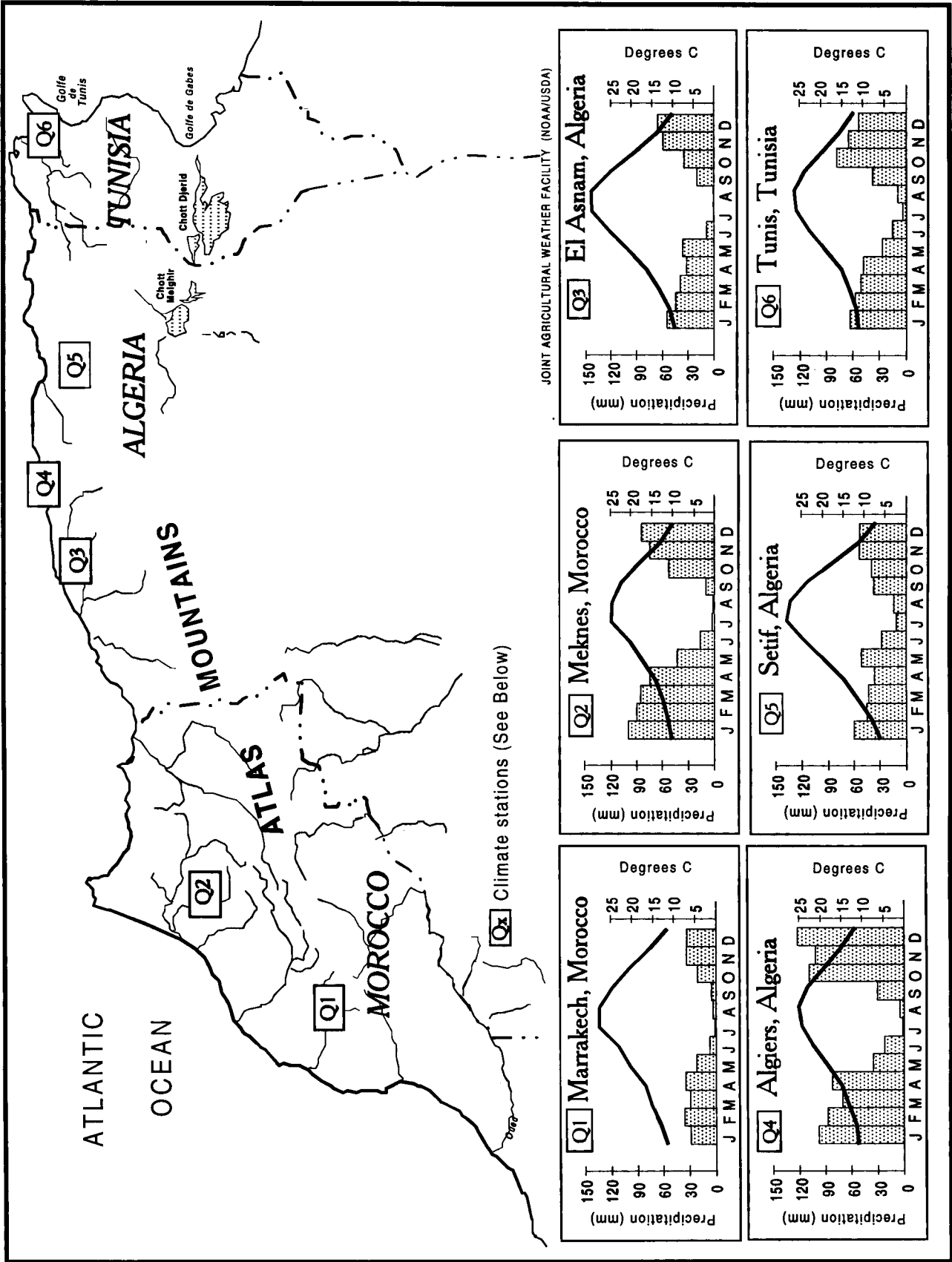
South Korea: Historical rice statistics

Crop Year	Area		Yield		Prod. (Milled)
	1,000 ha	t/ha	(Rough)	(Milled)	
1970/71	1,203	4.55		1,000 t	
1971/72	1,190	4.67		3,939	
1972/73	1,191	4.61		3,998	
1973/74	1,182	4.95		3,957	
1974/75	1,204	5.13		4,212	
1975/76	1,218	5.32		4,445	
1976/77	1,215	6.20		4,669	
1977/78	1,230	6.91		5,215	
1978/79	1,230	6.79		6,006	
1979/80	1,233	5.90		5,797	
1980/81	1,233	4.85		5,136	
1981/82	1,224	5.84		4,000	
1982/83	1,188	6.15		5,063	
1983/84	1,228	6.20		5,175	
1984/85	1,231	6.47		5,404	
1985/86	1,237	6.35		5,626	
1986/87	1,236	6.37		5,607	
1987/88	1,262	6.02		5,493	
1988/89	1,260	6.64		6,053	
1989/90	1,257	6.47		5,898	
1990/91	1,244	6.22		5,606	
1991/92	1,209	6.14		5,385	
1992/93	1,157	6.27		5,331	
1988/89-1992/93 average	1,225	6.35		5,655	

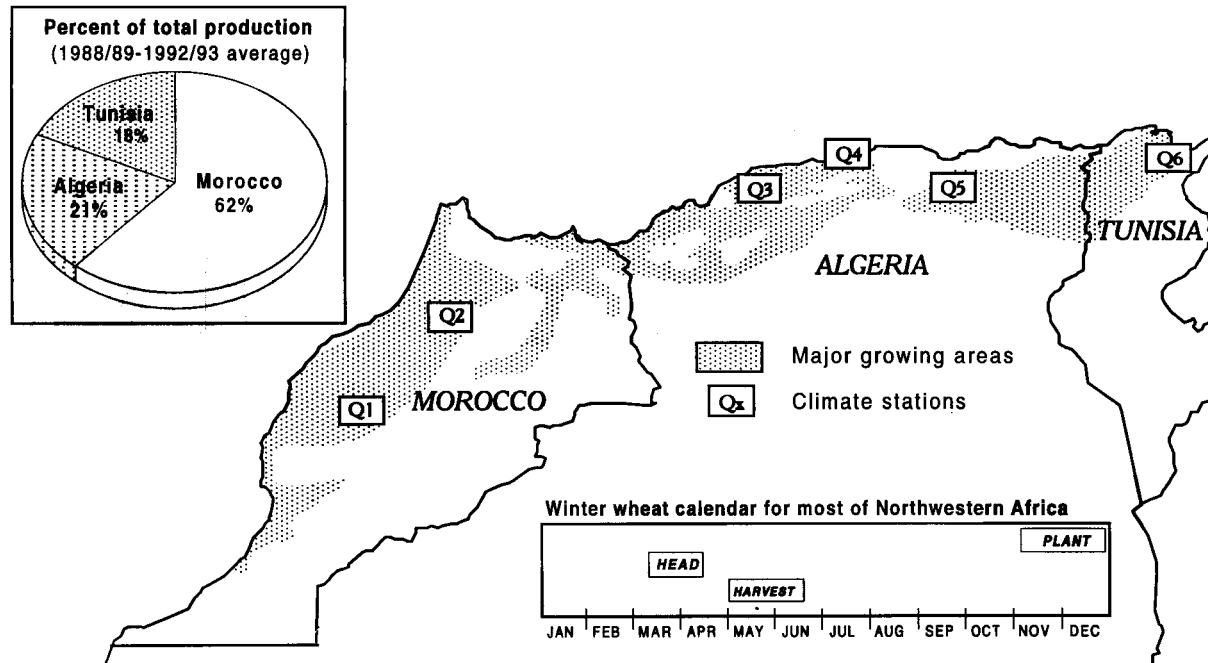
Rice crop calendar for most of South Korea



Northwestern Africa: Landforms and climate stations



Northwestern Africa: Winter wheat

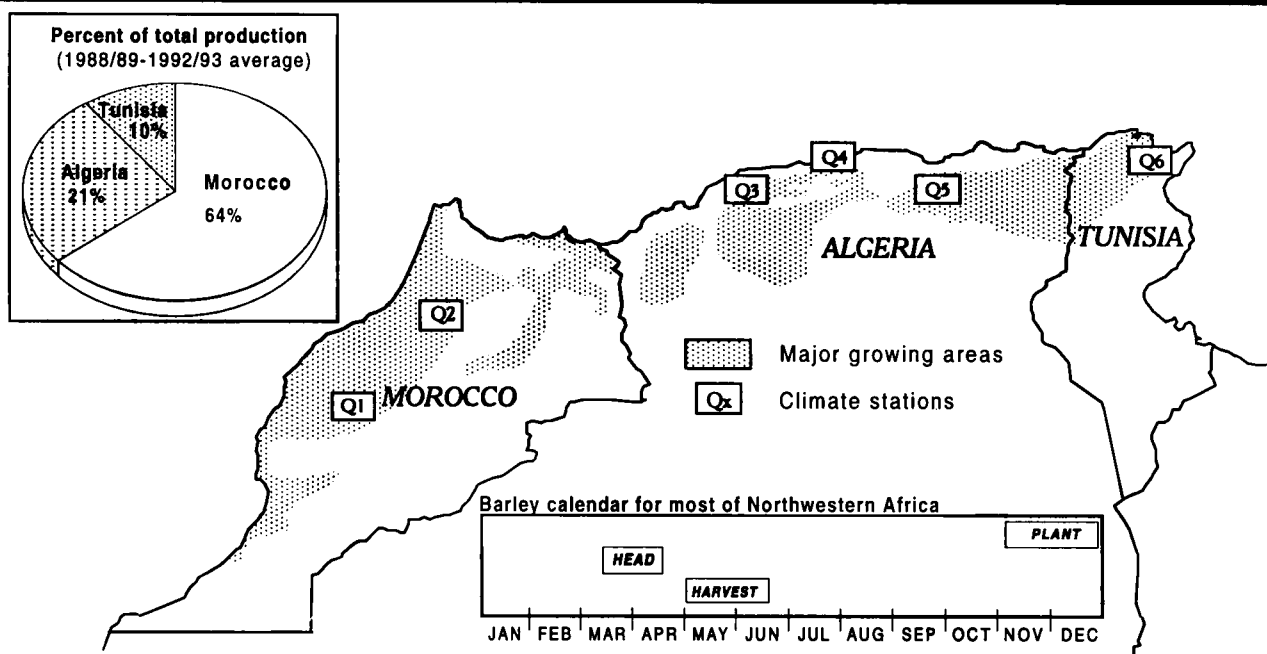


Northwestern Africa: Historical winter wheat statistics

Year	Morocco			Algeria			Tunisia		
	Area 1,000 ha	Yield t/ha	Prod 1,000 t	Area 1,000 ha	Yield t/ha	Prod 1,000 t	Area 1,000 ha	Yield t/ha	Prod 1,000 t
1971/72	1,885	1.16	2,189	2,250	0.59	1,317	950	0.69	660
1972/73	2,058	1.05	2,160	2,336	0.84	1,956	1,040	0.85	887
1973/74	2,040	0.77	1,574	1,700	0.54	920	1,140	0.72	820
1974/75	1,917	0.97	1,853	2,050	0.56	1,150	1,070	0.74	795
1975/76	1,691	0.93	1,575	2,605	0.73	1,897	1,065	0.91	965
1976/77	1,921	1.14	2,188	2,755	0.69	1,901	1,050	0.77	810
1977/78	1,929	0.67	1,288	2,242	0.43	962	964	0.59	570
1978/79	1,754	1.07	1,877	2,565	0.45	1,154	1,138	0.66	750
1979/80	1,657	1.08	1,797	1,945	0.56	1,081	1,134	0.60	680
1980/81	1,713	1.06	1,811	2,071	0.73	1,512	853	1.02	869
1981/82	1,647	0.54	892	2,074	0.62	1,295	783	1.23	963
1982/83	1,686	1.29	2,183	1,637	0.60	977	714	1.28	916
1983/84	1,976	1.00	1,971	1,400	0.57	794	931	0.66	618
1984/85	1,856	1.07	1,989	1,724	0.95	1,646	900	0.79	711
1985/86	1,894	1.08	2,050	1,735	0.96	1,660	1,033	1.34	1,380
1986/87	2,226	1.71	3,809	1,520	0.81	1,230	540	0.88	474
1987/88	2,288	1.06	2,427	1,511	0.78	1,175	971	1.40	1,360
1988/89	2,317	1.73	4,019	1,023	0.60	615	299	0.74	220
1989/90	2,630	1.49	3,927	1,470	0.78	1,150	557	0.75	420
1990/91	2,720	1.33	3,614	1,550	0.50	775	882	1.27	1,122
1991/92	2,642	1.87	4,939	1,730	1.04	1,800	1,073	1.66	1,786
1992/93	2,228	0.70	1,562	1,700	1.03	1,750	981	1.61	1,584
1993/94	2,310	0.66	1,520	1,500	0.90	1,350	1,030	1.36	1,400
average									
1986-90	2,436	1.46	3,559	1,415	0.69	989	650	1.01	719
1988-92	2,507	1.42	3,612	1,495	0.79	1,218	758	1.21	1,026

JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Northwestern Africa: Barley

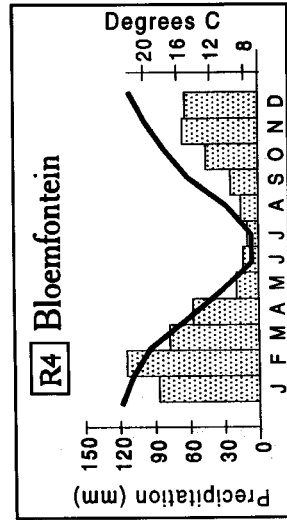
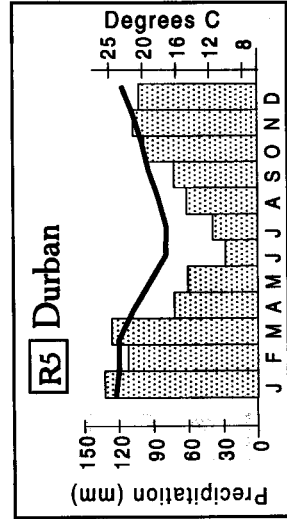
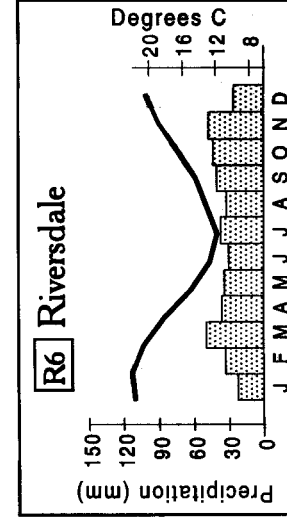
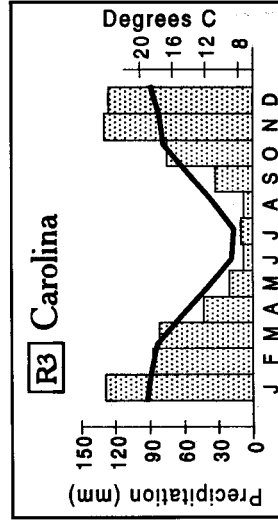
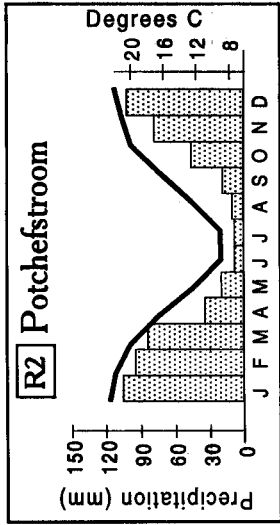
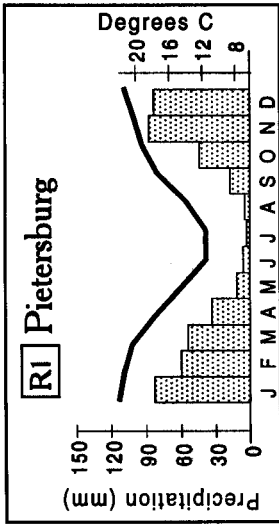
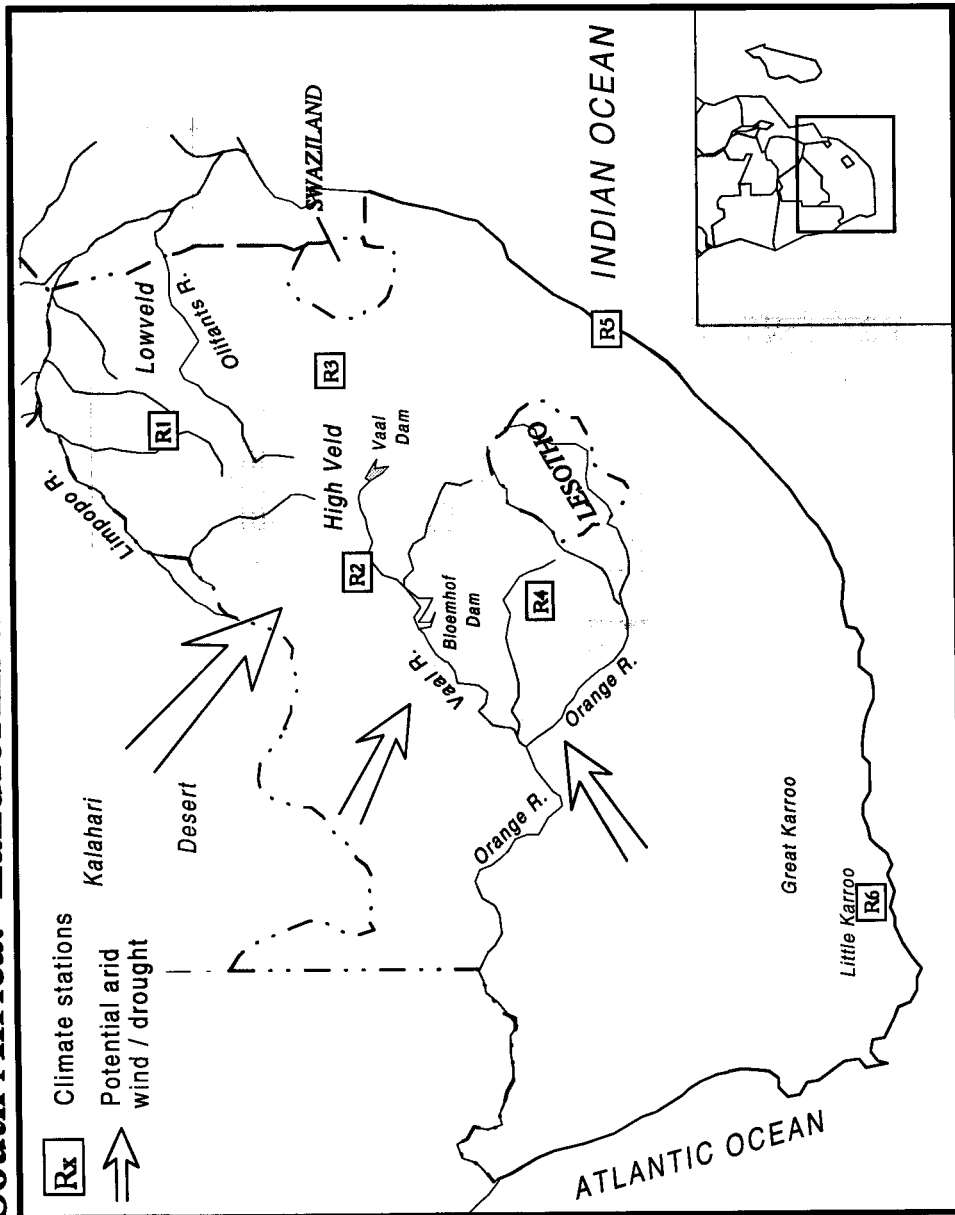


Northwestern Africa: Historical barley statistics

Year	Morocco			Algeria			Tunisia		
	Area 1,000 ha	Yield t/ha	Prod 1,000 t	Area 1,000 ha	Yield t/ha	Prod 1,000 t	Area 1,000 ha	Yield t/ha	Prod 1,000 t
1971/72	1,650	1.02	1,675	600	0.62	372	350	0.46	160
1972/73	1,593	1.09	1,744	800	0.81	644	358	0.68	245
1973/74	2,016	0.62	1,255	781	0.48	374	490	0.58	282
1974/75	1,973	1.21	2,387	690	0.48	331	340	0.67	228
1975/76	1,019	1.56	1,585	1,175	0.94	1,101	340	0.91	310
1976/77	2,117	1.35	2,860	1,285	0.83	1,061	350	0.69	240
1977/78	2,316	0.58	1,345	863	0.38	325	450	0.22	100
1978/79	2,389	0.97	2,326	1,108	0.46	515	497	0.40	200
1979/80	2,168	0.87	1,886	809	0.56	457	642	0.42	270
1980/81	2,150	1.03	2,210	945	0.84	794	382	0.77	296
1981/82	2,228	0.47	1,039	1,297	0.63	818	443	0.61	270
1982/83	2,047	1.14	2,334	815	0.59	483	395	0.86	339
1983/84	2,151	0.57	1,228	718	0.62	444	631	0.48	303
1984/85	2,126	0.66	1,405	1,171	1.11	1,295	580	0.54	312
1985/86	2,383	0.93	2,225	1,200	1.08	1,300	821	0.84	686
1986/87	2,472	1.44	3,563	1,212	0.89	1,083	241	0.55	132
1987/88	2,315	0.67	1,543	1,089	0.75	820	639	0.84	537
1988/89	2,499	1.38	3,454	674	0.58	390	151	0.42	63
1989/90	2,399	1.25	2,999	1,050	0.75	790	412	0.49	200
1990/91	2,415	0.89	2,138	1,200	0.67	800	509	0.94	478
1991/92	2,357	1.38	3,253	1,500	1.20	1,800	552	1.31	721
1992/93	2,233	0.48	1,081	1,300	1.15	1,500	503	1.13	570
1993/94	2,150	0.47	1,020	1,000	0.60	600	400	0.40	160
average									
1986-90	2,420	1.13	2,739	1,045	0.73	777	390	0.65	282
1988-92	2,381	1.08	2,585	1,145	0.87	1,056	425	0.86	406

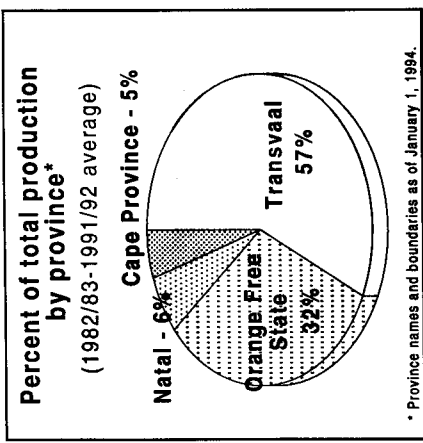
JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

South Africa: Landforms and climate stations

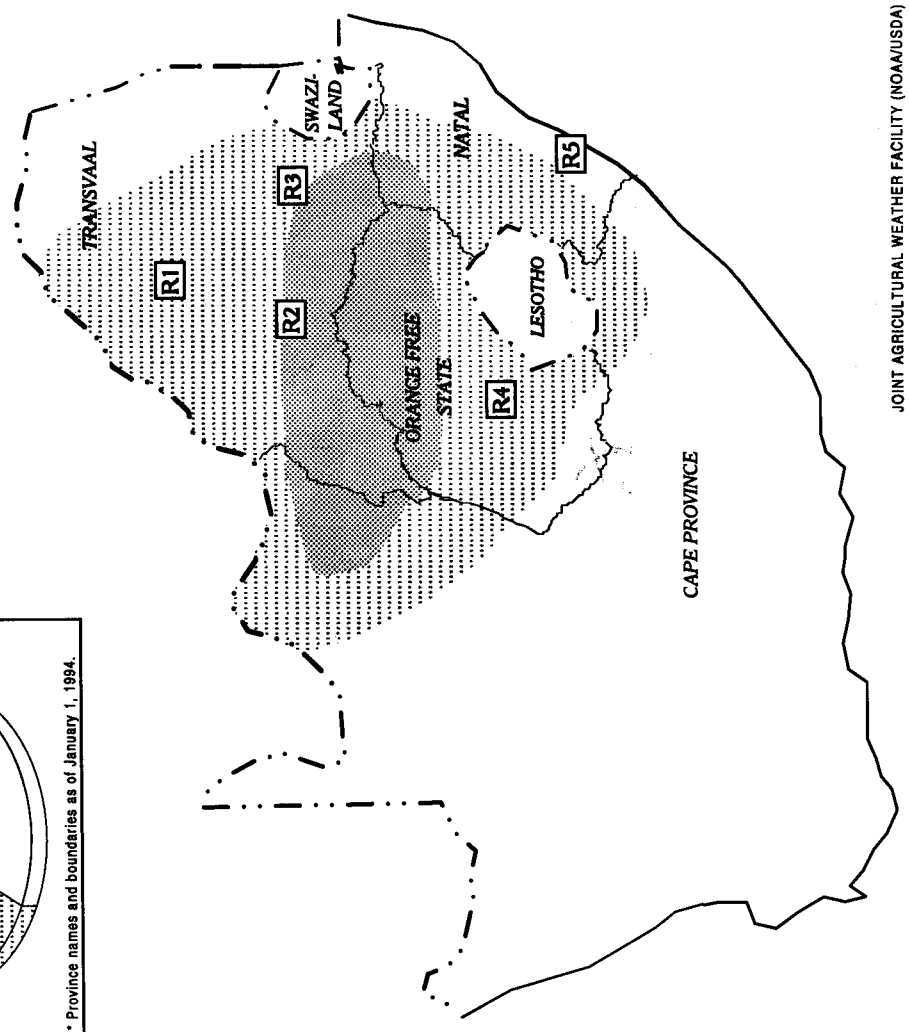


JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

South Africa: Corn



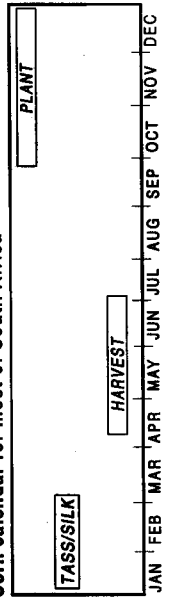
- Major growing areas
- Minor growing areas
- Climate stations



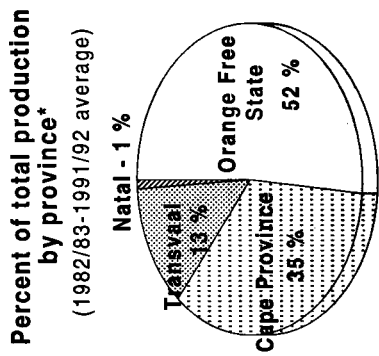
South Africa: Historical corn statistics

Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1971/72	4,578	2.07	9,483
1972/73	3,611	1.15	4,160
1973/74	4,463	2.49	11,105
1974/75	4,488	2.04	9,140
1975/76	4,549	1.61	7,314
1976/77	4,453	2.18	9,727
1977/78	4,499	2.24	10,056
1978/79	4,305	1.94	8,332
1979/80	4,322	2.49	10,762
1980/81	4,339	3.38	14,656
1981/82	4,278	1.95	8,359
1982/83	4,065	1.00	4,083
1983/84	3,953	1.11	4,405
1984/85	3,913	2.08	8,136
1985/86	4,054	1.99	8,078
1986/87	4,029	1.77	7,150
1987/88	3,657	1.93	7,075
1988/89	3,778	3.28	12,384
1989/90	3,475	2.56	8,900
1990/91	3,026	2.74	8,300
1991/92	3,452	0.91	3,125
1992/93	3,660	2.62	9,600
1988/89-1992/93 average	3,478	2.42	8,462

Corn calendar for most of South Africa

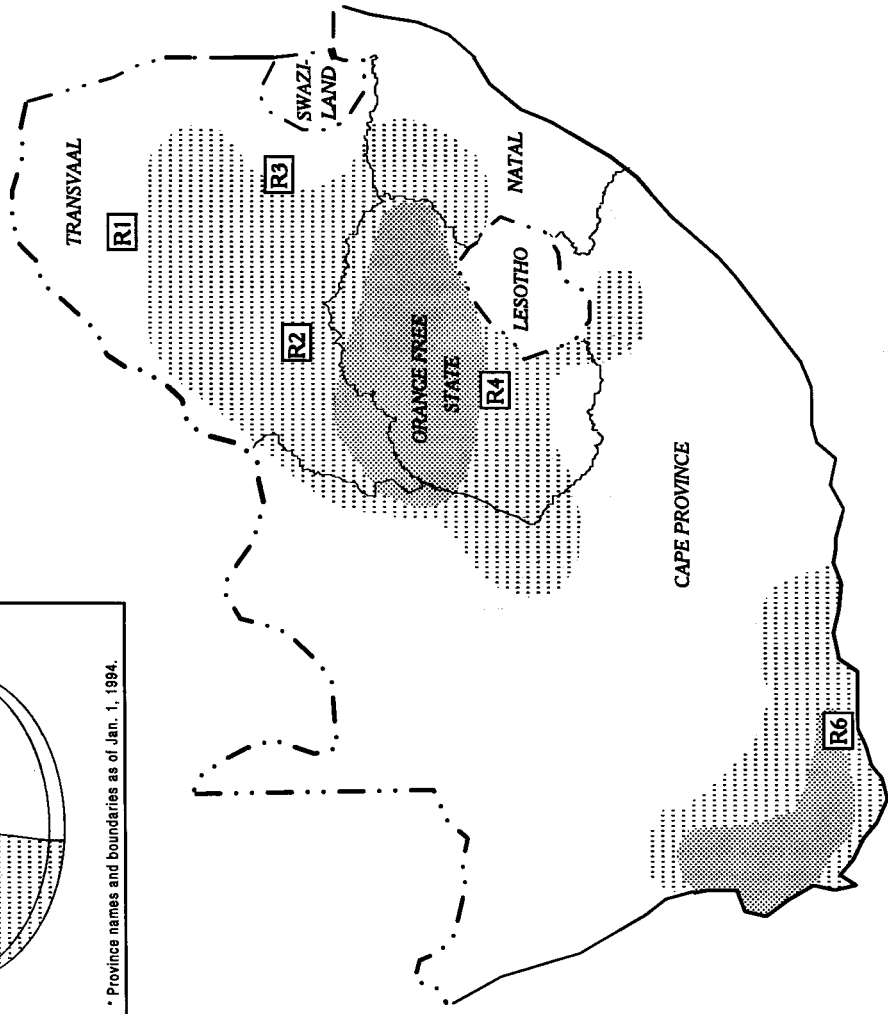


South Africa: Winter wheat



* Province names and boundaries as of Jan. 1, 1994.

- Major growing areas
- Minor growing areas
- Climate stations

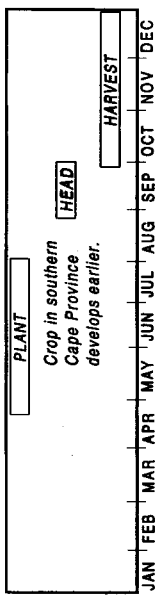


South Africa: Historical wheat* statistics

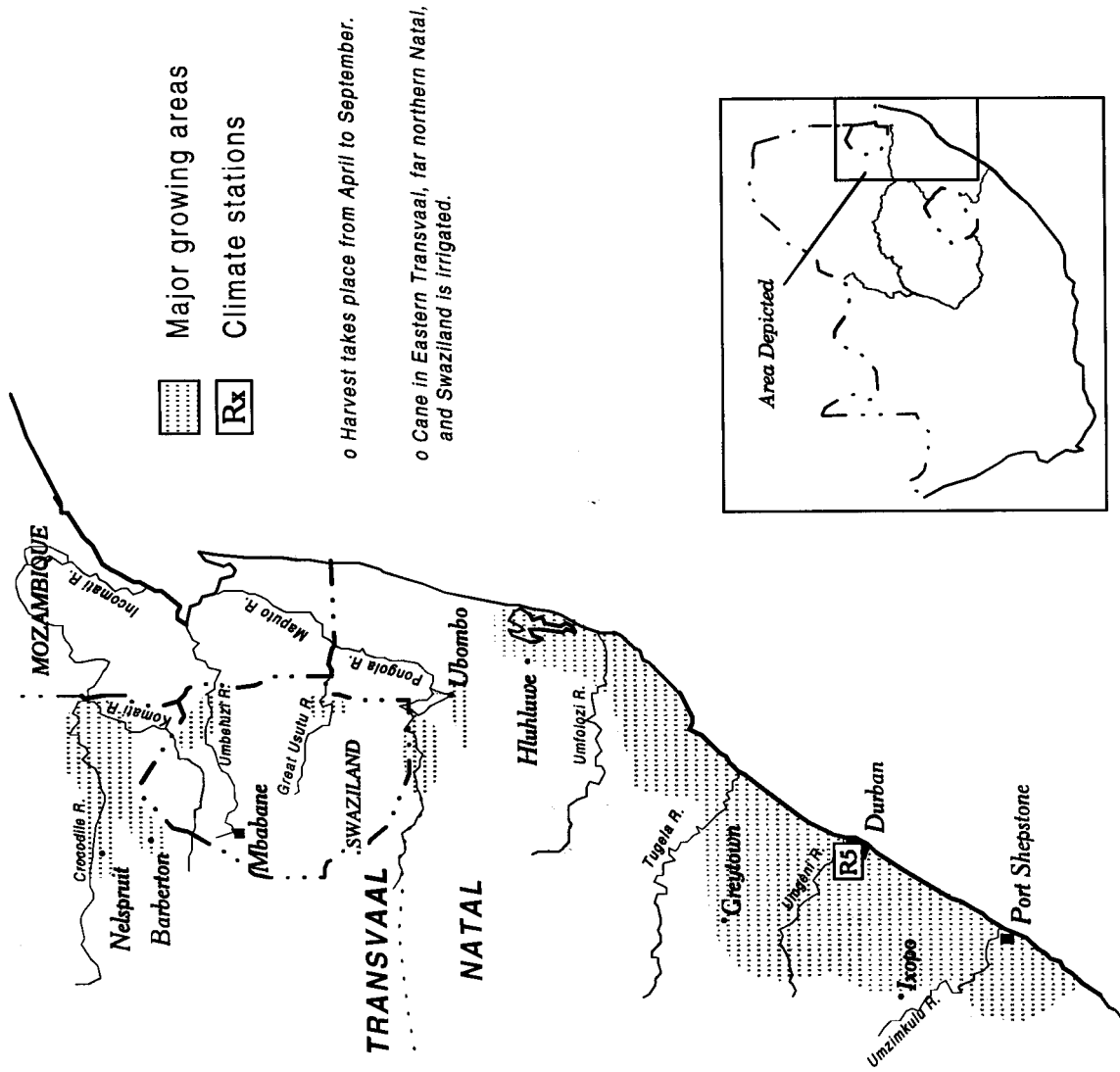
Crop Year	Area 1,000 ha	Yield t/ha	Prod. 1,000 t
1971/72	2,010	0.83	1,670
1972/73	2,017	0.87	1,746
1973/74	2,025	0.92	1,871
1974/75	1,865	0.86	1,596
1975/76	1,788	1.00	1,792
1976/77	1,867	1.20	2,239
1977/78	1,705	1.09	1,860
1978/79	1,880	0.90	1,690
1979/80	1,901	1.10	2,086
1980/81	1,623	0.91	1,470
1981/82	1,787	1.31	2,339
1982/83	1,974	1.23	2,420
1983/84	1,809	1.00	1,809
1984/85	1,919	1.16	2,224
1985/86	1,951	0.86	1,680
1986/87	1,926	1.21	2,321
1987/88	1,729	1.81	3,135
1988/89	1,985	1.78	3,535
1989/90	1,831	1.11	2,026
1990/91	1,550	1.10	1,702
1991/92	1,433	1.49	2,132
1992/93	743	1.77	1,318
1988/89- 1992/93 average	1,508	1.45	2,143



* Data include minor portion of crop that is spring sown.

Winter wheat calendar for most of South Africa



South Africa: Sugarcane



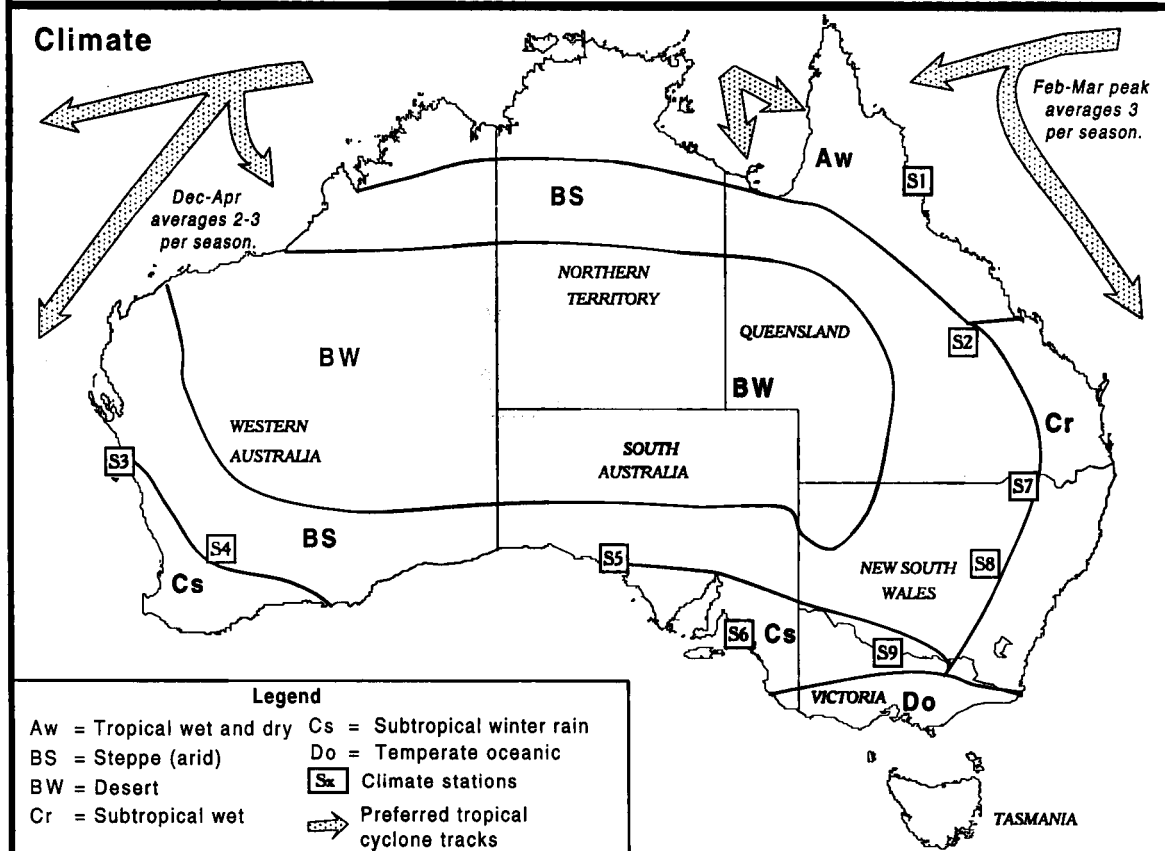
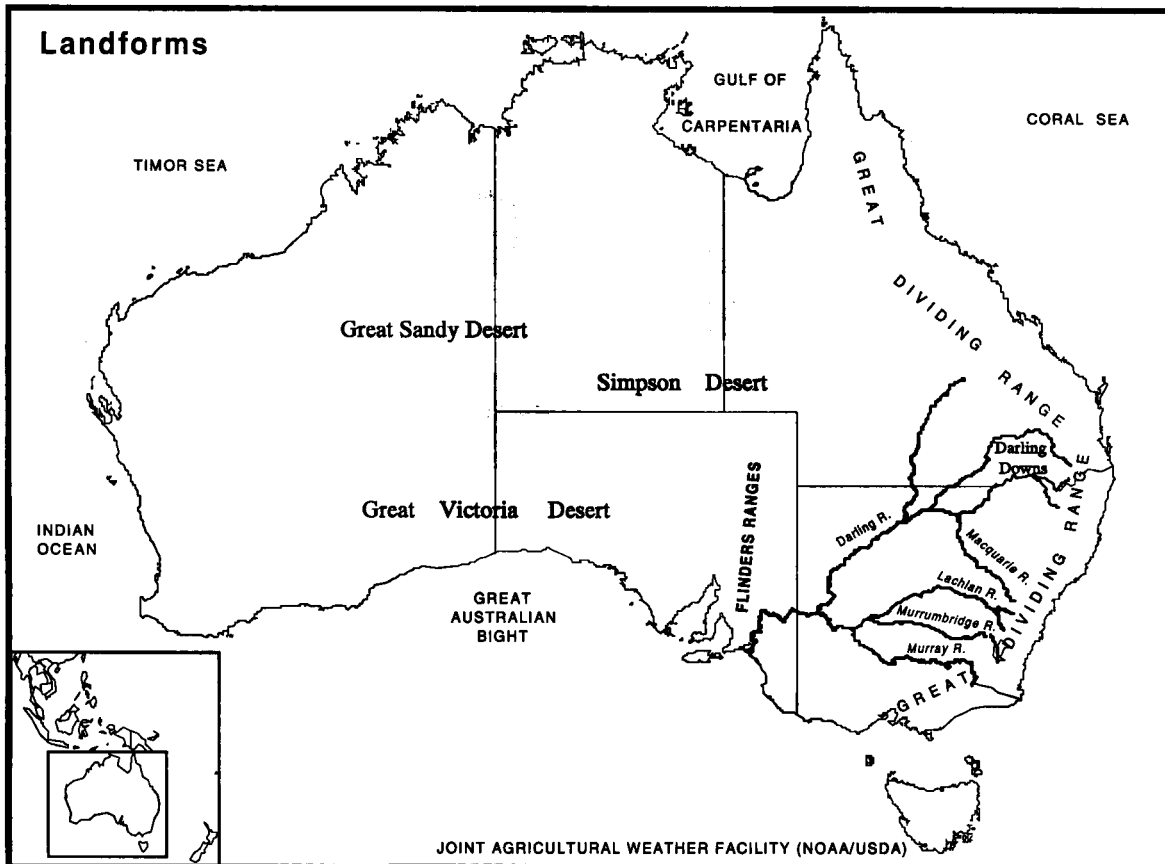
 Major growing areas
 Climate stations

o Harvest takes place from April to September.
 o Cane in Eastern Transvaal, far northern Natal, and Swaziland is irrigated.

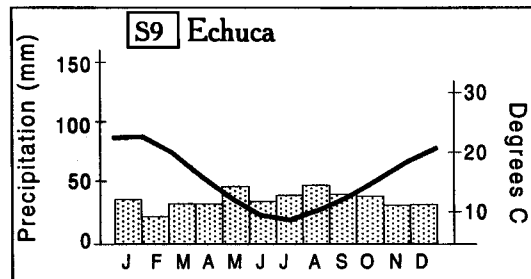
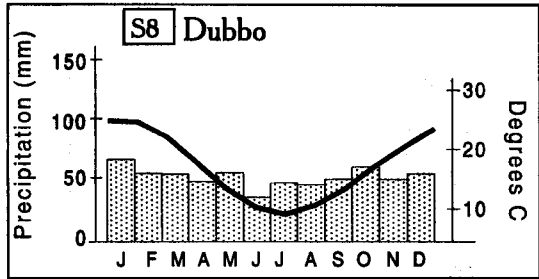
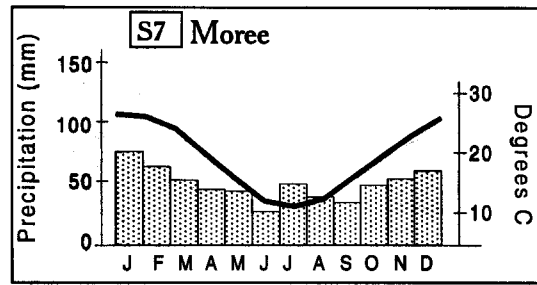
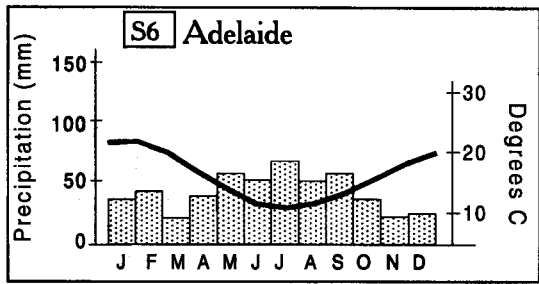
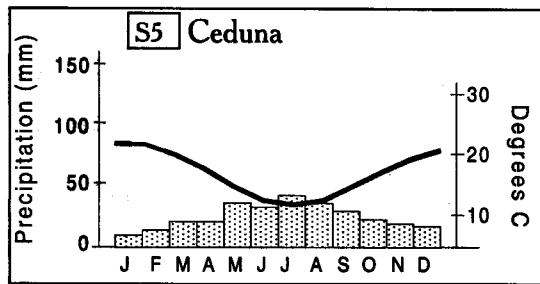
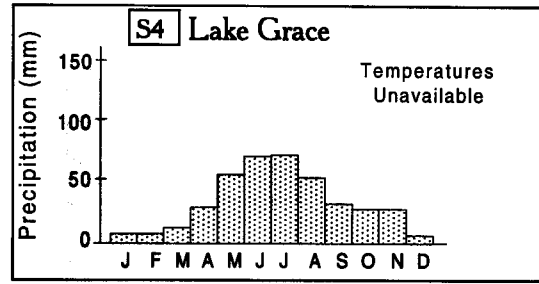
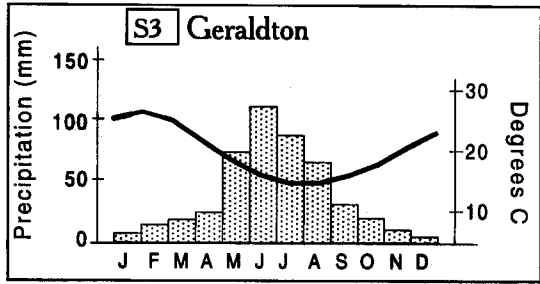
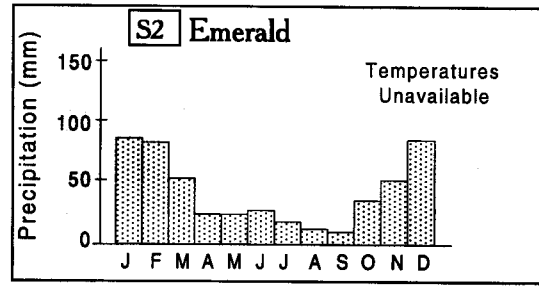
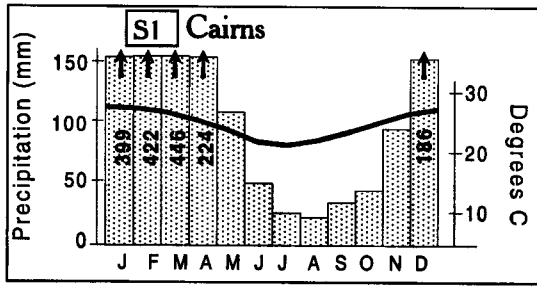
South Africa: Historical sugarcane statistics

Crop Year	Area		Yield t/ha	Prod.		Raw sugar 1,000 t
	1,000 ha	ha		1,000 t	t	
1970/71	165	73.60	12,144	1,469		
1971/72	183	91.54	16,751	1,941		
1972/73	180	93.36	16,805	1,985		
1973/74	181	85.38	15,454	1,794		
1974/75	187	90.35	16,895	2,033		
1975/76	187	89.91	16,814	1,934		
1976/77	201	95.63	19,221	2,198		
1977/78	212	89.30	18,932	2,254		
1978/79	212	89.30	18,932	2,199		
1979/80	218	84.46	18,412	2,125		
1980/81	213	66.02	14,062	1,737		
1981/82	258	75.71	19,532	2,233		
1982/83	266	72.70	19,339	2,289		
1983/84	242	55.24	13,423	1,480		
1984/85	273	81.89	22,356	2,551		
1985/86	266	70.69	18,803	2,287		
1986/87	276	66.26	18,287	2,200		
1987/88	274	76.88	21,066	2,235		
1988/89	276	71.97	19,864	2,240		
1989/90	258	72.23	18,636	2,289		
1990/91	265	68.24	18,083	2,152		
1991/92	276	72.75	20,078	2,429		
1992/93	275	47.11	12,955	1,600		
1986/89- 1992/93 average	270	66.46	17,923	2,142		

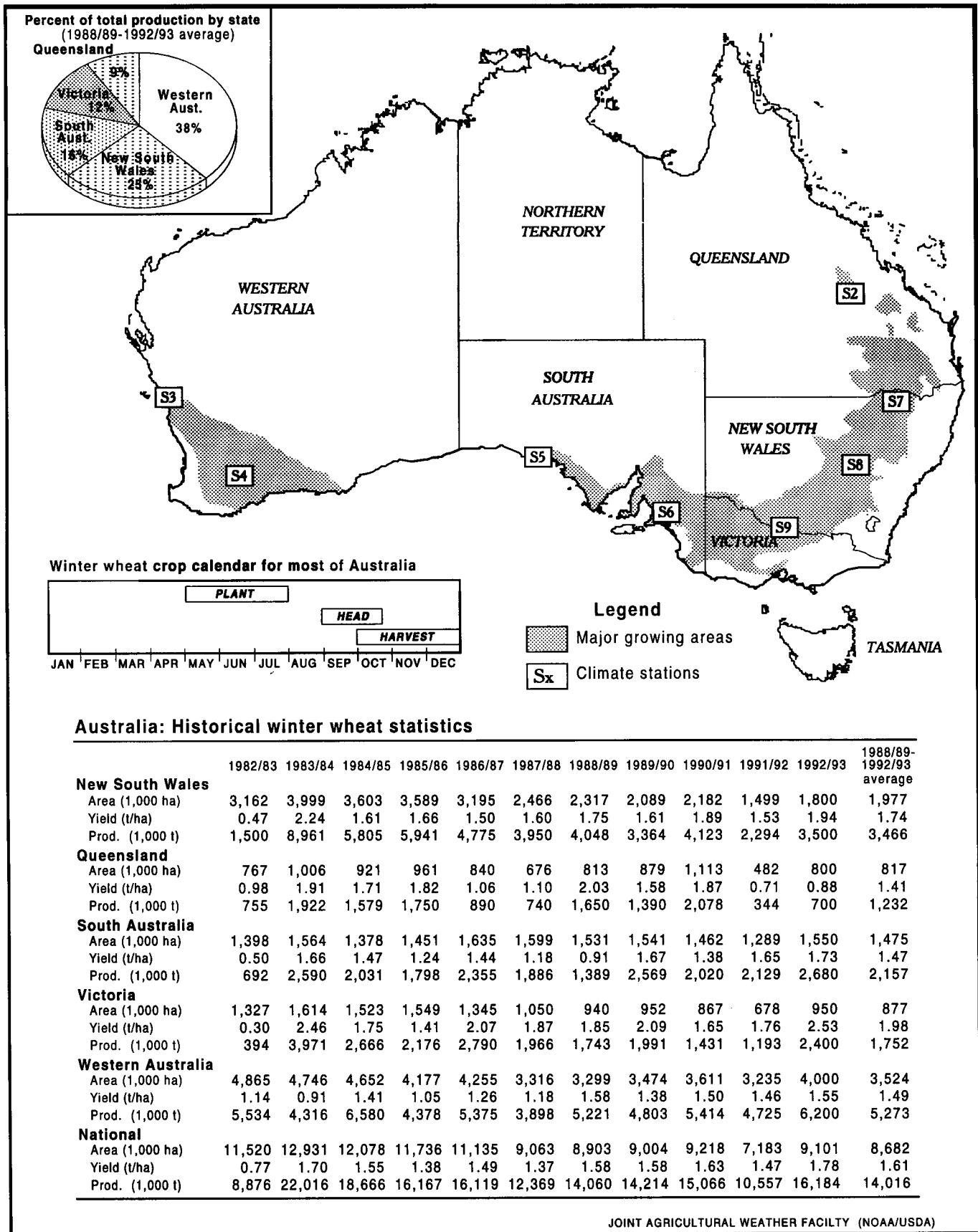
Australia: Landforms and climate



Australia: Climate stations



Australia: Winter wheat

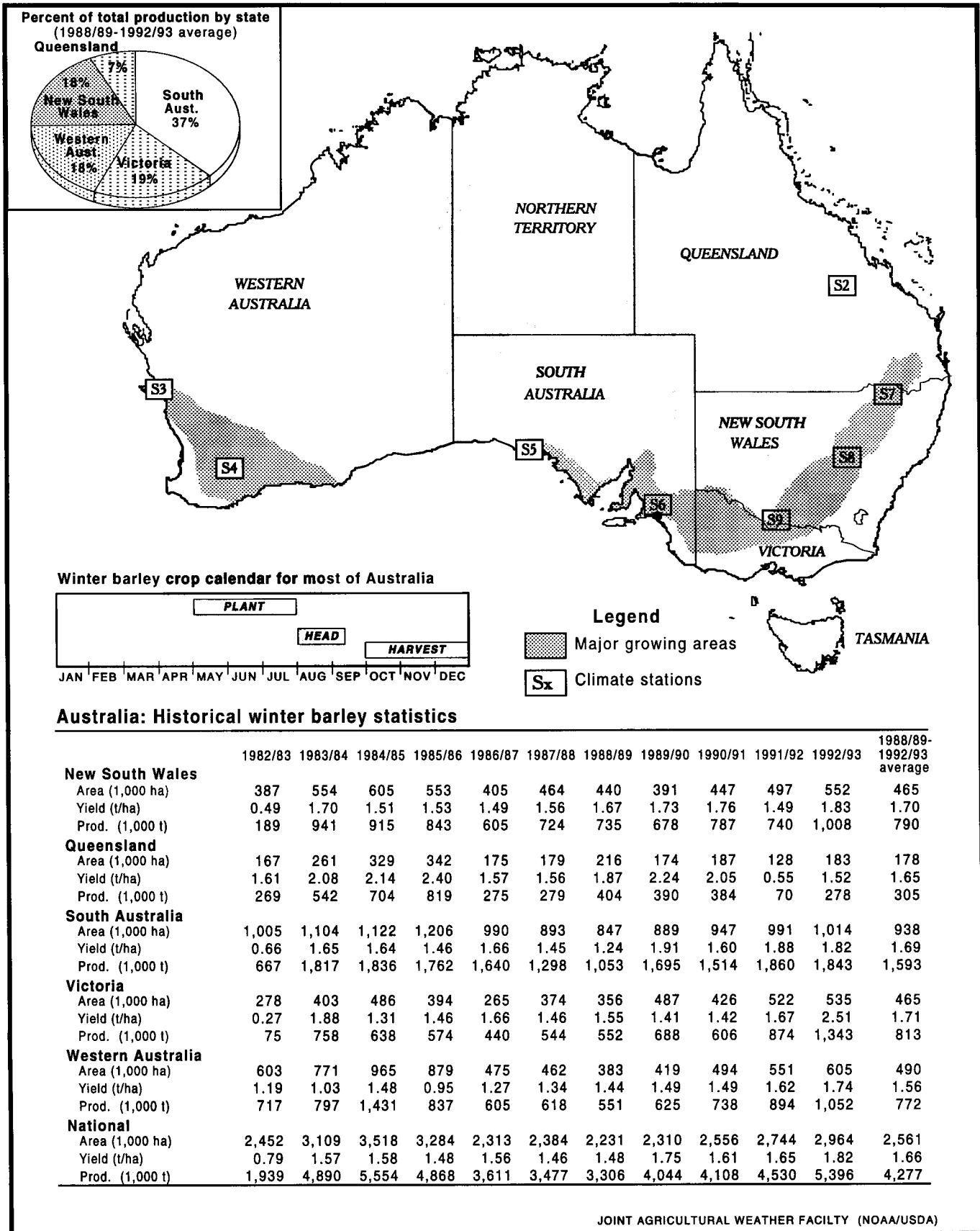


Australia: Historical winter wheat statistics

	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1988/89-1992/93 average
New South Wales												
Area (1,000 ha)	3,162	3,999	3,603	3,589	3,195	2,466	2,317	2,089	2,182	1,499	1,800	1,977
Yield (t/ha)	0.47	2.24	1.61	1.66	1.50	1.60	1.75	1.61	1.89	1.53	1.94	1.74
Prod. (1,000 t)	1,500	8,961	5,805	5,941	4,775	3,950	4,048	3,364	4,123	2,294	3,500	3,466
Queensland												
Area (1,000 ha)	767	1,006	921	961	840	676	813	879	1,113	482	800	817
Yield (t/ha)	0.98	1.91	1.71	1.82	1.06	1.10	2.03	1.58	1.87	0.71	0.88	1.41
Prod. (1,000 t)	755	1,922	1,579	1,750	890	740	1,650	1,390	2,078	344	700	1,232
South Australia												
Area (1,000 ha)	1,398	1,564	1,378	1,451	1,635	1,599	1,531	1,541	1,462	1,289	1,550	1,475
Yield (t/ha)	0.50	1.66	1.47	1.24	1.44	1.18	0.91	1.67	1.38	1.65	1.73	1.47
Prod. (1,000 t)	692	2,590	2,031	1,798	2,355	1,886	1,389	2,569	2,020	2,129	2,680	2,157
Victoria												
Area (1,000 ha)	1,327	1,614	1,523	1,549	1,345	1,050	940	952	867	678	950	877
Yield (t/ha)	0.30	2.46	1.75	1.41	2.07	1.87	1.85	2.09	1.65	1.76	2.53	1.98
Prod. (1,000 t)	394	3,971	2,666	2,176	2,790	1,966	1,743	1,991	1,431	1,193	2,400	1,752
Western Australia												
Area (1,000 ha)	4,865	4,746	4,652	4,177	4,255	3,316	3,299	3,474	3,611	3,235	4,000	3,524
Yield (t/ha)	1.14	0.91	1.41	1.05	1.26	1.18	1.58	1.38	1.50	1.46	1.55	1.49
Prod. (1,000 t)	5,534	4,316	6,580	4,378	5,375	3,898	5,221	4,803	5,414	4,725	6,200	5,273
National												
Area (1,000 ha)	11,520	12,931	12,078	11,736	11,135	9,063	8,903	9,004	9,218	7,183	9,101	8,682
Yield (t/ha)	0.77	1.70	1.55	1.38	1.49	1.37	1.58	1.58	1.63	1.47	1.78	1.61
Prod. (1,000 t)	8,876	22,016	18,666	16,167	16,119	12,369	14,060	14,214	15,066	10,557	16,184	14,016

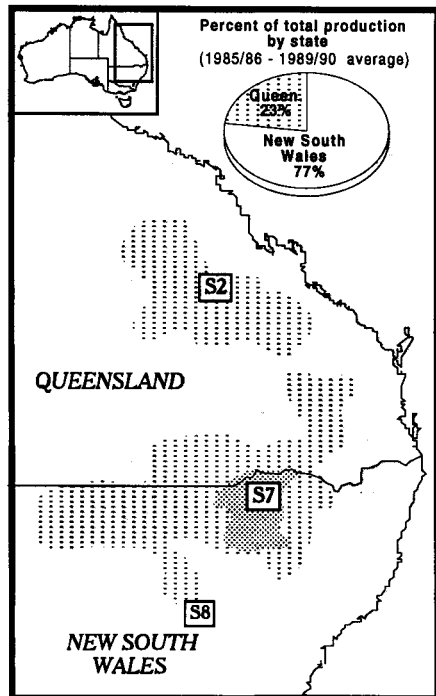
JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Australia: Winter barley

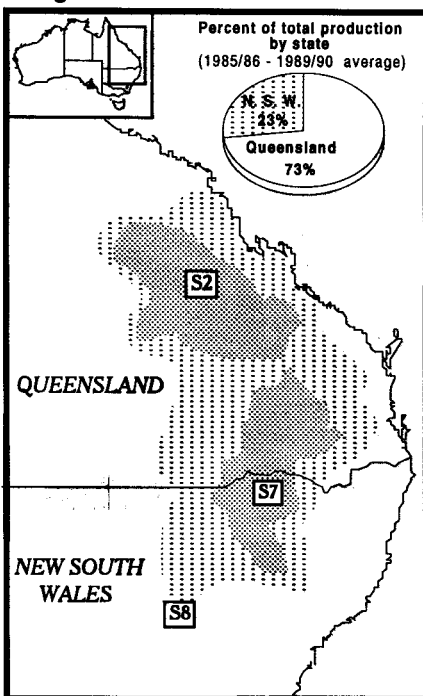


Australia: Cotton, sorghum, and sugarcane

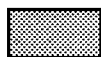
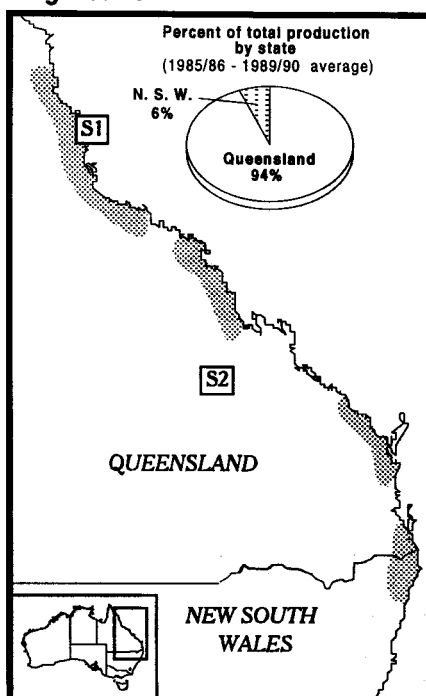
Cotton



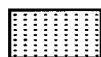
Sorghum



Sugarcane



Major growing areas

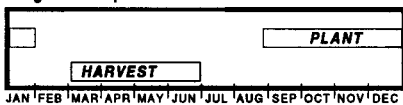


Minor growing areas

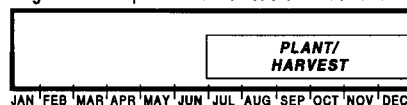
Cotton crop calendar for eastern Australia



Sorghum crop calendar for eastern Australia



Sugarcane crop calendar for eastern Australia



Historical cotton statistics

Crop year	Area	Yield	Prod.
	1,000 ha	kg/ha	1,000 480 lb. bales
1975/76	30	850	115
1976/77	34	830	129
1977/78	40	1,110	202
1978/79	49	1,080	243
1979/80	70	1,190	381
1980/81	84	1,180	455
1981/82	103	1,300	615
1982/83	96	1,050	464
1983/84	137	1,030	648
1984/85	183	1,360	1,144
1985/86	177	1,460	1,185
1986/87	148	1,450	983
1987/88	247	1,120	1,277
1988/89	194	1,380	1,226
1989/90	240	1,270	1,401
1990/91	279	1,550	1,989
1991/92	282	1,780	2,306
1992/93	262	1,420	1,713
1988/89-1992/93 average	251	1,480	1,727

Historical sorghum statistics

Crop year	Area	Yield	Prod.
	1,000 ha	t/ha	1,000 t
1975/76	504	2.23	1,124
1976/77	532	1.80	956
1977/78	394	1.81	714
1978/79	469	2.40	1,125
1979/80	519	1.78	922
1980/81	658	1.83	1,204
1981/82	649	2.03	1,317
1982/83	707	1.36	958
1983/84	730	2.58	1,885
1984/85	723	1.89	1,369
1985/86	734	1.93	1,416
1986/87	818	1.74	1,422
1987/88	765	2.19	1,677
1988/89	645	1.99	1,283
1989/90	380	2.49	946
1990/91	401	2.22	890
1991/92	569	2.54	1,444
1992/93	426	1.28	546
1988/89-1992/93 average	484	2.10	1,022

Historical sugarcane statistics

Crop year	Area	Yield	Sugarcane	Raw sugar
	1,000 ha	t/ha	1,000 t	1,000 t
1975/76	257	85.44	21,959	2,988
1976/77	288	81.06	23,344	3,405
1977/78	295	79.64	23,493	3,322
1978/79	252	85.15	21,457	2,978
1979/80	267	79.22	21,151	2,963
1980/81	288	83.25	23,976	3,329
1981/82	316	79.54	25,136	3,434
1982/83	319	78.08	24,908	3,535
1983/84	307	78.79	24,190	3,414
1984/85	316	80.74	25,513	3,548
1985/86	304	80.31	24,414	3,404
1986/87	310	81.98	25,413	3,457
1987/88	314	89.21	28,013	3,528
1988/89	314	89.40	28,073	3,680
1989/90	331	83.27	27,562	3,797
1990/91	339	74.16	25,140	3,637
1991/92	341	62.48	21,306	3,190
1992/93	339	86.70	29,400	4,367
1988/89-1992/93 average	333	79.20	26,296	3,734

Appendix I: Climate station, location and normal climate data

Station Code	Name, location, and elevation	Monthly normal precipitaton (mm) and temperature (c)												
Region A: United States														
A1:	SACRAMENTO (Elev 8 m); Latitude: 38.5N; Longitude: 121.5W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 72483	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			95	73	65	30	7	3	1	2	9	27	69	64
			7.3	10.4	12.0	14.6	18.5	22.0	24.3	23.9	21.9	17.9	11.8	7.4
A2:	FRESNO (Elev 100 m); Latitude: 36.8N; Longitude: 119.7W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 72389	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			50	46	48	25	8	2	0	1	6	14	35	36
			7.6	10.7	12.8	16.2	20.5	24.8	27.7	26.8	23.6	18.4	12.0	7.4
A3:	SPOKANE (Elev 721 m); Latitude: 47.6N; Longitude: 117.5W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 72785	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			50	38	38	30	36	32	17	18	19	25	55	62
			-2.7	0.7	3.7	7.7	12.2	16.6	20.4	20.2	14.9	8.5	1.7	-2.3
A4:	PENDLETON (Elev 456 m); Latitude: 45.7N; Longitude: 118.8W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 72688	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			38	29	30	26	25	16	9	14	15	22	40	41
			0.8	4.0	7.1	10.2	14.4	19.0	22.7	22.2	17.3	11.3	5.3	1.3
A5:	GREAT FALLS (Elev 1115 m); Latitude: 47.5N; Longitude: 111.4W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 72775	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			23	15	28	36	64	61	32	39	32	20	17	22
			-6.0	-2.6	0.7	6.4	11.7	16.4	20.1	19.4	13.7	8.6	1.1	-4.5
A6:	POCATELLO (Elev 1365 m); Latitude: 42.9N; Longitude: 112.6W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 72578	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			26	23	32	31	34	26	17	17	22	23	30	28
			-4.8	-1.6	2.4	7.2	12.0	17.0	21.4	20.4	15.0	8.9	2.0	-4.0
A7:	CHEYENNE (Elev 1872 m); Latitude: 41.2N; Longitude: 104.8W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 72564	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			10	10	26	35	61	53	53	43	32	19	14	11
			-3.1	-1.5	0.9	5.8	11.1	16.3	20.2	19.1	14.1	8.3	1.8	-2.3
A8:	WILLISTON (Elev 581 m); Latitude: 48.2N; Longitude: 103.6W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 72767	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			14	11	18	33	51	58	53	32	34	20	11	15
			-12.8	-8.8	-2.0	6.2	12.9	18.1	21.5	20.4	13.5	7.1	-2.7	-10.4
A9:	FARGO (Elev 274 m); Latitude: 46.9N; Longitude: 96.8W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 72753	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			17	11	27	46	62	72	69	62	51	43	19	17
			-14.5	-11.1	-3.4	6.1	13.4	18.6	21.7	20.4	14.3	7.6	-2.2	-11.3

Appendix I: Climate station, location and normal climate data -- (continued)

Station Code	Name, location, and elevation	Monthly normal precipitation (mm) and temperature (c)												
A10:	ABERDEEN (Elev 396 m); Latitude: 45.5N; Longitude: 98.4W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 72659	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			15	15	28	47	72	85	81	74	50	36	18	14
			-12.2	-8.8	-1.7	6.9	13.9	19.2	22.3	21.1	15.0	8.3	-1.2	-9.3
A11:	NORTH PLATTE (Elev 849 m); Latitude: 41.1N; Longitude: 100.7W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 72562	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			9	11	31	51	87	86	78	44	41	25	17	12
			-5.8	-2.4	2.5	9.0	14.5	19.9	23.3	22.1	16.3	9.8	1.9	-4.3
A12:	SIOUX CITY (Elev 334 m); Latitude: 42.4N; Longitude: 96.4W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 72557	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			14	18	50	59	93	94	83	75	73	49	27	20
			-7.9	-4.7	2.1	10.1	16.4	21.5	24.3	22.6	17.4	11.0	2.4	-5.7
A13:	ROCHESTER (Elev 402 m); Latitude: 43.9N; Longitude: 92.5W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 72644	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			20	19	45	69	86	95	107	99	88	59	41	26
			-11.4	-8.3	-1.2	7.2	13.8	19.1	21.6	20.1	15.1	8.8	0.3	-8.2
A14:	OTTUMWA (Elev 258 m); Latitude: 41.1N; Longitude: 92.4W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 990TM	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			25	23	58	84	100	97	113	99	108	68	57	36
			-6.2	-3.3	3.4	10.8	17.0	22.2	24.7	23.1	18.6	12.2	4.5	-3.4
A15:	CONCORDIA (Elev 452 m); Latitude: 39.5N; Longitude: 97.7W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 72458	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			15	19	56	59	109	114	93	90	77	51	29	21
			-3.4	-0.6	5.2	11.5	17.1	23.0	26.4	25.0	19.6	13.4	5.3	-1.3
A16:	DODGE CITY (Elev 790 m); Latitude: 37.8N; Longitude: 100.0W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 72451	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			12	16	40	52	77	79	82	69	49	33	21	17
			-1.2	1.7	6.4	12.6	17.9	23.5	26.8	25.6	20.5	14.2	6.2	0.3
A17:	SPRINGFIELD (Elev 187 m); Latitude: 39.8N; Longitude: 89.7W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 72439	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			38	45	82	94	92	87	89	84	85	66	54	69
			-4.3	-1.8	4.9	11.8	17.5	22.7	24.7	23.1	19.6	13.1	6.0	-1.3
A18:	FLINT (Elev 233 m); Latitude: 43.0N; Longitude: 83.7W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 72637	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			35	33	55	75	67	82	69	89	90	55	66	54
			-5.8	-4.7	1.1	7.8	13.8	18.8	21.4	20.3	16.3	10.0	4.1	-2.7

Appendix I: Climate station, location and normal climate data -- (continued)

Station Code	Name, location, and elevation	Monthly normal precipitation (mm) and temperature (c)												
A19:	FORT WAYNE (Elev 252 m); Latitude: 41.0N; Longitude: 85.2W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 72533	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			48	49	74	86	87	91	88	86	68	63	71	73
			-5.1	-3.4	3.1	9.5	15.7	21.2	23.3	22.0	18.3	11.6	5.2	-1.9
A20:	DAYTON (Elev 306 m); Latitude: 39.9N; Longitude: 84.2W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 72429	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			54	55	87	88	99	97	90	81	65	63	78	74
			-3.3	-1.4	4.7	10.7	16.5	21.3	23.4	22.3	18.8	12.3	6.0	-0.2
A21:	HARRISBURG (Elev 106 m); Latitude: 40.2N; Longitude: 76.8W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 72511	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			72	74	83	82	108	98	91	84	89	74	89	82
			-1.9	-0.4	5.1	10.9	16.5	21.6	24.3	23.4	19.1	12.6	6.9	0.9
A22:	NEW BERN (Elev 6 m); Latitude: 35.1N; Longitude: 77.1W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 99EWN	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			109	108	99	82	117	137	178	167	130	77	80	94
			6.3	7.7	11.9	16.4	20.8	24.4	26.3	25.9	23.1	17.6	12.8	8.3
A23:	MEMPHIS (Elev 87 m); Latitude: 35.0N; Longitude: 90.0W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 72334	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			95	111	137	139	127	91	96	87	90	77	130	146
			4.3	6.8	11.7	17.1	21.8	26.1	28.1	27.2	23.4	17.3	11.4	6.5
A24:	LUBBOCK (Elev 988 m); Latitude: 33.7N; Longitude: 101.8W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 72267	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			10	17	23	25	60	70	60	64	66	47	19	14
			3.8	6.2	10.7	16.2	20.8	25.1	26.6	25.5	21.7	16.3	9.9	4.8
A25:	DALLAS-FORT WORTH (Elev 182 m); Latitude: 32.9N; Longitude: 97.0W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 72259	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			46	62	77	94	134	84	56	57	121	102	61	53
			5.5	8.2	12.9	17.9	21.9	26.0	28.4	28.0	24.0	18.4	12.4	7.4
A26:	VICTORIA (Elev 36 m); Latitude: 28.9N; Longitude: 96.9W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 72255	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			86	71	57	68	115	116	107	92	161	111	93	75
			11.0	12.7	16.7	20.9	24.3	27.0	28.4	28.2	26.0	21.8	17.1	12.8
A27:	MCALLEN (Elev 33 m); Latitude: 26.2N; Longitude: 98.2W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 99MFE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			36	33	16	34	72	68	44	60	113	66	26	28
			14.0	16.0	20.2	24.0	26.3	28.4	29.2	29.5	27.8	24.0	19.8	15.6

Appendix I: Climate station, location and normal climate data -- (continued)

Station Code	Name, location, and elevation	Monthly normal precipitation (mm) and temperature (c)											
A28:	LAFAYETTE (Elev 13 m); Latitude: 30.2N; Longitude: 92.0W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 99LFT Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 126 109 105 103 131 130 177 137 136 96 97 136 10.3 12.0 16.2 20.3 23.9 26.9 27.8 27.6 25.5 20.5 15.9 12.2											
A29:	ALBANY (Elev 59 m); Latitude: 31.5N; Longitude: 84.2W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 99ABY Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 141 126 133 94 103 132 149 111 89 49 82 100 8.0 9.8 14.1 18.1 22.3 25.7 27.1 27.0 24.6 18.9 13.9 9.8											
A30:	ORLANDO (Elev 32 m); Latitude: 28.4N; Longitude: 81.3W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 72205 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 58 77 82 46 90 186 184 172 153 62 58 55 15.4 16.2 19.3 21.8 24.9 27.3 27.9 28.0 27.2 24.0 20.0 16.7											
A31:	WEST PALM BEACH (Elev 6 m); Latitude: 26.7N; Longitude: 80.1W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 72203 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 63 73 75 75 169 204 153 167 183 194 89 58 19.0 19.3 21.6 23.5 25.4 27.2 28.0 28.2 27.7 25.6 22.6 20.2											
A32:	KAHULUI, MAUI (Elev 17 m); Latitude: 20.9N; Longitude: 156.4W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 91190 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 105 73 69 47 20 7 10 12 9 31 66 83 22.0 22.1 22.8 23.4 24.3 25.3 25.9 26.3 26.0 25.5 24.3 22.8											
Region B: Canada													
B1:	PEACE RIVER (Elev 571 m); Latitude: 56.2N; Longitude: 117.4W; Precipitation (mm) - (1944-1990 average) Temperatures (C) - (1944-1990 average)	WMO: 71068 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 21 19 15 15 31 67 62 51 40 24 22 20 -17.5 -13.3 -7.1 2.9 9.9 14.1 15.9 14.6 9.2 3.4 -8.4 -15.2											
B2:	EDMONTON (Elev 671 m); Latitude: 53.6N; Longitude: 113.5W; Precipitation (mm) - (1883-1990 average) Temperatures (C) - (1883-1990 average)	WMO: 71879 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 23 17 17 22 44 80 95 67 42 17 16 23 -12.4 -8.8 -3.5 4.9 11.6 15.6 17.5 16.6 11.1 5.9 -4.1 -10.4											
B3:	MEDICINE HAT (Elev 717 m); Latitude: 50.0N; Longitude: 110.7W; Precipitation (mm) - (1883-1990 average) Temperatures (C) - (1883-1990 average)	WMO: 71872 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 17 10 16 25 42 56 41 30 34 15 14 16 -10.7 -6.8 -1.1 6.3 12.4 17.1 19.8 19.1 13.0 7.3 -2.1 -8.6											
B4:	SASKATOON (Elev 504 m); Latitude: 52.2N; Longitude: 106.7W; Precipitation (mm) - (1941-1990 average) Temperatures (C) - (1941-1990 average)	WMO: 71866 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 16 13 16 19 44 60 57 36 32 17 14 17 -17.5 -13.9 -7.0 3.9 11.4 16.2 18.6 17.4 11.1 4.8 -5.9 -14.7											

Appendix I: Climate station, location and normal climate data -- (continued)

Station Code	Name, location, and elevation	Monthly normal precipitation (mm) and temperature (c)												
B5:	THE PAS (Elev 271 m); Latitude: 54.0N; Longitude: 101.1W; Precipitation (mm) - (1910-1990 average) Temperatures (C) - (1921-1990 average)	WMO: 71867	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			17	15	21	26	34	63	69	65	58	37	27	20
			-21.3	-17.4	-9.9	0.5	8.9	14.8	17.7	16.3	9.9	3.5	-7.6	-17.9
B6:	BRANDON (Elev 409 m); Latitude: 49.9N; Longitude: 99.9W; Precipitation (mm) - (1941-1990 average) Temperatures (C) - (1941-1990 average)	WMO: 71140	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			18	17	20	35	46	66	75	67	51	22	15	18
			-18.4	-15.0	-7.4	3.3	10.9	16.2	18.7	17.5	11.4	4.9	-5.6	-15.0
B7:	LONDON (Elev 278 m); Latitude: 43.0N; Longitude: 81.2W; Precipitation (mm) - (1940-1990 average) Temperatures (C) - (1940-1990 average)	WMO: 71623	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			69	60	74	79	73	82	76	87	84	76	91	95
			-6.7	-6.2	-0.5	6.2	12.6	17.7	20.3	19.2	15.2	9.1	3.3	-3.4
B8:	MT. FOREST (Elev 415 m); Latitude: 44.0N; Longitude: 80.8W; Precipitation (mm) - (1941-1960 average) Temperatures (C) - (1941-1960 average)	WMO: 71631	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			30	28	54	60	104	85	78	62	96	77	63	42
			-7.6	-8.2	-3.2	4.0	11.3	16.6	18.9	18.2	14.4	8.1	1.2	-5.3
B9:	MONTREAL (Elev 36 m); Latitude: 45.5N; Longitude: 73.8W; Precipitation (mm) - (1941-1990 average) Temperatures (C) - (1941-1990 average)	WMO: 71627	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			63	57	67	75	68	83	86	100	87	76	93	86
			-10.2	-8.7	-2.3	5.7	12.9	17.9	20.8	19.4	14.5	8.3	1.6	-6.8
Region C: Mexico														
C1:	HERMOSILLO (Elev 211 m); Latitude: 29.1N; Longitude: 111.0W; Precipitation (mm) - (1946-1960 average) Temperatures (C) - (1946-1960 average)	WMO: 76160	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			2	16	5	2	2	4	71	84	63	41	6	26
			15.7	17.3	20.2	22.9	26.4	31.0	32.0	31.4	30.3	26.0	21.1	15.6
C2:	MATAMOROS (Elev 211 m); Latitude: 25.9N; Longitude: 97.5W; Precipitation (mm) - (32 YEARS average) Temperatures (C) - (67 YEARS average)	WMO: 76399	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			46	38	41	43	66	81	58	74	147	91	58	48
			16.0	17.0	20.0	23.5	26.5	28.0	28.5	29.0	27.5	24.0	19.5	17.0
C3:	CULIACAN (Elev 84 m); Latitude: 24.8N; Longitude: 107.4W; Precipitation (mm) - (23 YEARS average) Temperatures (C) - (23 YEARS average)	WMO: 76412	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			8	20	5	0	0	25	119	165	117	33	18	31
			20.0	20.0	21.5	24.0	26.0	29.5	29.0	28.5	28.5	27.0	24.0	20.5
C4:	GUADALAJARA (Elev 1589 m); Latitude: 20.7N; Longitude: 103.4W; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	WMO: 76612	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			12	7	6	8	27	152	257	211	160	70	13	17
			15.6	16.7	19.1	21.7	23.9	22.7	21.5	20.7	20.6	19.2	17.4	15.5

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Appendix I: Climate station, location and normal climate data -- (continued)

Station Code	Name, location, and elevation	Monthly normal precipitation (mm) and temperature (c)											
C5: TOLUC (Elev 2680 m); Latitude: 19.3N; Longitude: 99.7W; Precipitation (mm) - (1946-1960 average) Temperatures (C) - (1946-1960 average)	WMO: 76675 Jan Feb 10 9 9.3 11.1	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		11 13.0	26 14.3	63 14.9	135 14.4	168 13.4	144 13.5	151 13.4	49 12.8	20 11.3	7 10.3		
C6: VERACRUZ (Elev 16 m); Latitude: 19.1N; Longitude: 96.1W; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	WMO: 76692 Jan Feb 21 13 21.2 21.7	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		16 23.3	26 26.4	51 27.4	280 27.3	362 27.4	304 27.9	308 27.6	128 26.6	58 24.5	42 22.7		
C7: LAS CASAS (Elev 2276 m); Latitude: 16.7N; Longitude: 92.6W; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	WMO: 76845 Jan Feb 9 10 11.7 12.5	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		16 14.1	53 16.0	73 15.3	218 15.3	135 16.2	176 15.4	208 16.4	111 15.0	28 13.6	11 12.2		
C8: MERIDA (Elev 9 m); Latitude: 21.0N; Longitude: 89.7W; Precipitation (mm) - (1895-1990 average) Temperatures (C) - (1895-1990 average)	WMO: 76644 Jan Feb 54 20 23.1 23.8	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		31 25.9	33 27.6	57 28.9	137 28.2	147 27.4	135 27.6	156 27.2	86 26.0	39 24.2	34 23.1		
Region D: Cuba													
D1: HAVANA (Elev 50 m); Latitude: 23.2N; Longitude: 82.3W; Precipitation (mm) - (1859-1990 average) Temperatures (C) - (1871-1990 average)	WMO: 78325 Jan Feb 62 52 21.7 21.9	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		43 23.2	50 24.6	115 25.5	162 26.5	105 27.1	99 27.4	144 26.9	177 25.6	71 23.8	50 22.1		
D2: CIENFUEGOS (Elev 39 m); Latitude: 22.1N; Longitude: 80.4W; Precipitation (mm) - (1947--999 average) Temperatures (C) - (1951--999 average)	WMO: 78244 Jan Feb 38 36 22.2 23.3	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		61 24.4	91 26.1	193 26.7	267 26.7	142 27.8	140 27.8	185 27.2	137 26.1	79 24.4	51 22.8		
D3: CAMAGUEY (Elev 125 m); Latitude: 21.4N; Longitude: 77.9W; Precipitation (mm) - (1950-1990 average) Temperatures (C) - (1951-1960 average)	WMO: 78355 Jan Feb 43 41 21.6 22.6	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		44 24.1	70 25.4	206 26.0	223 26.6	128 27.0	188 27.4	175 26.9	207 25.8	65 24.2	19 22.3		
D4: GUANTANAMO (Elev 23 m); Latitude: 19.9N; Longitude: 75.2W; Precipitation (mm) - (1946-1990 average) Temperatures (C) - (1946-1990 average)	WMO: 78367 Jan Feb 35 18 24.2 24.4	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		29 25.2	28 26.2	68 27.0	51 27.9	24 28.5	48 28.6	71 28.1	161 27.3	37 26.1	27 24.8		

Appendix I: Climate station, location and normal climate data -- (continued)

Station Code	Name, location, and elevation	Monthly normal precipitaton (mm) and temperature (c)												
Region E: Argentina, Chile, and Paraguay														
E1:	PUERTO STROESSNER, PAR. (Elev 196 m); Latitude: 25.5S; Longitude: 54.6W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1951-1990 average)	WMO: 86248	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			172	167	144	140	131	124	90	104	136	200	178	146
			26.3	26.0	24.8	21.6	18.9	16.4	16.4	17.7	19.6	22.2	24.1	25.7
E2:	TUCUMAN, ARG. (Elev 421 m); Latitude: 26.8S; Longitude: 65.2W; Precipitation (mm) - (1952-1990 average) Temperatures (C) - (1953-1990 average)	WMO: 87120	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			216	190	175	64	25	14	11	9	16	68	111	149
			25.1	24.2	22.1	19.1	15.9	12.4	12.1	14.3	17.7	21.0	23.1	24.7
E3:	RESISTENCIA, ARG. (Elev 53 m); Latitude: 27.5S; Longitude: 59.0W; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	WMO: 87155	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			171	135	171	173	88	54	43	53	67	117	141	125
			26.6	25.8	24.2	20.8	18.0	15.0	15.3	16.3	18.2	21.3	23.5	25.8
E4:	ROSARIO, ARG. (Elev 25 m); Latitude: 32.9S; Longitude: 60.8W; Precipitation (mm) - (1941-1990 average) Temperatures (C) - (1941-1990 average)	WMO: 87480	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			105	118	166	112	48	37	38	37	63	91	97	124
			24.2	23.1	20.6	17.1	13.7	10.2	10.3	11.4	13.8	17.3	20.3	22.9
E5:	RIO CUARTO, ARG. (Elev 420 m); Latitude: 33.1S; Longitude: 64.3W; Precipitation (mm) - (1931-1990 average) Temperatures (C) - (1931-1990 average)	WMO: 87453	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			126	87	119	48	24	17	14	16	42	77	121	141
			23.1	22.0	19.7	16.5	13.1	9.6	9.3	10.9	13.5	16.8	19.7	22.1
E6:	SANTA ROSA, ARG. (Elev 190 m); Latitude: 36.6S; Longitude: 64.3W; Precipitation (mm) - (1941-1990 average) Temperatures (C) - (1941-1990 average)	WMO: 87623	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			73	70	88	51	28	16	19	23	39	70	100	85
			23.7	22.5	19.2	15.1	11.2	7.7	7.6	9.4	12.2	15.7	19.3	22.3
E7:	TRES ARROYOS, ARG. (Elev 114 m); Latitude: 38.3S; Longitude: 60.3W; Precipitation (mm) - (1931-1990 average) Temperatures (C) - (1931-1990 average)	WMO: 87688	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			81	67	83	87	67	29	42	43	54	84	75	95
			21.2	20.5	18.1	14.2	10.5	7.5	7.4	8.5	10.9	13.5	16.4	19.7
E8:	SANTIAGO, CHILE (Elev 196 m); Latitude: 33.4S; Longitude: 70.7W; Precipitation (mm) - (1941-1970 average) Temperatures (C) - (1941-1970 average)	WMO: 85577	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			1	4	4	20	52	62	62	61	22	13	5	2
			20.9	20.2	17.8	14.3	11.2	8.6	8.1	9.4	11.7	14.5	17.5	19.9
E9:	TEMUCO, CHILE (Elev 114 m); Latitude: 38.8S; Longitude: 72.7W; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	WMO: 85743	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			37	41	43	77	164	176	177	138	92	82	60	58
			16.0	15.6	14.0	11.2	9.7	7.6	7.5	7.8	9.0	10.8	12.7	14.8

-- continued

Appendix I: Climate station, location and normal climate data -- (continued)

Station Code	Name, location, and elevation	Monthly normal precipitaton (mm) and temperature (c)												
Region F: Brazil														
F1:	PORTO VELHO (Elev 105 m); Latitude: 8.8S; Longitude: 63.9W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 82825	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			312	322	290	232	119	39	31	46	114	196	215	317
			25.4	25.5	25.5	25.6	25.1	24.2	23.8	25.2	25.5	25.8	25.7	25.5
F2:	QUIXERAMOBIM (Elev 199 m); Latitude: 5.2S; Longitude: 39.3W; Precipitation (mm) - (1896-1990 average) Temperatures (C) - (1896-1990 average)	WMO: 82586	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			74	129	180	184	133	76	44	10	3	2	13	23
			28.2	27.4	26.7	26.4	26.2	25.7	26.0	27.4	28.1	28.5	28.5	28.7
F3:	MACEIO (Elev 115 m); Latitude: 9.5S; Longitude: 35.8W; Precipitation (mm) - (1943-1960 average) Temperatures (C) - (1943-1960 average)	WMO: 82993	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			51	107	113	191	280	303	281	181	109	40	38	48
			25.3	25.3	25.3	24.7	24.2	23.2	22.5	22.3	23.1	24.0	25.0	25.3
F4:	CUIABA (Elev 165 m); Latitude: 15.6S; Longitude: 56.1W; Precipitation (mm) - (1901-1990 average) Temperatures (C) - (1901-1990 average)	WMO: 83361	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			212	204	183	127	45	14	10	15	59	124	159	193
			26.7	26.5	26.4	26.2	24.6	23.3	23.1	25.2	26.6	27.5	27.2	27.1
F5:	GOIANIA (Elev 733 m); Latitude: 16.7S; Longitude: 49.3W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 83423	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			267	221	204	128	36	9	7	10	46	173	225	259
			24.2	23.9	24.1	23.8	22.4	21.4	21.1	23.1	24.6	24.6	24.1	23.7
F6:	ILHEUS (Elev 65 m); Latitude: 14.8S; Longitude: 39.0W; Precipitation (mm) - (1931-1960 average) Temperatures (C) - (1931-1960 average)	WMO: 83348	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			149	162	254	270	170	195	191	130	97	124	189	152
			25.9	26.1	25.9	25.2	23.8	22.7	22.0	22.4	23.4	24.3	24.9	25.5
F7:	CAMPO GRANDE (Elev 559 m); Latitude: 20.5S; Longitude: 54.7W; Precipitation (mm) - (1931-1960 average) Temperatures (C) - (1961-1990 average)	WMO: 83612	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			229	199	140	101	81	50	36	29	62	162	157	191
			25.1	24.8	24.9	23.9	21.6	20.4	20.6	22.5	23.3	24.7	25.0	24.9
F8:	POCOS DE CALDAS (Elev 1252 m); Latitude: 21.8S; Longitude: 46.6W; Precipitation (mm) - (1931-1960 average) Temperatures (C) - (1931-1960 average)	WMO: 83681	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			317	248	218	83	55	30	26	25	69	142	201	284
			20.3	20.4	19.8	17.8	15.1	13.6	13.6	15.6	17.5	19.0	19.4	19.8
F9:	LONDRINA (Elev 566 m); Latitude: 23.4S; Longitude: 51.2W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 83766	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			222	179	142	113	102	96	68	56	100	166	151	239
			23.5	24.2	23.8	21.7	18.9	17.1	16.7	18.3	19.4	21.5	22.6	23.2

Appendix I: Climate station, location and normal climate data -- (continued)

Station Code	Name, location, and elevation	Monthly normal precipitation (mm) and temperature (c)												
F10:	PASSO FUNDO (Elev 680 m); Latitude: 28.3S; Longitude: 52.4W; Precipitation (mm) - (1931-1960 average) Temperatures (C) - (1931-1960 average)	WMO: 83914	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			144	147	120	129	140	149	132	132	160	162	111	133
			22.4	21.8	20.3	17.0	14.7	13.2	13.3	13.8	15.6	18.1	19.5	21.8
F11:	BAGE (Elev 196 m); Latitude: 31.3S; Longitude: 54.1W; Precipitation (mm) - (1931-1960 average) Temperatures (C) - (1931-1960 average)	WMO: 83980	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			108	96	97	120	120	119	104	112	125	134	75	77
			24.2	23.5	21.7	17.8	14.8	12.9	12.2	13.3	14.9	17.5	20.1	22.8
Region G: Europe														
G1:	MANCHESTER AIRPORT (Elev 78 m); Latitude: 53.3N; Longitude: 2.3W; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	WMO: 03334	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			69	50	59	50	61	66	69	81	74	77	78	78
			4.0	4.0	5.8	8.0	11.3	14.2	15.8	15.7	13.5	10.7	6.5	4.7
G2:	LONDON/GATWICK (Elev 62 m); Latitude: 51.2N; Longitude: 0.2W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 03776	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			78	51	60	54	55	57	45	56	68	73	77	79
			4.1	4.1	6.0	7.9	11.4	14.3	16.8	16.4	13.8	10.8	6.8	5.4
G3:	ALBORG (Elev 3 m); Latitude: 57.1N; Longitude: 9.9E; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 06030	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			43	28	37	35	43	51	62	60	65	66	62	51
			0.3	0.0	2.1	5.5	11.0	14.2	16.0	15.7	12.1	8.6	4.5	1.8
G4:	HAMBURG (Elev 16 m); Latitude: 53.6N; Longitude: 10.0E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	WMO: 10147	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			61	41	56	51	57	75	82	69	70	63	72	72
			0.5	1.1	3.7	7.3	12.2	15.5	16.8	16.6	13.5	9.7	5.1	1.9
G5:	NURNBERG (Elev 312 m); Latitude: 49.5N; Longitude: 11.1E; Precipitation (mm) - (1955-1990 average) Temperatures (C) - (1955-1990 average)	WMO: 10763	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			45	39	46	48	65	75	69	65	51	45	44	52
			-0.6	0.5	3.9	8.2	13.2	16.6	18.3	17.6	14.0	9.0	3.9	0.6
G6:	PARIS/LE BOURGET (Elev 66 m); Latitude: 49.0N; Longitude: 2.5E; Precipitation (mm) - (1874-1990 average) Temperatures (C) - (1874-1990 average)	WMO: 07150	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			53	46	54	44	63	57	54	52	54	55	57	53
			3.5	4.2	6.6	9.5	13.2	16.3	18.3	18.0	15.3	11.4	6.7	4.3
G7:	TOULOUSE (Elev 152 m); Latitude: 43.6N; Longitude: 1.4E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	WMO: 07630	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			52	51	58	62	74	60	42	48	47	52	48	55
			5.0	6.5	8.3	11.0	14.5	18.2	21.1	20.5	18.0	13.8	8.6	5.7

Appendix I: Climate station, location and normal climate data -- (continued)

Station Code	Name, location, and elevation	Monthly normal precipitation (mm) and temperature (c)												
G8:	MILANO/LINATE (Elev 107 m); Latitude: 45.4N; Longitude: 9.3E; Precipitation (mm) - (1851-1990 average) Temperatures (C) - (1866-1990 average)	WMO: 16080	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			64	61	78	88	97	68	63	92	67	104	95	55
			1.1	3.8	8.0	12.1	16.5	20.6	23.2	22.0	18.6	12.9	6.7	2.1
G9:	KARLSTAD (Elev 55 m); Latitude: 59.4N; Longitude: 13.5E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	WMO: 02418	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			45	31	37	37	42	53	61	72	70	67	71	48
			-4.0	-4.3	-0.7	3.9	10.2	15.0	16.3	15.3	11.1	6.8	1.5	-2.2
G10:	HELSINKI/SEUTULA (Elev 51 m); Latitude: 60.3N; Longitude: 25.0E; Precipitation (mm) - (1851-1990 average) Temperatures (C) - (1851-1990 average)	WMO: 02974	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			41	31	34	37	35	44	72	80	73	73	71	57
			-6.7	-6.6	-2.8	2.9	9.9	14.9	16.6	15.0	10.0	5.3	0.2	-4.0
G11:	SZCZECIN (Elev 1 m); Latitude: 53.4N; Longitude: 14.6E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	WMO: 12205	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			36	28	32	38	52	57	61	55	44	39	47	41
			-0.9	-0.1	3.1	7.5	12.8	16.3	17.6	17.3	13.7	9.3	4.3	0.8
G12:	WARSAWA/OKECIE (Elev 106 m); Latitude: 52.2N; Longitude: 21.0E; Precipitation (mm) - (1885-1990 average) Temperatures (C) - (1885-1990 average)	WMO: 12375	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			22	21	28	33	57	72	67	60	41	37	41	33
			-3.2	-1.9	2.1	7.7	13.4	16.6	17.9	17.3	13.2	8.4	3.3	-0.8
G13:	PRAGUE/RUZYN (Elev 369 m); Latitude: 50.1N; Longitude: 14.3E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	WMO: 11518	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			24	23	28	38	79	73	66	69	40	30	31	24
			-2.3	-0.8	3.0	7.7	12.7	15.9	17.5	17.0	13.3	8.4	2.9	-0.4
G14:	SLIAC (Elev 316 m); Latitude: 48.6N; Longitude: 19.1E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	WMO: 11903	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			43	42	42	47	64	86	59	69	56	51	68	53
			-3.7	-1.0	3.1	8.6	13.6	16.6	18.1	17.4	13.5	8.5	3.1	-1.7
G15:	TIMISOARA (Elev 89 m); Latitude: 45.8N; Longitude: 21.3E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	WMO: 15247	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			38	35	36	47	62	77	63	44	38	32	46	52
			-1.5	1.2	5.8	11.2	16.2	19.2	21.1	20.4	16.6	11.1	5.6	0.9
G16:	BELGRADE (Elev 132 m); Latitude: 44.8N; Longitude: 20.5E; Precipitation (mm) - (1888-1990 average) Temperatures (C) - (1888-1990 average)	WMO: 13274	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			49	44	52	59	72	93	69	54	50	42	55	58
			0.6	2.8	7.1	12.2	17.3	20.0	21.5	21.3	17.6	12.5	7.0	2.4

Appendix I: Climate station, location and normal climate data -- (continued)

Station Code	Name, location, and elevation	Monthly normal precipitation (mm) and temperature (c)											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
G17:	PLEVEN (Elev 71 m); Latitude: 43.4N; Longitude: 24.6E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	40	37	37	47	65	76	56	35	36	40	47	47
		-1.2	1.0	5.1	12.3	17.3	20.7	23.0	22.9	18.3	12.3	6.9	1.1
		WMO: 15526											
G18:	VALLADOLID (Elev 696 m); Latitude: 41.7N; Longitude: 4.7W; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	47	40	33	43	47	35	17	12	33	36	52	41
		4.0	5.8	7.8	10.0	13.6	17.7	21.4	20.9	18.2	13.0	7.5	4.2
		WMO: 08141											
G19:	ALICANTE (Elev 81 m); Latitude: 38.4N; Longitude: 0.5W; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	19	27	26	34	32	24	4	9	40	70	44	35
		11.7	12.4	13.7	15.7	18.8	22.1	25.1	25.4	23.3	19.2	15.1	12.0
		WMO: 08359											
G20:	SEVILLA/TABLADA (Elev 14 m); Latitude: 37.4N; Longitude: 6.0W; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	91	78	52	57	33	17	2	5	18	66	96	92
		10.9	12.2	14.0	16.2	19.7	23.4	26.8	26.9	24.5	19.7	14.5	11.2
		WMO: 08390											
G21:	ROME/FIUMICINO (Elev 2 m); Latitude: 41.8N; Longitude: 12.2E; Precipitation (mm) - (1871-1990 average) Temperatures (C) - (1871-1990 average)	84	73	64	51	35	21	13	31	71	92	107	90
		8.1	8.9	10.8	13.4	17.2	21.0	23.8	23.8	21.0	17.0	12.5	9.2
		WMO: 16242											
G22:	MARINA DI GINOSA (Elev 12 m); Latitude: 40.4N; Longitude: 16.9E; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	44	49	43	31	26	19	21	21	29	60	52	49
		8.7	9.3	11.1	13.4	17.6	21.9	24.9	24.8	21.8	17.5	12.6	9.6
		WMO: 16325											
G23:	LARISA (Elev 73 m); Latitude: 39.6N; Longitude: 22.5E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	58	39	38	30	37	24	21	16	32	47	60	55
		5.1	6.8	9.5	14.0	19.5	24.7	26.8	25.9	22.0	16.0	10.7	6.3
		WMO: 16648											
Region H: Former Soviet Union													
H1:	KAUNAS, LITHUANIA (Elev 75 m); Latitude: 54.9N; Longitude: 23.9E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	36	27	33	41	55	93	72	66	57	48	52	45
		-4.9	-4.1	-0.3	6.0	12.6	15.9	17.0	16.2	12.1	7.1	2.2	-2.3
		WMO: 26629											
H2:	MINSK, BELARUS (Elev 234 m); Latitude: 53.9N; Longitude: 27.5E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	38	33	40	43	60	77	102	73	56	48	51	48
		-6.8	-5.8	-1.3	6.1	13.1	16.1	17.3	16.5	11.8	6.3	0.8	-4.0
		WMO: 26850											

Appendix I: Climate station, location and normal climate data -- (continued)

Station Code	Name, location, and elevation	Monthly normal precipitaton (mm) and temperature (c)											
H3: MOSCOW OBSY., RUSSIA (Elev 156 m); Latitude: 55.8N; Longitude: 37.6E; Precipitation (mm) - (1881-1990 average) Temperatures (C) - (1881-1990 average)	WMO: 27612 Jan 40 Feb 36 Mar 33 Apr 42 May 54 Jun 77 Jul 91 Aug 74 Sep 61 Oct 55 Nov 56 Dec 50	-9.0	-7.5	-2.4	5.8	13.1	16.7	18.2	16.4	10.9	5.0	-1.2	-5.9
H4: KAZAN, RUSSIA (Elev 64 m); Latitude: 55.8N; Longitude: 49.2E; Precipitation (mm) - (1881-1990 average) Temperatures (C) - (1881-1990 average)	WMO: 27595 Jan 32 Feb 28 Mar 26 Apr 35 May 35 Jun 68 Jul 69 Aug 68 Sep 45 Oct 46 Nov 44 Dec 36	-12.9	-11.4	-5.2	4.5	13.2	17.3	19.4	17.2	11.2	3.5	-3.3	-8.9
H5: KRASNODAR, RUSSIA (Elev 32 m); Latitude: 45.0N; Longitude: 39.1E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	WMO: 34929 Jan 66 Feb 55 Mar 56 Apr 53 May 63 Jun 77 Jul 46 Aug 56 Sep 29 Oct 36 Nov 61 Dec 75	-0.1	0.0	3.5	11.6	17.1	21.0	23.6	22.9	17.4	11.1	6.2	1.9
H6: VORONEZH, RUSSIA (Elev 164 m); Latitude: 51.7N; Longitude: 39.2E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	WMO: 34122 Jan 40 Feb 33 Mar 30 Apr 38 May 45 Jun 69 Jul 73 Aug 56 Sep 53 Oct 37 Nov 52 Dec 50	-8.6	-8.0	-2.3	7.9	14.9	18.2	19.6	18.4	13.0	6.0	-0.1	-5.0
H7: SARATOV, RUSSIA (Elev 156 m); Latitude: 51.6N; Longitude: 46.0E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	WMO: 34172 Jan 34 Feb 23 Mar 20 Apr 27 May 50 Jun 44 Jul 52 Aug 41 Sep 36 Oct 32 Nov 40 Dec 32	-10.8	-10.7	-4.4	6.6	14.7	18.4	20.4	18.6	12.5	4.8	-1.7	-7.5
H8: OMSK, RUSSIA (Elev 94 m); Latitude: 54.9N; Longitude: 73.4E; Precipitation (mm) - (1921-1990 average) Temperatures (C) - (1887-1990 average)	WMO: 28698 Jan 22 Feb 15 Mar 14 Apr 21 May 33 Jun 58 Jul 61 Aug 54 Sep 32 Oct 31 Nov 27 Dec 21	-17.1	-16.6	-8.0	3.4	11.7	17.7	19.7	16.1	10.5	1.7	-7.3	-14.2
H9: BARNAUL, RUSSIA (Elev 196 m); Latitude: 53.3N; Longitude: 83.7E; Precipitation (mm) - (1921-1990 average) Temperatures (C) - (1881-1990 average)	WMO: 29838 Jan 24 Feb 24 Mar 19 Apr 25 May 38 Jun 43 Jul 62 Aug 51 Sep 29 Oct 50 Nov 34 Dec 29	-14.8	-14.9	-7.3	2.9	11.8	17.8	19.8	16.6	11.0	2.5	-6.6	-13.5
H10: KIEV, UKRAINE (Elev 179 m); Latitude: 50.4N; Longitude: 30.5E; Precipitation (mm) - (1881-1990 average) Temperatures (C) - (1881-1990 average)	WMO: 33345 Jan 42 Feb 47 Mar 37 Apr 47 May 51 Jun 72 Jul 87 Aug 71 Sep 46 Oct 33 Nov 49 Dec 44	-5.4	-4.0	0.7	8.7	15.2	18.1	19.3	18.6	13.8	8.1	2.1	-2.1
H11: KHARKIV, UKRAINE (Elev 152 m); Latitude: 49.9N; Longitude: 36.3E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	WMO: 34300 Jan 44 Feb 35 Mar 28 Apr 36 May 47 Jun 59 Jul 58 Aug 78 Sep 40 Oct 35 Nov 43 Dec 45	-6.6	-5.5	-0.3	9.0	15.6	18.8	20.4	19.3	14.1	7.4	1.5	-3.1

Appendix I: Climate station, location and normal climate data -- (continued)

Station Code	Name, location, and elevation	Monthly normal precipitaton (mm) and temperature (c)												
H12:	KISHINEV, MOLDOVA (Elev 95 m); Latitude: 47.0N; Longitude: 28.9E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	WMO: 33815	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			38	40	26	34	42	74	51	45	40	23	48	38
			-3.1	-2.0	1.3	10.0	16.0	20.0	21.9	21.1	16.2	10.3	4.7	-0.2
H13:	KIROVOHRAD, UKRAINE (Elev 148 m); Latitude: 48.5N; Longitude: 32.3E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	WMO: 33711	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			35	30	24	31	48	52	61	44	36	32	35	37
			-5.2	-4.8	-0.4	8.4	15.1	19.2	21.2	20.1	14.0	8.4	2.0	-2.2
H14:	KUSTANAY, KAZAKH. (Elev 171 m); Latitude: 53.2N; Longitude: 63.6E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	WMO: 28952	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			17	13	15	23	25	39	58	32	27	25	23	20
			-16.4	-15.0	-7.9	5.4	13.7	19.0	20.9	17.9	11.9	3.1	-5.3	-12.4
H15:	AKMOLA, KAZAKH. (Elev 349 m); Latitude: 51.1N; Longitude: 71.4E; Precipitation (mm) - (1931-1960 average) Temperatures (C) - (1931-1960 average)	WMO: 35188	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			7	6	9	14	27	32	50	34	24	18	12	10
			-17.3	-16.8	-10.7	3.0	12.5	18.1	19.9	17.6	11.2	2.9	-8.2	-14.9
Region I: Former Soviet Union, Central Asia														
I1:	CHIMBAY, UZBEK. (Elev 66 m); Latitude: 43.0N; Longitude: 59.8E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	WMO: 38262	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			17	8	13	19	9	7	3	3	2	7	8	36
			-5.4	-4.0	3.0	12.8	20.2	25.4	27.4	24.5	17.6	9.6	3.5	-2.1
I2:	TASHKENT, UZBEK. (Elev 428 m); Latitude: 41.3N; Longitude: 69.3E; Precipitation (mm) - (1877-1990 average) Temperatures (C) - (1881-1990 average)	WMO: 38457	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			52	46	71	60	46	7	3	2	4	34	43	51
			1.3	2.4	8.6	15.4	20.4	25.6	27.6	25.3	20.1	12.9	7.8	3.1
I3:	ASHKABAD, TURKMEN. (Elev 230 m); Latitude: 38.0N; Longitude: 58.3E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	WMO: 38880	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			25	26	43	42	28	4	3	1	5	16	21	23
			2.1	4.3	9.7	16.9	23.1	28.5	30.9	28.7	23.0	15.1	9.7	4.3
I4:	DUSHANBE, TAJIK. (Elev 824 m); Latitude: 38.6N; Longitude: 68.8E; Precipitation (mm) - (1930-1970 average) Temperatures (C) - (1963--999 average)	WMO: 38836	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			21	66	112	115	65	12	0	0	0	33	50	51
			1.4	3.2	8.7	14.9	19.6	24.2	28.2	26.8	21.6	14.9	9.5	4.7

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Appendix I: Climate station, location and normal climate data -- (continued)

Station Code	Name, location, and elevation	Monthly normal precipitaton (mm) and temperature (c)												
Region J: Mid East and Egypt														
J1:	BURSA (Elev 101 m); Latitude: 40.2N; Longitude: 29.1E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	WMO: 17116	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			94	66	63	62	44	29	16	18	34	57	81	119
			4.9	6.3	8.1	12.6	16.9	21.5	23.6	23.1	19.3	14.6	10.9	7.4
J2:	SAMSUN (Elev 4 m); Latitude: 41.3N; Longitude: 36.3E; Precipitation (mm) - (1929-1990 average) Temperatures (C) - (1929-1990 average)	WMO: 17030	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			64	50	56	62	49	46	31	33	51	86	86	82
			6.9	7.2	8.0	11.2	15.4	20.0	22.6	22.7	19.6	15.6	12.8	9.2
J3:	ANKARA (Elev 806 m); Latitude: 40.0N; Longitude: 32.7E; Precipitation (mm) - (1926-1990 average) Temperatures (C) - (1941-1970 average)	WMO: 17129	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			46	39	38	44	55	37	13	8	21	24	27	46
			0.3	1.1	5.0	11.1	15.9	20.0	23.1	23.2	18.3	12.5	7.5	2.6
J4:	MUGLA (Elev 646 m); Latitude: 37.2N; Longitude: 28.4E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	WMO: 17292	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			240	194	122	62	41	19	6	8	19	71	123	272
			5.4	5.7	8.5	12.4	17.4	22.4	25.8	25.5	21.6	15.6	10.8	7.0
J5:	GAZIANTEP (Elev 855 m); Latitude: 37.1N; Longitude: 37.4E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	WMO: 17260	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			106	85	72	45	34	7	2	0	3	30	57	99
			2.8	3.9	7.4	12.7	18.0	23.7	27.3	27.1	22.3	15.5	9.2	4.5
J6:	KAMISHLI (Elev 452 m); Latitude: 37.0N; Longitude: 41.2E; Precipitation (mm) - (1952-1990 average) Temperatures (C) - (1952-1990 average)	WMO: 40001	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			78	70	65	73	34	2	0	0	0	21	37	70
			6.2	7.6	11.5	16.0	22.0	28.3	32.1	31.6	27.4	20.9	13.7	8.0
J7:	HAMA (Elev 310 m); Latitude: 35.1N; Longitude: 36.8E; Precipitation (mm) - (1951-1960 average) Temperatures (C) - (1951-1960 average)	WMO: 40030	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			69	61	41	28	12	2	0	0	0	7	29	50
			7.4	8.4	11.7	16.7	21.9	26.0	28.3	28.9	25.1	20.4	13.5	8.2
J8:	AMMAN (Elev 767 m); Latitude: 32.0N; Longitude: 36.0E; Precipitation (mm) - (1923-1990 average) Temperatures (C) - (1923-1990 average)	WMO: 40270	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			65	54	49	23	3	0	0	0	0	8	26	51
			7.8	9.0	11.6	15.7	20.1	23.6	25.1	25.2	23.4	19.8	14.3	9.4
J9:	CAIRO (Elev 74 m); Latitude: 30.1N; Longitude: 31.4E; Precipitation (mm) - (1903-1990 average) Temperatures (C) - (1951-1990 average)	WMO: 62366	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			6	3	6	2	0	0	0	0	0	0	4	7
			13.8	15.3	17.5	21.7	24.9	27.4	28.1	27.9	26.7	23.7	18.9	15.3

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Appendix I: Climate station, location and normal climate data -- (continued)

Station Code	Name, location, and elevation	Monthly normal precipitation (mm) and temperature (C)											
J10: MOSUL (Elev 222 m); Latitude: 36.3N; Longitude: 43.1E; Precipitation (mm) - (1923-1990 average) Temperatures (C) - (1961--999 average)	WMO: 40608 Jan Feb 59 64 7.2 6.1 12.2 17.2 23.9 28.9 32.8 32.2 27.8 21.1 15.0 8.9	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
J11: NASIRIYA (Elev 3 m); Latitude: 31.1N; Longitude: 46.2E; Precipitation (mm) - (1941-1990 average) Temperatures (C) - (1941-1970 average)	WMO: 40676 Jan Feb 22 17 11.5 13.8 18.1 23.4 29.6 32.7 34.1 34.4 31.7 0 0 3 14 19	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
J12: TEHERAN (Elev 1191 m); Latitude: 35.7N; Longitude: 51.3E; Precipitation (mm) - (1893-1990 average) Temperatures (C) - (1951--999 average)	WMO: 40754 Jan Feb 34 30 2.2 5.0 9.4 15.6 21.1 26.7 30.0 28.9 25.0 18.3 11.7 5.6	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Region K: China													
K1: URUMQI (Elev 654 m); Latitude: 43.9N; Longitude: 87.5E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 51463 Jan Feb 8 8 -12.2 -10.2 -1.9 9.6 16.4 21.0 23.7 22.4 16.7 7.4 -2.8 -9.1	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
K2: URAD ZHONGQI (HALIUT) (Elev 1290 m); Latitude: 41.6N; Longitude: 108.5E; Precipitation (mm) - (1954-1990 average) Temperatures (C) - (1938--999 average)	WMO: 53336 Jan Feb 2 1 -15.9 -11.8 -2.3 6.7 15.0 20.0 22.1 20.0 13.3 5.3 -5.3 -14.0	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
K3: HARBIN (Elev 173 m); Latitude: 45.7N; Longitude: 126.6E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1941-1960 average)	WMO: 50953 Jan Feb 3 5 -20.3 -15.7 -6.5 5.7 13.8 19.7 23.2 21.6 14.2 5.3 -7.2 -17.4	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
K4: SHENYANG (Elev 43 m); Latitude: 41.8N; Longitude: 123.6E; Precipitation (mm) - (1958-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 54342 Jan Feb 7 15 -10.6 -6.8 1.3 10.3 17.1 22.1 24.4 23.7 17.5 10.0 0.4 -6.6	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
K5: XIAN (Elev 398 m); Latitude: 34.3N; Longitude: 108.9E; Precipitation (mm) - (1922-1990 average) Temperatures (C) - (1922-1990 average)	WMO: 57036 Jan Feb 6 11 -0.2 2.2 7.8 14.2 19.4 24.8 26.2 25.5 19.5 14.0 6.7 1.0	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
K6: HEZE (Elev 51 m); Latitude: 35.3N; Longitude: 115.4E; Precipitation (mm) - (1954-1990 average) Temperatures (C) - (1898--999 average)	WMO: 54906 Jan Feb 8 10 -1.6 0.8 7.1 14.1 21.0 25.9 27.4 26.3 20.6 14.8 7.3 0.8	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

Appendix I: Climate station, location and normal climate data -- (continued)

Station Code	Name, location, and elevation	Monthly normal precipitation (mm) and temperature (c)											
K7: CHONGQING (CHUNGKING) (Elev 351 m); Latitude: 29.5N; Longitude: 106.5E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1916-1960 average)													
WMO: 57515		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		22	25	38	91	160	162	160	129	145	93	52	26
		9.2	9.9	14.3	19.7	23.1	25.9	28.0	29.1	24.4	19.4	14.8	10.2
K8: CHANGSHA (Elev 44 m); Latitude: 28.2N; Longitude: 113.0E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1940--999 average)													
WMO: 57679		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		62	91	138	205	188	197	102	100	62	85	72	45
		5.1	6.4	11.2	16.8	22.3	25.5	29.3	29.2	24.4	18.5	12.5	7.1
K9: HANGZHOU (Elev 43 m); Latitude: 30.2N; Longitude: 120.2E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1933-1960 average)													
WMO: 58457		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		59	88	110	128	163	180	121	167	168	92	59	49
		4.7	5.4	9.1	15.0	20.2	24.5	28.3	27.9	23.2	18.2	11.8	6.0
K10: KUNMING (Elev 1892 m); Latitude: 25.0N; Longitude: 102.7E; Precipitation (mm) - (1921-1990 average) Temperatures (C) - (1921-1990 average)													
WMO: 56778		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		13	14	16	26	92	170	202	205	122	85	40	17
		7.8	9.6	12.7	16.1	19.0	19.6	19.8	19.2	17.5	15.1	11.4	8.1
K11: GUANGZHOU (CANTON) (Elev 7 m); Latitude: 23.1N; Longitude: 113.3E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1961-1990 average)													
WMO: 59287		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		43	64	84	182	266	258	213	208	159	79	42	25
		13.5	14.2	17.5	21.8	25.4	27.5	28.7	28.6	27.2	24.2	19.2	15.1
K12: HAIKOU (Elev 15 m); Latitude: 20.0N; Longitude: 110.4E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1961-1990 average)													
WMO: 59758		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		23	34	52	106	182	211	209	224	258	201	97	34
		17.7	18.4	21.5	25.0	27.2	28.5	28.7	28.1	27.3	25.3	22.2	18.9
Region I: South Asia													
L1: PESHAWAR (Elev 360 m); Latitude: 34.0N; Longitude: 71.6E; Precipitation (mm) - (1862-1990 average) Temperatures (C) - (1931-1990 average)													
WMO: 41530		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		25	44	120	48	28	8	43	68	17	11	13	22
		11.2	13.0	17.3	23.1	28.3	33.0	32.0	30.9	28.8	23.5	17.6	12.5
L2: HYDERABAD (Elev 28 m); Latitude: 25.4N; Longitude: 68.4E; Precipitation (mm) - (1866-1990 average) Temperatures (C) - (1878-1990 average)													
WMO: 41765		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		1	4	5	6	4	14	56	58	19	0	1	2
		17.8	21.1	26.1	30.9	33.9	34.1	32.6	31.5	31.2	29.7	24.5	19.4
L3: AMRITSAR (Elev 234 m); Latitude: 31.6N; Longitude: 74.9E; Precipitation (mm) - (1948-1990 average) Temperatures (C) - (1948-1990 average)													
WMO: 42071		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		25	32	42	25	19	57	200	179	86	15	7	17
		11.6	14.1	19.0	25.0	29.7	32.3	30.4	29.7	28.6	24.0	17.9	12.8

Appendix I: Climate station, location and normal climate data -- (continued)

Station Code	Name, location, and elevation	Monthly normal precipitaton (mm) and temperature (c)											
L4: BAREILLY (Elev 172 m); Latitude: 28.4N; Longitude: 79.4E; Precipitation (mm) - (1931-1960 average) Temperatures (C) - (1931-1960 average)	WMO: 42189 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 25 22 14 8 15 102 346 297 172 62 3 5 15.3 17.8 23.3 29.1 33.2 33.3 30.0 29.1 28.8 25.9 20.5 16.6	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
L5: GAUHATI (Elev 54 m); Latitude: 26.1N; Longitude: 91.6E; Precipitation (mm) - (1902-1990 average) Temperatures (C) - (1902-1990 average)	WMO: 42410 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 10 19 52 160 228 322 354 245 181 82 21 7 17.0 19.0 23.0 25.4 26.7 28.2 28.6 28.7 28.0 26.0 22.0 17.9	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
L6: RAJKOT (Elev 134 m); Latitude: 22.3N; Longitude: 70.8E; Precipitation (mm) - (1931-1960 average) Temperatures (C) - (1931-1960 average)	WMO: 42737 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 1 0 1 2 7 99 293 143 93 25 5 4 19.4 21.9 26.3 30.1 32.6 32.0 28.8 27.8 27.9 28.2 24.8 20.9	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
L7: INDORE (Elev 562 m); Latitude: 22.7N; Longitude: 75.8E; Precipitation (mm) - (1877-1990 average) Temperatures (C) - (1878-1990 average)	WMO: 42754 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 5 3 3 3 18 136 276 313 180 41 21 10 18.0 20.3 25.1 29.8 32.3 30.1 26.4 25.1 25.7 24.9 21.7 18.7	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
L8: PENDRA (Elev 624 m); Latitude: 22.8N; Longitude: 81.9E; Precipitation (mm) - (1931-1960 average) Temperatures (C) - (1931-1960 average)	WMO: 42779 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 29 31 25 21 22 205 401 393 229 83 11 11 17.4 19.5 24.6 29.2 32.7 29.3 25.8 25.4 25.4 23.4 19.8 17.2	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
L9: CHANDBALI (Elev 5 m); Latitude: 20.8N; Longitude: 86.7E; Precipitation (mm) - (1931-1960 average) Temperatures (C) - (1931-1960 average)	WMO: 42973 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 10 19 26 43 90 201 348 334 264 229 57 7 20.9 23.7 27.8 30.7 31.5 30.3 28.6 28.6 28.6 27.2 23.6 20.8	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
L10: POONA (Elev 559 m); Latitude: 18.5N; Longitude: 73.9E; Precipitation (mm) - (1856-1990 average) Temperatures (C) - (1876-1990 average)	WMO: 43063 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 0 2 3 12 45 124 188 125 132 66 23 7 20.4 22.1 25.7 29.0 29.7 27.4 25.2 24.5 25.0 25.0 22.3 20.4	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
L11: BEGAMPET (Elev 545 m); Latitude: 17.5N; Longitude: 78.5E; Precipitation (mm) - (1893-1990 average) Temperatures (C) - (1893-1990 average)	WMO: 43128 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 5 8 15 21 34 107 169 160 171 93 23 7 21.9 24.8 28.1 31.1 32.6 29.1 26.7 26.0 26.2 25.4 22.9 21.3	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
L12: BANGALORE (Elev 920 m); Latitude: 13.0N; Longitude: 77.6E; Precipitation (mm) - (1851-1990 average) Temperatures (C) - (1875-1990 average)	WMO: 43295 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 2 6 12 40 106 114 108 129 218 142 63 26 21.1 23.4 26.0 27.8 27.3 24.7 23.7 23.5 23.8 23.5 22.1 21.0	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Appendix I: Climate station, location and normal climate data -- (continued)

Station Code	Name, location, and elevation	Monthly normal precipitaton (mm) and temperature (c)												
Region M: Southeast Asia														
M1:	MANDALAY (Elev 74 m); Latitude: 22.0N; Longitude: 96.1E; Precipitation (mm) - (1889-1990 average) Temperatures (C) - (1931-1990 average)	WMO: 48042	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			3	0	11	43	159	119	89	136	147	109	33	8
			20.8	23.2	27.9	30.9	30.9	29.6	29.5	28.8	28.5	27.2	24.8	21.5
M2:	MINGALADON (Elev 28 m); Latitude: 16.9N; Longitude: 96.2E; Precipitation (mm) - (1951-1960 average) Temperatures (C) - (1951-1960 average)	WMO: 48096	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			11	1	5	24	229	543	567	801	385	186	27	22
			24.7	26.2	28.3	30.6	30.3	27.4	27.0	27.1	27.1	27.6	27.2	24.8
M3:	CHIANG MAI (Elev 312 m); Latitude: 18.8N; Longitude: 99.0E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1952-1990 average)	WMO: 48327	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			8	4	12	50	161	132	161	237	230	121	58	15
			21.4	23.6	26.6	28.9	28.7	28.0	27.7	27.2	27.2	26.4	24.3	21.6
M4:	NAKHON SAWAN (Elev 34 m); Latitude: 15.8N; Longitude: 100.2E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	WMO: 48400	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			11	16	31	61	141	116	133	200	225	142	39	7
			25.3	28.3	30.4	31.8	30.6	29.8	29.3	28.8	28.3	27.8	26.4	24.4
M5:	UDON THANI (Elev 182 m); Latitude: 17.4N; Longitude: 102.8E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	WMO: 48354	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			6	14	37	83	220	229	222	279	244	87	10	3
			22.5	25.1	27.9	29.7	29.2	28.8	28.4	28.0	27.7	27.0	24.9	22.2
M6:	UBON RATCHATHANI (Elev 123 m); Latitude: 15.3N; Longitude: 104.9E; Precipitation (mm) - (1931-1960 average) Temperatures (C) - (1931-1960 average)	WMO: 48407	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			1	1	40	72	172	205	261	313	310	132	23	3
			23.8	26.1	28.5	29.8	29.2	28.4	27.9	27.8	27.3	26.6	25.3	23.7
M7:	KRUNG THEP (BANGKOK) (Elev 16 m); Latitude: 13.7N; Longitude: 100.6E; Precipitation (mm) - (1931-1990 average) Temperatures (C) - (1931-1990 average)	WMO: 48455	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			9	24	28	69	220	147	155	197	342	238	53	12
			26.5	28.0	29.4	30.4	29.8	29.3	28.9	28.7	28.4	28.1	27.3	26.0
M8:	PHNOM PENH (Elev 10 m); Latitude: 11.6N; Longitude: 104.9E; Precipitation (mm) - (1906-1990 average) Temperatures (C) - (1954--999 average)	WMO: 48991	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			8	8	26	74	168	142	132	156	234	272	128	29
			26.7	27.8	28.9	30.0	29.4	28.9	28.3	28.3	27.8	27.8	26.7	28.9
M9:	HANOI (Elev 8 m); Latitude: 21.0N; Longitude: 105.8E; Precipitation (mm) - (1930-1960 average) Temperatures (C) - (1930-1960 average)	WMO: 48820	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			18	28	38	81	196	239	323	343	254	99	43	20
			16.7	17.2	20.0	23.9	27.8	29.4	28.9	28.3	27.8	25.0	21.7	18.3

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Appendix I: Climate station, location and normal climate data -- (continued)

Station Code	Name, location, and elevation	Monthly normal precipitaton (mm) and temperature (c)												
M10:	QUI NHON (Elev 6 m); Latitude: 13.8N; Longitude: 109.2E; Precipitation (mm) - (1921-1960 average) Temperatures (C) - (1921-1960 average)	WMO: 48870	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			63	35	25	36	56	57	62	63	260	446	448	171
			23.0	23.7	25.2	27.0	28.6	29.6	29.5	29.5	28.2	26.5	25.2	23.7
M11:	HO CHI MINH (SAIGON) (Elev 19 m); Latitude: 10.8N; Longitude: 106.7E; Precipitation (mm) - (1906-1990 average) Temperatures (C) - (1907-1990 average)	WMO: 48900	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			10	6	11	49	215	294	281	271	309	265	105	34
			26.1	27.1	28.2	29.4	29.1	28.1	27.8	27.6	27.5	27.2	26.9	26.2
M12:	BAN DON (Elev 10 m); Latitude: 9.1N; Longitude: 99.4E; Precipitation (mm) - (1931-1960 average) Temperatures (C) - (1931-1960 average)	WMO: 48551	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			63	28	31	96	204	145	131	144	197	270	312	240
			25.7	26.7	27.9	28.8	28.7	28.1	27.8	27.8	27.5	27.1	26.3	25.6
Region N: Philippines														
N1:	APARRI, LUZON (Elev 4 m); Latitude: 18.4N; Longitude: 121.6E; Precipitation (mm) - (1903-1990 average) Temperatures (C) - (1903-1990 average)	WMO: 98232	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			123	62	46	31	125	143	204	234	226	333	318	188
			23.0	24.2	25.3	27.6	28.9	29.0	28.7	28.2	28.0	27.1	25.6	24.1
N2:	MANILA AIRPORT, LUZON (Elev 23 m); Latitude: 14.5N; Longitude: 121.0E; Precipitation (mm) - (1887-1990 average) Temperatures (C) - (1887-1990 average)	WMO: 98429	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			14	4	5	13	107	240	360	378	316	227	90	55
			25.7	26.1	27.5	29.0	29.4	28.4	27.7	27.4	27.6	27.3	26.8	25.9
N3:	ILOILO (Elev 8 m); Latitude: 10.7N; Longitude: 122.6E; Precipitation (mm) - (1903-1990 average) Temperatures (C) - (1903-1990 average)	WMO: 98637	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			43	23	35	44	121	307	328	363	267	264	173	73
			26.1	26.4	27.3	28.7	29.1	28.0	27.5	27.5	27.5	27.5	27.3	26.7
N4:	LEGASPI, LUZON (Elev 17 m); Latitude: 13.1N; Longitude: 123.7E; Precipitation (mm) - (1903-1990 average) Temperatures (C) - (1903-1990 average)	WMO: 98444	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			294	183	158	146	172	239	271	255	256	313	452	418
			25.3	25.8	26.5	27.5	28.3	28.2	27.8	27.8	27.5	27.2	26.7	25.9
N5:	MAASIN, SAMAR (Elev 19 m); Latitude: 10.1N; Longitude: 124.8E; Precipitation (mm) - (1923-1960 average) Temperatures (C) - (1923-1960 average)	WMO: 98648	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			260	168	135	76	125	165	257	200	258	254	293	318
			25.8	26.1	26.5	27.3	28.0	28.0	27.5	27.4	27.1	27.2	26.8	26.4
N6:	HINATUAN, MINDANAO (Elev 2 m); Latitude: 8.4N; Longitude: 126.3E; Precipitation (mm) - (1939-1960 average) Temperatures (C) - (1939-1960 average)	WMO: 98755	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			724	427	460	322	295	220	218	199	195	210	371	665
			25.6	25.5	25.9	26.4	26.9	26.8	26.8	27.1	27.0	26.9	26.7	25.9

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Appendix I: Climate station, location and normal climate data -- (continued)

Station Code	Name, location, and elevation	Monthly normal precipitation (mm) and temperature (C)												
Region O: Indonesia and Malaysia														
O1:	PENANG (Elev 3 m); Latitude: 5.3N; Longitude: 100.3E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	WMO: 48601	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			69	72	146	218	234	179	192	240	353	382	230	113
			27.0	27.4	27.6	27.8	27.6	27.3	26.9	26.8	26.5	26.4	26.6	26.8
O2:	KUALA LUMPUR (Elev 17 m); Latitude: 3.1N; Longitude: 101.5E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	WMO: 48647	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			163	157	216	273	192	127	131	136	191	272	276	231
			26.1	26.6	26.9	27.0	27.2	27.0	26.6	26.6	26.4	26.4	26.2	26.0
O3:	KUANTAN (Elev 18 m); Latitude: 3.8N; Longitude: 103.2E; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 48657	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			208	106	184	180	199	161	163	200	219	279	332	365
			24.7	25.4	26.2	26.9	27.2	27.0	26.5	26.6	26.4	26.3	25.6	24.8
O4:	DJAKARTA OBSY., JAVA (Elev 8 m); Latitude: 6.2S; Longitude: 106.8E; Precipitation (mm) - (1864-1990 average) Temperatures (C) - (1866-1990 average)	WMO: 96745	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			405	288	222	118	106	93	60	69	66	90	136	208
			26.3	26.4	26.9	27.5	27.6	27.2	26.9	27.0	27.5	27.4	27.3	26.7
O5:	TJILATJAP, JAVA (Elev 6 m); Latitude: 7.7S; Longitude: 109.0E; Precipitation (mm) - (PERIOD UNKNOWN) Temperature data unavailable	WMO: 96805	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			275	249	274	294	241	220	141	113	142	326	449	361
O6:	SEMARANG KALIBENTANG, (Elev 3 m); Latitude: 7.0S; Longitude: 110.4E; Precipitation (mm) - (1961-1980 average) Temperatures (C) - (1961-1990 average)	WMO: 96839	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			454	355	338	244	164	84	105	64	103	175	222	335
			26.7	26.8	27.0	27.3	27.1	27.7	26.8	27.2	27.7	28.0	27.8	27.1
Region P: Japan and Korea														
P1:	INCHON, SOUTH KOREA (Elev 70 m); Latitude: 37.5N; Longitude: 126.6E; Precipitation (mm) - (1905-1990 average) Temperatures (C) - (1905-1990 average)	WMO: 47112	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			22	34	41	83	85	104	282	251	148	45	51	20
			-3.2	-1.1	3.9	10.4	15.9	20.1	23.7	24.8	20.5	14.6	7.0	0.2
P2:	TAEGU, SOUTH KOREA (Elev 58 m); Latitude: 35.9N; Longitude: 128.6E; Precipitation (mm) - (1931-1960 average) Temperatures (C) - (1931-1960 average)	WMO: 47143	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			16	27	46	65	68	132	201	165	162	44	30	25
			-1.4	0.6	5.7	12.0	17.6	21.6	25.3	25.9	20.5	14.2	7.8	1.5

Appendix I: Climate station, location and normal climate data -- (continued)

Station Code	Name, location, and elevation	Monthly normal precipitation (mm) and temperature (c)												
P3:	KWANGJU, S. KOREA (Elev 71 m); Latitude: 35.1N; Longitude: 126.9E; Precipitation (mm) - (1931-1960 average) Temperatures (C) - (1931-1960 average)	WMO: 47156	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			32	34	69	82	92	169	223	201	190	52	43	37
			-0.6	1.1	5.7	11.4	16.8	21.4	25.6	26.1	20.9	14.0	8.2	2.4
P4:	IWAMIZAWA, JAPAN (Elev 33 m); Latitude: 43.2N; Longitude: 141.8E; Precipitation (mm) - (1951-1980 average) Temperatures (C) - (1951-1980 average)	WMO: 47413	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			118	88	63	68	77	93	106	141	135	109	124	132
			-6.4	-5.8	-1.7	5.3	11.4	15.6	19.7	20.8	16.2	9.8	2.9	-2.9
P5:	AKITA, JAPAN (Elev 9 m); Latitude: 39.7N; Longitude: 140.1E; Precipitation (mm) - (1886-1990 average) Temperatures (C) - (1886-1990 average)	WMO: 47582	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			129	93	98	137	114	117	187	190	182	151	182	173
			-0.3	-0.1	2.8	9.1	14.2	18.6	22.6	24.4	19.6	13.1	7.4	2.5
P6:	ISHINOMAKI, JAPAN (Elev 43 m); Latitude: 38.4N; Longitude: 141.3E; Precipitation (mm) - (1951-1980 average) Temperatures (C) - (1951-1980 average)	WMO: 47592	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			44	48	70	78	107	117	129	116	142	117	62	47
			0.3	0.7	3.6	9.2	14.1	17.9	21.5	23.4	19.6	13.9	8.1	3.1
P7:	NIIGATA, JAPAN (Elev 2 m); Latitude: 37.9N; Longitude: 139.1E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	WMO: 47604	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			194	129	107	94	100	121	180	142	161	160	198	219
			2.1	2.2	5.0	11.0	16.2	20.3	24.4	26.2	21.7	15.6	9.9	5.0
P8:	KUMAGAYA, JAPAN (Elev 30 m); Latitude: 36.2N; Longitude: 139.4E; Precipitation (mm) - (1951-1980 average) Temperatures (C) - (1951-1980 average)	WMO: 47626	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			30	39	60	84	118	175	143	151	186	137	54	30
			3.1	3.9	7.0	12.7	17.4	21.0	24.6	25.9	21.7	15.9	10.5	5.5
P9:	FUKUYAMA, JAPAN (Elev 2 m); Latitude: 34.5N; Longitude: 133.3E; Precipitation (mm) - (1955-1980 average) Temperatures (C) - (1955-1980 average)	WMO: 47767	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			42	46	68	120	118	197	206	93	168	87	57	29
			3.8	4.3	7.2	13.1	17.6	21.5	25.9	27.0	22.8	16.6	11.0	6.1
P10:	SAGA, JAPAN (Elev 4 m); Latitude: 33.3N; Longitude: 130.3E; Precipitation (mm) - (1951-1980 average) Temperatures (C) - (1951-1980 average)	WMO: 47813	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			61	75	104	205	196	319	348	187	182	92	69	52
			5.0	6.0	9.3	14.6	19.0	22.5	26.7	27.4	23.6	17.8	12.4	7.3
Region Q: Northwest Africa														
Q1:	MARRAKECH, MOROCCO (Elev 468 m); Latitude: 31.6N; Longitude: 8.0W; Precipitation (mm) - (1900-1990 average) Temperatures (C) - (1924-1990 average)	WMO: 60230	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			24	36	31	34	22	3	1	2	4	17	38	26
			11.7	13.6	15.8	17.0	20.1	22.9	28.1	27.7	25.1	20.8	15.8	12.0

Appendix I: Climate station, location and normal climate data -- (continued)

Station Code	Name, location, and elevation	Monthly normal precipitaton (mm) and temperature (c)												
Q2:	MEKNES, MOROCCO (Elev 549 m); Latitude: 33.9N; Longitude: 5.5W; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 60150	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			89	82	75	72	48	12	2	47	9	47	76	80
			9.6	11.2	12.2	14.3	16.3	20.2	24.6	24.4	23.2	18.5	13.7	10.7
Q3:	EL ASNAM, ALGERIA (Elev 101 m); Latitude: 36.2N; Longitude: 1.3E; Precipitation (mm) - (1936-1960 average) Temperatures (C) - (1936-1960 average)	WMO: 60425	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			55	45	39	32	37	9	1	1	20	35	60	66
			9.6	10.9	13.4	16.4	20.8	25.5	29.6	29.8	25.2	19.3	13.9	10.2
Q4:	ALGIERS, ALGERIA (Elev 23 m); Latitude: 36.7N; Longitude: 3.3E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	WMO: 60390	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			96	75	59	81	36	21	1	3	29	106	105	109
			10.8	11.3	13.0	14.7	18.0	21.4	24.2	25.0	22.9	18.8	14.9	11.7
Q5:	SETIF, ALGERIA (Elev 1081 m); Latitude: 36.2N; Longitude: 5.4E; Precipitation (mm) - (1951--999 average) Temperatures (C) - (1951--999 average)	WMO: 60445	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			60	45	43	36	51	28	11	14	37	39	53	52
			6.2	8.2	11.5	14.8	19.3	24.1	28.4	27.5	23.5	17.3	11.2	7.2
Q6:	TUNIS, TUNISIA (Elev 5 m); Latitude: 36.8N; Longitude: 10.2E; Precipitation (mm) - (1895-1990 average) Temperatures (C) - (1896-1990 average)	WMO: 60715	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			73	58	45	39	23	11	2	7	32	67	56	64
			11.4	11.9	13.2	15.5	19.2	22.9	26.3	26.6	24.1	20.3	15.8	12.4
Region R: South Africa														
R1:	PIETERSBURG (Elev 1242 m); Latitude: 23.9S; Longitude: 29.5E; Precipitation (mm) - (1904-1990 average) Temperatures (C) - (1932-1990 average)	WMO: 68174	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			80	58	53	32	11	6	3	5	17	43	85	81
			22.0	21.4	20.4	17.8	14.7	11.7	11.8	14.1	17.5	19.3	20.3	21.4
R2:	POTCHEFSTROOM (Elev 1345 m); Latitude: 26.7S; Longitude: 27.1E; Precipitation (mm) - (1913-1960 average) Temperatures (C) - (1913-1960 average)	WMO: 68350	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			106	95	84	34	19	8	8	10	18	46	78	102
			22.4	21.7	20.0	16.7	12.7	9.4	9.5	12.8	16.5	19.9	21.0	21.9
R3:	CAROLINA (Elev 1696 m); Latitude: 26.1S; Longitude: 30.1E; Precipitation (mm) - (1918-1960 average) Temperatures (C) - (1918-1960 average)	WMO: 68380	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			128	88	82	42	20	8	10	8	33	75	129	126
			18.8	18.3	17.6	14.6	11.4	8.5	8.2	10.9	13.9	16.8	17.3	18.4
R4:	BLOEMFONTEIN (Elev 1359 m); Latitude: 29.1S; Longitude: 26.3E; Precipitation (mm) - (1903-1990 average) Temperatures (C) - (1951-1990 average)	WMO: 68442	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			83	110	74	55	18	13	9	14	23	43	63	61
			22.8	21.4	19.3	15.0	10.7	7.0	7.1	10.0	14.7	17.5	19.9	21.8

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Appendix I: Climate station, location and normal climate data -- (continued)

Station Code	Name, location, and elevation	Monthly normal precipitaton (mm) and temperature (c)											
R5: DURBAN Latitude: 30.0S; Longitude: 31.0E; Precipitation (mm) - (1873-1990 average) Temperatures (C) - (1885-1990 average)	WMO: 68588 Jan 134 Feb 113 Mar 128 Apr 73 May 61 Jun 28 Jul 39 Aug 62 Sep 73 Oct 99 Nov 108 Dec 103 24.1 23.6 23.7 21.6 19.1 16.6 16.5 17.7 19.1 20.1 21.4 23.1	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
R6: RIVERSDALE (Elev 117 m); Latitude: 34.1S; Longitude: 21.3E; Precipitation (mm) - (1926-1960 average) Temperatures (C) - (1926-1960 average)	WMO: 68926 Jan 23 Feb 34 Mar 51 Apr 37 May 35 Jun 31 Jul 38 Aug 33 Sep 42 Oct 45 Nov 49 Dec 27 21.7 22.1 20.7 18.3 15.2 13.0 12.1 13.4 14.6 16.7 19.0 20.5	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Region S: Australia													
S1: CAIRNS (Elev 2 m); Latitude: 16.9S; Longitude: 145.8E; Precipitation (mm) - (1882-1990 average) Temperatures (C) - (1907-1990 average)	WMO: 94287 Jan 399 Feb 422 Mar 446 Apr 225 May 107 Jun 50 Jul 26 Aug 22 Sep 35 Oct 44 Nov 94 Dec 186 27.5 27.3 26.6 25.3 23.7 21.7 21.2 22.0 23.3 24.9 26.4 27.2	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
S2: EMERALD (Elev 175 m); Latitude: 23.5S; Longitude: 148.2E; Precipitation (mm) - (PERIOD UNKNOWN) Temperature data unavailable	WMO: 94363 Jan 86 Feb 83 Mar 53 Apr 24 May 24 Jun 27 Jul 18 Aug 12 Sep 10 Oct 35 Nov 52 Dec 85	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
S3: GERALDTON (Elev 33 m); Latitude: 28.8S; Longitude: 114.7E; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1961-1990 average)	WMO: 94403 Jan 7 Feb 15 Mar 19 Apr 25 May 75 Jun 112 Jul 88 Aug 66 Sep 32 Oct 20 Nov 11 Dec 5 25.0 26.2 24.8 21.5 18.3 15.7 14.4 14.5 15.7 17.6 20.4 22.9	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
S4: LAKE GRACE (Elev 286 m); Latitude: 33.1S; Longitude: 118.5E; Precipitation (mm) - (PERIOD UNKNOWN) Temperature data unavailable	WMO: 94635 Jan 7 Feb 7 Mar 12 Apr 27 May 52 Jun 66 Jul 67 Aug 50 Sep 30 Oct 26 Nov 26 Dec 6	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
S5: CEDUNA (Elev 24 m); Latitude: 32.1S; Longitude: 133.7E; Precipitation (mm) - (1951-1990 average) Temperatures (C) - (1951-1990 average)	WMO: 94653 Jan 10 Feb 14 Mar 21 Apr 20 May 35 Jun 31 Jul 40 Aug 35 Sep 28 Oct 22 Nov 19 Dec 17 21.8 21.7 19.9 17.6 14.6 12.3 11.6 12.3 14.6 17.0 19.2 20.7	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
S6: ADELAIDE (Elev 6 m); Latitude: 35.0S; Longitude: 138.5E; Precipitation (mm) - (1851-1990 average) Temperatures (C) - (1857-1990 average)	WMO: 94672 Jan 36 Feb 43 Mar 21 Apr 39 May 57 Jun 52 Jul 67 Aug 51 Sep 57 Oct 36 Nov 22 Dec 25 21.7 21.9 20.0 16.9 14.0 11.6 10.9 11.7 13.4 15.7 18.2 20.0	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
S7: MOREE (Elev 212 m); Latitude: 29.5S; Longitude: 149.9E; Precipitation (mm) - (1961-1990 average) Temperatures (C) - (1964-1990 average)	WMO: 94527 Jan 74 Feb 62 Mar 51 Apr 44 May 43 Jun 26 Jul 48 Aug 38 Sep 34 Oct 47 Nov 52 Dec 59 26.4 26.0 23.9 19.7 15.6 11.8 10.9 12.1 15.7 19.3 22.8 25.8	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Appendix I: Climate station, location and normal climate data -- (continued)

Station Code	Name, location, and elevation	Monthly normal precipitaton (mm) and temperature (c)											
S8: DUBBO (Elev 263 m); Latitude: 32.2S; Longitude: 148.6E; Precipitation (mm) - (1871-1990 average) Temperatures (C) - (1872-1990 average)	WMO: 94719 Jan 66 Feb 55 Mar 54 Apr 48 May 55 Jun 35 Jul 47 Aug 45 Sep 50 Oct 60 Nov 50 Dec 54	24.9	24.7	22.1	17.8	13.3	10.1	8.9	10.4	13.2	17.1	20.5	23.5
S9: ECHUCA (Elev 96 m); Latitude: 36.1S; Longitude: 144.8E; Precipitation (mm) - (1859-1990 average) Temperatures (C) - (1881-1990 average)	WMO: 94861 Jan 36 Feb 22 Mar 33 Apr 32 May 47 Jun 34 Jul 39 Aug 48 Sep 40 Oct 38 Nov 31 Dec 31	22.6	22.8	20.1	16.0	12.2	9.3	8.5	10.2	12.4	15.4	18.4	20.8

Appendix II: El Niño: Background, Mechanisms, and Impacts*

Background

The original definition of El Niño goes back to 18th or 19th century when Peruvian sailors coined the term to describe a warm southward current that appeared annually near Christmas off the Peruvian coast. Hence the name El Niño, Spanish for "Christ Child." Throughout the year, a northward cool current prevails because of southeast trade winds, causing upwelling of cool, nutrient-rich water. However, during late December the upwelling relaxes, causing warmer and nutrient-poor water to appear, which signals the end of the local fishing season.

Over the years, the warm, southward current occasionally seemed more intense than usual and was associated with periods of extreme wetness along the normally very dry Peruvian coast. These events were called "years of abundance." In the early 20th century, researchers found a strong inverse correlation, called the Southern Oscillation, between surface pressure over the Pacific and Indian Oceans, hence the saying, "When pressure is high in the Pacific Ocean it tends to be low in the Indian Ocean." Researchers tried, but failed to correlate the Southern Oscillation with Indian monsoon failures. In 1958-59, a strong "year of abundance" occurred, in which a large area of warm water in the Pacific Ocean extended from the South American coast westward to the date line. Coinciding with the extensive warm water were wetness along the Peruvian coast, low surface pressure in the eastern Pacific and high pressure in the western tropical Pacific. Consequently, scientists in the early 1960's concluded that these events were associated and occurred interannually. Since then, the term "El Niño" (or warm episode) has described not a local

warm current, but warming of the tropical Pacific surface waters occurring every 2-7 years and associated with changes in the atmospheric circulation in the tropical Pacific and world-wide.

Mechanisms

Figure 1 depicts the typical atmospheric and oceanic circulations that exist in the tropical Pacific. The prevailing easterlies (NE and SE trades) converge over Indonesia in conjunction with the Asian monsoon, producing widespread convection. Additionally, warm water "piles up" in the western Pacific, due to the easterly winds. Further east, the SE trades and equatorial easterlies in the eastern and central Pacific produce upwelling of cool water along the equator and coast of South America.

As the El Niño event begins, the easterlies relax, reducing the amount of upwelling and allowing the western warm water to move eastward. As time goes on, the warm pool in the western Pacific grows and expands eastward toward the central Pacific (figure 2). Detailed monitoring of recorded El Niño episodes has revealed that once the warmest water (near 3° C) reaches the International Dateline, anomalous convection usually appears in that region, accompanied by a weakening of the equatorial easterlies. This pattern typically occurs during the boreal winter (June-August) and may be preceded or followed by a warming along the coast of Peru. This coastal warming causes the Inter-Tropical Convergence Zone (ITCZ) to move farther south than normal, which contributes to enhanced rainfall across Ecuador and northern Peru, producing the "years of abundance".

In determining the atmospheric status of the tropical Pacific, climatologists devised the Southern Oscillation Index (SOI). It is the standardized sea level pressure difference between

*Robert J. Stefanski, Agricultural Meteorologist, World Agricultural Outlook Board, United States Department of Agriculture

Figure 1
Typical Tropical Pacific Conditions

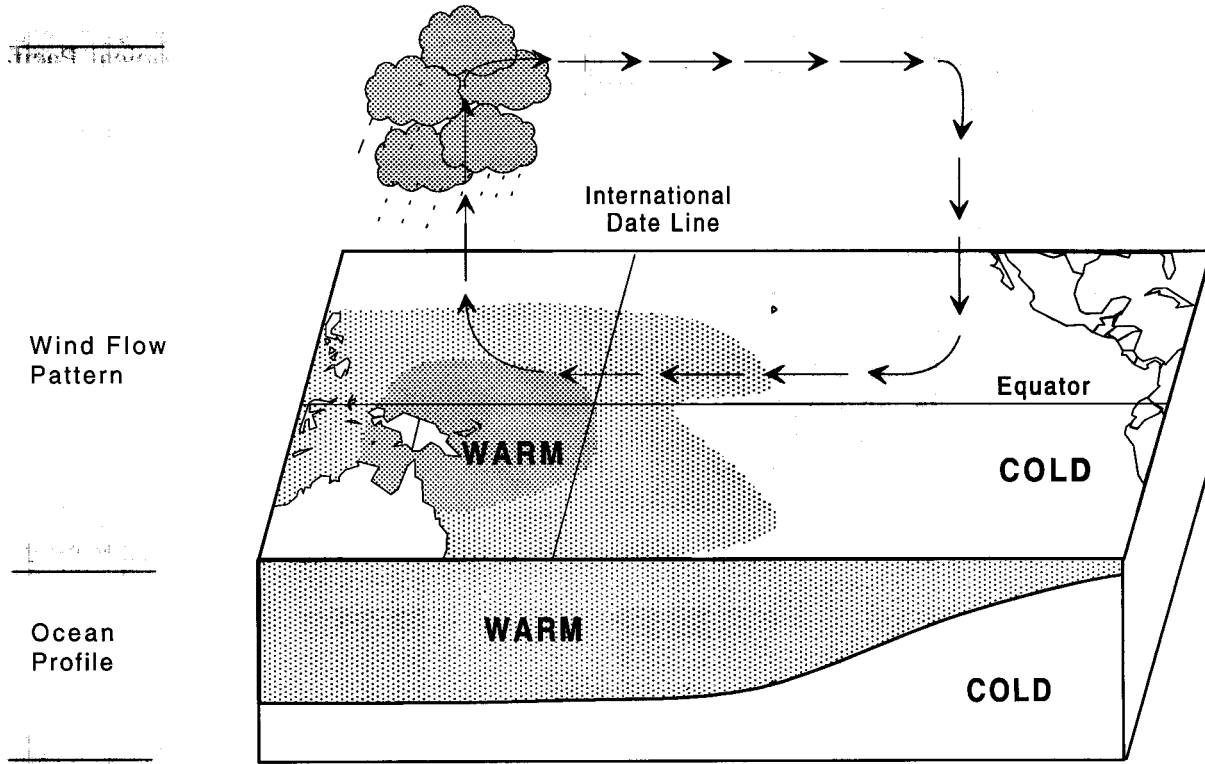
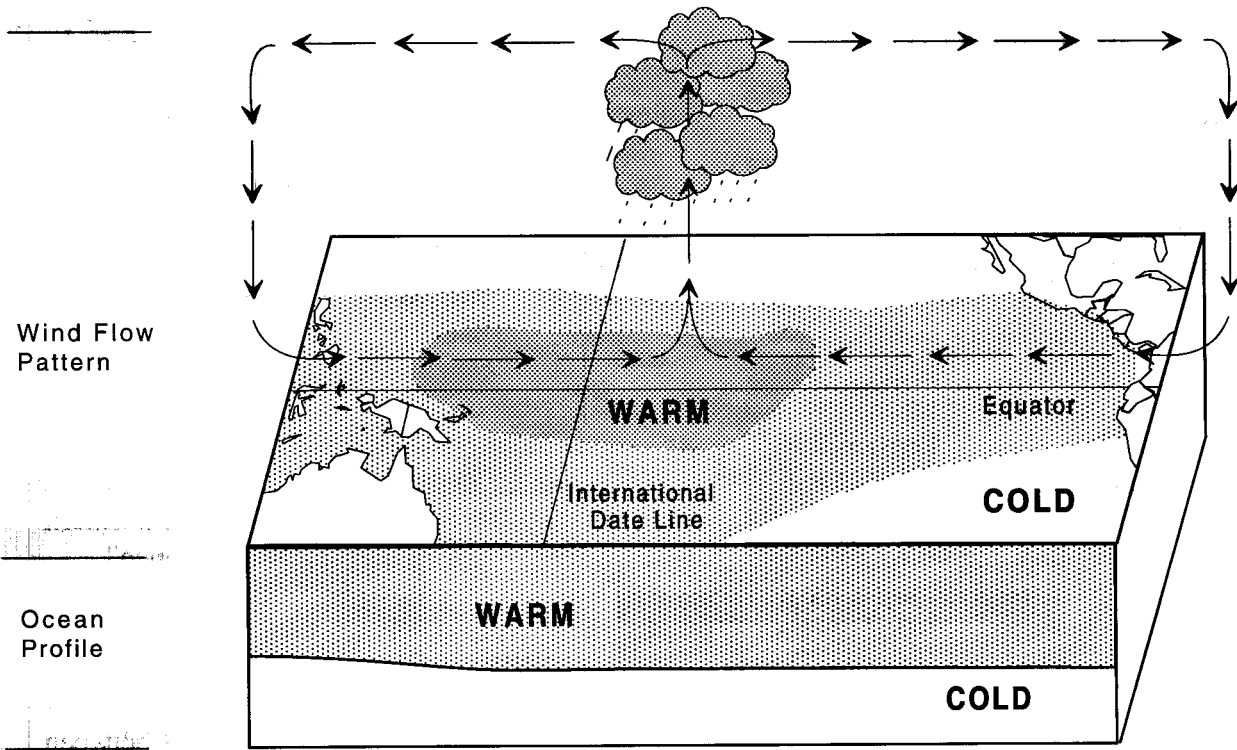


Figure 2
El Niño Tropical Pacific Conditions



Darwin, Australia, and Tahiti, French Polynesia, in the central Pacific (Tahiti minus Darwin). Thus, when the surface pressure is high at Darwin and low at Tahiti, the SOI is negative (El Niño); conversely, when surface pressure is low at Darwin and high at Tahiti the SOI is positive. When the SOI is strongly positive, cooler than normal equatorial water appears throughout the central and eastern equatorial Pacific. This is called a cold episode or sometimes La Niña, "Little Girl." Climatologists prefer to use the acronym ENSO (El Niño/Southern Oscillation) to describe the warm (El Niño) and cold (La Niña) episodes that periodically occur across the tropical Pacific. Figure 3 depicts the SOI (5-month running mean) from January 1933 to December 1993. Typically, when the SOI index is greater than 1 or less than -1 for several months, a La Niña

(cold episode) or El Niño (warm episode) occurs, respectively. The figure also shows that while both La Niña and El Niño events occur with regularity, there is still much variation in their occurrences and timing.

Impacts

When an El Niño or La Niña develops, several consistent weather anomalies typically occur around the world. Figures 4 and 5 depict potential rainfall and temperature impacts from El Niño while figures 6 and 7 show potential rainfall and temperature impacts from La Niña. Most climate anomalies associated with El Niño are reversed during La Niña. In general, a majority of the impacts occur in climates which have significant oceanic influences and border the tropical Pacific. Thus, the regions of the

Figure 3

Southern Oscillation Index: Five-month Running Mean Jan. 1933 - Dec. 1993

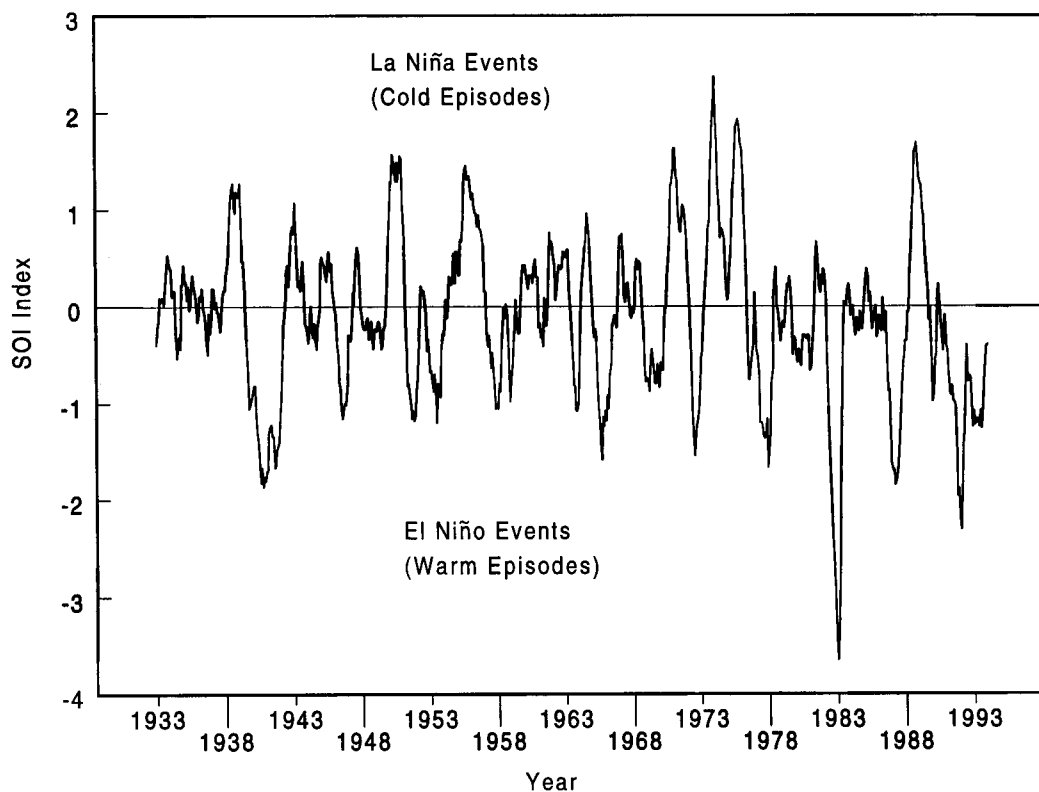
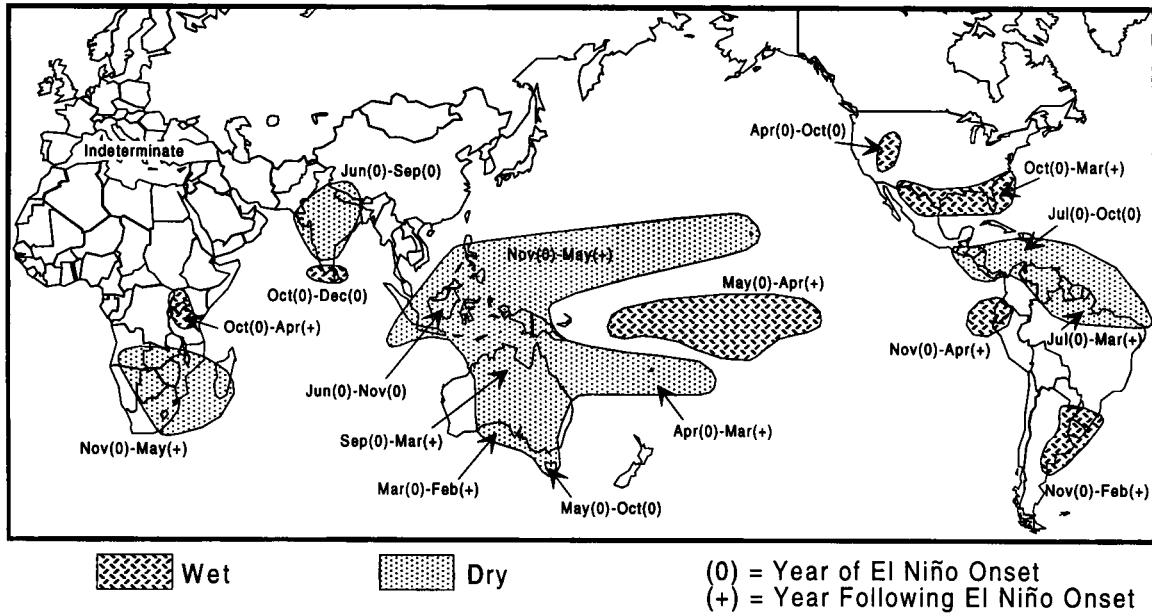
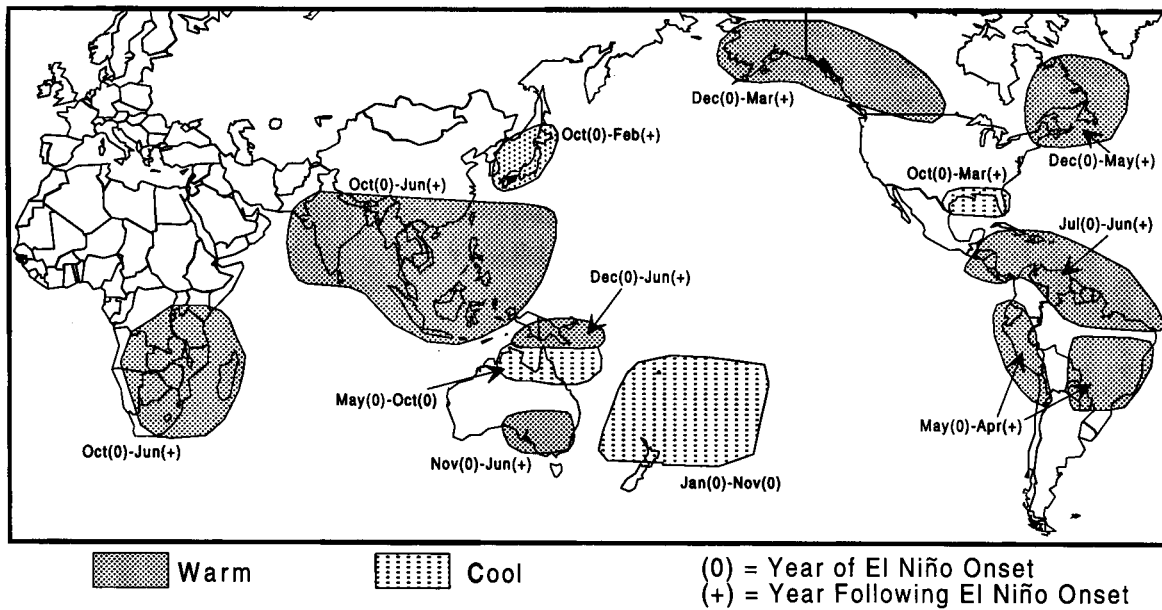


Figure 4
Potential Rainfall Impacts from El Niño Events
(Warm Episodes)



Source: Ropelewski and Halpert, 1987. Monthly Weather Review, (115) p. 1606-1626.

Figure 5
Potential Temperature Impacts from El Niño Events
(Warm Episodes)

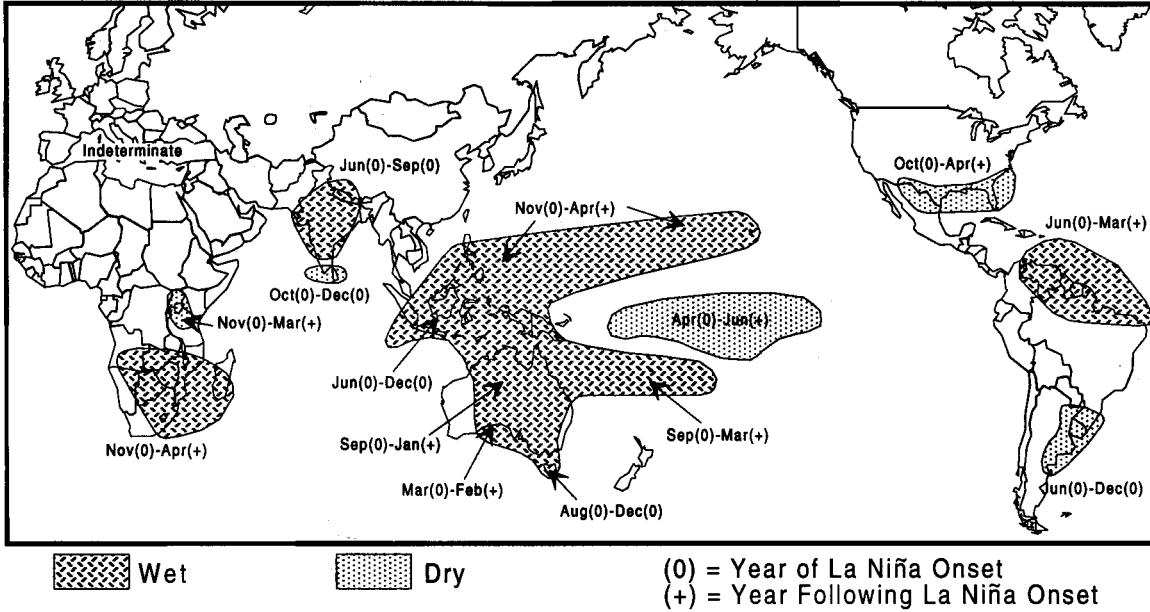


Source: Halpert and Ropelewski, 1990.

JOINT AGRICULTURAL WEATHER FACILITY (NOAA/USDA)

Figure 6

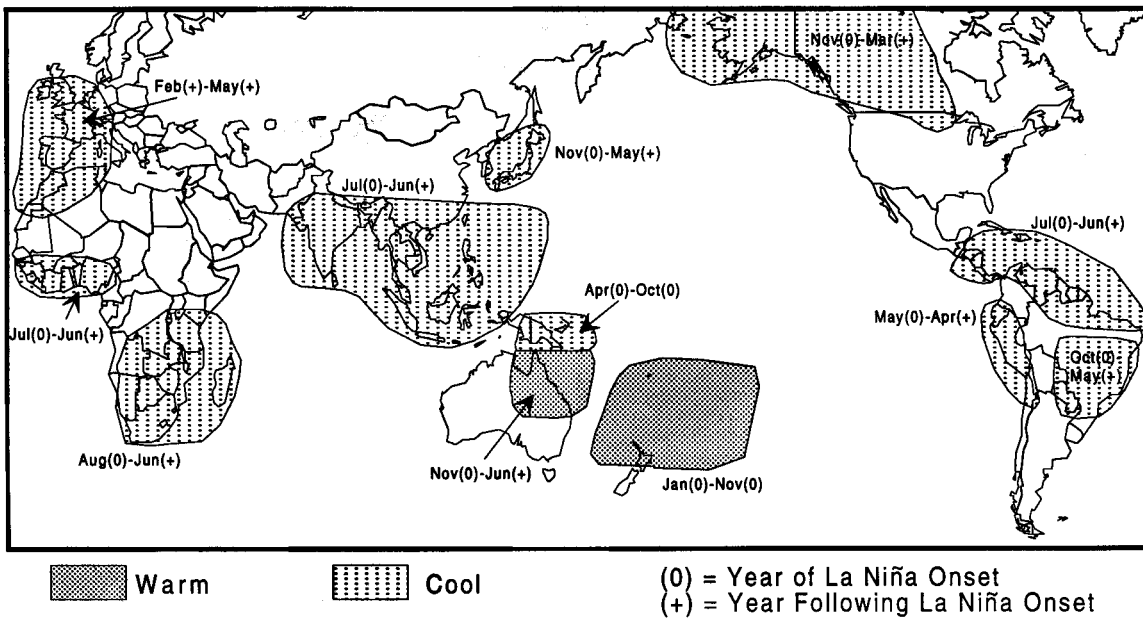
Potential Rainfall Impacts from La Niña Events (Cold Episodes)



Source: Ropelewski and Halpert, 1989. Journal of Climate, (2) p. 268-284.

Figure 7

Potential Temperature Impacts from La Niña Events (Cold Episodes)



Source: Halpert and Ropelewski, 1990.

world that show the highest correlation to warm or cold events are Indonesia, Australia, and the tropical Pacific islands. Weather anomalies (drought and excessive moisture) associated with El Niños and La Niñas can have significant impact on agricultural production (i.e., poor crops due to failure of the Indian monsoon). However, several factors make the impacts on crop production less dramatic and sometimes non-existent. These factors include the timing, duration, and intensity of ENSO events at various stages of crop development.

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Appendix III: The Indian Monsoon and Its Impact on Agriculture*

Introduction

The Asian drought of 1987 was, in terms of temperature and precipitation anomalies, one of the worst of this century from Afghanistan to the Philippines. The drought was attributed to El Niño (see the El Niño discussion in this publication), which is statistically correlated with the type, location, and timing of the unusual weather patterns. However, the physical cause of the drought was the weakness of the southwest monsoon circulation, the driving mechanism of the region's weather patterns.

This irregularity in the normal pattern was detected in the first weeks of the expected rainy season and lasted throughout the northern hemisphere summer. As a result, below-normal rainfall and record heat damaged crops and stressed livestock throughout Asia. In India, main-season grain and oilseed production was reduced to below expected levels and winter crops that depend on residual summer moisture for germination were planted well beyond the normal time frame (USDA). While the ramifications of the drought did not approach the famine years of the 1970's, commodity imports rose, reserves and exportable supplies were reduced, and growth was limited in other economic sectors. The agricultural sector alone accounts for 30 percent of India's gross domestic product and 67 percent of the labor force (U.S. CIA).

This article presents a brief physical description of the forces driving monsoons. Global monsoon climates will be identified, but in particular, the South Asian monsoon is featured in terms of seasonal changes in circulation patterns and what precursor and post-onset signals are

important for detection (and, potentially, prediction). Finally, agricultural impacts of the performance of the monsoon are examined.

Definition

A monsoon is defined as a seasonal shift in wind direction, being derived from the Arabic word "mausim", meaning season (Glossary of Meteorology). The word itself does not mean heavy rain, although the misnomer is not baseless. In a true monsoon climate, seasonal wind shifts typically cause a drastic change in the general precipitation and temperature patterns. However, the monsoon may also be associated with dry weather as well, since the "wet" monsoon phase of warm, moist air is seasonally replaced by a "dry" monsoon of cool, dry air. This phenomenon is the dominant feature of low-latitude climates stretching from West Africa to the western Pacific Ocean (figure 1). To understand why these are favored areas, we need to discuss some of the driving forces behind monsoons and the Earth's weather in general.

The annual monsoon cycle can be physically described as a result of the annual variation of incoming solar radiation and the differential heating at the surface of land and water. This has been recognized for hundreds of years, as Webster noted in his discussion of monsoon dynamics. Simply stated, sections of the earth's surface heat and cool at different rates depending on their ability to absorb solar radiation and the time of year. Bodies of water, which can absorb sunlight at varying depths (and consequently reflect less back to the atmosphere), store energy more efficiently than land and therefore retain heat longer than a land mass. Land surfaces gain or lose heat at a quicker rate due to the shallowness of their absorbing surfaces. To maintain an energy balance, heat is transferred from areas of surplus to deficit, and in the case of a land-water differential, this is

*Mark D. Brusberg, Agricultural Meteorologist, World Agricultural Outlook Board, United States Department of Agriculture

accomplished through a phenomenon known as the "land-sea breeze". For example, on a sunny day at the beach, the land warms more quickly than the ocean. As the hot air rises over the land, it is replaced by the cooler air over the water. At night, however, the land cools at a quicker rate than the water, so the wind shifts, blowing from the land to the warmer water (figure 2).

On a larger scale, such as a continent surrounded by oceans, heat buildup on land over time will result in lower density air masses, or areas of low pressure. Conversely, denser air associated with high pressure dominates ocean surfaces. Wind and ocean currents that result from air

flowing from high to low pressure mix areas of warmer and colder air and water, contributing to the global energy balance. This exchange is evident at different levels of the atmosphere. Air converging into a low pressure center at the surface rises, leading to moisture condensation and the subsequent transfer of heat into the upper atmosphere. Diverging air at the surface in a high pressure center is associated with subsiding air from the upper atmosphere and evaporation, a mechanism for energy storage.

Just as energy imbalances develop between land and water surfaces, the variations in space and time of solar heating due to the earth's tilt create seasonal hemispheric energy imbalances.

Figure 1. Monsoon dominated climates (shaded)

Source: The Encyclopedia of Climatology (Oliver & Fairbridge, 1987)

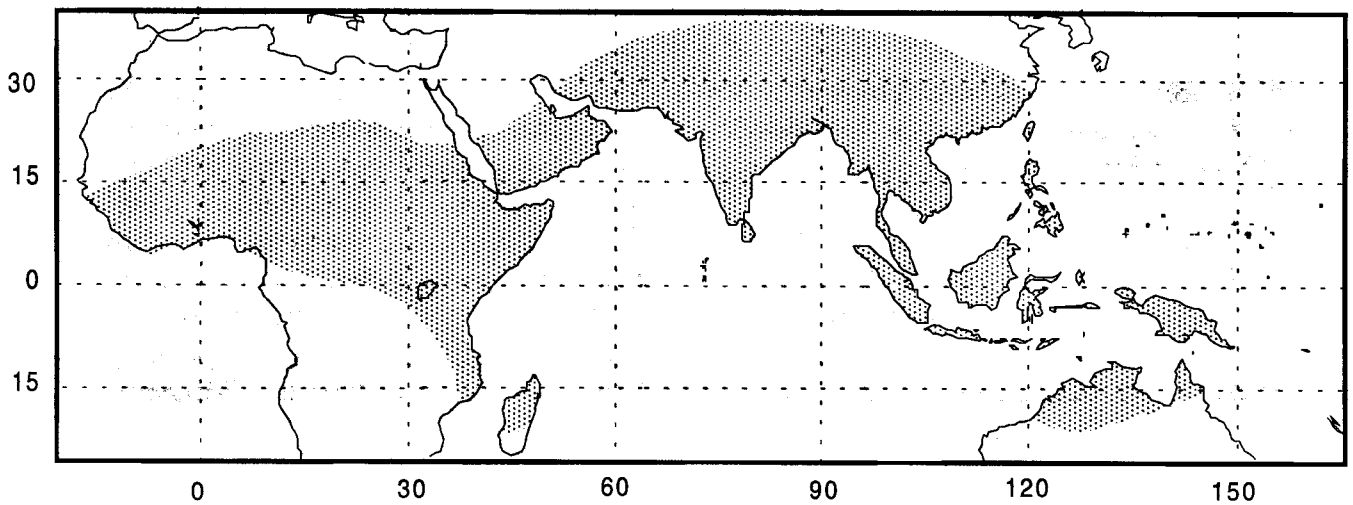
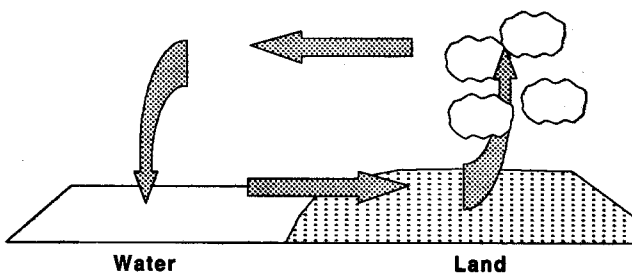
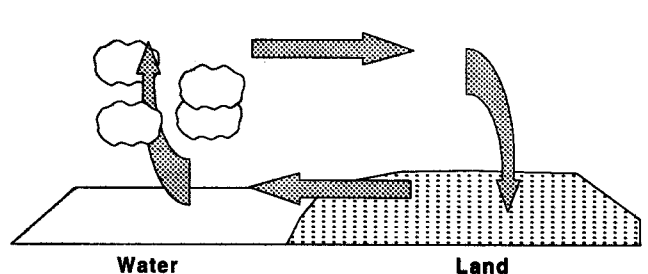


Figure 2. Simplified sketch of land-sea breeze phenomenon

Day



Night



The hemisphere receiving the most direct radiation (during the summer months) experiences a net radiative heating (more energy is gained from the sun than is lost to space). The winter hemisphere is at the same time experiencing net radiative cooling. As part of a global compensation, heat is transported from warmer to cooler areas by ocean and wind currents. Since the areas of heat surplus and deficit change throughout the year, as in the sea breeze example, the direction of transport must change as well. Figure 3 shows low latitude surface wind directions averaged over the summer and winter seasons. As noted earlier, climates dominated by monsoons experience the most pronounced seasonal wind shifts, indicative of a pronounced land-sea effect. In the South Asian example, the rainy season, typically beginning in June, is preceded by nearly two months of scorching temperatures, cooled only with the commencement of the summer rains brought by the southwesterlies. January is the peak of the dry season, which is marked by cool, dry northeasterly flow over most of the region.

The Indian Monsoon and Its Forecasting Potential

Understanding the mechanisms driving global weather patterns leads us to question "what went wrong" when anomalous conditions arise. When periods of drought or flooding exceed what is normally expected, driving forces in the weather have likely been either suppressed or enhanced in some manner. Anticipating anomalies aids in mitigating their impact.

As with any meteorological phenomenon, especially one demonstrating a periodic (cyclic, or recurring) tendency, attempts to forecast the monsoon have been underway for many years. In fact, efforts to predict the performance of monsoons based on correlations of observed weather features have been pursued since the late 1800's, when Blanford hypothesized that

Himalayan snowcover directly affected regional weather patterns. However, before forecasting can be attempted, knowledge of the phenomenon itself must be obtained. In the case of the Indian monsoon, what to look for in the period leading up to the monsoon onset as well as during the active monsoon itself are vital components of understanding the physical nature of the phenomenon.

In the months prior to the expected start of the rainy season, the Indian Meteorological Department (IMD) predicts the onset date and rainfall potential of the monsoon using a statistical model that evaluates 16 "precursor" conditions, which indicate the potential strength of the monsoon circulation (Monsoon, 1991). Of the 16 parameters used, 6 regard temperature conditions, 3 wind or pressure field values, 5 pressure anomalies, and 2 snowcover. The most important of these appear to be: 1) the average April position of the 500mb ridge centered over 75 E longitude; 2) monthly average temperatures over the Indian subcontinent (March and May monthly averages at different locations); and 3) El Niño/Southern Oscillation conditions. Independent studies have shown these parameters to have a high correlation separate from other fields, and are frequently used separately for unofficial pre-season forecasts (Mooley).

Once the season has begun, forecasts of daily rainfall are attempted by observing and predicting the lengths of "active" and "break" periods. These are naturally occurring phases in the monsoon, lasting from 5 to 7 days, identified by fluctuations in the typical pattern. Das identified several features associated with the active phase, which brings rain to the northern Indian Plains and its west coast. They include tropical depressions in the Bay of Bengal, a low-level jet stream along the east African coast, and the variations in the monsoon trough, the area of low pressure that develops over India during the summer monsoon season. Figure 4 depicts a typical active monsoon (Hamilton).

Figure 3. Seasonal average surface winds in monsoon dominated climates
Adapted from *The Elementary Monsoon* (Webster, 1987)

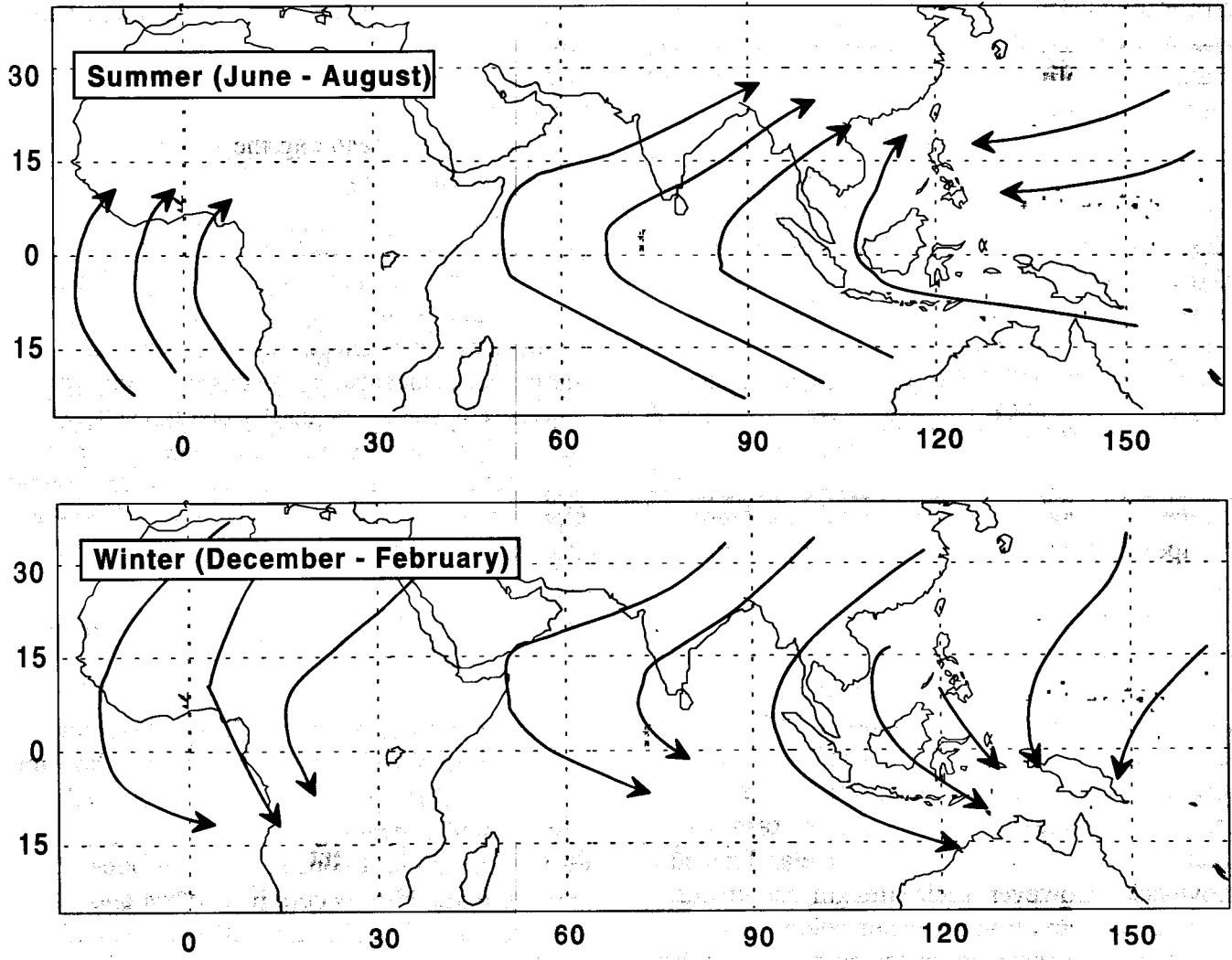
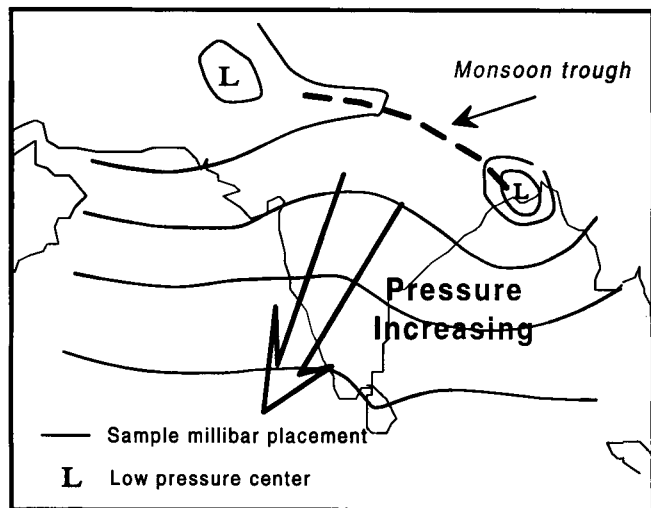


Figure 4. Surface features associated with a sample active monsoon (Adapted from Hamilton, 1987)



The current monsoon forecast methods are generally either statistical or numerical. Statistical forecasts look at correlations or relationships between known phenomena and the event being analyzed, such as the earlier example of monsoon performance based on the Tibetan Plateau snowpack. However, their strength lies in steering one towards a logical result rather than absolutes. For instance, in the case of the Asian drought of 1987, the monsoon was weak, resulting in one of the worst droughts of the century. But the El Niño which caused the disruption in world weather patterns was not as strong as the 1982/83 event (Stefanski). In contrast, a numerical model is a mathematical simulation of the atmosphere, represented by known physical relationships such as the equations of motion, thermodynamics, etc. For example, the various models used by meteorologists to provide temperature and precipitation forecasts out to 5 days are numerical models, run on super-computers due to the large amounts of data being processed. Krishnamurti identified several current models and the physical basis of each, outlining the problems of data initialization and

the potential for using satellite observations in supplementing conventional data sets. Also pointed out are the limits to their effectiveness by data availability and computer technology.

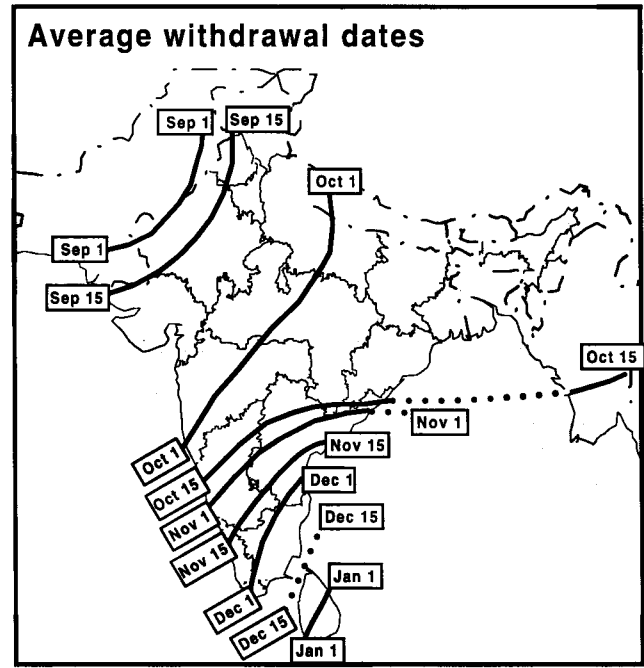
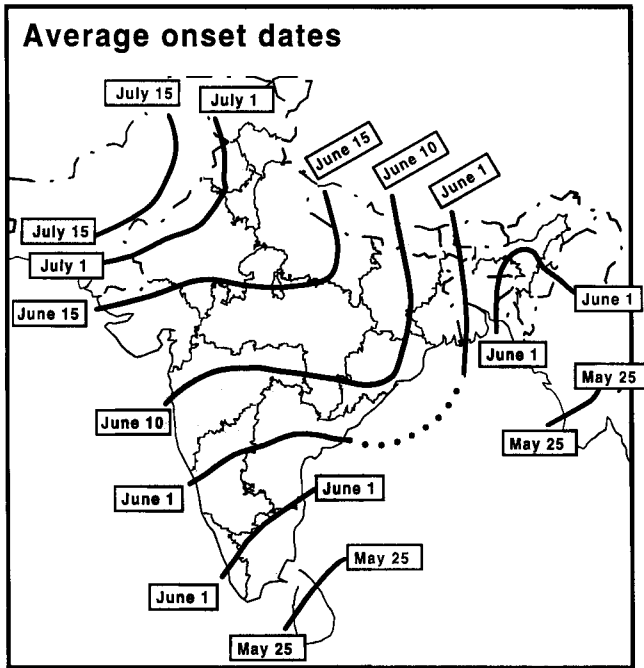
Agricultural Planning for the Indian Monsoon

To ensure sustainable agriculture in a region, knowledge of the local climate is vital. Climatic limitations are a strong indicator of agronomic potential and can be used to determine which crops are best suited for a region, as rainfall and temperatures are two major variables affecting crop type and yield. Planning is especially critical in monsoon regions which experience distinct wet and dry seasons. Soil moisture prior to the beginning of the rainy season is usually negligible, a situation exacerbated by the preceding heat buildup and high evaporative losses. Except where irrigation is available, planting is consequently restricted to the beginning of the wet season.

In India, the onset of the southwest monsoon (when the dominant winds bringing rain become established) for a particular area is expected in June or July, depending on its location (figure 5). The highest concentration of non-irrigated agriculture occurs in western and southern oilseed, grain, and cotton areas and in the East, where much of the rice is raised. These crops would suffer most from a late or weak start to the rainy season, and could be considerably affected during an extended break in monsoon rains. Also, if the southwest monsoon withdraws from the region earlier than expected, late-planted crops may be hurt during the filling stages from lack of moisture. Conversely, a late withdrawal, if accompanied by late-season rain, could be detrimental to maturing crops, especially cotton.

During the drought of 1987, kharif (summer planted) crop production was down as temperatures and rainfall were among the lowest on record in central and northern rainfed grain, oilseed, and cotton areas. Rabi (fall-planted)

Figure 5. Average monsoon onset and withdrawal dates
(From Das, 1987)



crops, planted primarily in southern India and areas with adequate irrigation reserves, partially made up for the shortfall but also suffered some losses. In winter wheat areas of northern Pakistan and India, planting was delayed for months due to insufficient moisture availability for germination (although most of the crop is irrigated, low reservoirs and fuel shortages hampered irrigation efforts).

Conversely, a strong monsoon circulation can bring flooding, especially along the Ganges and Indus Rivers. Bangladesh encompasses most of the area considered the Mouths of the Ganges, with other major rivers (primarily the Brahmaputra and the Meghna) converging within its boundaries. Rao (WMO) showed that eastern India and Bangladesh are the least drought-prone areas, indicating the consistency of the monsoon in that region. In fact, a certain level of flooding is expected each year, and local rice cropping patterns are dependent upon the seasonal abundance. In September of 1992, a late surge in the monsoon flooded cotton areas of Pakistan and generally soaked crops, mostly

in the open boll stage. Disease was also a problem as the spraying patterns were disrupted by the unseasonable heavy showers. However, while the rainfall was unusually heavy, it occurred only a few weeks later than normal, highlighting the hazard for the region's cotton, which ripens so close to the end of the rainy season.

From the early 1950's to late 1970's, Indian food production outpaced population growth, owing to increased area cultivated as well as a number of technological factors including increased irrigation and fertilizer inputs (Sanderson). Over the past 20 years, coarse grain production has risen steadily despite dramatic decreases in area. Much of this area, predominantly rainfed acreage in western India, is increasingly used for oilseed production, which has increased dramatically over the same period (USDA). This shift in agriculture, vital in meeting the Nation's nutritional requirements, was possible due to the region's versatile climate. As stated earlier, though, the rainfed crops are at greatest risk of failure in times of

drought, especially in the drought-prone west (WMO). Advances in genetic research have been important in developing cultivars which would thrive in certain areas, balancing drought resistance and yield. In fact, some of the more drastic increases in production stem from improved germplasm, most notably wheat production, which has more than quadrupled over the last 30 years (Swaminathan).

Conclusion

The monsoon climates identified in this discussion are especially vulnerable to disruptions in global weather which in any given year could result in drought, flooding, or both. Over 100 years of research on the driving forces behind the Indian monsoon circulation has resulted in a better understanding of weather extremes experienced throughout the tropics, and their subsequent impact on agriculture. The benefits of monsoon abundance are certainly tempered by the risks of farming in such a volatile area, although forecast techniques currently being developed are helping to mitigate the impacts of poor monsoon performance.

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Appendix IV: The Geography, Climate and Soils of the Former Soviet Union*

Introduction

Climate and weather are significant factors affecting agricultural production around the world. Both seasonal and regional variability in weather directly influence crop yield potential. In order to improve the global monitoring of agricultural weather, the Joint Agricultural Weather Facility (JAWF) was established within the United States Department of Agriculture (USDA) in 1978. JAWF is a cooperative effort between the National Weather Service's Climate Analysis Center and USDA's World Agricultural Outlook Board and National Agricultural Statistics Service. The facility's primary function is to coordinate a world agricultural weather watch and assess the impact of weather variability on crop and livestock production prospects (Motha). One of the primary responsibilities of JAWF is to monitor weather and crop conditions within the former Soviet Union.

With the breakup of the Soviet Union in late 1991, the agricultural system changed from one where most decisions of agricultural programs were centrally planned, originating from Moscow, to one where individual republics and even regional authorities began making these decisions. In the past, the former Soviet government dictated where certain crops were to be grown and set levels on agricultural production. These decisions were based on perceived economic needs and climate considerations. Agriculture was geared to satisfying planners' as opposed to consumers' desires. As a result, crop varieties and production levels between republics often differed considerably.

After the dissolution of the USSR, individual republics (states) began some type of program

to restructure their own agriculture. While great diversity in natural resources and variability in agricultural production created the need for strong economic and trade relations between the former republics, there has been considerable friction and protectionist policies. Thus far, the former republics have created only a loose association known as the Commonwealth of Independent States. The four nonparticipating republics include Estonia, Latvia, Lithuania, and Georgia. All 15 former republics of the Soviet Union are shown in figure 1.

As the former republics strive to restructure agriculture to meet their particular interests, environmental factors such as climate, soils, and water resources will play a major role in determining crop varieties and production levels. This article summarizes the environmental and geographic contexts that influence crop production in the former Soviet Union (FSU). State-level statistics on population, soils, and crop production are presented for background information. Climate and weather variability which influence crop yield potential are discussed.

Population, Geography, and Agricultural Statistics

State-level statistics on population, land mass, total area sown to all crops, area sown to grain crops, and total grain production for 1986-90 are shown in tables 1 and 2. The data were reported by the State Statistical Committee (GOSKOMSTAT) of the FSU.

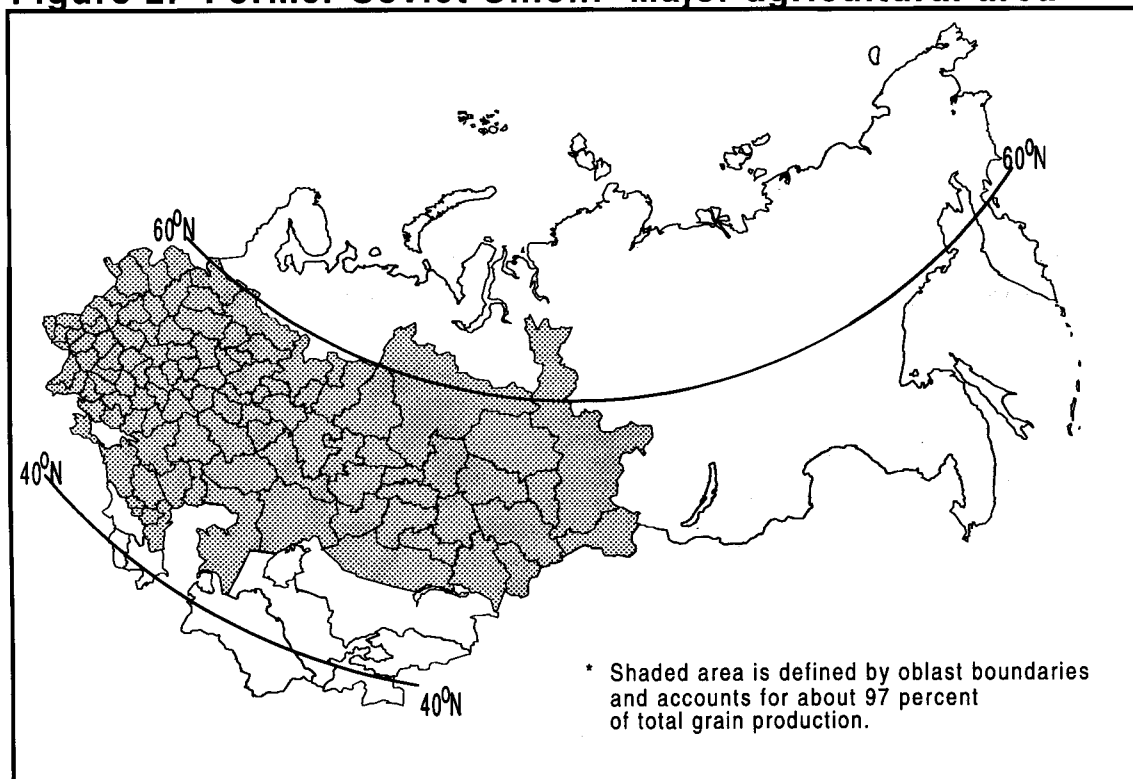
Containing about 1,708 million hectares or 77 percent of the total land mass of the FSU, Russia is the largest of the former republics. Kazakhstan ranks second in geographic expanse, with 272 million hectares or 12 percent of the total land mass. Ukraine ranks third, containing about 60 million hectares, or 3 percent of the total area. The other 12 former republics contain the remaining 8 percent of total size.

*Thomas L. Puterbaugh, Agricultural Meteorologist, World Agricultural Outlook Board, United States Department of Agriculture

Figure 1. Former Soviet Union



Figure 2. Former Soviet Union: Major agricultural area*



About half of the total population, or, 146 million people, live in Russia. Ukraine, the second most populous former republic, has about 51 million people. The former republics of Uzbekistan, Kazakhstan, and Belarus rank third, fourth, and fifth in total population, respectively.

Russia, Ukraine, and Kazakhstan account for about 90 percent of the area sown to crops. About 119 million hectares of land are sown to all crops in Russia, or 57 percent of the total FSU crop area. Only 7 percent of the total land mass in Russia is sown to crops, with area sown to grains around 4 percent. Russia's far northern location, vast rugged terrain, and harsh climate cause most of the area to be unsuitable for crop production. About 36 million hectares of land are sown to crops in Kazakhstan (17 percent of total FSU crop area). However, as in Russia, only a small portion of the land in Kazakhstan is sown to crops (about 13 percent). The climate of Kazakhstan restricts grain

production. Most of Kazakhstan is arid to semi-arid, with agriculture largely limited to the Steppe region in the north. Ukraine contains 16 percent of total FSU sown crop area or about 33 million hectares. Since about 55 percent of Ukraine land area is sown to all crops, with 26 percent sown to grains, Ukraine was often referred to as the breadbasket of the Soviet Union. The other 12 former republics contain about 11 percent of total FSU sown area and 7 percent of FSU grain area.

The major agricultural area in the FSU (defined by oblast-level boundaries) is shaded in figure 2. The shaded area accounts for about 97 percent of total grain production, and will be enlarged and used as the primary base map for most of the remaining customized maps in this article. The remaining unshaded areas and boundaries of the FSU that are provided in figure 2 are shown as a point of reference and do not appear in the later maps.

Table 1. Statistics of Population, Land Mass, Sown Area, Total Grains Area, Total Grains Production, Former Republics of the USSR (1986-90 Average)

Former Republic	Population	Land Mass	----Total Grains----		
			Sown Area	Area	Production
	1,000	-----1,000 hectares-----			1,000 metric tons
Russia	146,000	1,708,000	119,049	65,643	104,260
Ukraine	51,300	60,400	32,775	15,525	47,420
Belarus	10,000	20,700	6,191	2,709	6,820
Moldova	4,200	3,400	1,798	746	2,560
Kazakhstan	16,400	271,700	35,456	24,109	24,120
Uzbekistan	19,500	44,800	4,198	929	1,680
Turkmenistan	3,500	48,800	1,217	184	360
Kyrgyzstan	4,200	19,800	1,297	540	1,640
Tajikistan	5,700	14,300	817	208	300
Azerbaijan	6,900	8,700	1,390	478	1,140
Armenia	3,200	3,000	446	133	260
Georgia	5,400	7,000	721	260	620
Lithuania	3,700	6,400	2,306	1,128	3,040
Latvia	2,700	6,500	1,641	691	1,480
Estonia	1,600	4,500	929	396	840
TOTAL	284,300	2,228,000	210,231	113,679	196,540

Table 2. Percent of Total FSU Statistics in Table 1 by Former Republics

Former Republic	Population	Land Mass	----Total Grains----		
			Sown Area	Area	Production
	percent of total FSU				
Russia	51.35	76.66	56.63	57.74	53.05
Ukraine	18.04	2.71	15.59	13.66	24.13
Belarus	3.52	0.93	2.94	2.38	3.47
Moldova	1.48	0.15	0.86	0.66	1.30
Kazakhstan	5.77	12.19	16.87	21.21	12.27
Uzbekistan	6.86	2.01	2.00	0.82	0.86
Turkmenistan	1.23	2.19	0.58	0.16	0.18
Kyrgyzstan	1.48	0.89	0.62	0.48	0.83
Tajikistan	2.00	0.64	0.39	0.18	0.15
Azerbaijan	2.43	0.39	0.66	0.42	0.58
Armenia	1.13	0.13	0.21	0.12	0.13
Georgia	1.90	0.31	0.34	0.23	0.32
Lithuania	1.30	0.29	1.10	0.99	1.55
Latvia	0.95	0.29	0.78	0.61	0.75
Estonia	0.56	0.20	0.44	0.35	0.43

Soils

Under the leadership of V. Dokuchaiev, in about 1870, the Russians pioneered the system of soil classification still found today (Brady). Russian soil scientists were the first to study soils in the field as compared to their European counterparts who restricted these studies to the laboratory. Vegetation and climate were considered major factors responsible for regional characteristics of soils, and this was the premise from which a system of soil classification was developed. Many of the Russian terms such as Podzol, Chernozem, and Solonetz, are still used by soil scientists. Major soil zones in the primary grain producing areas of the FSU include chernozem, chestnut and desert, and podzolic intergrade soils.

Chernozem soils are found in Moldova, most of Ukraine, North Caucasus, Central Chernozem (Central Black Soils Zone), western Volga, southern Urals, northern Kazakhstan, and southern areas of West Siberia. Chernozem is a Russian term meaning black soils. Chernozem soil characteristics include a thick, black top soil, a neutral pH, rich in humus and the highest fertility of all soil types.

Chernozem soils are fine grained and easily cultivated but are also highly susceptible to wind erosion. As a result of the natural fertility of chernozem soils, they are rated among the world's best (Brady). This zone is well suited for growing wheat, sugarbeets, and a variety of other crops.

Chestnut and desert soils stretch eastward in a zone that covers the eastern North Caucasus, the lower Volga, and central Kazakhstan. This zone receives progressively less rainfall and is a marginal grain producing area. Chestnut and desert soils are less fertile and more alkaline than the chernozem soils. However, like the chernozems, chestnut soils are well drained, well structured and easy to cultivate. The agricultural productivity of these soils is limited mainly by the lack of rainfall, with this zone receiving less

rainfall than the chernozem zone, making it a more marginal producing area. This zone is well suited for growing wheat and sunflowers.

Podzolic intergrade soils are located in the Baltic States, Central Region, Northwest Region, Volga Vyatsk, northern Urals, and Siberia. Podzolic soils are less fertile than the chernozem or chestnut soils, and lack the ability to generate and store nutrients. Found in northern latitudes where the growing season is short, podzolic soils require large and continuous applications of fertilizer and lime. They have a poor water holding capacity, resulting in an inefficient use of both rainfall and fertilizer (CIA). This zone is suited for growing rye, barley, oats, potatoes, and flax.

Although the FSU has some of the best soils in the world, the degradation of these soils continues to be a concern. Removal of straw from the fields after threshing combined with deep tillage contributes greatly to the decrease in organic matter of the soil. Although deep tillage is an effective practice for combatting weeds, soils are subject to water and wind erosion, resulting in the depletion of topsoil and decline in organic material.

Climate

Climate and weather in the FSU limit grain production and influence crop yield potential. Climate is the long-term trend of weather in a region, which influences the types of crops that can be grown and the yield potential. Weather influences year-to-year variations in crop yield. Weather variability will be discussed in a later section.

The climate of the FSU is influenced by its geographic location in high latitudes and its vast size. Most of the agricultural activities not dependent upon irrigation are located in the interior of the continent, between 40 degrees N and 60 degrees N latitude (figure 2). Higher latitudes are associated with long, cold winters and short, hot summers which serve to limit the

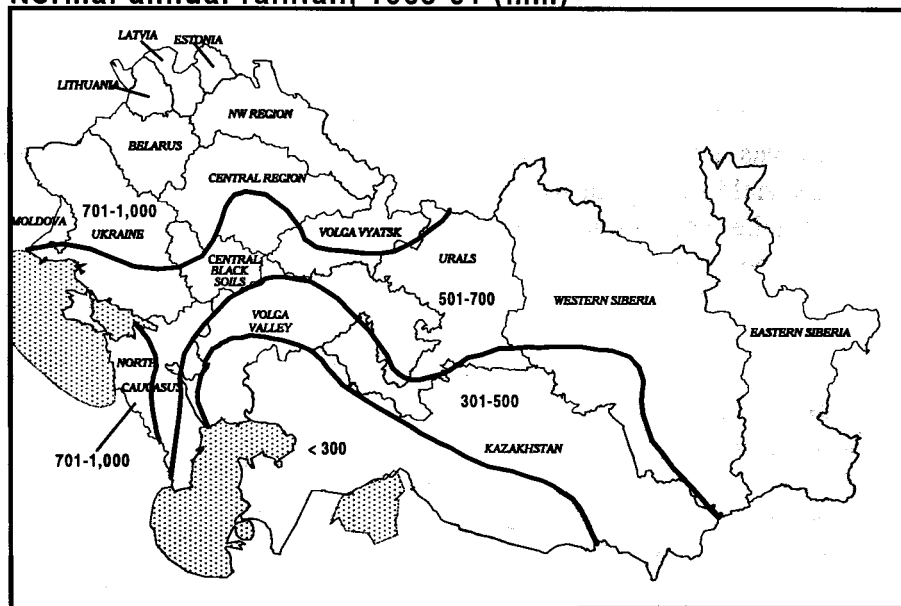
growing season. The length of the growing season ranges from 160 days in the extreme southern portion of the major agricultural area, to 100 days in the north. The transitional seasons of autumn and spring are short, creating a brief window of opportunity for crop seeding and harvest. Winters are harsh, with temperatures dropping below -40 degrees Celsius (C) in some years. As a result, snow cover is required to protect winter grains from winterkill caused by freezing and fluctuating temperatures. The magnitude of winterkill depends on the establishment of crops in the autumn, the severity of the winter, and the depth of snow cover. Since moisture becomes more limited in winter due to inability of air to hold moisture at lower temperatures, snowfall is often meager, limiting potential moisture recharge and leaving crops vulnerable to extreme cold.

The FSU land mass is almost 10,000 kilometers from East to West, encompassing 10 time zones. This vastness causes the climate to be continental in nature, characterized by large annual, daily, and day-to-day ranges in temperature, low relative humidity, and irregular rainfall. Annual ranges of temperature in central and eastern

Siberia, for example, near the center of the land mass, are in excess of 60 degrees C. The geographic location away from a significant water source, high mountain barriers along most of the southern periphery, and the frozen arctic to the north all combine to limit moisture resources. Most of the precipitation which falls over the FSU comes from the Atlantic Ocean and its bordering seas. However, this maritime air must cross the entire continent of Europe before reaching the FSU, with a larger portion of precipitation falling over Europe (Lydolph, 1977).

Water is the main climatic factor limiting grain production in the FSU (Kogan). The main agricultural area of the FSU receives, on average, annual precipitation which ranges from as little as 164 mm in Guryev Oblast, Kazakhstan, to about 1,000 mm in Krasnodar Oblast, North Caucasus (figure 3). The limitations of precipitation and growing season determine the type of crop that can be grown in a particular region. For example, spring wheat requires from 350-400 mm for reliable yields (Arnon), so this crop is best suited for dryland areas such as Kazakhstan. Corn, on the other hand, requires more than 600 mm of precipitation and is best suited

Figure 3. Former Soviet Union major agricultural area: Normal annual rainfall, 1968-91 (mm)



for southern Ukraine and North Caucasus in terms of both annual rainfall and temperature during the growing season.

Crop Production

This section provides information on winter wheat, spring wheat, corn, barley, rye, oats, sugarbeets, sunflowers, potatoes, and cotton. State-level production statistics for each crop are given along with crop geography, crop calendar information, growing practices, and general adaptation of the crop to the climate and soils of the area where it is grown. State-level statistics for the selected crops in this section were obtained from various agencies within the USDA. Selected publications which were used as reference and data sources include the "Former USSR Agriculture and Trade Report" (ERS), "World Agricultural Production" (FAS, 1992), and "Major World Crop Areas and Climatic Profiles" (WAOB).

Production and yield statistics in tables 3 and 5 represent averages for the 1986-90 period. In 1991, the Soviets changed their traditional reporting of grains from a bunkerweight basis to a cleanweight basis. As a result, the production and yield data in tables 3 and 5 reflect cleanweight averages. The difference between bunkerweight and cleanweight is primarily that in the latter, excessive moisture and foreign material have been removed. Each republic's percentage contribution to total former USSR production for each crop was also summarized. For graphs which display yield data prior to 1986 (figures 5 and 7), bunkerweight data were used for a more homogeneous time series.

Wheat is the most important grain crop grown in the FSU. The major wheat producing republics are the Russian Federation, Ukraine, and Kazakhstan, accounting for about 94 percent of total wheat production. Both winter and spring wheat varieties are grown in the FSU. However, the type of wheat grown in each republic differs considerably.

Winter Wheat

The bulk of winter wheat is grown west of the Ural mountains, in Russia, southern Belarus, Moldova, and Ukraine (figure 4). Winter wheat historically accounts for about 28 percent of total FSU grain production. Winter wheat yields are traditionally higher than those for spring wheat. For 1986-90, winter wheat yields averaged almost 3.0 metric tons per hectare, compared to spring wheat yields which averaged about 1.1 metric ton per hectare (table 5). Winter wheat is planted in the autumn, with the optimum planting period occurring from late August in northern areas, to late September in southern Ukraine and western North Caucasus. Winter wheat is harvested in July and August. Russia and Ukraine are the highest producers of winter wheat, accounting for about 45 percent and 43 percent of total FSU winter wheat production, respectively. Winter wheat is a high yielding crop, second only to corn (table 5). Highest yields of winter wheat are obtained in Ukraine, while Russia ranks fifth in yield. In figure 5, area and bunkerweight yields for winter wheat are plotted over 1981-90. Area data are represented with a bar graph, while yield data are indicated with data points connected by a line. Area and yield data used in creating figure 5 are given in a table located at the bottom of the graph. Looking at figure 5, no definitive trend in area data is seen. Planted area for winter wheat varied from a low of 15.32 million hectares in 1987 to a high of 20.7 million hectares in 1990. In contrast, a definite trend is seen in winter wheat yields, particularly after 1985 when bunkerweight yields rose from 2.16 tons per hectare in 1985 to 3.41 tons in 1990. This increase in yield is attributed to intensive technology along with generally favorable weather.

In 1982, under the leadership of General Secretary Brezhnev, the Soviets began an intensive technology program. Modeled after advanced growing practices in Western Europe, intensive technology is an integrated management approach to growing crops, which includes the

Figure 4. Former Soviet Union: Winter wheat

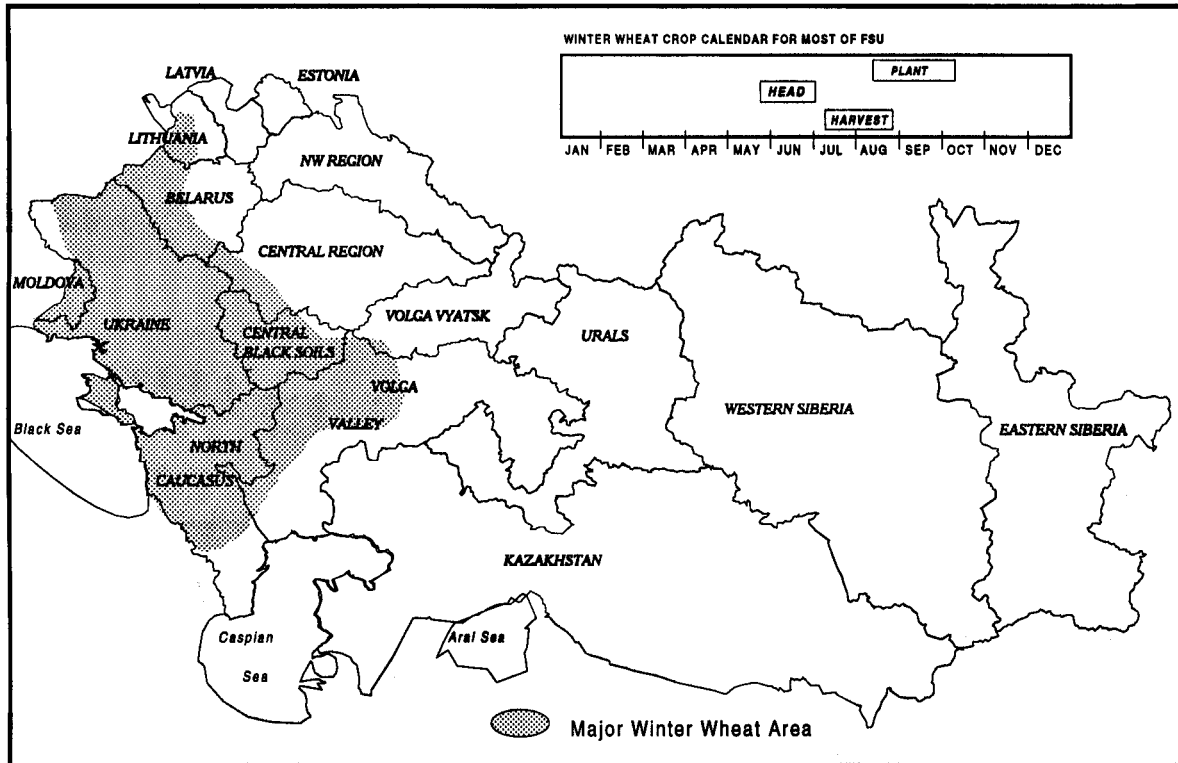


Figure 5. Former Soviet Union: Winter wheat area and bunkerweight yield, 1981-90

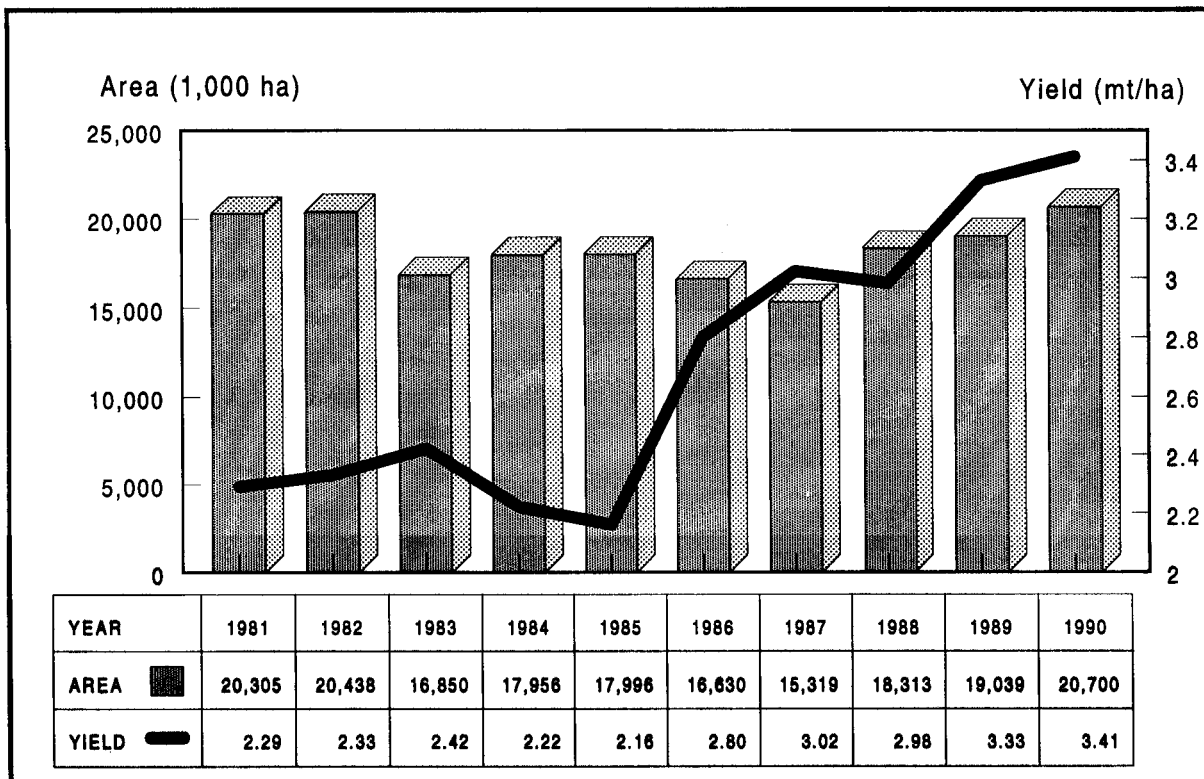


Table 3. Cleanweight Production of Selected Grains by Former Republics (1986-90 Average)

Former Republic	-----Wheat-----			Rye	Barley	Oats	Corn
	Winter	Spring	Total				
	-----1,000 metric tons-----						
Russia	24,347	19,206	43,553	12,470	24,109	12,576	3,296
Ukraine	23,479	31	23,510	1,198	10,034	1,384	7,344
Belarus	325	59	383	2,368	2,852	849	--
Moldova	945	--	945	--	371	5	1,093
Kazakhstan	1,1671	12,728	14,399	569	6,737	456	493
Uzbekistan	413	26	439	10	289	--	444
Turkmenistan	98	--	98	--	101	--	125
Kyrgyzstan	555	20	575	--	585	15	449
Tajikistan	133	9	142	--	39	--	88
Azerbaijan	694	--	694	--	367	5	48
Armenia	144	--	144	--	112	--	--
Georgia	197	--	197	--	98	13	299
Lithuania	914	--	914	428	1,169	204	--
Latvia	305	--	305	267	721	144	--
Estonia	37	12	49	135	570	59	--
TOTAL	54,257	32,091	86,347	17,445	48,154	15,710	13,679

-- = None or negligible.

Table 4. Percent of Total FSU Production, for Selected Grains by Former Republic in Table 3

Former Republic	-----Wheat-----			Rye	Barley	Oats	Corn
	Winter	Spring	Total				
	percent of total FSU						
Russia	44.87	59.85	50.44	71.48	50.07	80.05	24.10
Ukraine	43.27	0.10	27.23	6.87	20.84	8.81	53.69
Belarus	0.60	0.18	0.44	13.57	5.92	5.40	--
Moldova	1.74	--	1.03	--	0.77	0.03	7.99
Kazakhstan	3.08	39.66	16.68	3.26	13.99	2.90	3.60
Uzbekistan	0.76	0.08	0.51	0.06	0.60	--	3.25
Turkmenistan	0.18	--	0.11	--	0.21	--	0.91
Kyrgyzstan	1.02	0.06	0.67	--	1.21	0.10	3.28
Tajikistan	0.25	0.03	0.16	--	0.08	--	0.64
Azerbaijan	1.28	--	0.80	--	0.76	0.03	0.35
Armenia	0.27	--	0.17	--	0.23	--	--
Georgia	0.36	--	0.23	--	0.20	0.08	2.19
Lithuania	1.68	--	1.06	2.45	2.43	1.30	--
Latvia	0.56	--	0.35	1.53	1.50	0.92	--
Estonia	0.07	0.04	0.06	0.77	1.18	0.38	--

-- = None or negligible.

Table 5. Cleanweight Yields of Selected Grains by Former Republics (1986-90 Average)

Former Republic	-----Wheat-----			Rye	Barley	Oats	Corn
	Winter	Spring	Total				
Metric tons per hectare							
Russia	2.82	1.19	1.77	1.65	1.58	1.28	2.87
Ukraine	3.64	2.80	3.64	2.11	2.87	2.34	3.53
Belarus	2.80	2.11	2.68	2.60	2.82	2.26	--
Moldova	3.61	--	3.61	--	3.04	2.13	3.91
Kazakhstan	1.53	0.92	0.97	0.92	0.99	1.10	3.87
Uzbekistan	1.08	0.95	1.07	1.33	1.18	--	3.90
Turkmenistan	1.64	--	1.64	--	1.62	--	2.88
Kyrgyzstan	2.85	2.09	2.82	--	2.29	2.46	6.58
Tajikistan	1.11	1.16	1.11	--	1.07	--	4.94
Azerbaijan	2.43	--	2.42	--	2.38	1.71	1.83
Armenia	2.21	--	2.16	--	1.90	--	--
Georgia	2.42	--	2.38	--	2.28	1.19	2.74
Lithuania	3.20	--	3.18	2.54	2.62	2.27	--
Latvia	2.70	--	2.70	2.41	2.00	1.94	--
Estonia	2.35	2.40	2.35	2.36	2.06	2.07	--
TOTAL	2.99	1.07	1.80	1.74	1.68	1.37	3.39

-- = None or negligible.

development of high yielding seed varieties and planned applications of fertilizers, herbicides, fungicides, and plant growth regulators, based on stages of plant growth rather than calendar dates. In 1983, some 20,000 hectares were grown using intensive technological methods. Impressive increases in yield prompted a dramatic expansion of the program in 1985, when intensive technology encompassed around 19 million hectares. Results in 1985 were limited because of grower mismanagement or lack of understanding of the new procedures. As intensive technology expanded to cover 50 million hectares in 1990, yields increased as growers became more adept at using the new procedures. Although intensive technology is practiced throughout the entire USSR, a greater percentage of agrochemicals are applied in major winter wheat areas where moisture is less of a limiting factor and better soils are found. How

successful the original intensive technology program will be after the breakup of the FSU is hard to know. The rapid rise in input prices, lower availabilities of fertilizers, as well as fuel shortages, mean that growers must be highly efficient in their management practices. In addition, the degree to which funding and research is being transferred between and within the former republics is unknown.

Spring Wheat

Spring wheat areas in the Urals, Kazakhstan, and Siberia were brought under cultivation in the spring of 1954, under Khrushchev's virgin land program (Medvedev). This area is generally known as the "New Lands". Grown mainly east of the Ural mountains, spring wheat is also grown in Volga Valley and Volga Vyatsk regions (figure 6). About 60 percent of

Figure 6. Former Soviet Union: Spring wheat

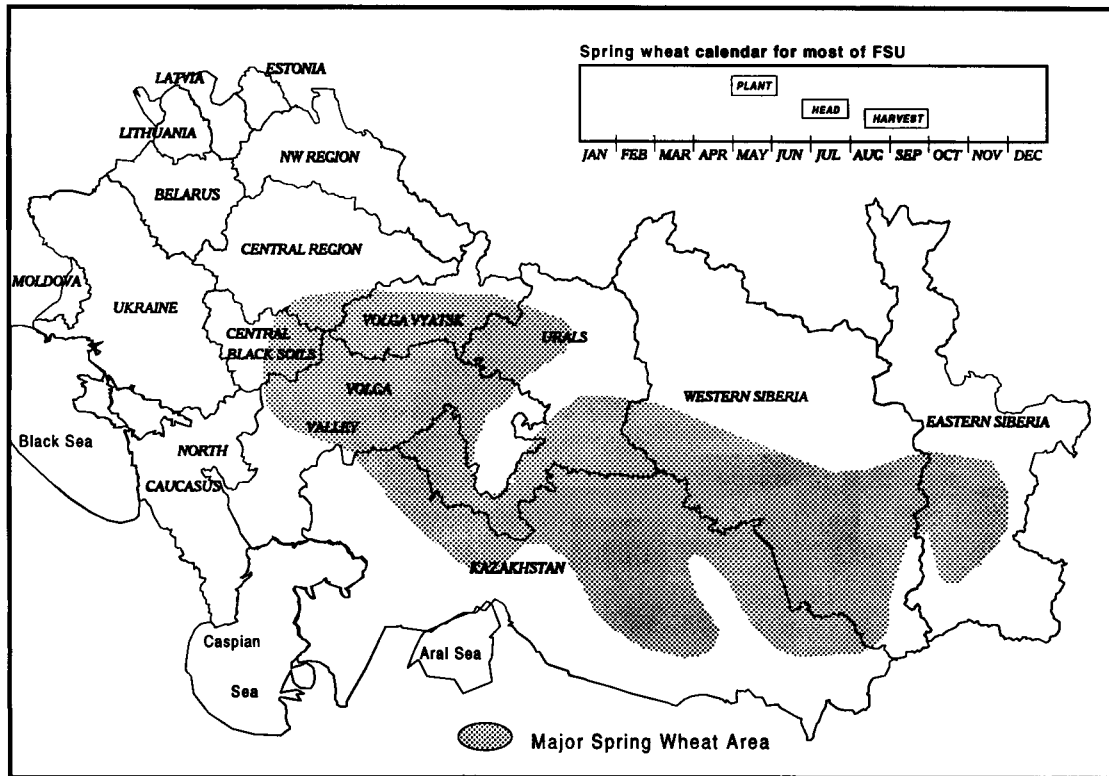
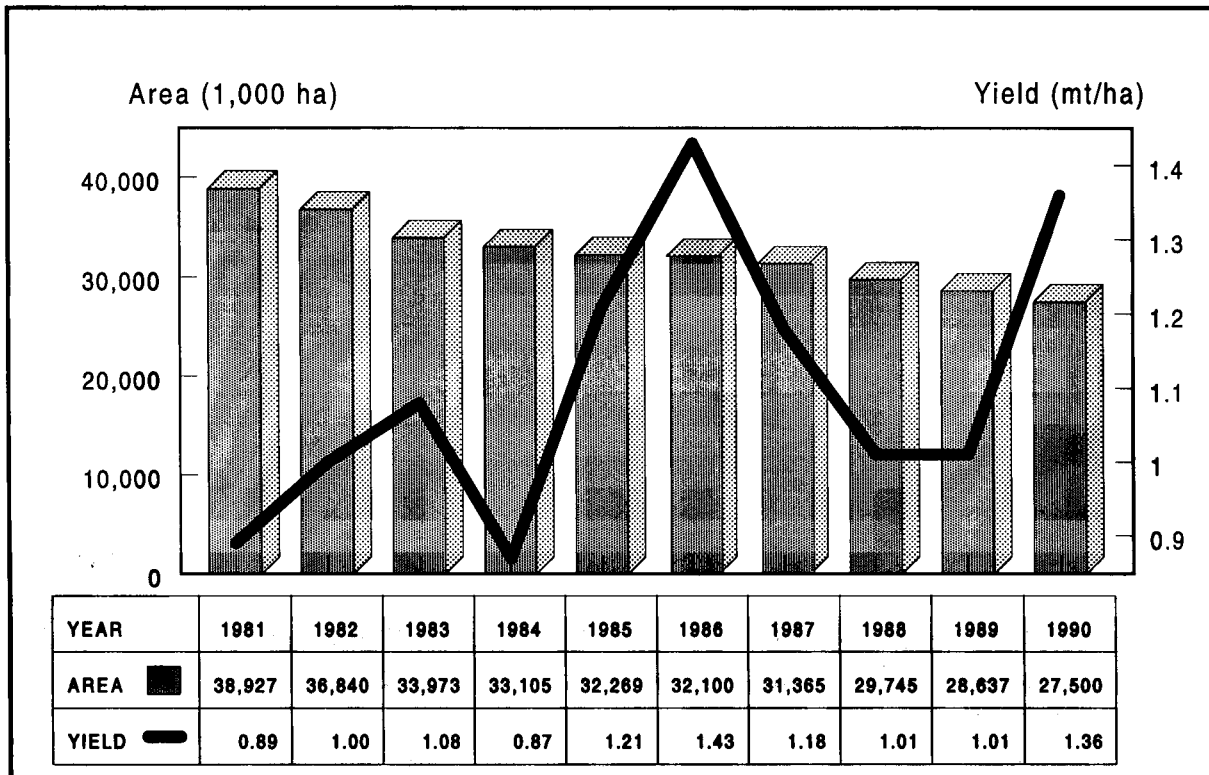


Figure 7. Former Soviet Union: Spring wheat area and bunkerweight yield, 1981-90



spring wheat is produced in Russia, while about 40 percent is produced in Kazakhstan (table 4). Spring wheat historically accounts for about 16 percent of total FSU grain production. Area sown to spring wheat declined steadily from about 39 million hectares in 1981 to 27.5 million hectares in 1990 (figure 7). This decrease in area planted to spring wheat is a direct result of more land left fallow in recent years, as well as land being taken out of production due to high cost and marginal returns.

Along with a short growing season, drought is a major limitation to grain production in spring wheat areas. Since the meager rainfall in spring wheat areas limits the effectiveness of agrochemicals, intensive technology in the spring wheat areas is different from that for winter grains. The emphasis in spring wheat areas has been on stabilizing yields. Less emphasis is placed on chemical applications, because the drier climate places an environmental constraint on the effectiveness of agrochemicals in increasing yield. Other farm management practices such as planting after fallow, windbreaks, and improved tillage methods make up the intensive technology methods in these areas. For intensive technology to work efficiently, growing practices must be fine-tuned for each area based on soil and environmental conditions. Spring wheat varieties are being bred based on local conditions for drought and disease resistance. However, traditional varieties of spring wheat such as Saratov 29 and Altai 81 continue to predominate, mainly because of their drought tolerance. Other practices used to help stabilize yields are staggered sowing, planting several varieties, snow retention, fallow, and improved tillage methods.

Corn

The areas most suited to corn for grain production include Ukraine, Moldova, and North Caucasus in Russia. About 85 percent of corn for grain is produced in these areas. Although the statistics in this section refer to corn for grain

production, a sizeable portion of the corn crop that is planted in the FSU is used for silage and fodder. The percentage harvested for grain can deviate from year to year based on weather conditions. In southern areas, unseasonably cool weather during the summer prevents corn in some areas from reaching full maturity. As a result, corn that was originally planted for grain must be harvested for silage or fodder. In areas further north and east, corn is grown mainly for silage or fodder because the growing season is not long enough for corn to mature. Corn is the highest yielding grain crop (table 5), accounting for about 7 percent of total FSU grain production. Corn is usually planted in May and harvested in October. Corn area has fluctuated widely in recent years from a high of 4.6 million hectares in 1987 to a low of 2.8 million hectares in 1990. Corn is also grown in areas under intensive technology, which in recent years has helped to bolster yields.

Barley

Barley, an important feed grain, is grown throughout the FSU. More adaptable to the harsh FSU climate than corn, barley accounts for one-fourth of total grain production. Most of the barley crop (about 90 percent) is sown to spring varieties, and is often the grain sown in areas where winter grains are lost to winterkill (Moore). Spring barley is planted in April in areas west of the Ural mountains, and in May, in areas further east. Harvest occurs from July-August in the west to September in the east. Russia ranks first in barley production (table 3), accounting for about 50 percent of the total FSU barley crop. Ukraine and Kazakhstan rank second and third, producing about 21 percent and 14 percent, respectively (table 4). On average, highest barley yields (table 5) of around 3.0 tons per hectare are obtained in Moldova and Ukraine, while lowest yields of around 1.0 tons per hectare are obtained in Kazakhstan. Barley yields have increased in recent years, in part because of intensive technology.

Rye

Rye, more winter hardy than wheat, is adaptable to the cool, moist, acidic soils of northern growing areas. Rye is less prone to winterkill than winter wheat. Rye accounts for about 9 percent of total FSU grain production. Russia produces most of the rye crop, accounting for about 70 percent of total rye production. Belarus ranks second, producing about 14 percent of FSU rye. Rye is also grown in Ukraine and Kazakhstan, which produce about 14 percent and 3 percent of total FSU rye, respectively. Rye is planted in the autumn from mid-August to mid-September. Harvest occurs from mid-July to mid-August. Area sown to rye has increased in recent years, rising from about 7.6 million hectares in 1981 to 10.4 million hectares in 1990. This upward trend has been due to an increase in demand for rye bread, particularly in urban areas (Moore). Emphasis on rye production has increased. Rye yields increased from 1.5 tons per hectare (bunkerweight) in 1984 to 2.0 tons (bunkerweight) in 1990 as a direct result of intensive technology.

Oats

Oats, a spring grain, account for about 8 percent of total FSU grain production. Oats are suitable to areas sown to rye, and are well adapted to the cool northern regions where soils are acidic. Russia produces about 80 percent of oats grown in FSU, mainly in the regions of Western Siberia, Central Region, and Volga. The Ukraine ranks second with about 9 percent, Belarus with 5 percent, and Kazakhstan with 3 percent. The crop calendar for oats is similar to that of spring barley. Area sown to oats has declined in recent years, decreasing from about 13.1 million hectares in 1986 to 10.7 million hectares in 1990. This decline in area is attributed to an increase in fallow. Oat yields have been relatively stable in recent years, averaging about 1.37 tons per hectare (table 5).

Sugarbeets

The FSU is the world's leading producer of sugarbeets. Sugarbeets are the only domestic source of sugar. Republic-level sugarbeet production can be found in table 6. The Ukraine is the largest producer of sugarbeets, while the Russian Federation (mainly Central Black Soils Region, and the Kuban region of North Caucasus) ranks second (table 7). Sugarbeets are also grown in Lithuania, Belarus, Moldova, and in irrigated areas of Kyrgyzstan, Armenia, Georgia, and Kazakhstan. Sugarbeets are planted in May and harvested in October. Because of significant losses of beets after harvest (as much as 50 percent), along with a decaying infrastructure, the Soviets have not been able to keep up with the domestic demand for sugar. As a result, sugar must be imported from other countries. The potential for significant increases in domestic sugarbeet plantings needed to offset these demands is restricted because a 4-to 6-year field rotation pattern is necessary to reduce the plants's susceptibility to pest and disease problems (CIA). Sugarbeet area has remained relatively stable during the past decade, but an increase in sugarbeet area might occur in the future as the former republics attempt to increase self-sufficiency.

Sunflowers

The sunflower plant is well suited to Soviet agriculture, because it is hardy and is a good source of desperately needed vegetable oils and protein meal. As a result, the FSU is the world's largest producer of sunflowerseed. Sunflowerseed is the primary source of vegetable oil in the FSU, while sunflowerseed meal is a major source of protein feed in dairy and livestock production. The Russian Federation produces about half of the sunflowers grown in the former USSR (table 6). Ukraine ranks a close second, at about 45 percent of total FSU production (table 7). Sunflowers in Ukraine are

mainly concentrated in the south and east, while greatest concentrations in Russia are located in the Black Soils Region, Volga Valley, and North Caucasus. The area sown to sunflowers increased in recent years because of an attempt to improve supplies of vegetable oils to the population and protein meal supplies to feed livestock. The area sown to sunflowers rose from 3.8 million hectares in 1986 to 4.7 million hectares in 1990. Russia realized a 25-percent increase in area, while Ukraine experienced an 8-percent increase. Yields rose from an average of 1.2 tons per hectare during 1981-85 to an average of 1.5 tons per hectare for 1986-90. This increase in yield can be attributed to intensive technology as well as more favorable weather.

Potatoes

The FSU is one of the world's largest producers of potatoes. Potatoes are the most important food crop after grains and are also used for animal feed and as a raw material for industrial

products (Lydolph). Over half of the total potato production comes from private plots. State-level potato production is shown in table 6. Potatoes are grown throughout all agricultural regions of the FSU, but are best suited for western and central areas where soils are well drained and the climate is cool and moist. Russia ranks first in FSU potato production, at around 50 percent, followed by Ukraine, Belarus, Kazakhstan, and Lithuania at 25, 15, 3, and 2 percent, respectively (table 7). Area planted to potatoes decreased in recent years, falling from about 6.9 million hectares in 1981 to 5.8 million hectares in 1990. Potato yields fluctuated widely during 1981-90. The lowest yield, about 10.5 tons per hectare, occurred in the drought year of 1981. The highest yields were obtained in 1988, when 13.7 tons per hectare was achieved.

Cotton

The FSU ranks fourth in the world in cotton production. Most of the cotton crop is grown

Table 6. Crop Production of Sugarbeets, Sunflowers, Seed Cotton, Potato, by Former Republics (1986-90) Average

Former Republic	Sugarbeets	Sunflowers	Cotton	Potatoes
-----1,000 metric tons-----				
Russia	32,930	3,121	--	35,879
Ukraine	47,410	2,732	--	17,965
Belarus	1,592	--	--	10,513
Moldova	2,565	253	--	362
Kazakhstan	1,434	117	322	2,114
Uzbekistan	--	--	5,112	308
Turkmenistan	--	--	1,318	34
Kyrgyzstan	--	--	75	328
Tajikistan	--	--	904	200
Azerbaijan	--	--	644	185
Armenia	71	--	--	250
Georgia	46	8	--	336
Lithuania	989	--	--	1,812
Latvia	401	--	--	1,228
Estonia	--	--	--	814
TOTAL	87,438	6,231	8,375	72,328

-- = None or negligible.

in the Central Asian republics and Azerbaijan (table 6 and figure 8). Cotton is planted during April and May, and is harvested during September and October. Most FSU cotton areas are located in a desert basin, surrounded by high mountains to the east, west, and south. These mountains are the main reason the cotton area experiences dry weather during the summer months. Warm, moist winds from the Indian Ocean and Mediterranean Sea lose most of their moisture as they rise above the mountains and become drier and warmer as they descend into the basin cotton areas. As a result, irrigation is required during the dry summer months to meet the total water demands of the cotton crop.

Most of the water used to grow cotton comes from rivers or irrigation canals that are fed by melting snow from the Tien Shan mountains. Cotton occupies more irrigated land than any other crop. Irrigation water is supplied by the Syrdar'ya and Amudar'ya Rivers. Canal systems are used to transport water from these rivers to the cotton areas. Since there are no

mountains to the north, bitter cold air from Siberia often moves southward into the cotton area during the winter. In contrast, summer temperatures often exceed 40 degrees C. Most of the annual precipitation that covers the cotton area falls during the spring and autumn. Cotton is a heat-loving plant and cannot survive frosts, prolonged cloudiness, or excessive moisture in early stages of development. Sub-freezing temperatures or excessive rain after spring sowing can have a detrimental effect on tender young plants, necessitating replanting.

Uzbekistan is the largest producer of cotton, accounting for about 60 percent of total FSU cotton production (table 6). Turkmenistan ranks second, with about 16 percent, followed by Tajikistan, Azerbaijan, Kazakhstan, and Kyrgyzstan, respectively.

Reaching a peak of about 3.5 million hectares in 1987, area sown to cotton declined to 3.1 million hectares in 1990 (figure 9). The decline in area is a result of several factors. In some areas, heavy irrigation has caused excessive

Table 7. Percent of Total FSU Production for Selected Crops in Table 6, by Former Republic

Former Republic	Sugarbeets	Sunflowers	Cotton	Potatoes
	percent of total FSU			
Russia	37.66	50.09	--	49.61
Ukraine	54.22	43.85	--	24.84
Byelarus	1.82	--	--	14.54
Moldova	2.93	4.06	--	0.50
Kazakhstan	1.64	1.88	3.84	2.92
Uzbekistan	--	--	61.04	0.43
Turkmenistan	--	--	15.74	0.05
Kyrgyzstan	--	--	0.90	0.45
Tajikistan	--	--	10.79	0.28
Azerbaijan	--	--	7.69	0.26
Armenia	0.08	--	--	0.35
Georgia	0.05	0.13	--	0.46
Lithuania	1.13	--	--	2.51
Latvia	0.46	--	--	1.70
Estonia	--	--	--	1.13

-- = None or negligible.

Figure 8. Former Soviet Union: Cotton growing areas

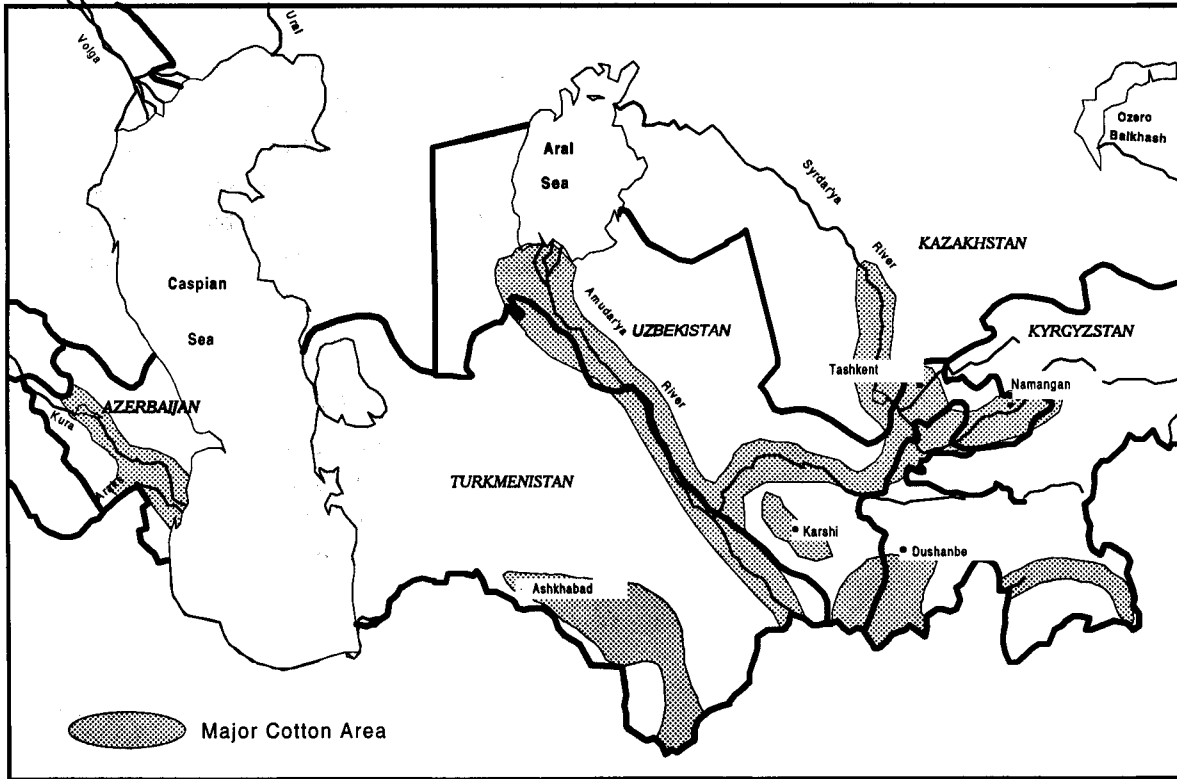
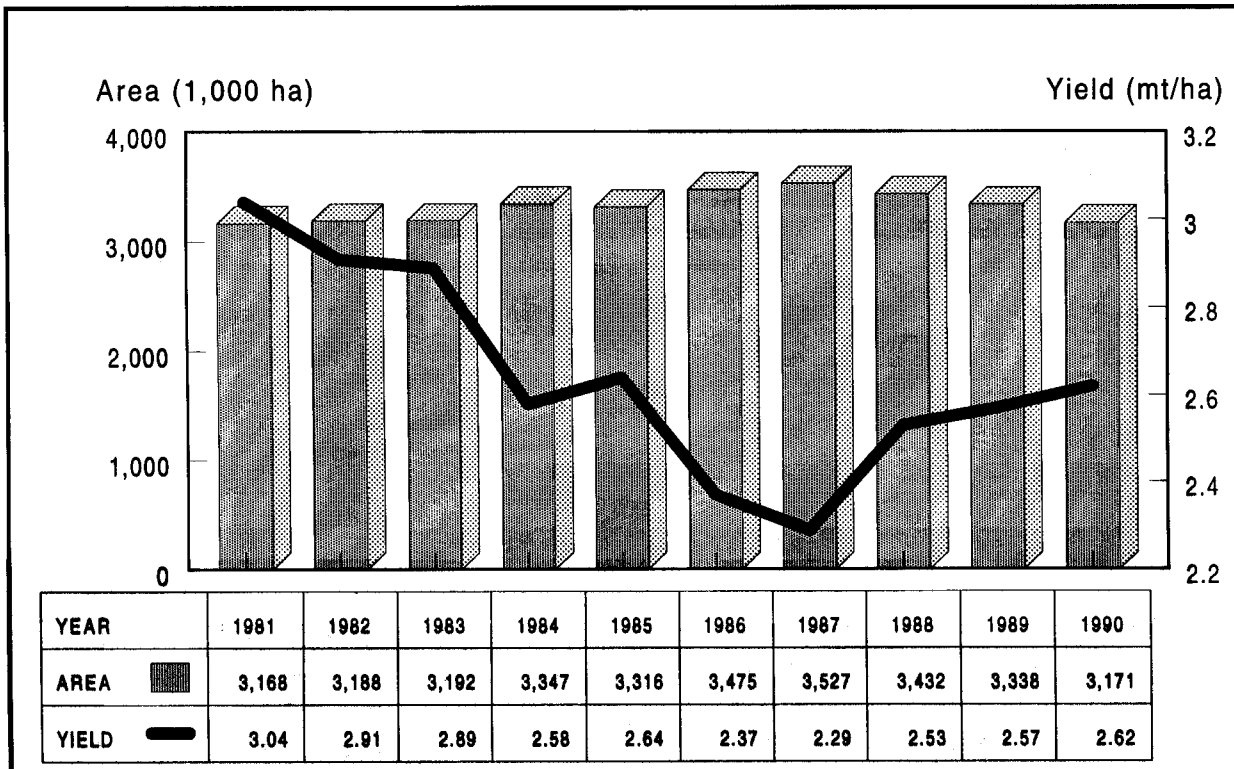


Figure 9. Former Soviet Union: Cotton area and yield, 1981-90



salinization, making them unsuitable for production. In other areas, cotton has been replaced by grains and forages, in an attempt to become more self-sufficient in grain production. Yield of seed cotton has also declined in recent years, falling from 2.8 tons per hectare during the period 1981-85 to 2.5 tons per hectare during the period 1986-90. This decline in yield has been attributed to lower quality inputs, increased soil salinity, and general degradation of soils caused by heavy use of fertilizers, defoliants, and pesticides (USDA, May 1992).

The high emphasis on cotton production in Central Asia along with excessive use of fertilizer, pesticides, and poor drainage have led to ecological and soil fertility problems. The Aral Sea has been most acutely affected. Since most of the fresh water which feeds the Aral Sea comes from the Syrdar'ya and Amudar'ya Rivers, the siphoning off of water from these rivers for irrigation has led to a catastrophic decrease in the Aral Sea. Over the past 30 years, the Aral Sea has decreased in size by about 40 percent, and now contains only about half of its original water. Salt deposits from the exposed areas are carried by the wind and have a detrimental impact on the nearby population and crops. A switch from cotton production to other crops (corn, wheat, soybeans, sunflowers, and barley) that require less irrigation water, as well as increasing the use of drip irrigations systems, would serve to increase the water flowing into the Aral Sea, helping to stabilize the current situation.

Weather Variability

Crop varieties grown in marginal areas are vulnerable to year-to-year variability in weather. Although water is the primary climatic factor limiting crop production in the former USSR, temperature also plays an important role. When water is limited during the spring and summer, these dry periods are sometimes accompanied by influxes of hot, dry air commonly known as *sukhoveis* (Dzerdzeevskii). Although local *sukhovei* conditions occur each year, in some

years, *sukhoveis* adversely affect large areas. When *sukhoveis* occur at a critical stage of crop development, a significant decline in yield can result. For example, a typical *sukhovei* event occurred in early July 1984 (WWCB) when desiccating winds covered spring wheat areas. This particular *sukhovei* occurred at a time when spring grains were in the most weather-sensitive flowering stage of development, lowering yields by about 30 percent from early-season projections.

To better illustrate the year-to-year variability in weather over former USSR agricultural areas, monthly temperature and precipitation data for the period 1950-92 were averaged for weather stations in the Ukraine and Kazakhstan. The data were obtained from the World Meteorological Organization's Global Telecommunications System via the National Oceanic and Atmospheric Administration's Climate Analysis Center. For Ukraine, the months of May-July were combined into one seasonal value, a time when winter wheat is usually advancing through the reproductive and filling periods of development. For Kazakhstan, the summer months of June-July were combined to contain the period when spring wheat advances through the reproductive to early filling periods. These seasonal temperature and precipitation data were then ranked over the 1950-92 period and categorized into percentiles. The years from 1977-92 are shown. To provide insight into the relationship between seasonal weather variability and fluctuations in yield, bunkerweight winter wheat yields were overlaid on the seasonal rankings for the Ukraine, while bunkerweight spring wheat yields were plotted on the rankings for Kazakhstan. Cleanweight yields were converted into bunkerweight yields for 1991 and 1992 because bunkerweights were not published. Conversion was based on 1986-90 ratios. No attempt was made to de-trend yields.

Percentile rankings of temperature and precipitation for Kazakhstan are shown in figure 10. Years with rankings above the 70th percentile were categorized as wet or hot years, while

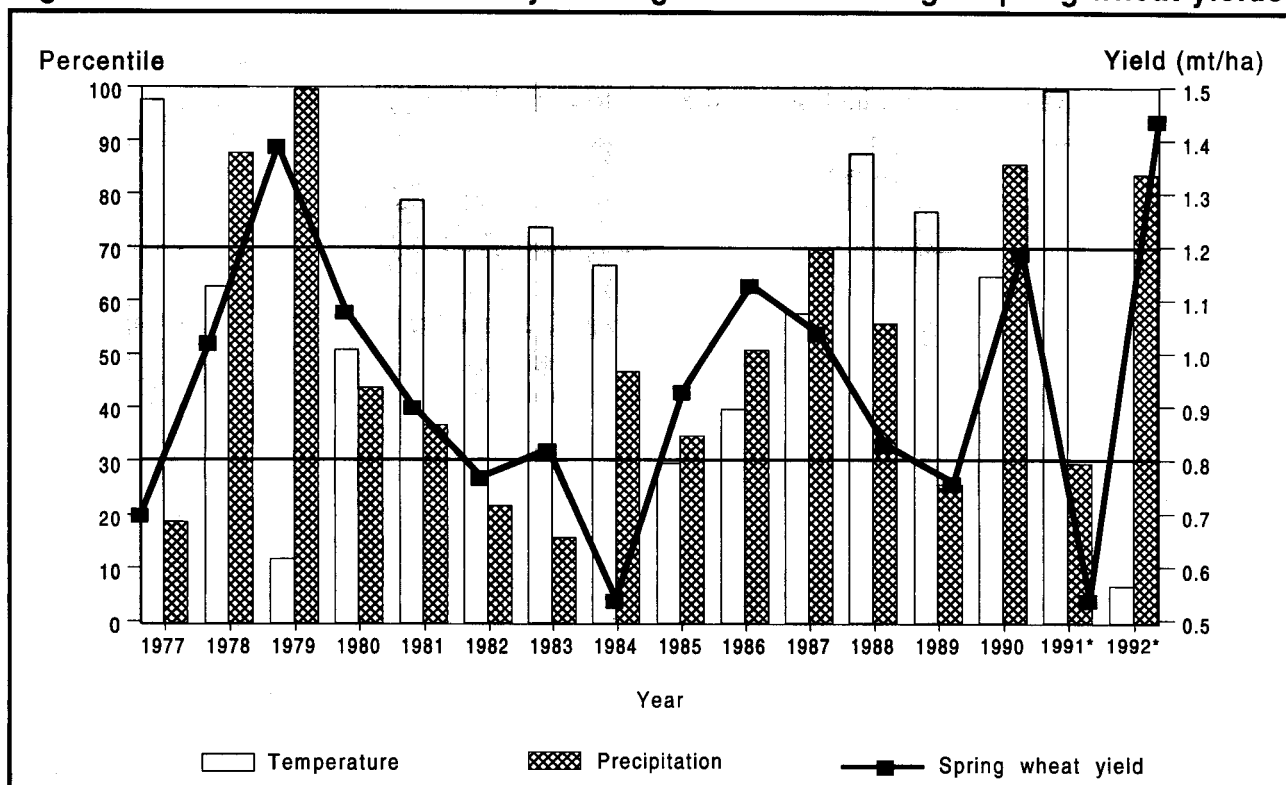
rankings below the 30th percentile were categorized into dry or cold years. Rankings which fell between the 30th and 70th percentiles were categorized into near-normal years. Temperature rankings exceeded or approached the 70th percentile (hot category) and precipitation rankings fell near or below the 30th percentile (dry category) during the years of 1977, 1981, 1982, 1983, 1984, 1988, 1989, and 1991. For these years, spring grain yields fell below the 1977-92 average of .95 tons per hectare. In contrast, for years when precipitation rankings exceeded the temperature rankings (1978, 1979, 1985, 1986, 1987, 1990 and 1992), yields rose above the 1977-92 average. From this graph, year-to-year seasonal weather variability for June-July appears to be closely associated with yield. Yields are highest on cold, wet years and lowest on hot, dry years. Of course, the timing of the weather events and the stage of crop development will determine the degree to which yields will be most greatly affected. Results from figure 10 show that spring wheat yields in Kazakhstan are highly dependent on rainfall and

temperature during the June-July period. In addition, from figure 10, there appears to be less variability in yields after 1985, indicating that intensive technology is in fact, helping to stabilize yields.

Percentile rankings of seasonal temperature and precipitation for Ukraine are shown in figure 11. The winter wheat yield series for Ukraine for the period 1977-92 is overlaid on the percentile rankings. The relationship between seasonal weather variability and yield variability for winter wheat is not as evident as that for spring wheat in Kazakhstan. However, some useful relationships between seasonal weather and winter wheat yield can be found.

Of the 43 years (1950-92) of seasonal data that were ranked, only 2 years (1979 and 1981) experienced temperature rankings that were categorized in the hot category. For these same years, precipitation was ranked in the dry category. Winter wheat yields for 1979 and 1981 were low. Inspection of the weather during

Figure 10. Kazakhstan: June-July rankings and bunkerweight spring wheat yields



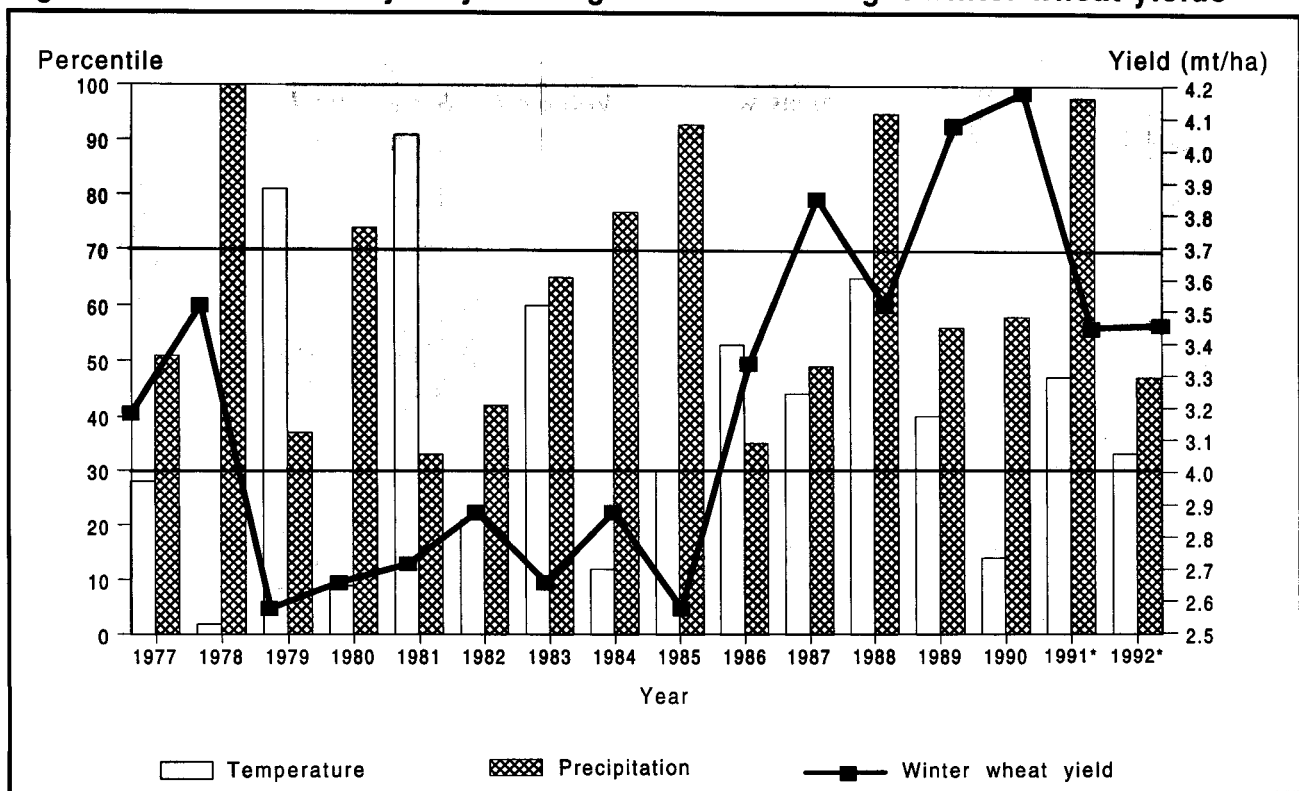
*Data for 1991 and 1992 are based on USDA January 1993 estimates.

these 2 years revealed hot, dry sukhovei conditions occurred around the flowering and early grain fill period, negatively affecting winter wheat yields. However, for the low-yielding years of 1980, 1983, and 1985, temperature rankings were either in the near-normal or below-normal category, and precipitation rankings were in the near-normal or wet category. Investigation into weather conditions for these years reveals that for 1980, wet weather from the spring throughout the summer caused significant harvest delays and grain spoilage, resulting in yield reductions. In 1983, adverse weather during the autumn planting season along with dry weather in the spring resulted in decreased yields. For 1985, wet, cold weather throughout the Ukraine posed problems for crop development and harvesting. These unfavorable conditions in 1985 along with problems with grower mismanagement of intensive technology resulted in low yields.

Unlike Kazakhstan, there appears to be no relationship between wet summers and increased

winter wheat yields in Ukraine. In fact, in three (1985, 1988, and 1991) of the six years when the precipitation was ranked in the wet category winter wheat yields declined. This observation is better explained by Ulanova. In examining agrometeorological conditions that affect winter wheat yields, Ulanova explains that precipitation during the summer is an inadequate determinant of winter wheat yields because the rainfall is often excessive and falls extremely irregularly. Heavy precipitation in the summer is often associated with thunderstorms and gusty winds, resulting in increased lodging, harvest delays, and disease. Precipitation during the autumn, overwintering conditions, and spring moisture reserves have a greater role in determining the yield of winter wheat. Therefore, weather variability not only in the summer but throughout the entire year help to determine the yield potential for winter wheat in Ukraine. However, sukhovei conditions around flowering, such as that which occurred in 1979 and 1981, can have a detrimental impact on winter wheat.

Figure 11. Ukraine: May-July rankings and bunkerweight winter wheat yields



*Data for 1991 and 1992 are based on USDA January 1993 estimates.

Conclusions

The lack of precipitation and the northerly location of the FSU limit grain production. The climate is continental in nature, characterized by large temperature variations and irregular rainfall. Adverse weather such as droughts, hot, dry winds (sukhoveis), and winter freezes are common phenomena, plaguing agriculture in some areas on an annual basis. The severity of these adverse conditions, their geographic extent, and their timing with respect to the crop growth cycle will determine the degree to which crop yield potential is impacted.

Grain is produced in all of the 15 former republics. However, the type of grain as well as the level of production differs for each republic. The Russian Federation, Ukraine, Kazakhstan, and to a smaller extent Belarus, account for a large majority of the production of most crops in the FSU. An exception is cotton, grown mainly on irrigated land in the former republics of Central Asia.

Regarding the intensive technology program, the availability of inputs and management practices will be important determinants of the future successes of the program, especially in areas where agrochemicals are used heavily to promote increases in crop productivity. The transfer of technologies, funds, and inputs between and within the former republics will also play an important role.

As the former republics strive to restructure and diversify agriculture to become more self-sufficient, climate, soils, and weather variability will be key factors in determining crop mix and production levels. For example, in Kazakhstan, the combination of limited rainfall and year-to-year variability in weather limits agricultural production to those crops which are more drought resistant such as sunflowers. An increase in corn or winter wheat production seems unlikely, due to Kazakhstan's low annual rainfall and severe winters. Ukraine and adjacent

areas of Russia which have some of the better soils, moderate temperatures, and higher rainfall would be best suited for a wide variety of crops. For example, it is logical for these regions to increase soybean and rapeseed production in order to improve supplies of vegetable oils and protein meal.

Many of the former republics are moving toward privatization of the big collective and state farms. As the size of farms decrease, the type of crops that can be grown economically shift toward cash crops, and away from crops which lend themselves to large-scale production. Since the pace of privatization is likely to be slow, the current farming practices and crop mixes will likely continue in the near future.

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