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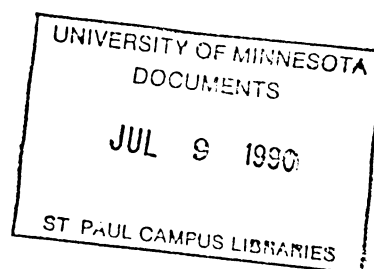
Proceedings of the NC-137/S-176 Grain Marketing Conference

Edited by Michael R. Reed

North Central Regional Publication 320

and

Southern Cooperative Series Bulletin 342



**Kentucky Agricultural Experiment Station
Lexington, Kentucky**

Grain Production and Utilization in the United States with Projections for 1990 and 2000

Eric J. Wailes and Joseph E. Vercimak¹

Production and utilization estimates of grain and soybeans are important for many types of agricultural analyses. Indications of future production and use provide a basis for planning and coordination of activities by a broad range of businesses and institutions. The solutions to planning issues facing grain merchandizing firms, such as location, expansion and integration, depend on knowledge about the spatial distribution and magnitude of production and utilization. Information needs by government officials include changes in volume and direction of flow to administer government agricultural programs and regulations. Production and utilization estimates provide the basis for determining the level and organization of marketing services needed to bring about an efficient transfer of grain and soybeans through the feed, seed and processing industries.

Purpose

The purpose of this study is to provide information about production and utilization of grains and soybeans in the United States as a basis for determining projected demands for commercial grain merchandizing services such as transportation in the North Central and Southern states. A more detailed analysis of this study can be found in Wailes and Vercimak (1988).

Projections of marketable grain surpluses or deficits are made on a state basis. Grain production is projected for 1989 and 1999 and grain consumption is projected for 1990 and 2000. The production projection precedes the consumption projection by one year since the bulk of the feed consumed during any given calendar year is harvested in the previous year.

Along with the projections, estimates are

presented of grain production, feed consumption and surpluses (deficits) for 1981, 1982 and 1983. Balance sheets showing stocks, production and utilization are provided for the North Central and Southern states that participated in a survey of grain flows for 1982 and 1983 and for all states for 1985.

Methodology

The research was organized with the cooperation of two regional research committees, S-176 and NC-137. Committee representatives from each state were responsible for providing data for their respective state. Projection procedures and models were similar for each state. The process provided for alternative estimates and adjustments by individual representatives when additional knowledge about the industry improved the estimates.

A trend share approach was used to maintain validity between the sum of the state estimates and the national production and utilization totals. National projections of grain and livestock production were provided by the Michigan State University Agriculture Model. Those projections were used as a basis to allocate state shares. The projection procedure for state shares used by a majority of states was to estimate a trend line, following the general form $Y = at^b$ where Y is state share and t is time. Each state's share of the national total was calculated for a 10-year historical base from 1973 through 1982. The projected state share for each class of grain and livestock was then multiplied by the Michigan State model projections. Projections for nonparticipating states were made by the production-utilization subcommittee.

Grain consumption estimates were based on

¹Associate Professor, Department of Agricultural Economics and Rural Sociology, University of Arkansas and Agricultural Economist, Department of Agricultural Economics, University of Illinois.

a procedure of multiplying livestock numbers by an annual grain consumption per animal (ration) estimate. Each state representative was responsible for providing current and projected rations for their respective state. For nonparticipating states, the Department of Animal Science of that state's land-grant university was contacted and requested to provide state ration estimates by livestock class. Ration coefficients were used to generate the quantity consumed by each class of livestock. These, in turn, were aggregated across livestock classes to generate total feed consumption by grain for each state.

An estimate of the surplus or deficit for each state was determined by subtracting the quantity of each grain consumed for feed from the quantity of each grain produced. This quantity represents a lower bound on the volumes that enter commercial grain-handling channels, creating a demand for transportation, storage and processing activities. This is a lower bound since grain consumed by livestock in a state may not be produced in that state even though the state's production may be in surplus of its needs. This can be the result of regional specialization within the state, typical for example of some Delta states where crop production is concentrated in the Mississippi Delta areas while feed consumption is located in the hills (e.g., Ozarks and Appalachias). Such a distinct geographic separation of crop and livestock production creates an interstate flow pattern where feed grains produced outside the state are shipped into the livestock areas, and grains produced in the state are shipped from the concentrated cropping area for export or other uses. A second reason why the resulting surplus/deficit figure is a lower bound is that much of the grain that is produced and also consumed within the state requires movement through commercial channels.

The estimates reported in this study are projections, not predictions, contingent upon the trend extrapolation of national share. Projections are based on two critical sets of assumptions. The first is that the trend relationships used to identify state shares of national production of grains and livestock will continue into the future. This assumption is clearly a risky one as changes in government programs, biotechnology and many other forces have the potential to bring about

nonmarginal changes in the production possibilities and, therefore, competitive position of the various states.

A second set of assumptions is implied in the baseline Michigan State University projection estimates. These estimates are based upon a dynamic structural model of domestic and international supply and demand equations of grains, oilseeds and livestock. The national production numbers used in this report are based upon the model structure and a set of assumptions for key exogenous variables. The assumptions are available from the authors upon request.

Results

Changes in Grain Production

Corn. Production of corn in the United States is projected to increase from 8.2 billion bushels in 1982 to 10.7 billion bushels by 1999. Table 1 shows the percent share of U.S. production for specified regions.

The Cornbelt, naturally, is the major production region, accounting for approximately one-half of the national output. The share of this region declines slightly over the projection period from 55% in 1982 to 51% by 1999. Iowa and Illinois remain the leading producing states. Figures 1 (a) and (b) provide a state comparison of production levels between 1982 and 1999.

The Lake States and Northern Plains Regions are the only other regions with more than 5% of the national production. The share of national production for the Lake States is projected to remain stable at 17%. For the Northern Plains, a large increase is projected, from 13.6% in 1982 to 16.0% by 1999.

The Northeast, Appalachia, Southeast, Southern Plains, Mountain Region and Pacific Coast are all projected to maintain roughly the same regional share. The Delta is projected to have the smallest regional output. However, substantial relative increases in corn production for Mississippi and Louisiana, consistent with production in the most recent years, is reflected in the Delta Regions's increasing share.

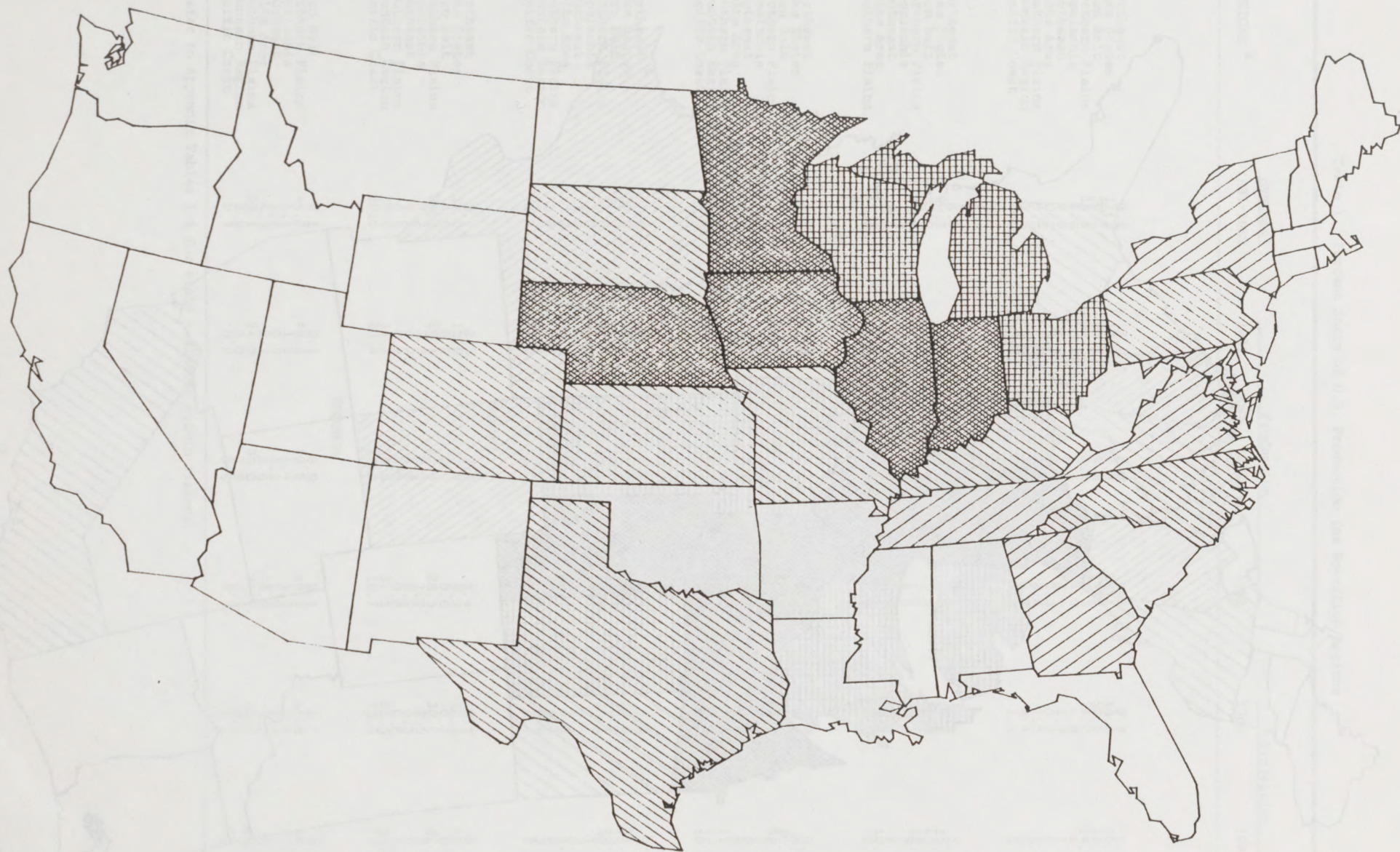


FIGURE 1(A). 1982/U. S. CORN PRODUCTION

FIGURE 1(A). 1983 / U. S. CORN PRODUCTION

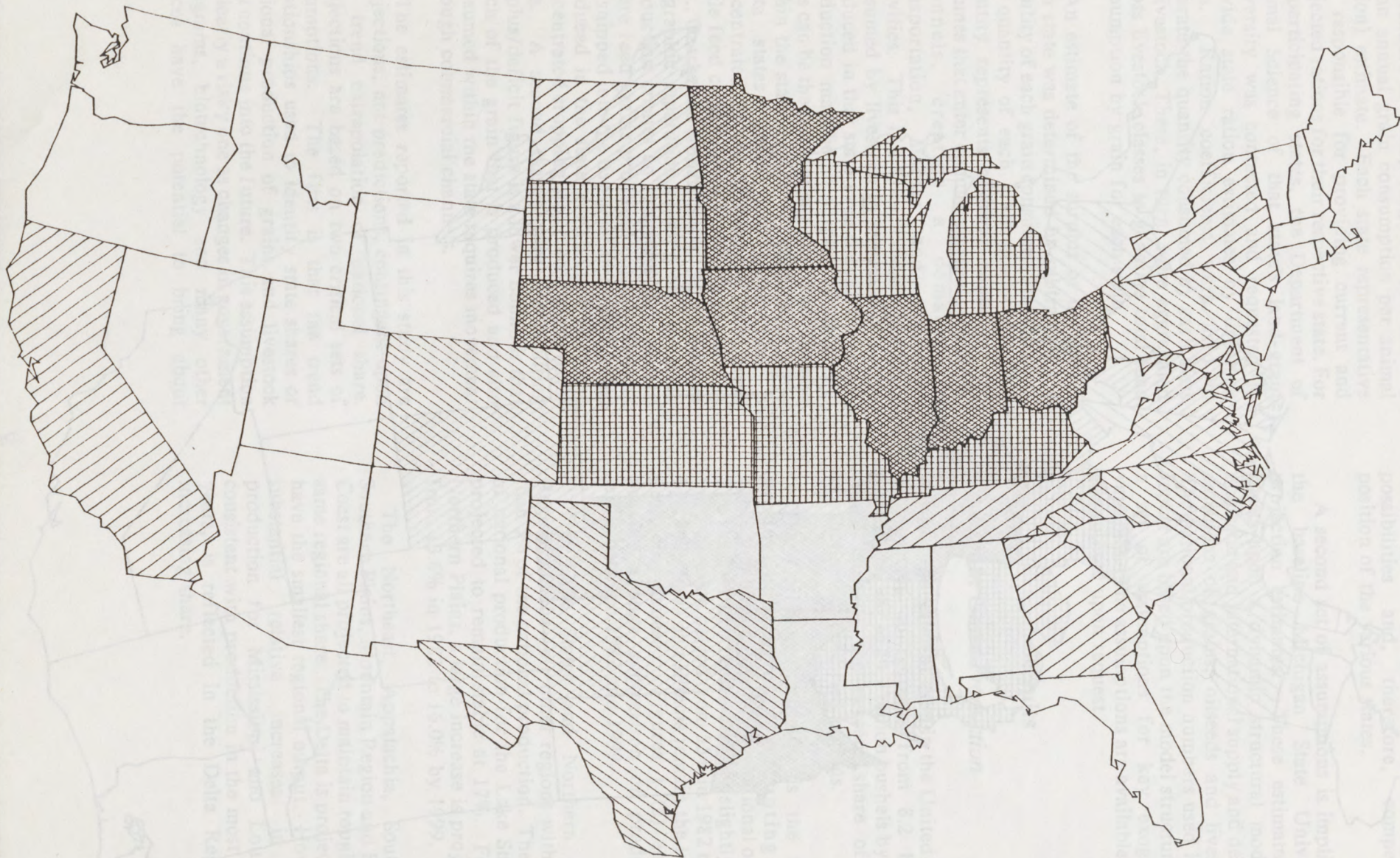


FIGURE 1(B). 1999 / U. S. CORN PRODUCTION

Table 1. Percent Share of U.S. Production for Specified Regions

REGIONS ^a	Average	Production			Projection	
	1981-1983	1981	1982	1983	1989	1999
CORN						
Northeast	3.8	3.8	3.5	4.3	3.7	3.7
Lake States	17.2	17.1	16.9	18.1	18.8	20.5
Corn Belt	53.1	53.9	54.9	48.0	51.3	48.9
Northern Plains	14.5	14.3	13.6	16.5	14.3	14.5
Appalachia	4.9	5.0	5.3	4.0	4.8	4.9
Southeast	1.9	1.8	1.7	2.4	1.7	1.7
Delta Area	0.2	0.1	0.1	0.3	0.3	0.3
Southern Plains	1.8	1.6	1.5	2.6	1.5	1.4
Mountain Region	1.8	1.6	1.6	2.4	2.4	2.7
Pacific Coast	0.9	0.7	0.9	1.3	1.1	1.5
SOYBEANS						
Northeast	1.3	1.3	1.2	1.5	1.4	1.5
Lake States	10.3	9.2	10.0	12.2	11.3	12.8
Corn Belt	53.0	53.8	52.0	53.6	50.5	45.4
Northern Plains	7.5	7.7	7.2	7.6	9.1	12.7
Appalachia	7.8	8.6	8.4	6.0	7.4	7.5
Southeast	6.8	6.5	7.5	6.3	6.8	7.2
Delta Area	12.2	12.1	12.5	12.1	12.1	10.7
Southern Plains	1.0	0.9	1.3	0.8	1.3	2.2
WHEAT						
Northeast	0.9	0.9	0.8	1.0	0.9	0.9
Lake States	5.8	6.7	5.6	5.0	6.9	8.0
Corn Belt	10.5	12.5	8.7	10.2	10.7	10.0
Northern Plains	33.2	29.6	35.6	34.5	32.7	32.4
Appalachia	3.3	3.8	3.3	2.8	2.6	2.7
Southeast	2.9	3.1	3.2	2.3	2.3	2.8
Delta Area	4.0	3.7	2.6	2.6	3.5	3.5
Southern Plains	13.1	12.8	13.4	12.9	12.4	16.5
Mountain Region	15.0	14.5	14.7	15.9	14.1	13.6
Pacific Coast	11.5	12.5	10.1	11.8	10.9	10.6
OATS						
Northeast	7.3	8.4	7.1	6.5	7.6	7.7
Lake States	30.2	32.1	29.6	28.8	30.8	31.3
Corn Belt	17.3	19.7	16.8	15.4	17.0	15.0
Northern Plains	32.6	27.4	36.1	33.9	30.2	30.5
Appalachia	1.3	1.4	1.1	1.3	1.3	1.3
Southeast	1.8	1.8	1.7	1.9	2.3	2.8
Delta Area	0.5	0.4	0.4	0.8	0.8	1.0
Southern Plains	4.1	4.4	2.4	5.9	4.3	3.7
Mountain Region	2.8	2.4	2.9	3.3	3.4	3.7
Pacific Coast	2.1	2.0	2.0	2.3	2.4	2.9
BARLEY						
Northeast	2.4	2.5	2.3	2.4	3.1	2.7
Lake States	11.0	12.9	10.8	9.3	12.2	12.5
Corn Belt	0.0	0.0	0.0	0.0	0.7	0.7
Northern Plains	26.6	26.1	25.3	28.5	30.0	32.9
Appalachia	2.2	2.6	2.1	1.8	2.0	1.7
Southeast	0.2	0.2	0.3	0.2	0.3	0.3
Southern Plains	0.6	0.6	0.5	0.8	0.6	0.6
Mountain Region	36.9	34.7	38.6	37.3	31.5	29.6
Pacific Coast	20.0	20.4	20.0	19.7	19.6	19.0
SORGHUM						
Corn Belt	9.1	9.1	8.9	9.7	8.7	8.8
Northern Plains	44.2	48.3	42.3	40.3	44.9	44.2
Appalachia	1.4	1.3	1.4	1.8	1.4	1.5
Southeast	1.2	0.8	1.2	1.6	1.7	1.6
Delta Area	4.3	2.7	3.6	8.2	5.0	6.0
Southern Plains	36.1	34.0	39.0	34.7	33.6	32.9
Mountain Region	3.0	3.0	2.9	2.9	3.6	3.6
Pacific Coast	0.7	0.8	0.6	0.7	1.1	1.1

^aRefer to Appendix Tables 1-6 for state estimates within regions.

Soybeans. Production of soybeans is projected to increase from the 1982 level by approximately 500 million bushels in 1999. The projections of regional production share shown in Table 1 indicate that the Cornbelt retains its position of production concentration. However, it loses relative national share to the adjacent Lake States and Northern Plains.

The Delta region, although second most important in the early 1980s, is fourth in relative regional importance by 1999. The only other regions with substantial soybean production are the Appalachia and Southeast. Both of these regions maintain 7 to 8% of the national production projection. These regional shifts, as detailed in Figure 2 (a) and (b), reflect a projected decrease in the regional concentration of soybean production out of the Cornbelt and Delta regions. Two-thirds of the increase in national production projected for 1999 is located in the Northern Plains and Lake States regions.

Wheat. Production of wheat in the United States is projected to increase above the 1982 level by 507 million bushels in 1999. The major production region is the Northern Plains (Table 1). The Southern Plains, Mountain Region, Cornbelt and Pacific Coast are of secondary importance. The projections indicate a reduction in the combined shares of these five regions. These shares were approximately 83% in 1982 and are projected to decline to 78% by 1999. The diffusion in the production density is reflected in the increases of the regional shares for most of the minor production regions. These shifts are apparent in the maps of Figures 3 (a) and (b). Major increases in wheat production are projected in several states. States projected to increase production by over 50 million bushels between 1982 and 1999 include Minnesota, South Dakota and Arkansas.

Oats. Production of oats is projected to decrease from the 1982 volume by 138 million bushels in 1999. The production of oats is clustered primarily in five states (South Dakota, North Dakota, Minnesota, Wisconsin and Iowa). This Oat Belt accounted for 64% of the national production in 1982. The estimate projected for these five states in 1999 is 61%, suggesting little change in the geographic distribution of future oat

production.

The major regions, as reported in Table 1, include the Lake States, Cornbelt and the Northern Plains. Production is projected to decline in all three regions, most substantially in the Northern Plains. Projected estimates indicate stable or slight declines in production levels for the Northeast, Appalachia and the Southern Plains--regions where oats are of relatively minor importance. Slight increases in production and share of national production are projected for the Pacific Coast, Mountain Region, Delta Area and the Southeast.

Barley. National production of barley is projected to increase by 251 million bushels between 1982 and 1999, nearly a 50% increase. Production is projected to increase in all regions of the country except the Southern Plains. The major production zone includes a northern belt of states stretching west from Minnesota, including North Dakota, Montana, Idaho, Washington and California. These six states produced 76% of the national volume in 1982. Their combined projected share by 1999 is 73%. As Figures 5 (a) and (b) indicates, the estimates imply almost no shift in the share of barley production on a regional or state basis. Although all regions are projected to increase their production level, the relative share of national production is projected to decline for Appalachia, the Mountain Region and the Pacific Coast (Table 1). The regional share for the Northern Plains is projected to increase by 6 percentage points.

Grain Sorghum. National production is projected to increase above the 1982 level by 280 million bushels in 1999. Three states (Nebraska, Kansas and Texas) accounted for 77% of the 1982 production total. Their share declines to 72% by 1999. No major shifts are projected in the distribution of grain sorghum production (Figure 6 (a) and (b)). Texas is projected to continue to produce more than any other state in the nation, but its relative importance is projected to decline significantly. Regions projected to become more important include the Delta, Southeast and Mountain Region (Table 1).

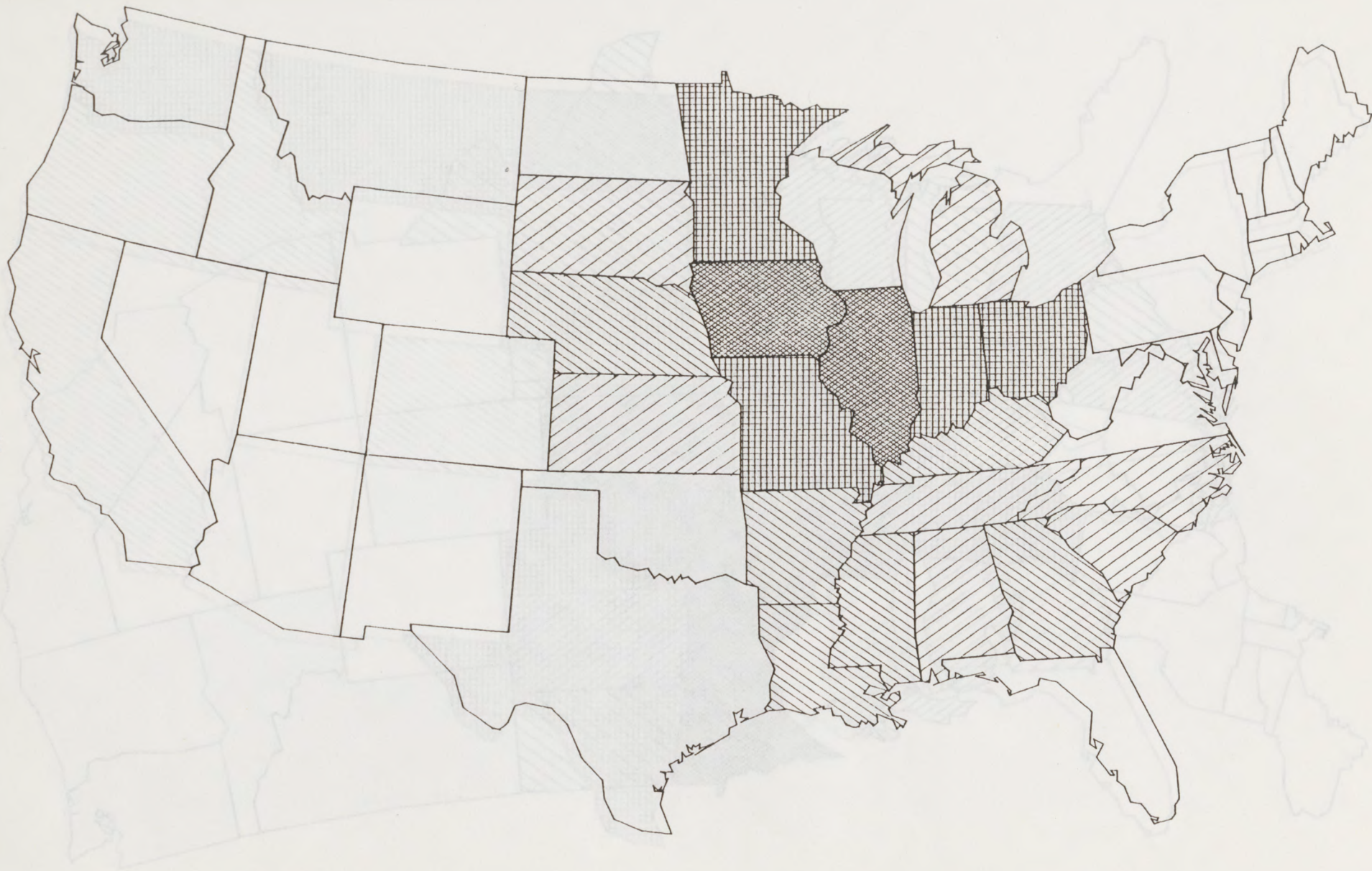


FIGURE 2(A). 1982/U. S. SOYBEAN PRODUCTION

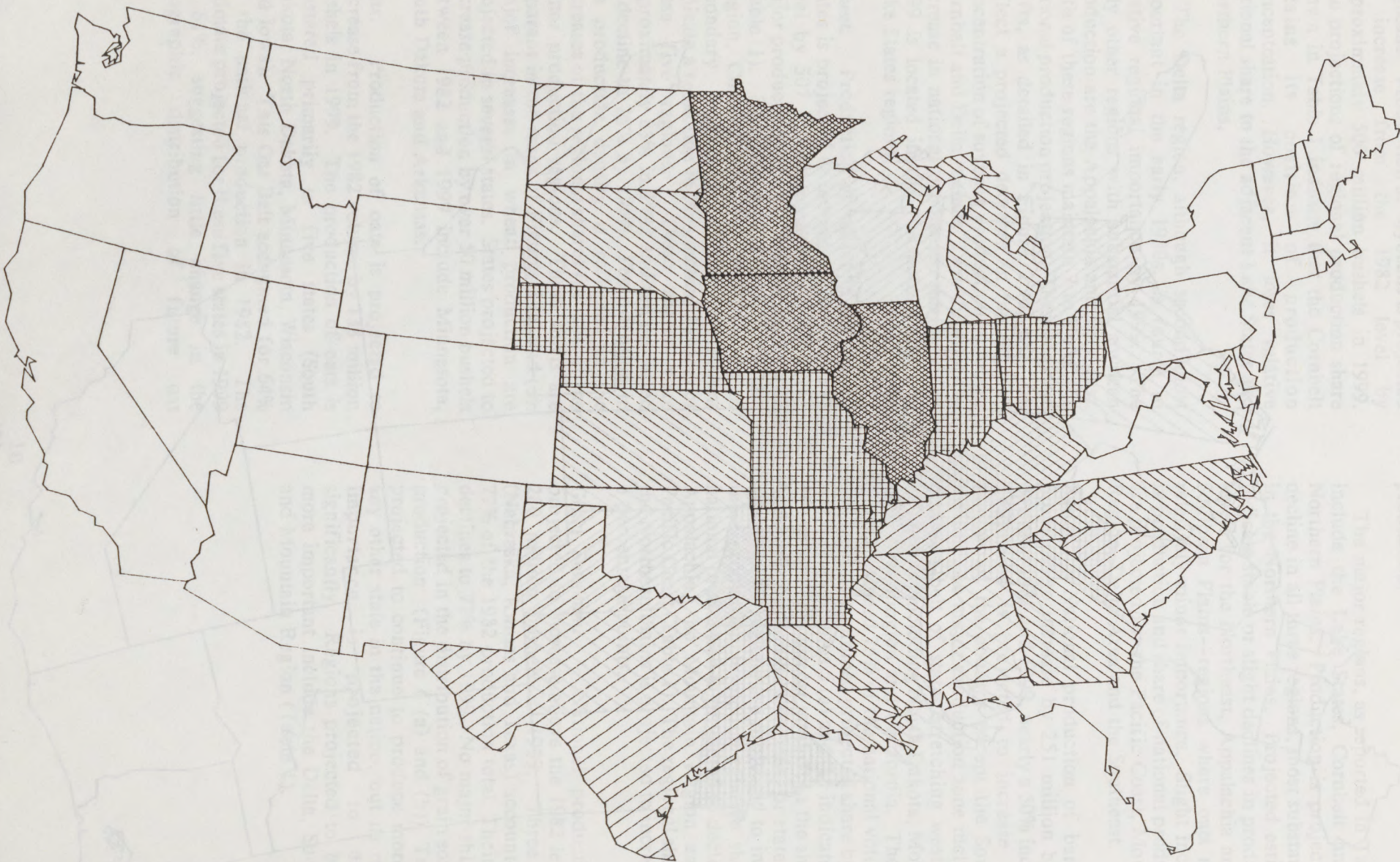


FIGURE 2(B). 1999 /U. S. SOYBEAN PRODUCTION

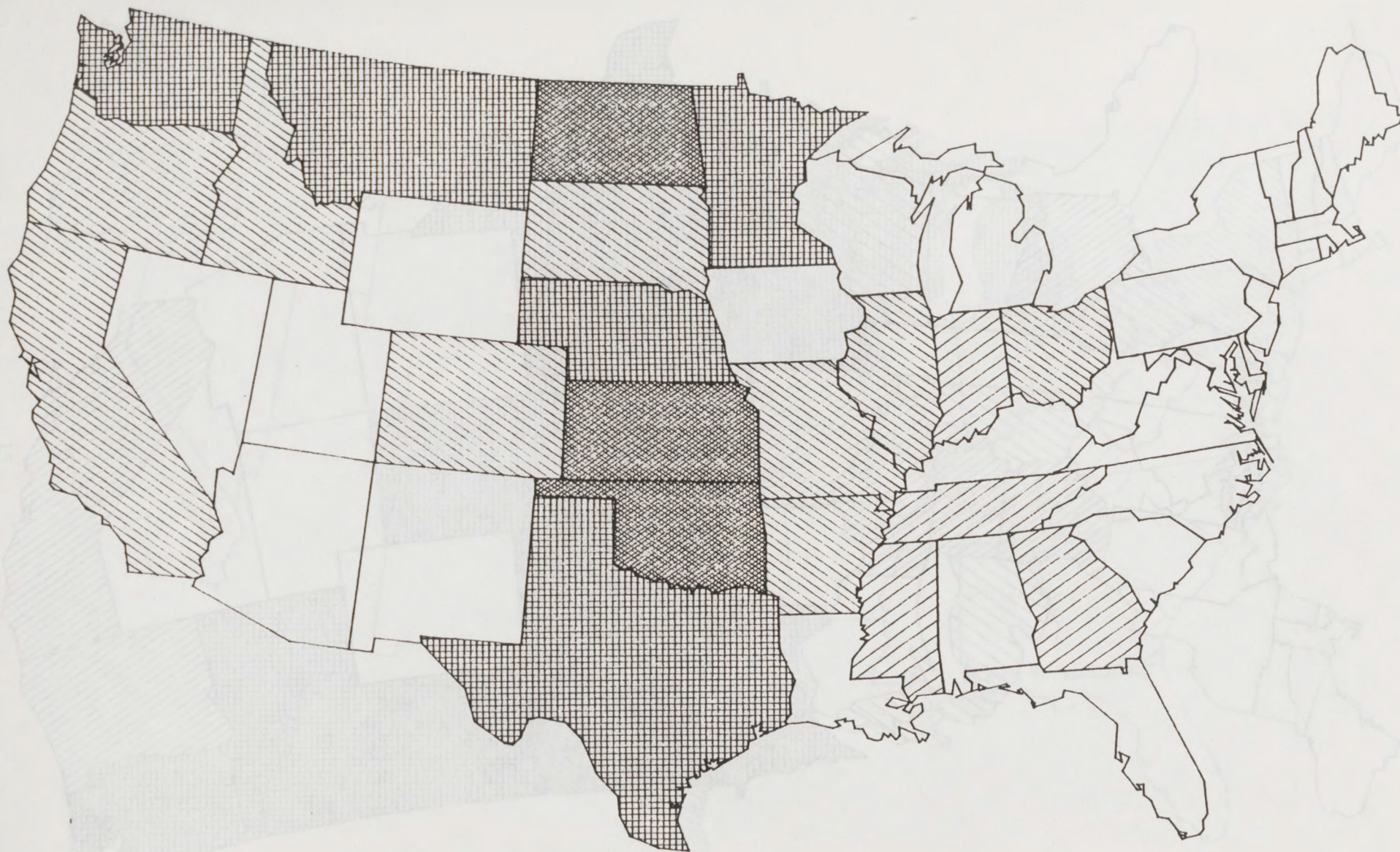


FIGURE 3(A). 1982/U. S. WHEAT PRODUCTION

FIGURE 3(A). 1985 / U. S. WHEAT PRODUCTION

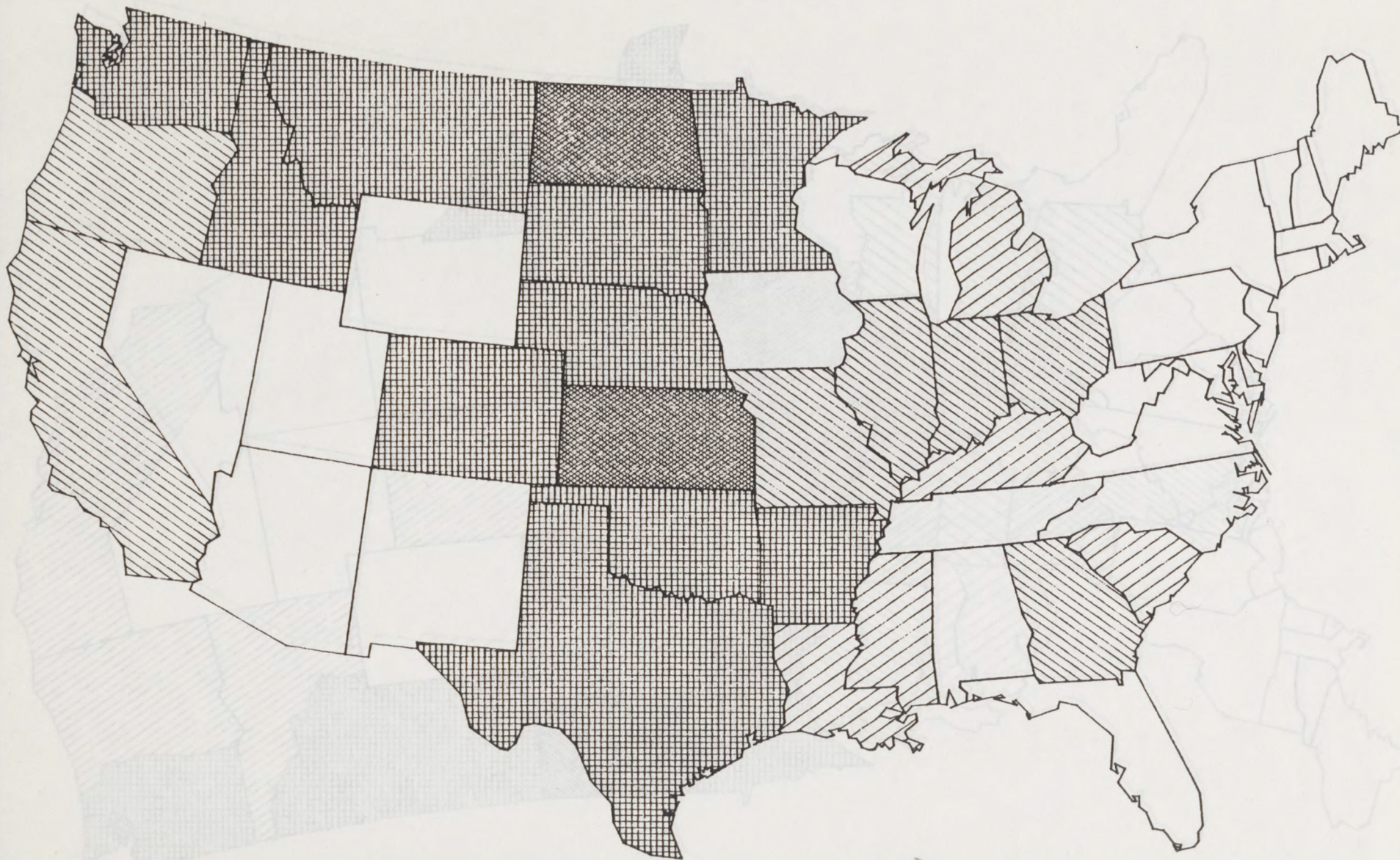


FIGURE 3(B). 1999 / U. S. WHEAT PRODUCTION

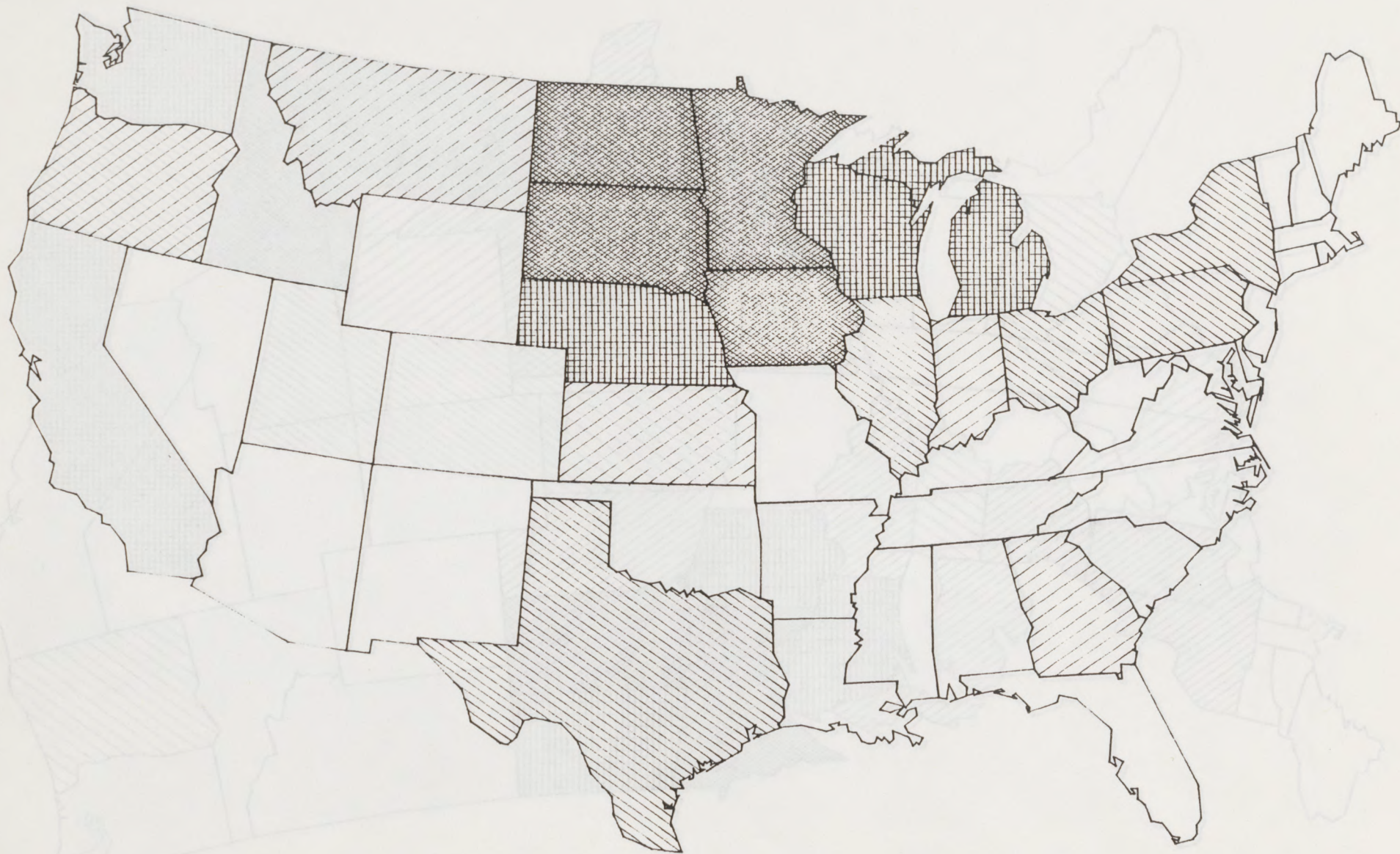


FIGURE 4(A). 1982/U. S. OAT PRODUCTION

FIGURE 4(A). 1982 / U. S. OAT PRODUCTION

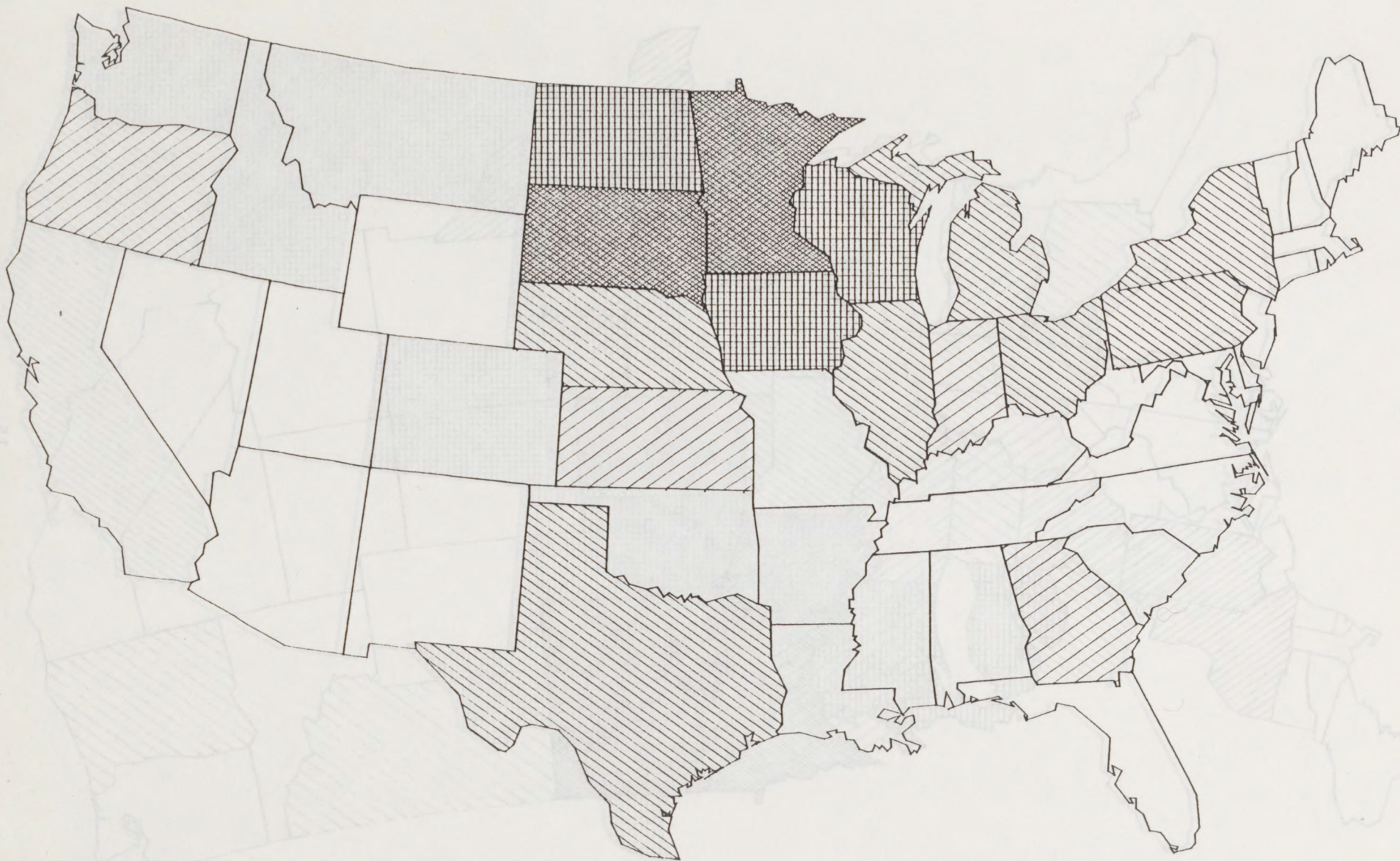


FIGURE 4(B). 1999 / U. S. OAT PRODUCTION

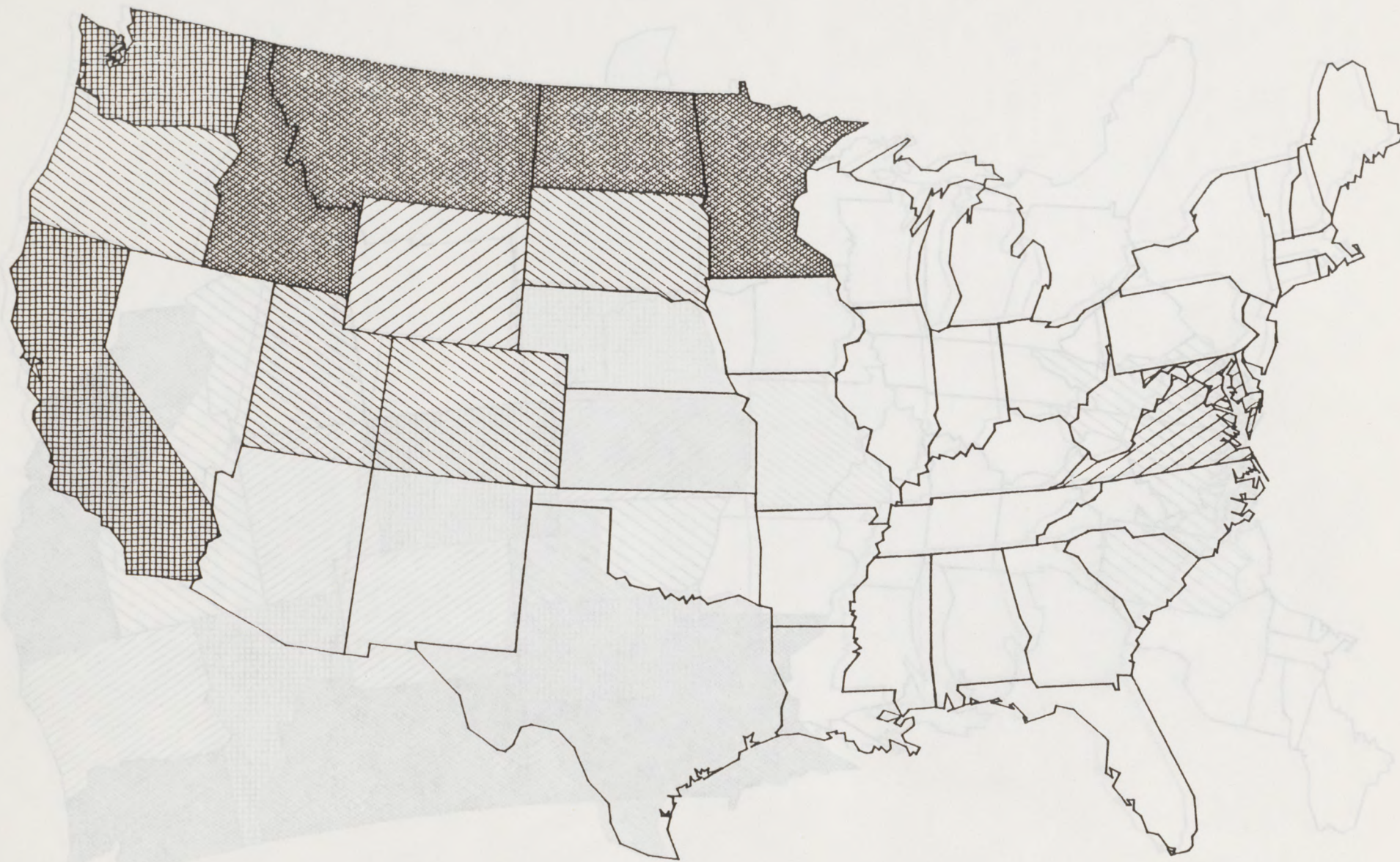


FIGURE 5(A). 1982/U. S. BARLEY PRODUCTION

FIGURE 2(A). 1985 / U. S. BARLEY PRODUCTION

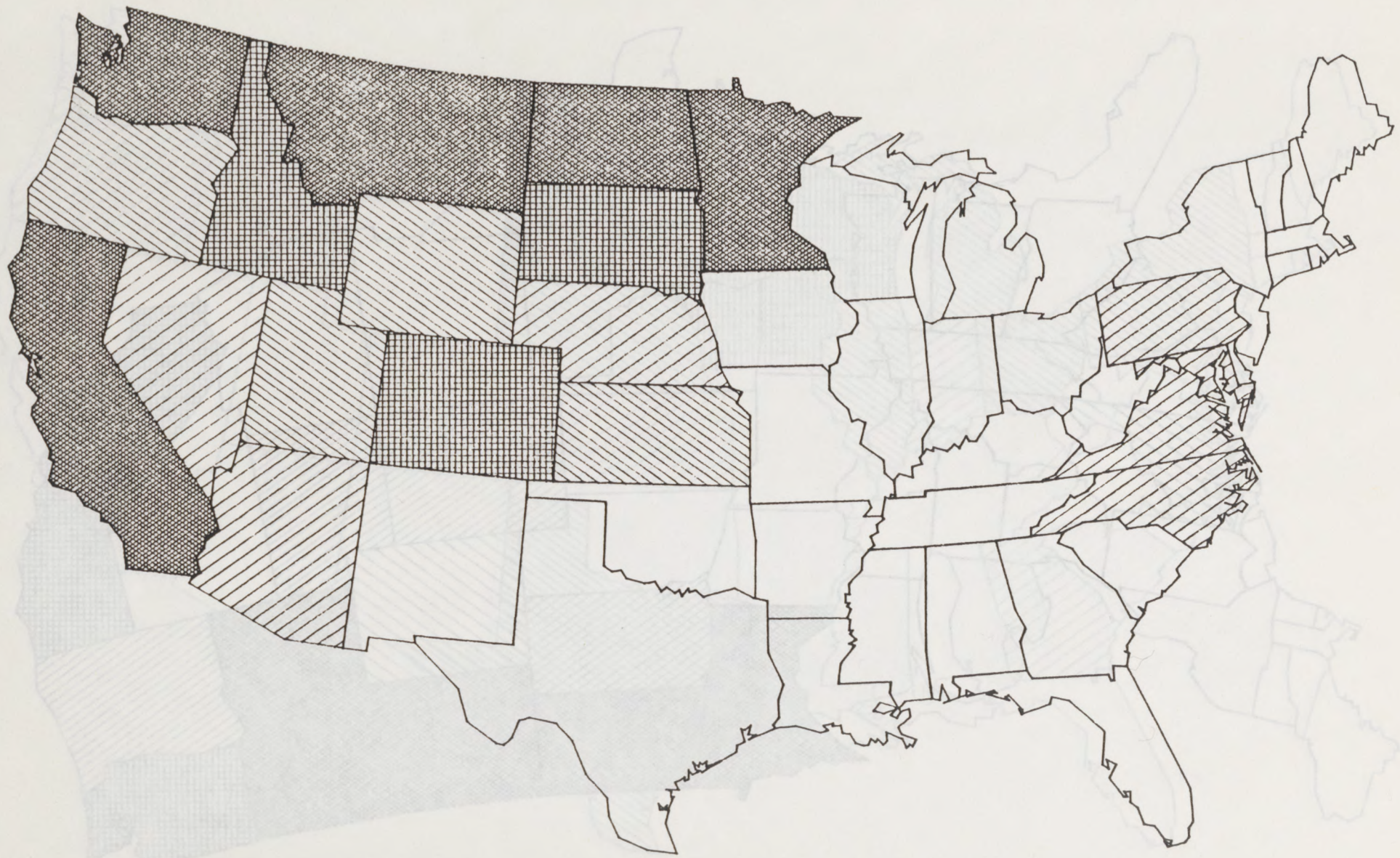


FIGURE 5(B). 1999 / U. S. BARLEY PRODUCTION

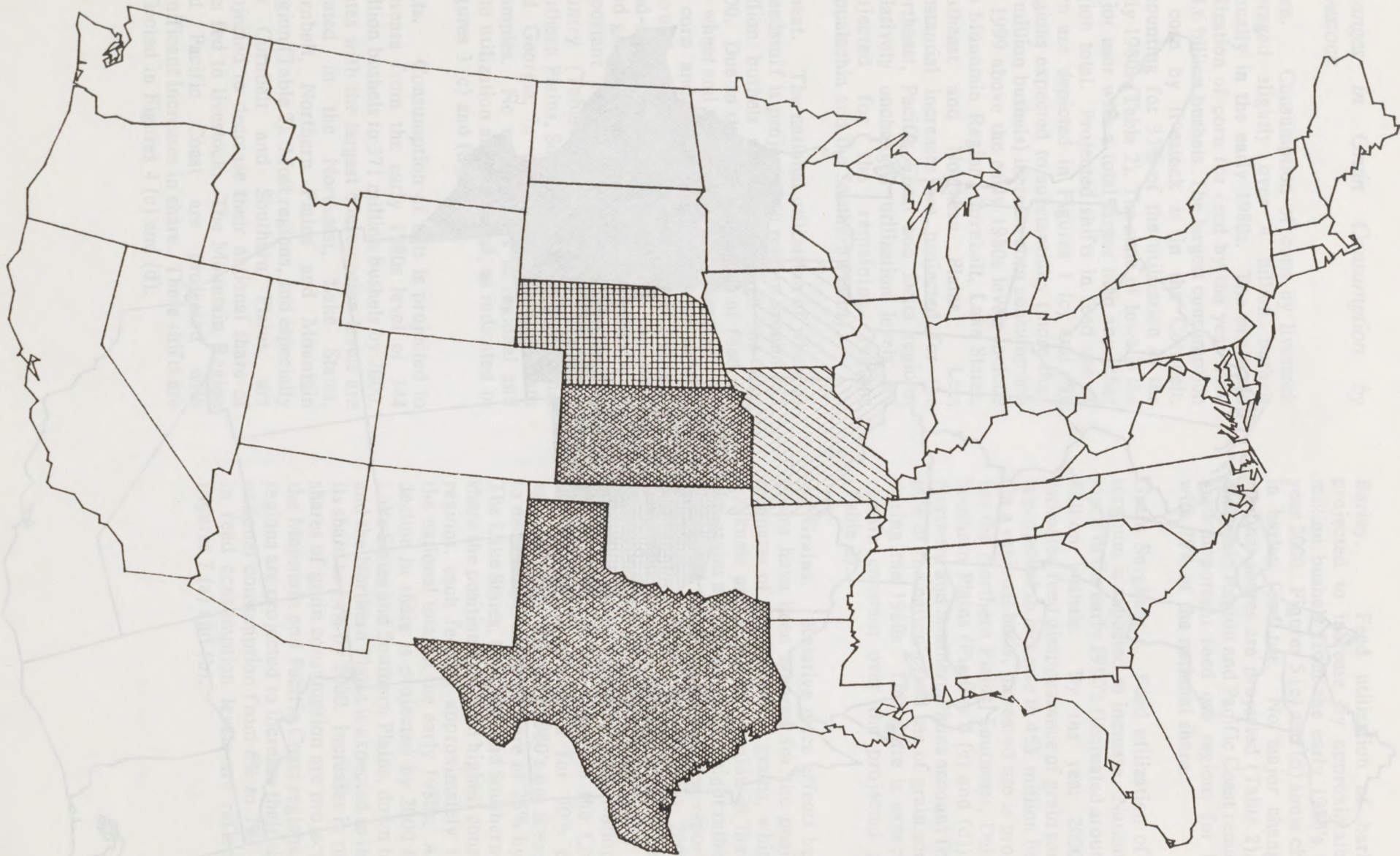


FIGURE 6(A). 1982/U. S. GRAIN SORGHUM PRODUCTION

FIGURE 6(B). 1999 / U. S. GRAIN SORGHUM PRODUCTION

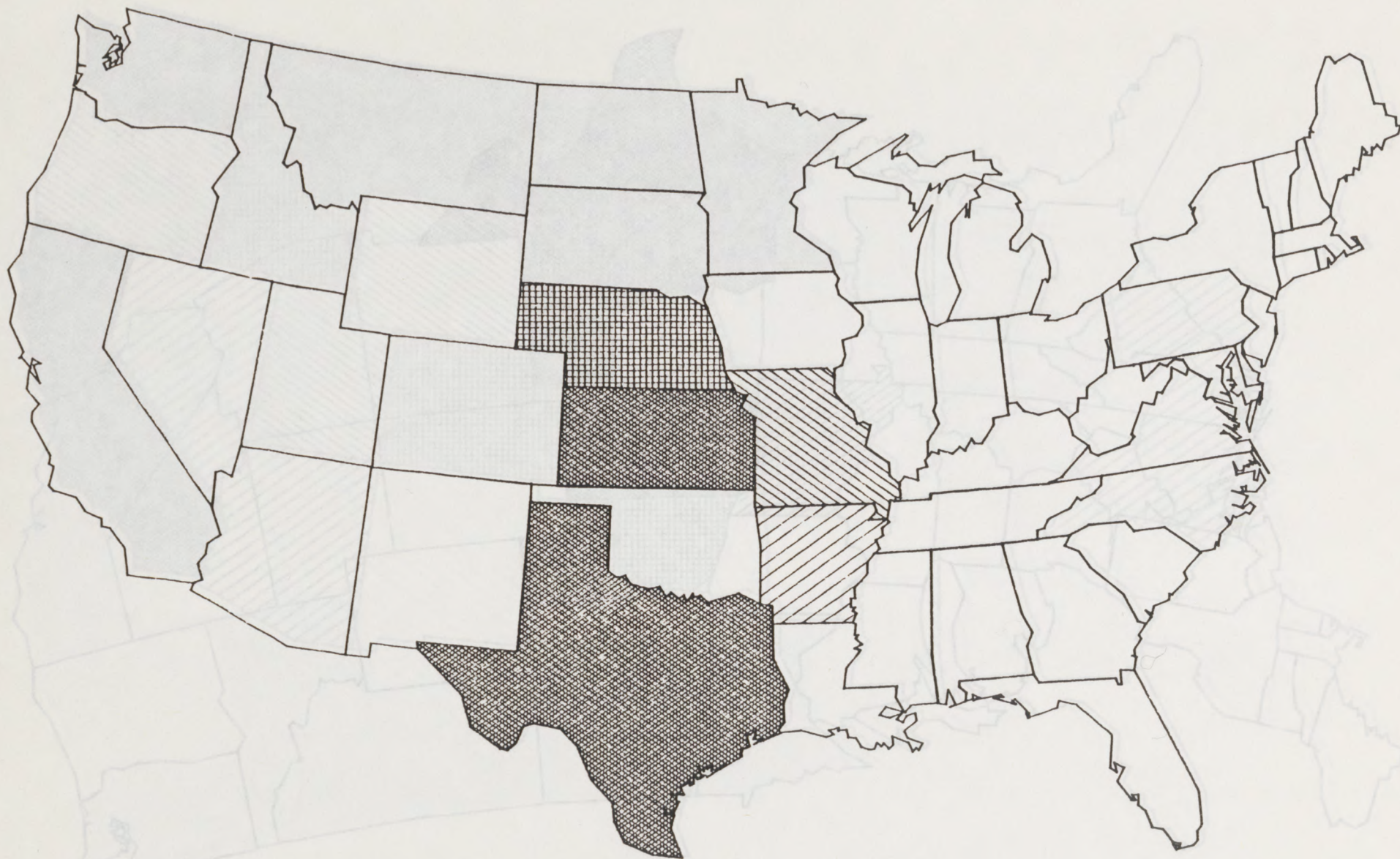


FIGURE 6(B). 1999 / U. S. GRAIN SORGHUM PRODUCTION

Changes in Grain Consumption by Livestock

Corn. Consumption of corn by livestock averaged slightly over 4 billion bushels annually in the early 1980s. The projected utilization of corn for feed by the year 2000 is 4.6 billion bushels. The largest consumption of corn by livestock is in the Cornbelt, accounting for 35% of the utilization in the early 1980s (Table 2). The state of Iowa is the major user with a total larger than any other region total. Projected shifts in feed use of corn are depicted in Figures 1 (c) and (d). Regions expected to substantially (more than 50 million bushels) increase corn consumption by 1999 above the early 1980s levels include the Mountain Region, Cornbelt, Lake States, Southeast and Northern Plains. Less substantial increases are projected for the Northeast, Pacific Coast and Delta regions. Relatively unchanged utilization levels are projected for the remaining regions (Appalachia and the Southern Plains).

Wheat. The national utilization of wheat as a feedstuff is projected to remain around 225 million bushels annually through the year 2000. Due to the residual nature of feed use for wheat and the sensitivity of wheat feed use to corn and wheat prices, greater caution should be used for the wheat feed-consumption estimates than for other feed grains. Wheat has been traditionally an important feed in certain regions of the country (Table 2). The Pacific Coast, Southern Plains, Southeast regions (California and Georgia in particular) are important examples. No major shifts in regional and state utilization are projected, as indicated in Figures 3 (c) and (d).

Oats. Consumption of oats is projected to increase from the early 1980s level of 344 million bushels to 371 million bushels by 2000. States with the largest consumption levels are located in the Northeast, Lake States, Cornbelt, Northern Plains and Mountain Region (Table 2). Most regions, and especially the Cornbelt and Southern Plains, are projected to decrease their national share of oats fed to livestock. The Mountain Region and Pacific Coast are projected with significant increases in share. These shifts are reflected in Figures 4 (c) and (d).

Barley. Feed utilization of barley is projected to increase by approximately 58 million bushels from the early 1980's to the year 2000. Figures 5 (c) and (d) show changes in barley feed use. No major changes in regional shares are projected (Table 2). The Mountain Region and Pacific Coast remain the most important feed use regions for barley with 79% of the national share.

Grain Sorghum. Feed utilization of grain sorghum is expected to increase. National use levels in the early 1980's fluctuated around 340 million bushels. By the year 2000, the estimated feed disappearance of grain sorghum is projected to increase to 453 million bushels. On a regional basis, increased use is projected for the Northern Plains, Southeast, Delta and Southern Plains (Figures 6 (c) and (d)). The Northern and Southern Plains account for over 60% of the nation's feed use of grain sorghum during the 1980s. This share is expected to remain constant over the projected period (Table 2).

All Grains. Relative price effects between grains have been ignored for the projection estimates of the individual grains, which is a weakness and cause for caution in their use. The grains are combined by weight rather than nutritional equivalence and are reported in thousands of tons. By the year 2000, the consumption of grains is projected to increase approximately 14% above the early 1980s utilization levels of around 140 million tons. The major feed use region is the Cornbelt (Table 2). It accounted for 30% of the national use in the early 1980's but is expected to decline to a national share of 26% by 2000. The Lake States, Northern and Southern Plains share the position as second highest consuming regions, each feeding approximately 11% of the national total in the early 1980s. A slight decline in share is projected by 2000 for the Lake States and Southern Plains, down to 11%, and the Northern Plains is expected to increase its share to 14% by 2000. Increases in regional shares of grain consumption are projected for the Mountain and Pacific Coast regions. Both regions are projected to increase their share of national consumption from 6% to 7%. Shifts in feed consumption levels are reflected in Figures 7 (a) and (b).

Table 2. Percent Share of U.S. Grain Consumption by Livestock for Specified Regions

REGIONS ^a	1981	1982	1983	1990	2000
CORN					
Northeast	6.2	6.3	6.2	6.5	6.6
Lake States	12.8	12.9	12.9	13.0	12.5
Corn Belt	35.8	34.3	34.7	34.9	31.9
Northern Plains	10.6	11.2	11.2	11.5	13.9
Appalachia	7.1	7.2	7.4	6.7	6.5
Southeast	6.5	6.2	5.9	7.1	6.7
Delta Area	3.6	3.7	3.5	4.1	4.1
Southern Plains	10.2	10.5	10.7	8.5	9.2
Mountain Region	4.2	4.5	4.5	4.5	5.1
Pacific Coast	3.1	3.1	3.0	3.4	3.5
WHEAT					
Northeast	5.6	5.8	5.8	5.2	4.7
Lake States	1.1	1.1	1.1	1.4	1.3
Corn Belt	10.2	10.1	10.3	9.6	8.4
Northern Plains	7.5	7.8	7.9	7.7	8.7
Appalachia	10.5	10.4	11.4	11.0	10.9
Southeast	20.8	19.7	19.0	19.8	18.9
Delta Area	4.5	4.5	4.3	4.6	4.3
Southern Plains	10.0	10.3	10.6	9.9	10.9
Mountain Region	7.3	7.4	7.3	7.7	8.1
Pacific Coast	22.3	23.0	22.3	23.1	23.8
OATS					
Northeast	21.2	21.1	21.1	20.7	19.3
Lake States	19.0	18.6	18.7	18.5	17.6
Corn Belt	14.5	14.2	14.5	11.6	10.2
Northern Plains	9.2	9.0	9.0	9.0	8.8
Appalachia	3.3	3.3	3.3	3.3	3.1
Southeast	3.0	2.7	2.7	3.1	2.5
Delta Area	2.7	2.8	2.7	3.3	3.5
Southern Plains	8.7	8.8	8.9	6.4	6.2
Mountain Region	13.1	13.8	13.7	17.5	20.3
Pacific Coast	5.4	5.6	5.4	6.7	8.4
BARLEY					
Northeast	0.2	0.3	0.3	0.3	0.3
Lake States	4.7	4.6	4.6	5.2	5.6
Corn Belt	0.6	0.6	0.6	0.6	0.6
Northern Plains	3.3	3.2	3.3	2.8	2.3
Appalachia	1.3	1.3	1.3	1.4	1.3
Southeast	2.8	2.7	2.6	2.6	2.1
Southern Plains	7.6	7.6	8.2	7.1	7.4
Mountain Region	29.6	29.8	30.0	30.4	29.8
Pacific Coast	49.8	49.9	49.1	49.6	50.6
SORGHUM					
Northeast	1.1	1.1	1.1	1.0	0.9
Lake States	1.5	1.3	1.3	1.6	1.6
Corn Belt	9.3	8.9	9.1	8.4	6.9
Northern Plains	30.8	31.3	29.0	29.9	33.4
Appalachia	4.6	4.6	4.9	4.3	4.0
Southeast	8.4	8.4	8.7	13.9	12.1
Delta Area	6.5	6.4	6.4	6.8	6.3
Southern Plains	30.5	31.1	32.7	27.3	28.6
Mountain Region	6.1	5.9	5.8	5.7	5.5
Pacific Coast	1.1	1.1	1.0	1.0	0.7
ALL GRAINS					
Northeast	6.1	6.2	6.1	6.3	6.2
Lake States	11.4	11.4	11.4	11.4	11.0
Corn Belt	30.3	29.0	29.4	29.1	26.4
Northern Plains	11.4	11.9	11.8	12.1	14.4
Appalachia	6.6	6.7	6.9	6.3	6.1
Southeast	7.0	6.7	6.4	7.8	7.3
Delta Area	3.6	3.7	3.5	4.1	4.0
Southern Plains	11.3	11.7	12.0	9.8	10.6
Mountain Region	6.0	6.4	6.3	6.5	7.1
Pacific Coast	6.2	6.4	6.1	6.6	6.9

^aRefer to Appendix Tables 7-12 for state estimates within regions.

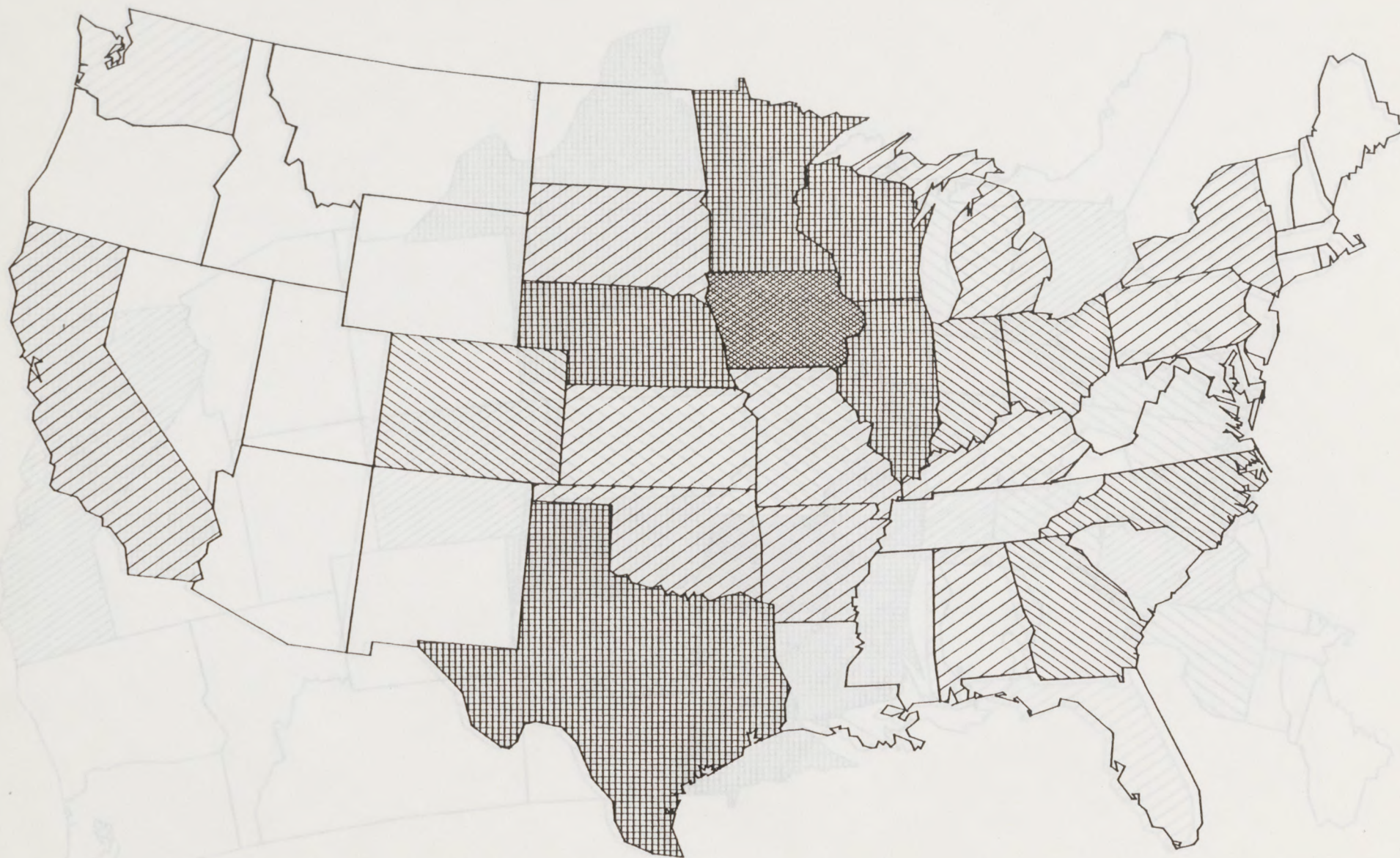


FIGURE 1(C). 1982/U. S. CORN FEED USE

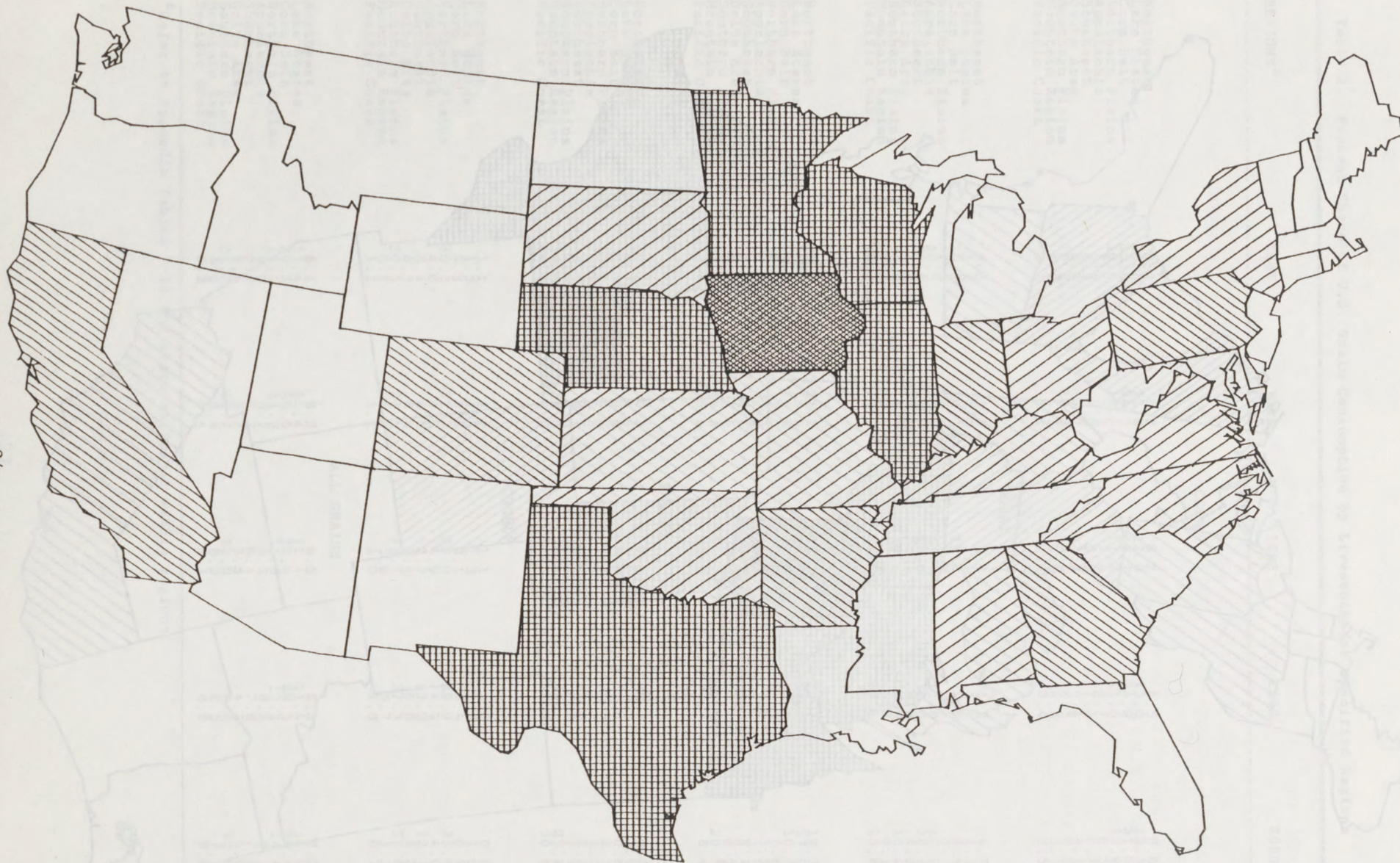


FIGURE 1(D). 2000 / U. S. CORN FEED USE

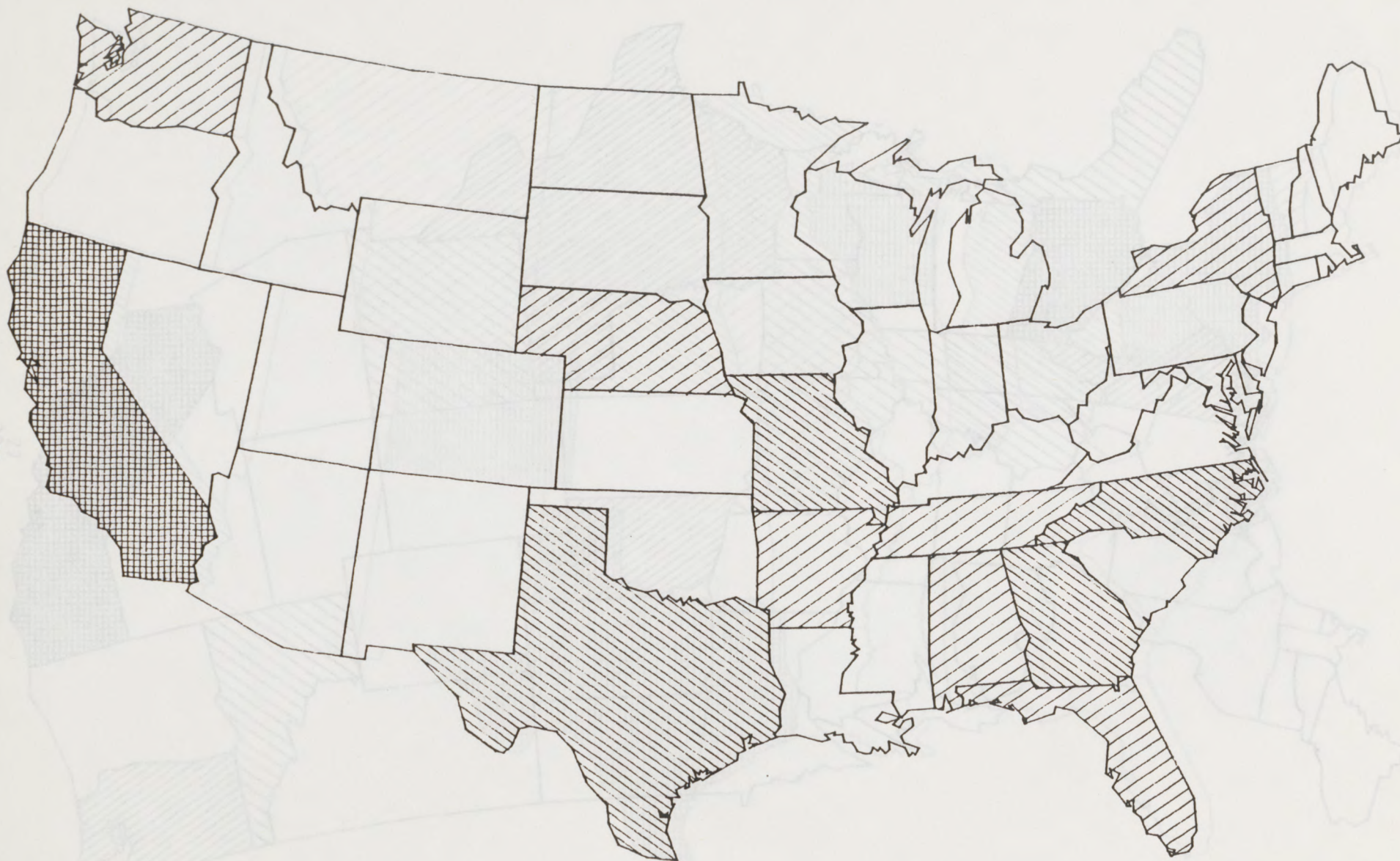


FIGURE 3(C). 1982/U. S. WHEAT FEED USE

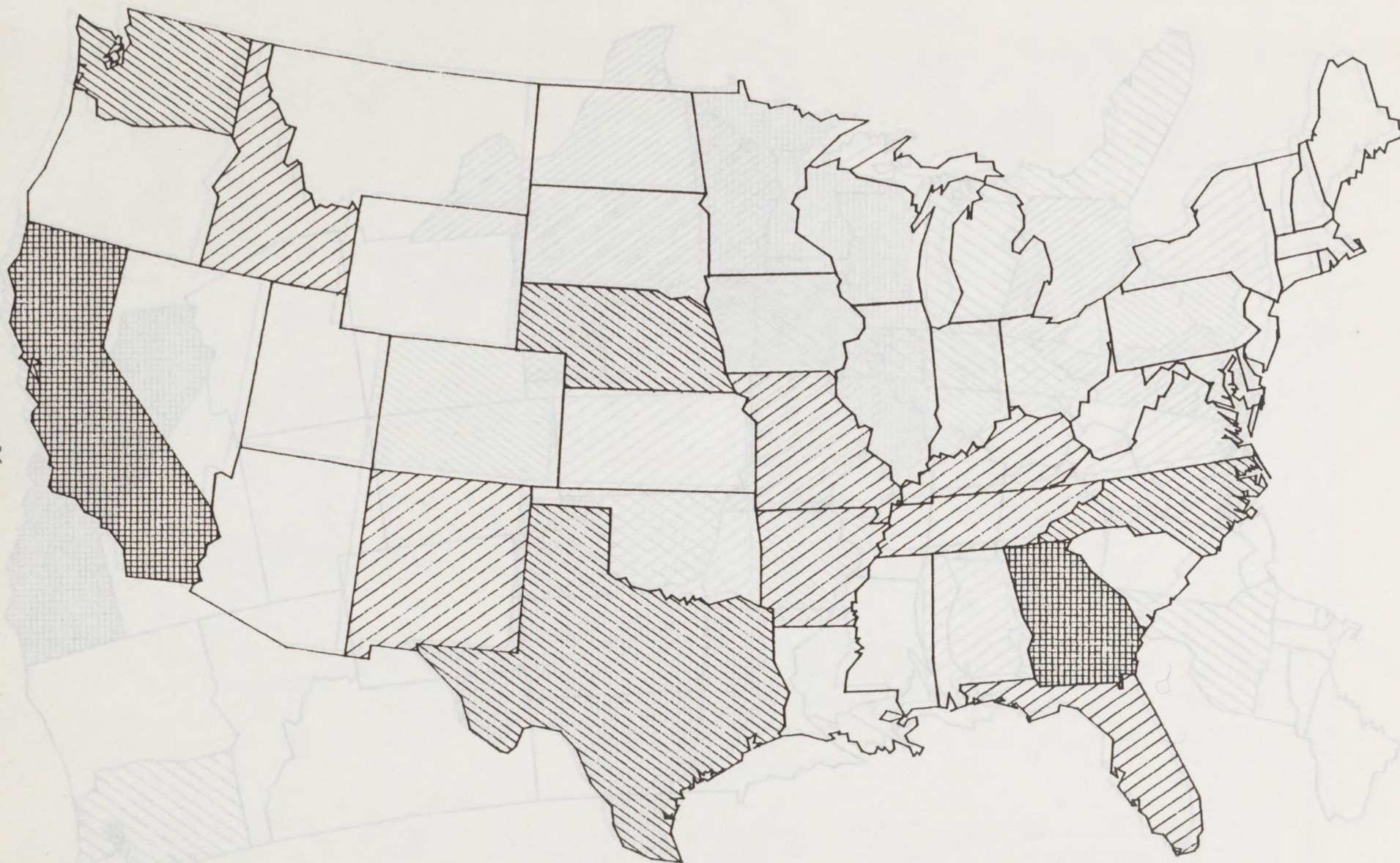


FIGURE 3(D). 2000 / U. S. WHEAT FEED USE

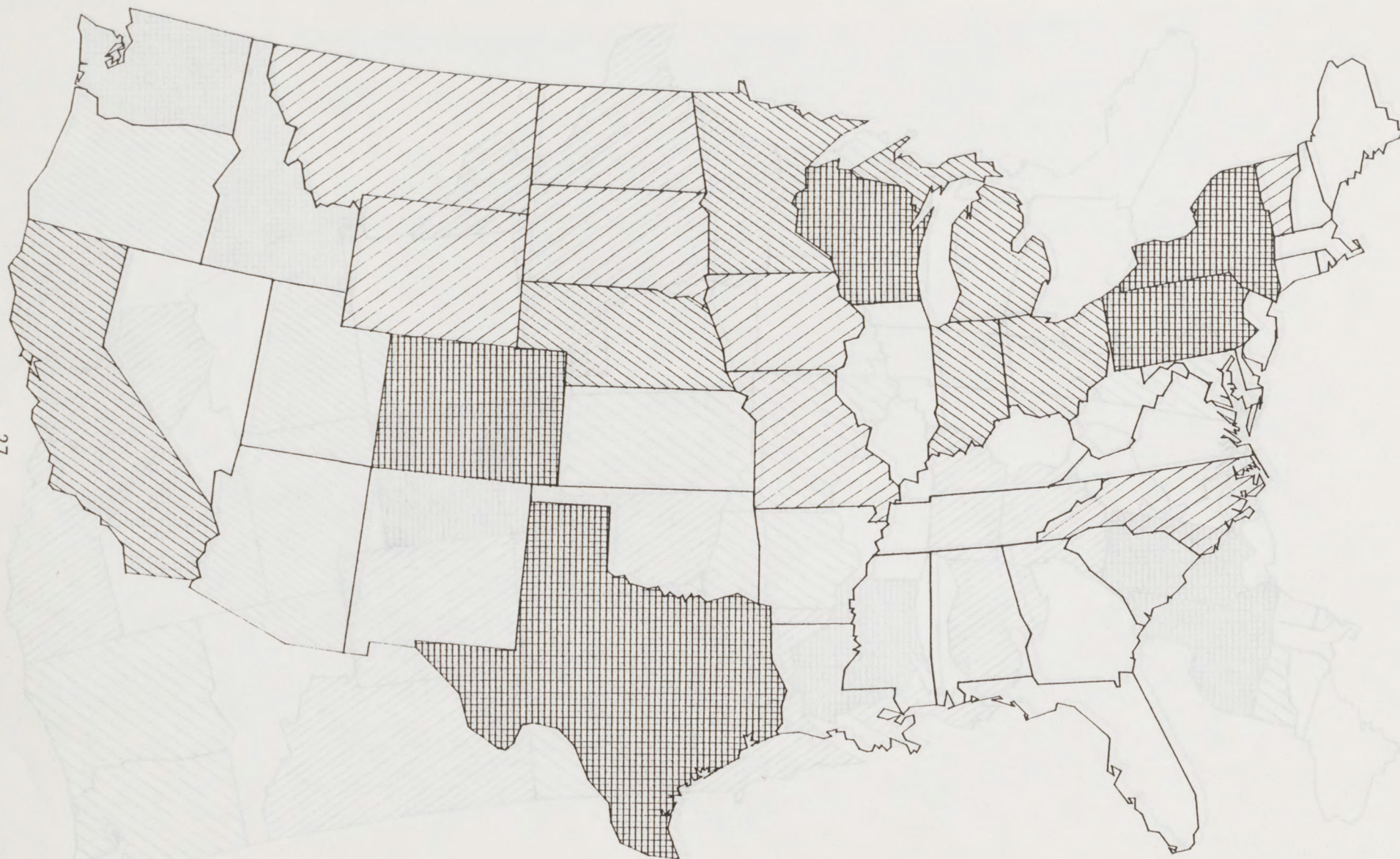


FIGURE 4(C). 1982/U. S. OAT FEED USE

FIGURE 4(C). 1985 / U. S. OAT FEED USE

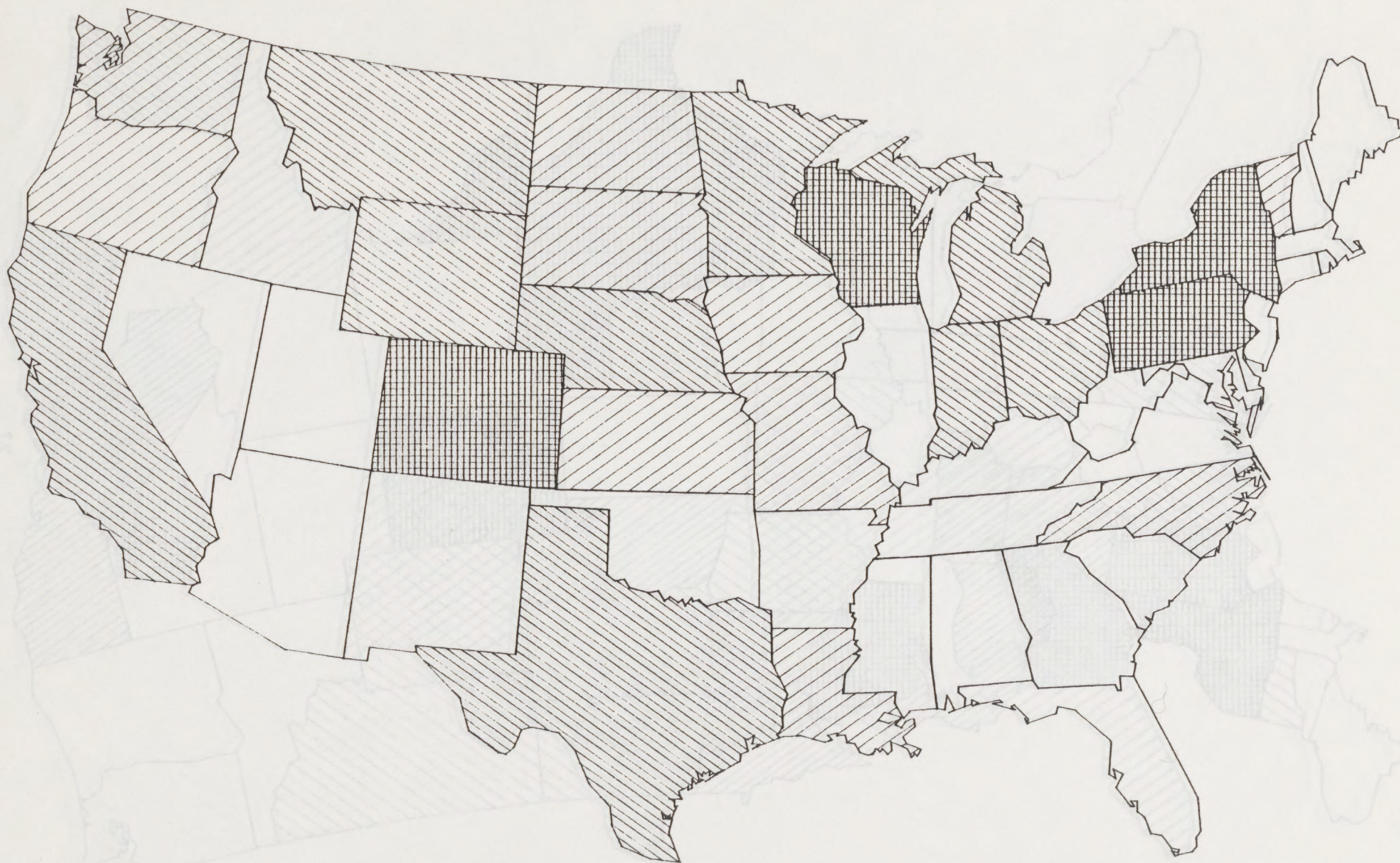


FIGURE 4(D). 2000 / U. S. OAT FEED USE



FIGURE 5(C). 1982/U. S. BARLEY FEED USE

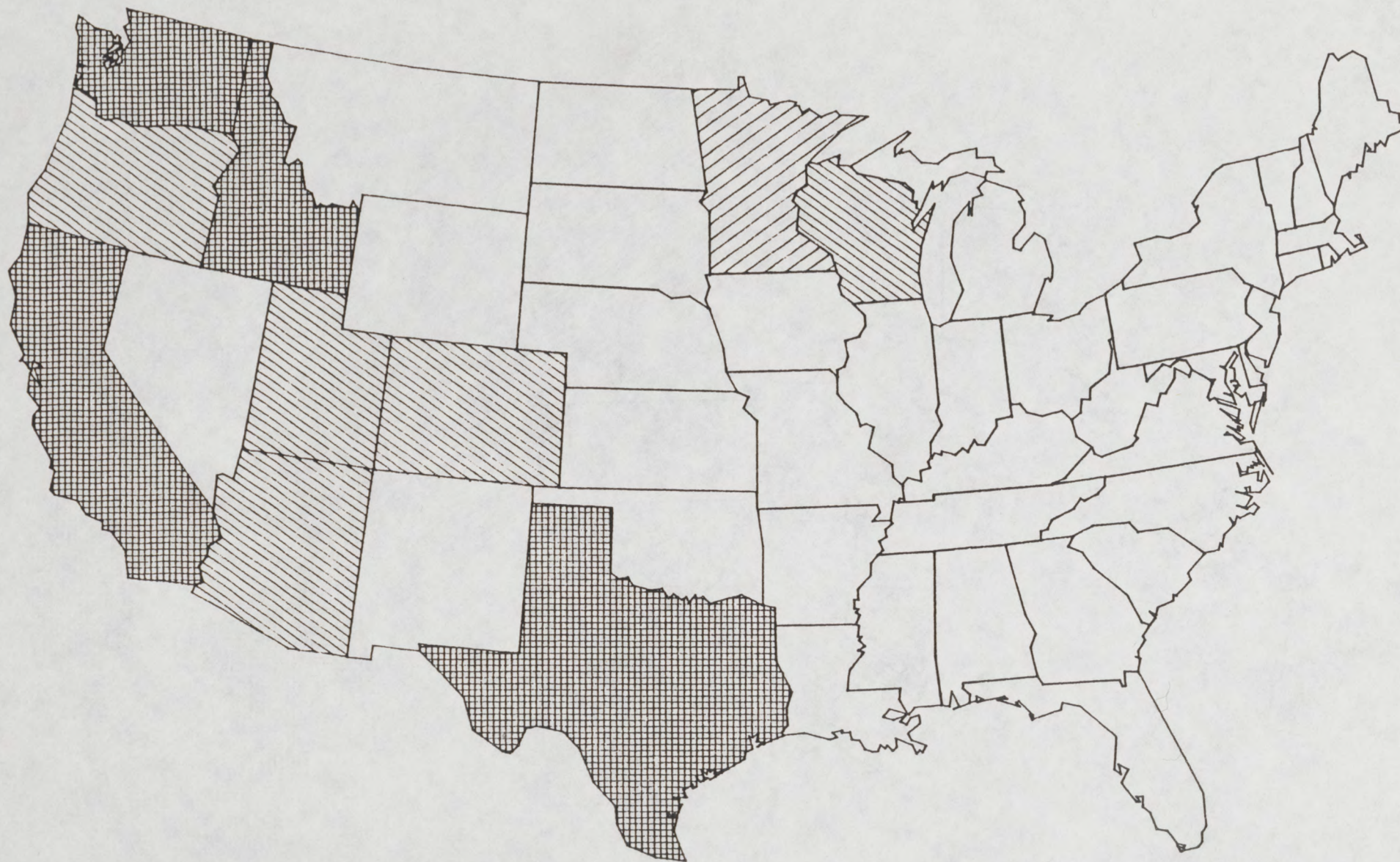


FIGURE 5(D). 2000/U.S. BARLEY FEED USE

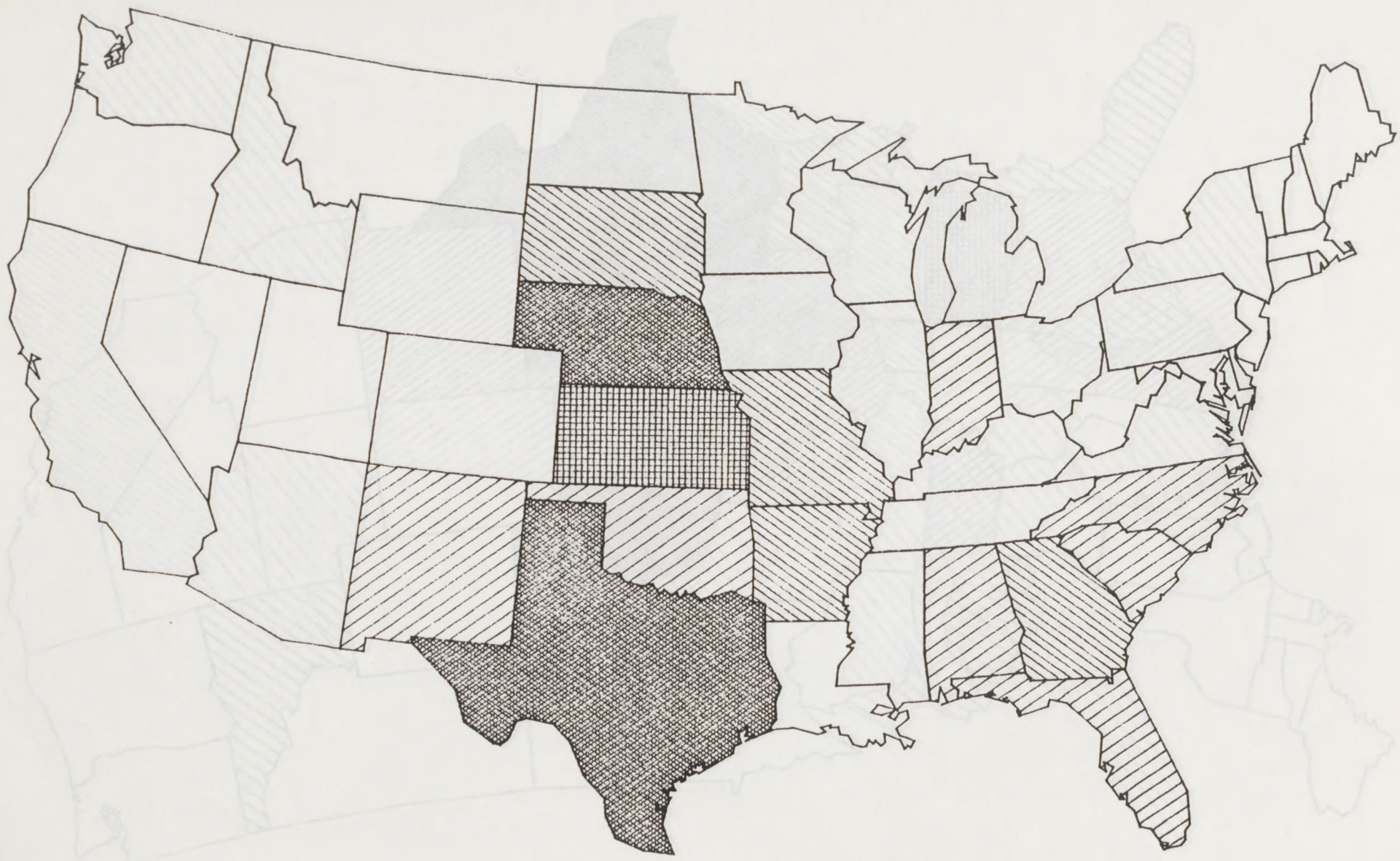


FIGURE 6(C). 1982/U. S. GRAIN SORGHUM FEED USE

FIGURE 6(C) 1985/0.2% GRAIN SORGHUM FEED USE

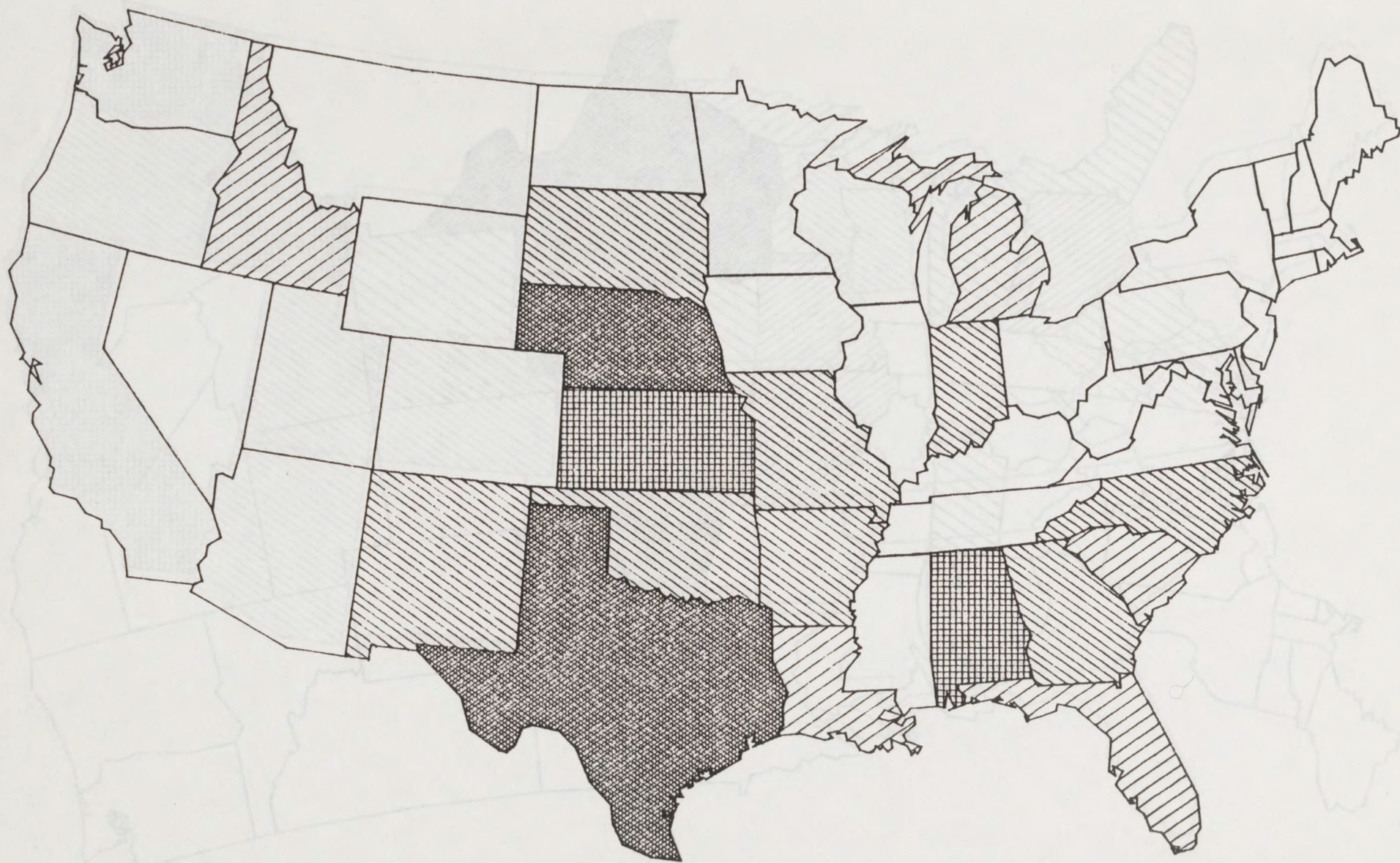


FIGURE 6(D). 2000/U. S. GRAIN SORGHUM FEED USE

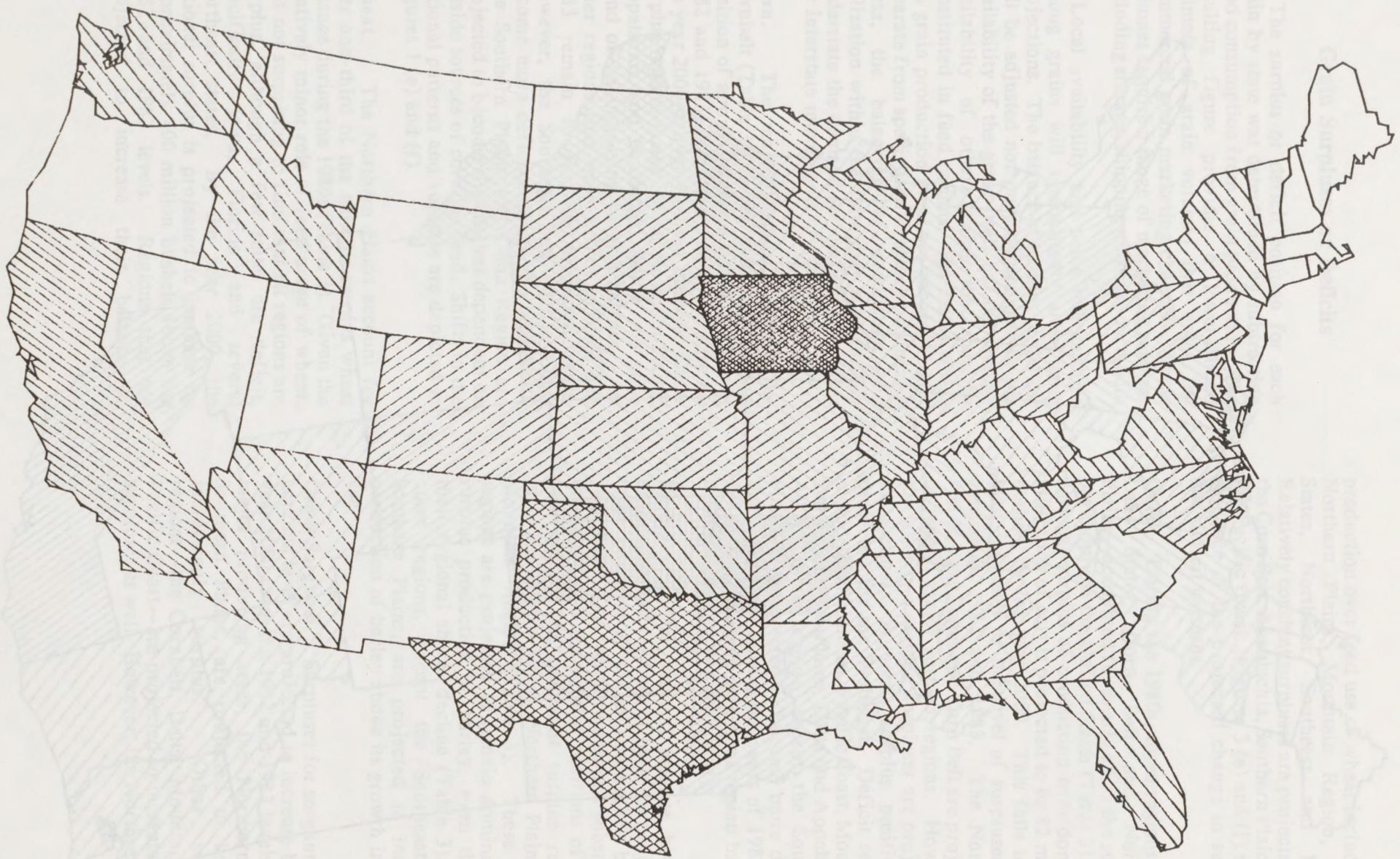


FIGURE 7(A). 1982/U. S. TOTAL GRAIN FEED USE

FIGURE 7(B). 1995/00 2nd TOTAL GRAIN FEED USE

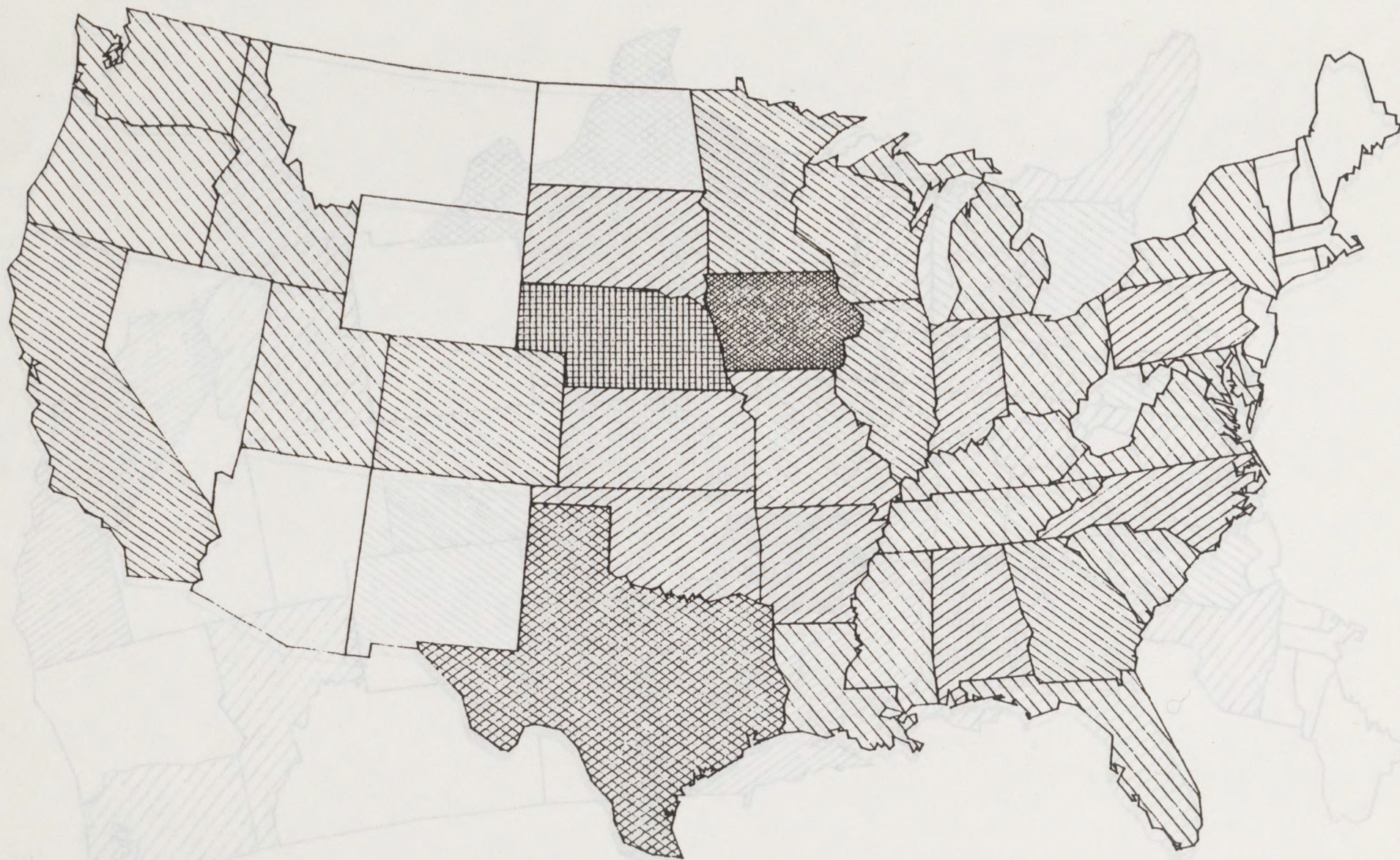


FIGURE 7(B). 2000/U. S. TOTAL GRAIN FEED USE

Grain Surpluses or Deficits

The surplus or deficit position for each grain by state was determined by subtracting feed consumption from grain production. The resulting figure provides a lower-bound estimate of grain volumes that enter the commercial grain marketing channels. These volumes require a range of marketing services including storage, shipping and transportation.

Local availability and price relationships among grains will undoubtedly alter these projections. The balance of surplus or deficit will be adjusted not only by changes in the availability of the grain itself but the relative availability of other grains that can be substituted in feed rations. For states where the grain production areas are geographically separate from specialized livestock production areas, the balancing of production and utilization within the state may substantially understate the demand for marketing services for interstate movements of grain.

Corn. The major surplus region is the Cornbelt (Table 3). From an average surplus position of approximately 3 billion bushels in 1982 and 1983, it is projected to increase by the year 2000 to over 4 billion bushels. Other surplus regions (Lake States, Northern Plains, Appalachia and Northeast) follow the same trend of an increasing surplus balance. All other regions that were deficit in 1982 and 1983 remain so for the projected years. However, the Southeast and Pacific Coast become more deficit through the year 2000. The Southern Plains and Delta Region are projected to become slightly less dependent on outside sources of corn for feed. Shifts in the regional patterns and volumes are depicted in Figures 1 (e) and (f).

Wheat. The Northern Plains account for over one-third of the nation's surplus wheat balance during the 1980s (Table 3). Given the relatively minor role of feed usage of wheat, it is not surprising to find that all regions are surplus, although a few states are deficit, specifically Iowa, Florida and several Northeast states. By the year 2000, the national surplus is projected to increase by approximately 400 million bushels above the 1982 and 1983 levels. Regions that are projected to increase their balance of

production over feed use of wheat include the Northern Plains, Mountain Region, Lake States, Northeast, Southeast and Delta. Relatively constant surpluses are projected for the Corn Belt, Appalachia, Southern Plains and the Pacific Coast. Figures 3 (e) and (f) shows evidence of the projected change in surplus and deficit patterns.

Oats. During the 1980s, three regions--the Lake States, Corn Belt and Northern Plains--accounted for nearly all of the surplus oat supply in the United States (Table 3). The national surplus of production over domestic utilization of oats is projected to be 82 million bushels by the year 2000. This falls to less than one-half of the level of surpluses that existed in 1982 and 1983. The Northern Plains, Lake States and Corn Belt are projected to remain major surplus regions. However, the latter two regions' surpluses are projected to decline. A small surplus position is projected for the Southeast. Deficit regions include the Northeast, Pacific Coast, Mountain States, Southern Plains, Delta and Appalachia. All of these regions, except the Southern Plains, are projected to become more deficit than they were during the years of 1982 and 1983. The changing pattern of region balance is shown in Figures 4 (e) and (f).

Barley. The national balance between production and feed use of barley is projected to be a surplus of 408 million bushels by the year 2000. This would represent a substantial increase above the surplus positions of 1982 and 1983. The dominant surplus regions include the Lake States, Northern Plains and Mountain Region (Table 3). These three regions are projected to remain dominant in surplus production of barley, even though their regional shares decline (Table 3). All other regions, except the Southeast and Southern Plains, are projected to increase production of barley above its growth in feed use.

Grain Sorghum. Surpluses for sorghum at a national level are projected to increase by the year 2000 from the 1982 and 1983 levels. The major producing areas, the Northern and Southern Plains, are projected to become increasingly surplus. Other surplus regions--the Cornbelt, Delta, Mountain and Pacific Coast--are projected to increase their surpluses as well. However, the Northeast and

Table 3. Percent Share of Net U.S. Surplus for Specified Regions¹

REGIONS ^a	1982	1983	1990	2000
CORN				
Northeast	1.3	0.8	1.1	1.6
Lake States	21.3	20.9	24.3	26.5
Corn Belt	73.1	75.4	66.5	61.5
Northern Plains	17.4	15.9	16.9	15.0
Appalachia	2.8	3.2	3.1	3.7
Southeast	-2.4	-2.5	-3.2	-2.1
Delta Area	-3.3	-3.3	-3.2	-2.6
Southern Plains	-7.1	-7.8	-4.9	-4.4
Mountain Region	-1.2	-1.4	0.4	0.9
Pacific Coast	-1.8	-1.2	-1.0	-0.1
WHEAT				
Northeast	0.5	0.4	0.5	0.5
Lake States	7.2	6.0	7.4	8.6
Corn Belt	12.7	8.5	10.8	10.2
Northern Plains	31.4	38.0	35.0	34.4
Appalachia	3.2	2.6	1.8	2.0
Southeast	1.7	1.8	2.0	2.5
Delta Area	3.6	4.6	5.4	6.7
Southern Plains	13.0	13.7	12.6	11.6
Mountain Region	15.1	15.3	14.6	14.0
Pacific Coast	11.6	9.1	9.8	9.4
OATS				
Northeast	-18.2	-12.8	-33.0	-45.1
Lake States	60.2	45.2	66.7	94.2
Corn Belt	31.0	20.0	32.8	36.8
Northern Plains	65.4	74.5	95.3	129.9
Appalachia	-2.4	-2.1	-4.9	-7.1
Southeast	-0.2	0.4	0.0	-4.0
Delta Area	-4.5	-2.8	-6.7	-10.2
Southern Plains	-4.6	-6.9	-2.2	-7.8
Mountain Region	-21.2	-12.5	-40.1	-72.8
Pacific Coast	-5.5	-3.0	-10.9	-22.4
BARLEY				
Northeast	6.5	5.2	5.4	4.9
Lake States	27.6	19.6	18.0	18.6
Corn Belt	-1.1	-0.8	0.9	0.7
Northern Plains	66.3	56.0	52.5	59.7
Appalachia	5.0	3.1	2.4	2.2
Southeast	-4.1	-2.9	-1.6	-1.3
Southern Plains	-11.7	-10.2	-4.8	-5.4
Mountain Region	43.2	50.7	32.5	29.4
Pacific Coast	-31.6	-20.7	-5.3	-8.7
SORGHUM				
Northeast	-0.7	-0.8	-0.7	-0.6
Lake States	-0.8	-0.9	-1.1	-1.1
Corn Belt	9.2	8.8	8.9	10.0
Northern Plains	59.2	51.8	55.5	51.6
Appalachia	-0.8	-1.1	-0.7	-0.1
Southeast	-4.0	-4.1	-6.9	-5.5
Delta Area	0.3	1.5	3.8	5.8
Southern Plains	35.9	43.5	38.1	35.9
Mountain Region	1.2	0.9	2.0	2.7
Pacific Coast	0.6	0.4	1.1	1.3

¹Negative percent share imply deficit positions.
^aRefer to Appendix Tables 13-17 for state estimates within regions.

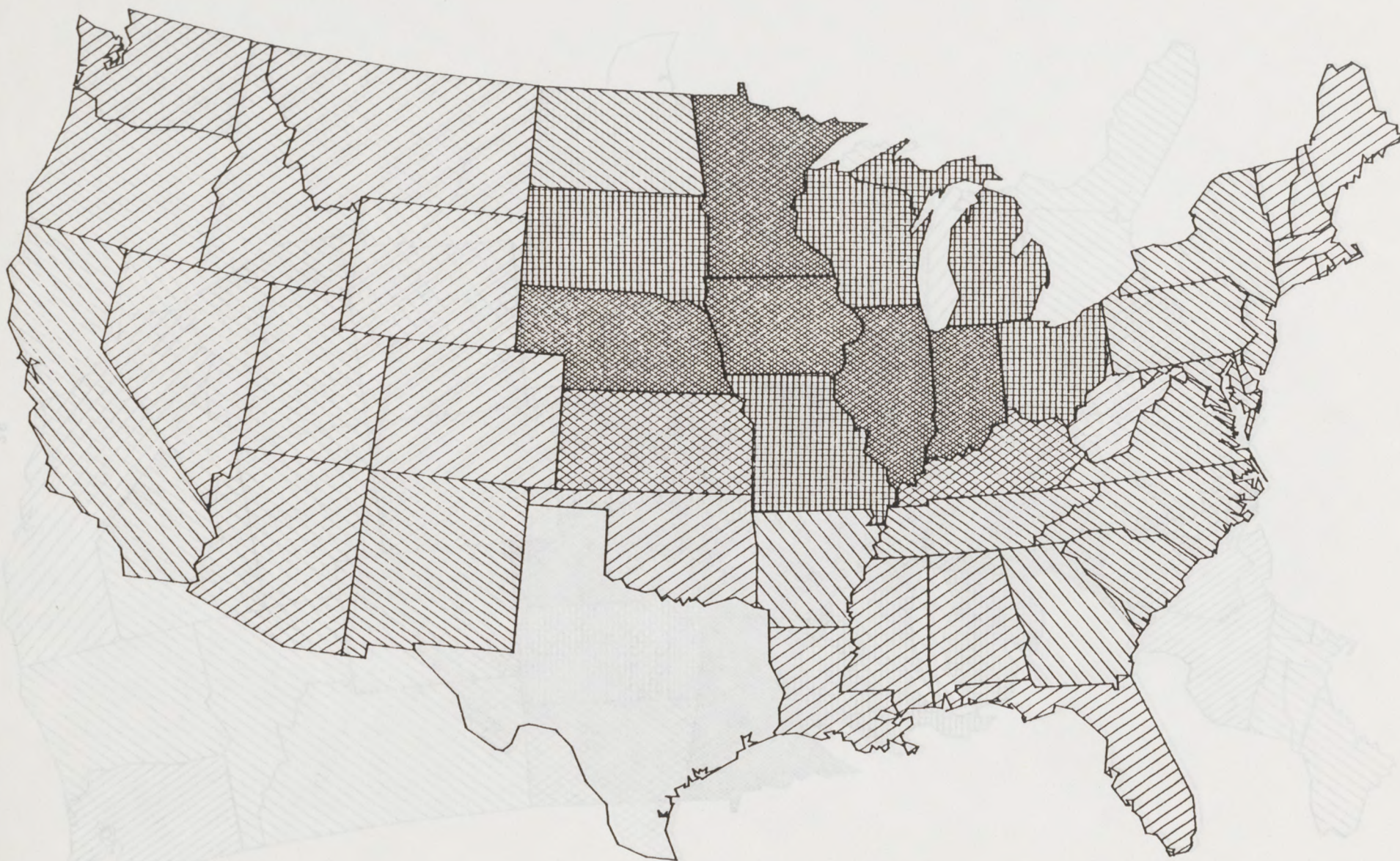


FIGURE 1(E). 1982/U. S. SURPLUS/DEFICIT CORN PRODUCTION

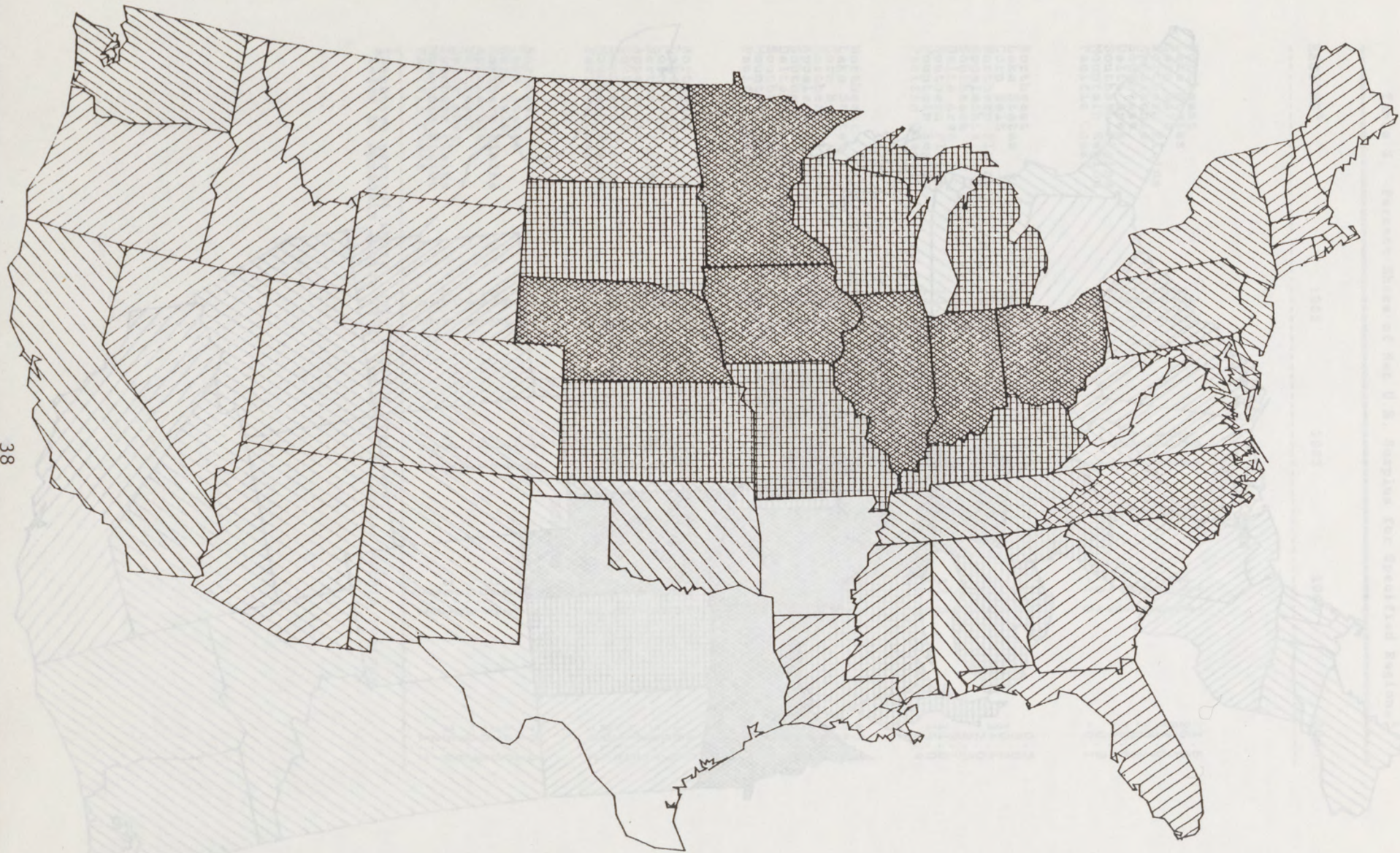


FIGURE 1(F). 2000/U. S. SURPLUS/DEFICIT CORN PRODUCTION

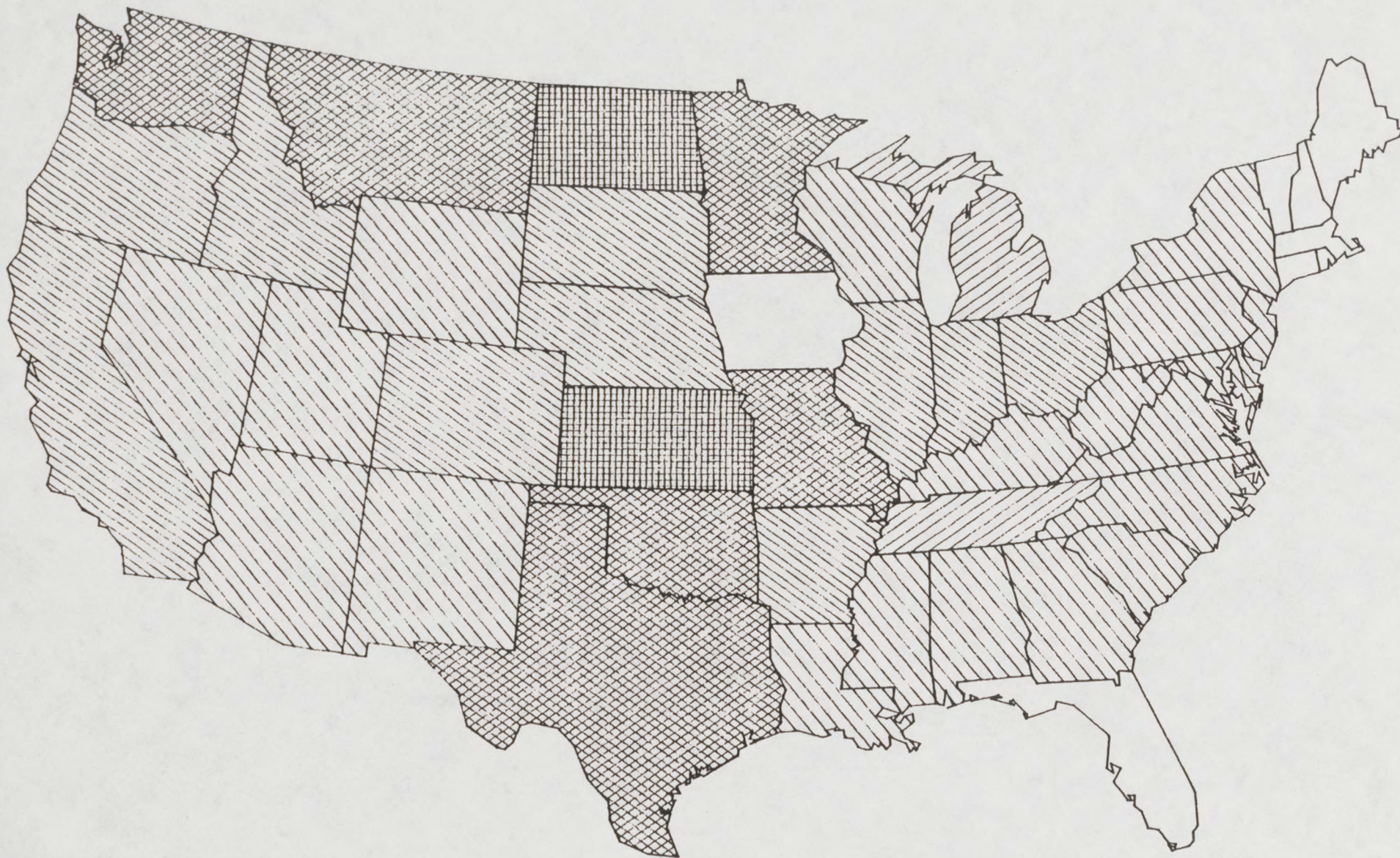


FIGURE 3(E). 1982/U. S. SURPLUS/DEFICIT WHEAT PRODUCTION

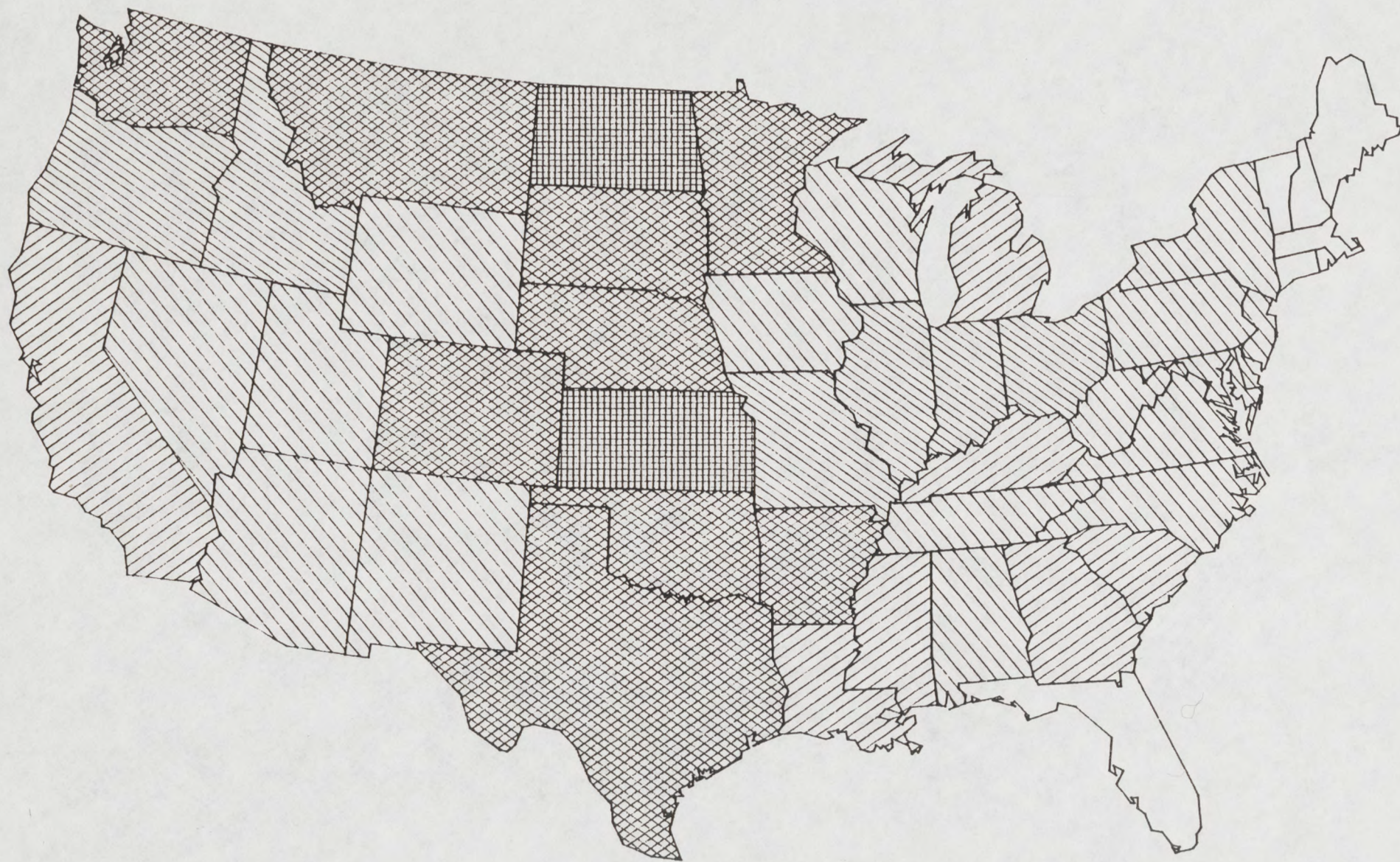


FIGURE 3(F). 2000/U. S. SURPLUS/DEFICIT WHEAT PRODUCTION

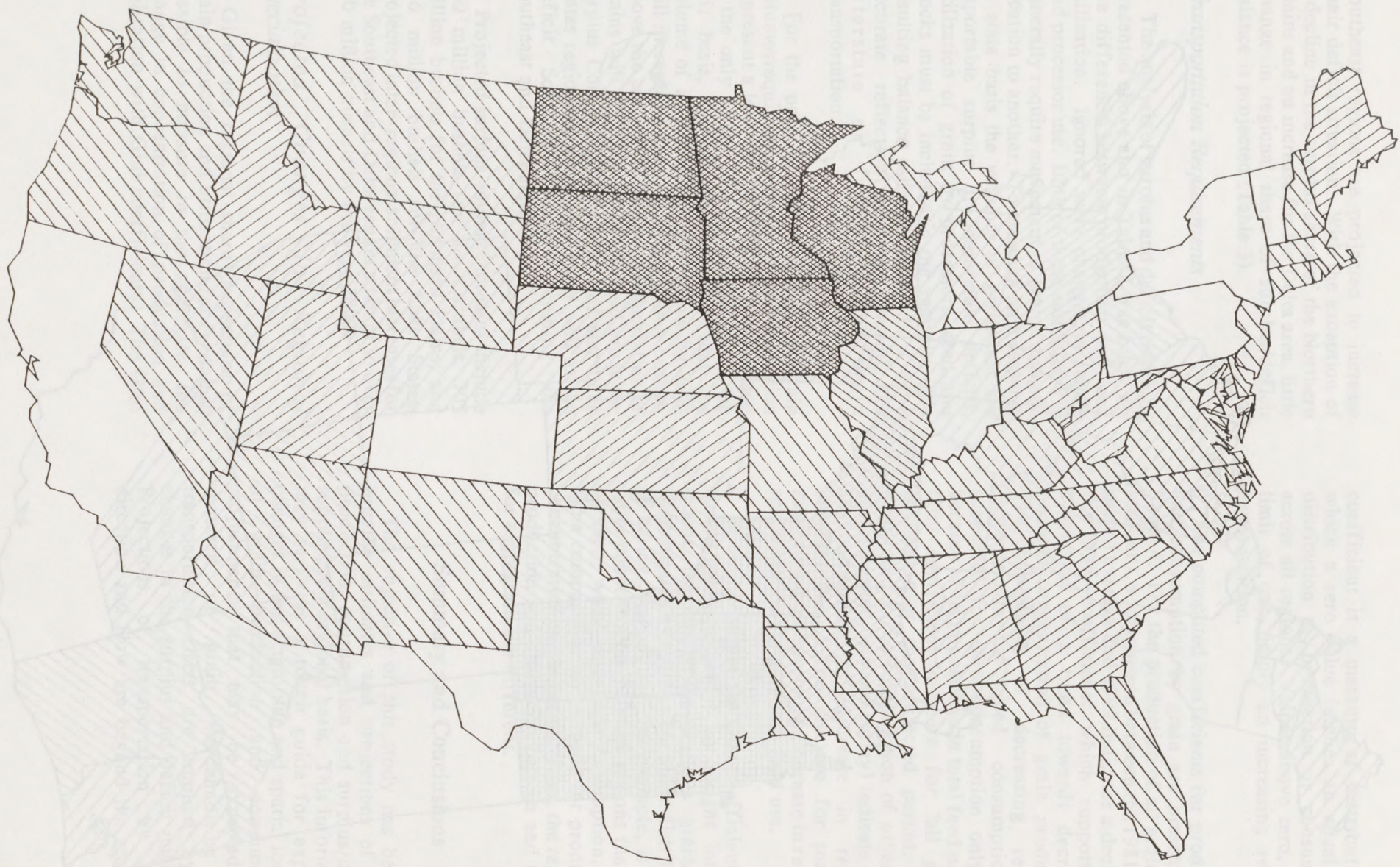


FIGURE 4(E). 1982/U. S. SURPLUS/DEFICIT OAT PRODUCTION

FIGURE 4(F). 2000 / U. S. SURPLUS / DEFICIT OAT PRODUCTION

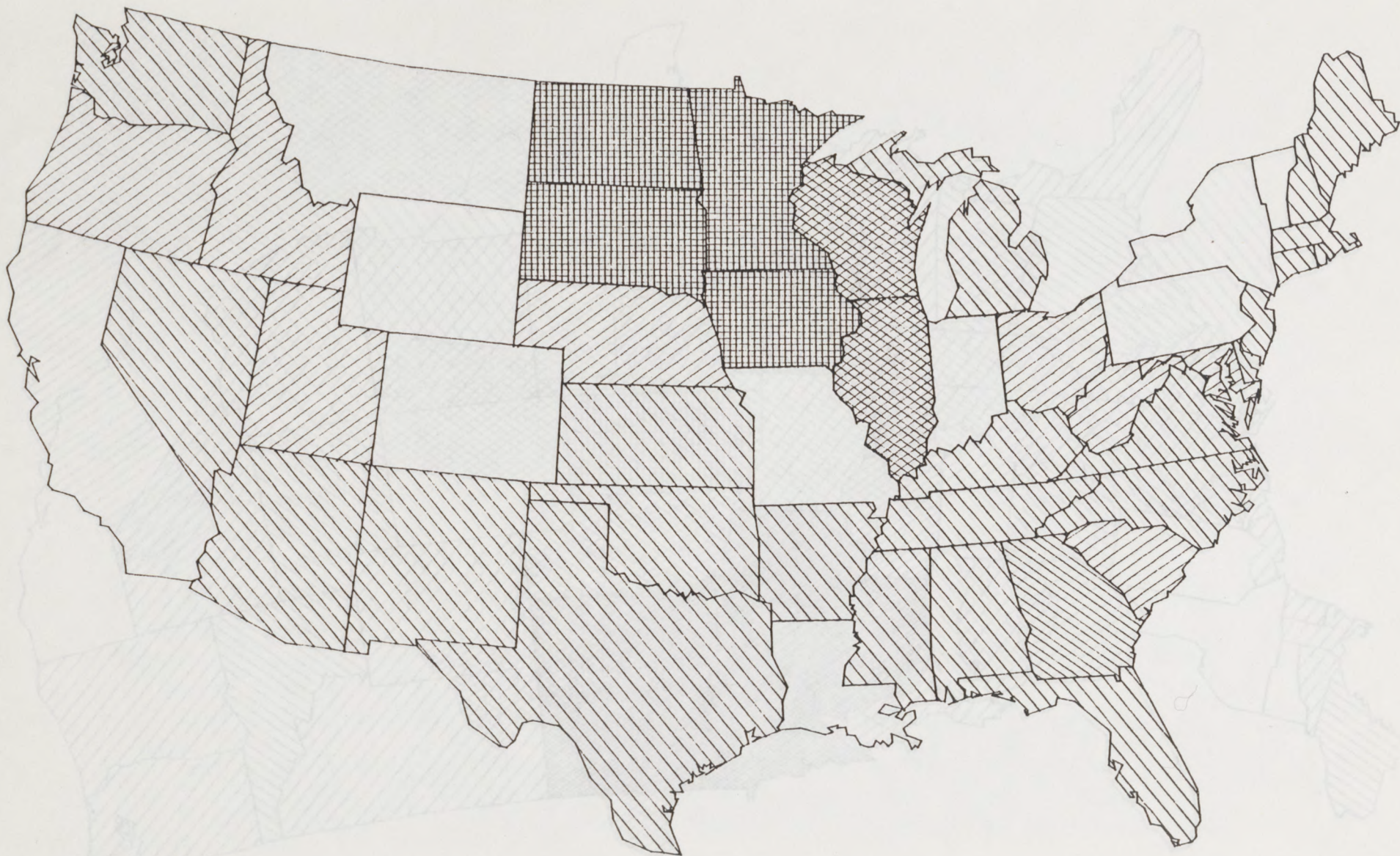


FIGURE 4(F). 2000 / U. S. SURPLUS / DEFICIT OAT PRODUCTION

Southeast regions are projected to increase their deficit situation. With the exception of a decline in the surplus share of the Northern Plains and an increase for the Delta area, little change in regional share of surplus/deficit balance is projected (Table 3).

Transportation Requirements

The analysis of surplus and deficit positions presented above and in Table 3 was based on the difference between production and feed utilization. Ignored were changes in stocks and processor use. Both of these activities will generally require movement of grain from one location to another. To estimate on a regional or state basis the volumes of grain that are exportable surplus or importable deficits, utilization of grain by processors, seed and stocks must be included in the analysis. The resulting balance estimate would be a more accurate reflection of the demand for interstate or inter-regional grain transportation.

For the present study, estimates of grain volumes requiring inter-regional transportation represent a lower bound since feed utilization is the only source of demand included. On this basis, the projections imply that the volume of inter-regional grain flow by 2000 will increase by more than 2.5 billion bushels above the early 1980 levels. Transportation of grains will continue to be directed from the surplus Cornbelt, Northern Plains and Lake States regions to export points as well as the deficit Southern regions including the Southeast and Delta states.

Projected surplus volume increases include 950 million bushels for the Cornbelt, 705 million bushels for the Northern Plains, and 416 million bushels for the Lake States. Projected inter-regional shipment increases for the Southeast and Delta region amount to over 200 million bushels by the year 2000.

Projected Changes in Regional Specialization

Given the regional share projections of grain production and utilization for feed, it is possible to measure in the aggregate, the change in concentration of production and utilization with Gini coefficients. The Gini

coefficient is a measure of distribution in which a zero value implies an equal share distribution of production or consumption across all regions. Values above zero, to the limit of one, imply an increasing regional concentration.

The computed coefficients for production and consumption by grain are presented in Table 4. For the production of all grains and soybeans, a comparison between the 1981-1983 period average and 1999 indicates a decline in the Gini coefficients which supports the conclusion of a trend towards decreasing regional concentration of grain production. The conclusion of decreasing regional concentration of feed consumption is supported for corn consumption only, but because of its importance in total feed use, the Gini coefficient measure for "all grains" declines over the projected period. The measures for the consumption of other feed grains (wheat, oats and barley) indicate only a slight increase or decrease in regional concentration. The measure for sorghum suggests a more substantial increase in regional specialization for sorghum feed use.

A comparison of the Gini coefficient level across grains provides an insight into the extent to which the various grains are concentrated by region. The share distribution of barley consumption, for example, is much more concentrated in fewer regions than that of corn, wheat and oats consumption. The same comparison can be made for production concentration across grains. Thus, the regional production and utilization pattern and trends for each grain are different.

Summary and Conclusions

The objective of this study has been to provide estimates and projections of grain production, consumption and surplus/deficit supplies on a regional basis. This information may serve as a rough guide for expected changes in the magnitude and spatial location of grain production and consumption. Adjustments that may be expected and required of grain merchandising and transportation firms are implied by the changes in the surplus and deficit positions. Projections of transportation by mode, direction and flow are beyond the scope of

Table 4. Gini Coefficient Measures of Regional Concentration
of Grain Production and Consumption

Grain	Production					
	1981-83	1981	1982	1983	989	1999
Corn	.690	.699	.704	.647	.680	.670
Soybeans	.653	.659	.647	.669	.636	.630
Wheat	.472	.434	.483	.496	.451	.433
Oats	.601	.594	.629	.590	.578	.567
Barley	.665	.650	.671	.676	.637	.645
Sorghum	.720	.740	.418	.686	.707	.699
	Consumption					
	1981	1982	1983	1990	2000	
Corn	.426	.413	.422	.411	.391	
Wheat	.353	.353	.348	.354	.359	
Oats	.375	.371	.375	.371	.371	
Barley	.718	.720	.718	.720	.729	
Sorghum	.537	.547	.547	.533	.566	
All Grains	.340	.330	.338	.323	.314	

this study. Descriptions of flows by mode of transport, firm type and other structural data are presented in other S-176 publications.

The results of this study update a previous publication on production and feed consumption by Lazarus, Hill and Thompson. Findings reported in this publication are generally consistent with the earlier bulletin. A significant difference is that the projections of this updated analysis imply a decline in the regional specialization of crops and livestock production. Summary measures based on Gini coefficients were presented as evidence on this conclusion.

Corn production is projected to increase 3% by 1989 and 31% by 1999 above the early 1980's level. Feed use of corn is projected to remain at a similar level by 1990 and increase by 12% by 2000 above the average of the consumption levels 1981-83. Consequently, surplus corn production is projected to increase only 6% by 1990 and 50% by 2000. Although production patterns are not projected to change significantly from the present, an increased concentration of feed use in the Northern Plains, Delta, Mountain Region and Pacific Coast is projected. Most of the growth in surplus production is projected for the Corn Belt, Lake States and Northern Plains.

Projected soybean production decreases by 10% by 1989 and increases by 13% by 1999 relative to levels of 1981-82. No projections of soybean utilization were made in this study.

Wheat production is projected to decrease 7% below the early 1980s level by 1989 and increase 14% by 1999. Feed use of wheat is projected to remain approximately at the early 1980s level for the projected years. Major growth in surplus production is in the Northern Plains and Delta Region, consistent with the projected growth in production.

Oat production is projected to decrease 16% by 1989 and 14% by 1999 below the levels of the early 1980s. The major area for reduced production is projected for the Northern Plains. Consumption is projected to follow the decline in production. Projected levels are lower 30% by 1990 and 24% by 2000. These trends are projected for all regions except the Pacific Coast and Mountain Region. With

declines in both production and consumption, surplus production is projected to remain at levels similar to the early 1980s.

Projections of barley production indicate increases above levels of the early 1980's of 46% by 1989 and 54% by 1999. The bulk of this expansion is in the traditional production areas of the Northern Plains, Mountain and Pacific Coast states. Feed use of barley is projected to decline. Utilization levels are 45% lower by 1990 and 36% lower by 2000. The projected expansion of production and decrease in feed use leads to projected increases of surplus production of approximately 182% by 1990 and 2000.

Sorghum production is projected to increase 5% by 1989 and 30% by 1999. The Northern and Southern Plains states account for most of this expansion, although their share of national production is projected to decline from 92% in the early 1980's to 76% by 1999. Consumption projections are 73% higher than 1982-83 levels by 1990 and 120% higher by 2000. These substantial increases in feed use relative to production lead to projected decreases in surplus production of 31% by 1990 and 17% by 2000.

Total feed use, including corn, wheat, sorghum, oats and barley is projected to increase from the 1981-1983 period by 4% in 1990 and 21% in 2000. On a regional basis, livestock production is projected to follow a trend of increased specialization in the Northern Plains, Mountain Region and Pacific Coast states. In the Corn Belt feed use is projected to decline, and in all other regions feed use and livestock production increases only slightly.

The regional concentration of grain production is projected to decline. For each grain, the share of national production by the leading production region declines over the projected years. Decreased regional concentration in feed use, reflected in a shift to western regions and decreased concentration of grain production, suggests increases in demand for transportation and marketing facilities.

The state projections provided in this study were based on trends in grain and livestock production from 1972 to 1983. The volatile

international grain markets as well as substantial governmental intervention characteristic of this period are unlikely to diminish in importance in determining the future volumes and location of U.S. grain and livestock production. With additional knowledge about these and other aspects, the projection estimates provided can be revised.

The balancing of production and consumption of grains in the United States is a major economic activity. It requires the physical movement and financial transactions for over 14 billion bushels of grains and soybeans produced annually. This activity is projected to expand to accommodate over 18 billion bushels by the year 2000. To do so, regional shifts in location and magnitude of production and consumption will require expansion and adjustment in the grainmarketing industries.

References

Lazarus, Sheryl S., Lowell D. Hill and Stanley R. Thompson. "Grain Production and Consumption for Feed in the North Central and Southern States with Projections for 1985, 1990, and 2000." Southern Cooperative Series Bulletin 245, North Central Regional Research Publication 267. University of Illinois, November 1980.

Wailes, Eric J. and Joseph E. Vercimak. "Grain Production and Utilization in the United States with Projections for 1990 and 2000." North Central Regional Publication 317, Southern Cooperative Series Bulletin 333. University of Arkansas, January, 1989.